

# Impact of a School Health Coordinator Intervention on Health-Related School Policies and Student Behavior

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## ABSTRACT

**BACKGROUND:** Health-related, school-based interventions may serve to prevent disease and improve academic performance. The Healthy Maine Partnerships (HMP) initiative funded local school health coordinators (SHCs) as a part of Maine's Coordinated School Health Program (CSHP) beginning in January 2001. SHCs established school health leadership teams and implemented annual work plans to address health risk behaviors. This study evaluates the impact of the Healthy Maine Partnerships SHC (HMPSHC) intervention on school policies and student risk behaviors after its first 5 years.

**METHODS:** Data sources include the Maine School Health Profiles Survey and the Maine Youth Drug and Alcohol Use Survey/Youth Tobacco Survey. Cross-sectional analyses were performed on 2006 data to assess physical activity, nutrition, and tobacco-related policy associations with the HMPSHC intervention. Finally, policy and student behavior analyses were conducted to assess associations.

**RESULTS:** Intervention schools were more likely to be associated with physical activity intramural offerings, improved nutritional offerings, and tobacco cessation programs. In intervention schools, supportive school policies were associated with decreased soda consumption, decreased inactivity, and decreased tobacco use. Required school health education curricula were more predictive of decreased risk behavior in intervention schools than in nonintervention schools.

**CONCLUSIONS:** In schools with SHCs, there exists a stronger association with improved school programs. Improved policies and programs were associated with decreases in risk behavior among students in intervention schools. The HMPSHC intervention may be a viable CSHP model to replicate and evaluate in other settings.

**Keywords:** policy; school health instruction; risk factors; physical fitness and sport; nutrition and diet; smoking and tobacco.

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## INTRODUCTION

### Literature Review

Behavioral risk factors are linked to the leading causes of death in the United States. Poor diet and physical inactivity are the primary risk factors for childhood obesity. The prevalence of childhood overweight is increasing rapidly in the United States, and now affects at least 16% of children and adolescents,<sup>1</sup> with even higher rates among subpopulations of minority, economically disadvantaged,<sup>2,3</sup> and rural children.<sup>4</sup> Overweight is associated with significant health problems in this age group and is an important early risk factor for much of adult morbidity and mortality. The rapid increase in the prevalence of childhood and adolescent overweight portends an increase in associated chronic disease. An estimated 60% of overweight 5-10-year-olds already have 1 associated cardiovascular disease risk factor, or hyperinsulinemia, and over 20% have 2 or more.<sup>5</sup> The incidence of type 2 diabetes, until recently thought to be almost exclusively adult onset, has dramatically increased among youth.<sup>6</sup> Overweight and sedentary children and adolescents are also more likely than their peers to have adverse lipid levels, hypertension, as well as orthopedic problems and social stigmatization.<sup>7</sup> Annual deaths attributable to cigarette smoking exceed all other behavioral risks in the United States.<sup>8</sup>

Prevention and control of these behavioral risks can reduce morbidity and mortality in the US population substantially.<sup>9</sup> For example, inactivity, poor nutrition, and tobacco use contribute to 35% of all deaths in Maine where almost half of students in grades 7 through 12 do not get the recommended amount of vigorous physical activity.<sup>10</sup> Sixty-one percent of these students watch 2 or more hours of television (TV) daily, contributing to the highest rate of obesity among children in New England.<sup>11</sup> Only 36% of Maine high school students report attending physical education class on at least 1 day per week and only 19% in grades 9 through 12 consume the recommended 5 servings of fruits and vegetables per day. Half of middle and high school students drink 2 or more 12-ounce cans of soda per week. Over 16% of Maine high school students smoke<sup>12</sup> and 2400 children under 18 years old become new daily smokers each year in Maine.<sup>13</sup> It is estimated that 29,200 Maine children currently under 18 will ultimately die prematurely from smoking.<sup>13</sup>

A combination of barriers to reducing chronic disease exists in Maine, including rural demography,

low socioeconomic status (SES), and sparse infrastructure limiting physical activity opportunities and the availability of healthy food options. These barriers combined with the aforementioned risk factors demand intervention strategies that are broad-based and multifaceted and involve multiple ecological intervention points including policy and environmental interventions.<sup>14</sup>

There is a large body of evidence linking policy and environmental change to desired behavior.<sup>15</sup> For example, policy changes such as mandatory seat belt laws have achieved broad-based behavioral change (seat belt use) resulting in the significant reduction of morbidity, mortality, and associated costs.<sup>16,17</sup> School-based policy and environmental interventions have the advantage of building on existing infrastructure to impact large numbers of children and adolescents statewide. Schools offer an ideal setting to impact students; indeed, a coordinated approach to school health is the ecological model applied in the school setting.<sup>18</sup> By caring for students each day, schools, by definition, play a role in student health. Additionally, research increasingly demonstrates a link between student-level health indicators and academic performance.<sup>19-21</sup>

The literature provides mounting evidence that school policies and environments can influence student behaviors. Studies have shown that food advertising affects children's food choices, food purchase requests, diets and health,<sup>22</sup> and labeling and signage on school campuses affect students' food selections at school.<sup>23</sup> Two studies that have explored the school food environment's impact on behavior demonstrated policies decreasing access to foods high in fats and sugars as well as policies enforcing a closed campus during lunch and limited vending hours were associated with less frequent purchase of these items by students.<sup>24,25</sup> Another study found that by reducing the prices of healthy options in vending machines, students could be influenced to choose unhealthy options less frequently.<sup>26</sup> Yet, another study demonstrated little, if any, student behavior change after implementation of a vending policy change in elementary schools, suggesting that school food environments are only 1 piece in a complex student food environment.<sup>27</sup> As of 2005, 19 states had implemented policies restricting school sales of competitive foods and beverages, and banning or limiting the sale of vending machine items.<sup>28</sup> It is important to determine the best way to use such policies to enact positive changes in student behaviors.

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There is also growing evidence suggesting that multifaceted and schoolwide consistent approaches, which include school policy and curriculum, can have an impact on student physical activity, dietary behaviors, and tobacco use.<sup>29,30</sup> For example, the Child and Adolescent Trial for Cardiovascular Health (CATCH) intervention's multifaceted approach including school food service modifications, enhanced physical education, and classroom health curricula was able to modify the fat content of school lunches, increase moderate-to-vigorous physical activity in physical education, and improve eating and physical activity behaviors in children during 3 school years.<sup>31</sup> Multifaceted smoking prevention programs, those designed with input based on extensive formative research, including studies with youth, directed at multiple levels of the social ecology, and sustained over time with significant resources and ongoing, multisector inputs may be the most effective in preventing youth smoking behavior.<sup>32,33</sup> Indeed, the Coordinated School Health Program (CSHP) model embraces a comprehensive approach focusing both on child-youth attitudes and behaviors, as well as their environment.<sup>34</sup>

### **Purpose**

**Intervention.** In January 2001, the Maine Centers for Disease Control and Prevention established Healthy Maine Partnerships (HMP)—a network of school and community partnerships. This network is statewide with every part of Maine belonging to an HMP. The 31 partnerships were funded by Maine's portion of the Tobacco Settlement to improve local community and school policies and environments related to physical activity, nutrition, and tobacco use. Maine has 653 public schools—416 of which have at least 1 of any grade 6 through 12. Every school in Maine falls under an HMP and the number of schools in an HMP varies between 3 and 12. Some (but not all) HMPs chose to hire at least 1 school health coordinator (SHC) and to place the SHC in whichever schools they deemed best. This placement may be based on previous relationships, previous work with schools, and/or convenience (eg, HMPs may have chosen to form a relationship with a school close in proximity to the HMP administrative office). An SHC rarely works in more than 2 or 3 schools. The SHCs report to the school superintendent, serve as members of the school administrative team, organize and facilitate school health leadership teams, and coordinate the implementation of an annual work plan focused on physical activity, nutrition, and tobacco use. SHCs have limited funding but collaborate with statewide entities such as the Maine-Harvard Prevention Research Center and the Maine Centers for Disease Control and Prevention's physical activity, nutrition, and tobacco programs to help implement best practices and obtain materials for their work.

The work of the SHC is to implement a comprehensive and coordinated approach to health issues in schools, using the coordinated school health 8-component model that has been adapted from the US Centers for Disease Control and Prevention.<sup>35</sup> The 8 components are (1) comprehensive school health education, (2) physical education and physical activity, (3) school nutrition and food services, (4) health promotion and wellness, (5) school counseling, physical and behavioral health services, (6) school climate, (7) physical environment, and (8) youth, parent, family, and community involvement. Although these components are listed separately, it is their composite that allows an SHC to have a significant impact. These components cover 3 key public health domains: education, policy and environmental change, and health services. The SHCs participate in a wide variety of activities such as writing grants, convening school wellness councils, coordinating fund-raising activities for school health, and making educational presentations to school boards.

Given recent interest in school policy and environmental change to support healthy student lifestyles, improved academic performance, and ultimately the reduction of chronic disease, it is imperative that we study existing models to ascertain their effectiveness and, if successful, advocate for their more widespread adoption. We evaluated the impact of the Healthy Maine Partnerships SHC (HMPSHC) intervention on school policies/environment, health education, and student risk behaviors. Henceforth, the intervention will be called the HMPSHC intervention and will be defined as schools that have an SHC assigned to them.

### **Research Questions**

The evaluation of the HMPSHC intervention sought to answer the following research questions:

1. Were more physical activity, nutrition, and tobacco-related school policies and programs associated with intervention schools than with nonintervention schools in 2006?
2. Were school policies and programs associated with lower student risk behavior in intervention schools than in nonintervention schools in 2006?

### **METHODS**

#### **Subjects**

The unit of analysis was at the school level for research question 1 and at the student level for research question 2. Analyses used data collected from 80,428 students in 328 schools across the state of Maine. There were 123 intervention schools and 205 nonintervention schools. Intervention schools are defined as middle or high schools with students in

grades 6 through 12. Intervention schools are affiliated with school administrative units (which may be thought of as school districts) that employ an SHC at least 20 hours per week. Nonintervention schools are all other middle or high schools with students in grades 6 through 12 in Maine that do not have an SHC, but that took part in the Maine School Health Profiles Survey and the Maine Youth Drug and Alcohol Survey (MYDAS)/Youth Tobacco Survey in those years. The intervention status of schools included in this study in 2006 was consistent since the inception of the HMPSHC program began in 2001.

### Instruments

The Maine School Health Profiles Survey (MEProfiles) is a biennial survey that is administered in even-numbered years by the Maine Department of Education to school principals and lead health education teachers in public schools that have any grade 6 through 12. This survey is divided into 2 pieces: the “principal” survey that asks about schoolwide policies and programs but not about topics covered in a required health education course, and the “lead health educator” survey which asks about components of the required health education course. The principal and lead health educator, respectively, fill out the surveys separately. The MEProfiles instrument is similar to the School Health Policies and Programs Study (SHPPS), which was found to be generally valid and reliable.<sup>36</sup> Although there is no specific validity or reliability information on the MEProfiles survey, the questions are very similar to the SHPPS, with those that match exactly having good psychometric properties.

The MYDAUS is a biennial survey administered in even-numbered years by the Maine Office of Substance Abuse to public school students in grades 6 through 12. Although any public school may opt to participate in the survey, the Maine Office of Substance Abuse randomly selects a sample of public schools from which to solicit information. In 2006, 68% of all eligible Maine students completed this survey. Use of this survey provides the opportunity to link student behavior to schools and school policy profile data. Limited psychometric information on the MYDAUS is available via a recent publication<sup>37</sup> which indicates that the questions have a high sensitivity, and the 3 MYDAUS questions we selected for analysis are straightforward in presentation and likely to provide valid results.

### Procedure

This study is a natural experiment of the HMPSHC intervention begun in 2001 and was evaluated through secondary data analysis on data collected 5 years after its inception. Three data sources were used in the analyses: the 2006 MYDAUS, the 2006 MEProfiles,

and a data set containing information on free and reduced lunch participation by school which was obtained from the Maine Department of Education. We used free/reduced lunch eligibility as a proxy for SES, which was used to adjust analyses. For analyses looking at the associations between school policies and student behaviors, the MYDAUS and MEProfiles surveys were merged together.

### Data Analysis

We address the data analysis and statistical methodology used to explore each of the research questions below. All analyses were done using Stata 10.<sup>38</sup>

The association of intervention status and presence of physical activity, nutrition, and tobacco policies/programs was done via cross-sectional analyses of the MEProfiles instruments (both the principal and lead health educator components) in 2006 (research question 1). All relevant physical activity, nutrition, and tobacco questions were selected (see Table 1, which indicates which of these 3 areas each of these questions addresses).

The analyses carried out for the cross-sectional analyses assessing the differences in policy used logistic regression modeling where presence/absence of the policy/program was the response variable. An indicator of school intervention status and the free and reduced lunch participation proxy for SES were included in the model as possible predictors along with their interaction.

To analyze the associations between school policies and student behaviors (research question 2), student behavior outcomes from the MYDAUS surveys were used. Three MYDAUS questions were used—1 from each of the areas of physical activity, nutrition, and tobacco use. The MYDAUS survey has a single question each related to physical activity and nutrition, but many referring to tobacco. The question addressing physical inactivity asked, “On an average day, how many hours do you watch TV?” There were 6 response categories ranging from “I do not watch TV” to “5 or more hours a day.” We dichotomized responses into “Less than 2 hours per day” and “2 or more hours per day.” This corresponds to the maximum recommended amount of TV viewing from the Smart Parent’s Guide to Kids’ TV published by the American Academy of Pediatrics.<sup>39</sup> The nutrition question asked, “How often do you drink soda (1 can or glass)?” There were 6 possible response categories ranging from “Never” to “2 or more cans per day.” Responses were dichotomized into “Less than 2 cans per week” and “2 or more cans per week.” The selected question related to tobacco use asked, “During the last 30 days, how many days have you smoked cigarettes?” This question was dichotomized as having smoked “none” versus “1 or more”. The tobacco question was chosen

Table 1. MEProfiles Policy/Program Questions Analyzed\*

MEProfiles Question		Nonintervention Schools		Intervention Schools		p <sup>†</sup>
		Yes	No	Yes	No	
Is physical education required for students in any of grades 6 through 12 in this school?	Physical activity	170 (98.3%)	3 (1.7%)	104 (100%)	0 (0%)	.294
Does this school offer opportunities for students to participate in intramural activities or physical activity clubs?	Physical activity	135 (78.0%)	38 (22.0%)	93 (89.4%)	11 (10.6%)	.022
Outside of school hours or when school is not in session, do children or adolescents use any of this school's physical activity or athletic facilities for community-sponsored sports teams, classes, or lessons?	Physical activity	169 (97.7%)	4 (2.3%)	102 (98.1%)	2 (1.9%)	.056
During this school year, have teachers in this school tried to increase student knowledge on physical activity and fitness in a required health education course in any of grades 6 through 12?	Physical activity	129 (99.2%)	1 (0.8%)	83 (98.8%)	1 (1.2%)	1.000
During this school year, did teachers in this school teach how to overcome barriers to physical activity in a required health education course for students in any of grades 6 through 12?	Physical activity	88 (65.7%)	46 (34.3%)	62 (69.7%)	27 (30.3%)	.563
During this school year, did teachers in this school teach how to decrease sedentary activities such as TV watching in a required health education course for students in any of grades 6 through 12?	Physical activity	107 (81.1%)	25 (18.2%)	73 (84.9%)	13 (15.1%)	.584
How long do students usually have to eat lunch once they are seated? Yes is more than 20 minutes, no is less.	Nutrition	56 (32.8%)	115 (67.2%)	33 (31.7%)	71 (68.3%)	.895
Has this school adopted a policy stating that, if food is served at student parties, after-school or extended day programs, or concession stands, fruits or vegetables will be among the foods offered?	Nutrition	48 (27.8%)	125 (72.2%)	50 (48.5%)	53 (51.5%)	.001
Can students purchase snack foods or beverages from one or more vending machines at the school or at a school store, canteen, or snack bar?	Nutrition	130 (75.1)	43 (24.9%)	87 (83.7%)	17 (16.3%)	.100
Can students purchase soda pop or fruit drinks that are not 100% juice from vending machines or at the school store, canteen, or snack bar?	Nutrition	106 (82.8%)	22 (17.2%)	70 (80.5%)	17 (19.5%)	.720
Can students purchase candy; snacks that are not low in fat; soda pop, sports drinks, or fruit drinks that are not 100% juice; or 2% or whole milk before classes begin in the morning?	Nutrition	40 (31.0%)	89 (69%)	20 (23.0%)	67 (77.0%)	.218
Can students purchase candy; snacks that are not low in fat; soda pop, sports drinks, or fruit drinks that are not 100% juice; or 2% or whole milk during any school hours when meals are not being served?	Nutrition	27 (20.9%)	102 (79.1%)	9 (10.3%)	78 (89.7%)	.043
Can students purchase candy; snacks that are not low in fat; soda pop, sports drinks, or fruit drinks that are not 100% juice; or 2% or whole milk during school lunch periods?	Nutrition	37 (28.7%)	92 (71.3%)	15 (17.2%)	72 (82.8%)	.074
During this school year, have teachers in this school tried to increase student knowledge on nutrition and dietary behavior in a required health education course in any of grades 6 through 12?	Nutrition	132 (99.3%)	1 (0.7%)	90 (100%)	0 (0%)	1.000
During this school year, did teachers in this school teach the benefits of healthy eating in a required health education course for students in any of grades 6 through 12?	Nutrition	131 (98.5%)	2 (1.5%)	88 (97.8%)	2 (2.2%)	1.000
During this school year, did teachers in this school teach food guidance using MyPyramid in a required health education course for students in any of grades 6 through 12?	Nutrition	116 (84.1%)	22 (15.9%)	78 (78.0%)	22 (22.0%)	.705
During this school year, did teachers in this school teach how to use food labels in a required health education course for students in any of grades 6 through 12?	Nutrition	122 (89.7%)	14 (10.3%)	81 (90.0%)	9 (10.0%)	1.000
Has this school adopted a policy prohibiting tobacco use?	Tobacco use	172 (99.3%)	1 (0.7%)	103 (99.0%)	1 (1.0%)	1.000
Does your school provide referrals to tobacco cessation programs for faculty and staff?	Tobacco use	58 (33.7%)	114 (66.3%)	48 (47.1%)	54 (52.9%)	.030

(Continued on next page)

Table 1. (Continued from previous page)

MEProfiles Question		Nonintervention Schools		Intervention Schools		p <sup>†</sup>
		Yes	No	Yes	No	
Does your school provide referrals to tobacco cessation programs for students?	Tobacco use	109 (63.7)	62 (36.3%)	78 (76.5%)	24 (23.5%)	.032
During this school year, have teachers in this school tried to increase student knowledge on tobacco-use prevention in a required health education course in any of grades 6 through 12?	Tobacco use	135 (98.5%)	2 (1.5%)	88 (98.9%)	1 (1.1%)	1.000
During this school year, did teachers in this school teach students about the short- and long-term health consequences of cigarette smoking (such as stained teeth, bad breath, heart disease, and cancer) in a required health education course for students in any of grades 6 through 12?	Tobacco use	133 (96.4%)	5 (3.6%)	87 (97.8%)	2 (2.2%)	.707
During this school year, did teachers in this school teach students about the benefits of not smoking cigarettes (including long- and short-term health benefits, social benefits, environmental benefits, and financial benefits) in a required health education course for students in any of grades 6 through 12?	Tobacco use	133 (96.4%)	5 (3.6%)	87 (97.8%)	2 (2.2%)	.707

\*"Area" denotes which of the 3 areas of physical activity, nutrition, or tobacco use the question applies to.

† p-values are for unadjusted differences which are not the same as the associations given in Tables 3 and 4.

based on the HMP efforts to prevent students from using tobacco by including tobacco-use prevention in health education curricula. A total of 80,428 students from the 328 schools provided information for these analyses.

These dichotomous student behavioral outcomes were then related to the appropriate MEProfiles survey questions, separately (the associations explored took each of the 3 MYDUAS questions in Table 2 and associated with them with each MEProfiles question from the same "area" in Table 1). Analyses were done via logistic regression for survey data. Interactions between intervention status and MEProfiles survey question responses were also assessed for significance, which allowed assessment of whether the relationship between MYDAUS behavior response and MEProfiles survey question response differed according to intervention status. This was found to be the case for all associations explored (interaction  $p < .001$ ),

and thus separate analyses for intervention and non-intervention schools were done. We chose to use the logistic models over a multinomial regression modeling strategy (which would not have required dichotomization of the survey responses) because the interpretation is more straightforward but still allowed us to maintain the "high/low" ordering inherent in the responses. Standard errors of the regression coefficients were calculated using the empirical (or "sandwich") variance estimator,<sup>40</sup> allowing responses from students within a given school to be correlated.

## RESULTS

When considering the associations of intervention status with presence of physical activity, nutrition, and tobacco policies/programs (research question 1), we found several important results. The odds of intervention schools offering intramural or physical

Table 2. MYDAUS Behavior Questions Analyzed\*

MYDAUS/YTS Question	Area	Nonintervention Schools		Intervention Schools		p <sup>†</sup>
		Less Than 2 Hours	2 or More Hours	Less Than 2 Hours	2 or More Hours	
On an average day, how many hours do you watch TV?	Physical activity	20,187 (40.6%)	29,536 (59.4%)	19,751 (38.5%)	31,497 (61.5%)	<.001
How often do you drink soda (1 can or glass)?	Nutrition	26,040 (50.4%)	25,674 (49.6%)	26,265 (49.2%)	27,121 (50.8%)	.002
During the past 30 days, on the days that you smoked, how many cigarettes did you smoke per day?	Tobacco use	43,258 (84.1%)	8164 (15.9%)	44136 (83.4%)	8785 (16.6%)	.011

\*"Area" denotes which of the 3 areas of physical activity, nutrition, or tobacco use the question applies to.

† p-values are for unadjusted differences which are not the same as the associations given in Tables 3 and 4.

**Table 3. School Health Profiles Survey (SHPS) Cross-Sectional Results 2006: Intervention Versus Nonintervention Schools**

Survey Item	Odds Ratio	p-Value
Does this school offer opportunities for students to participate in intramural activities or physical activity clubs?	3.28	.005
Does your school provide referrals to tobacco cessation programs for each of the following groups?		
1. Faculty and staff	1.88	.019
2. Students	2.08	.013
Has this school adopted a policy stating that if food is served at student parties, after-school or extended day programs, or concessions stands, fruits or vegetables will be among the foods offered?	2.60	<.001

Note: An odds ratio of 1 means equivalence. . . "just as likely."

Less than 1 means "less likely" in intervention schools and more than 1 means "more likely" in intervention schools.

activity clubs were over 3 times greater than nonintervention schools (OR = 3.28;  $p = .005$ ). The odds of intervention schools being associated with having fruit and vegetable offerings at concessions, parties, and other events were also over 2.5 times greater than those for nonintervention schools (OR = 2.60;  $p < .001$ ). Twenty-three percent of intervention schools had unhealthy snack foods or beverages available before classes begin in the morning versus 31.1% of nonintervention schools. Over 17% of intervention schools had unhealthy snack foods or beverages available during school lunch periods, whereas almost 29% of nonintervention schools had these items available. A larger percentage of intervention schools (49%) had adopted policies requiring healthy options versus nonintervention schools (28%). A summary of the program/policy status and HMPSHC intervention is in Table 3. As for tobacco, the odds of intervention schools offering tobacco cessation programs to faculty and staff were nearly twice those of nonintervention schools (OR = 1.88;  $p = .019$ ). Similarly, the odds of intervention schools offering these programs to students were over twice those of nonintervention schools (OR = 2.08;  $p = .013$ ). However, no differences in topics covered in required health education courses were found between intervention and nonintervention schools in 2006.

Analyses relating student-level behaviors as assessed by the MYDAUS to the policies in place at the school level as indicated by the MEProfiles survey were conducted on 2006 data (research question 2). Significant associations between student-level behaviors and school-level policies were seen in survey items related to physical activity, nutrition, and tobacco use (see Table 4). All these associations were found to be significantly different by intervention status. The odds of students in intervention schools drinking 2 or more sodas per week were 15% less if schools had a policy that did not allow for unhealthy items (ie, foods of minimal nutritional value) to be sold before classes begin in the morning than among students in schools without such a policy. Similarly, the odds of students drinking 2 or more sodas per week were 17% ( $p = .023$ ) smaller if schools had a policy that did not allow for unhealthy items to be sold during school lunch periods.

**Table 4. Analysis of Individual Behaviors' (MYDAUS 2006) Associations With School-Level Policies (SHPS 2006) by Intervention Status**

	Odds Ratio	p-Value
TV viewing > 2 hours/day		
Required teaching of physical activity and fitness concepts	0.95	.028
Two or more sodas per week		
Students can buy unhealthy items before school	0.85	.022
Students can buy unhealthy items during lunch	0.83	.023
Required teaching of nutrition and dietary concepts	0.93	<.001

Note: An odds ratio of 1 means equivalence. . . "just as likely."

Less than 1 means "less likely" in intervention schools and more than 1 means "more likely" in intervention schools.

In intervention schools with required health education courses that included nutrition and dietary behavior topics, the odds of students consuming 2 or more cans of soda per week were over 7 times lower ( $p = .12$ ). However, this did not reach strict statistical significance at the 5% level. In intervention schools with required health education courses that included required physical activity and fitness topics, the odds of students watching 2 or more hours of TV per day were 22% less ( $p < .001$ ) than those of students in schools without such a policy. No significant difference was found between intervention and nonintervention schools in the risk of students trying cigarettes when schools taught tobacco-use prevention in required health education courses.

## DISCUSSION

Data analyses revealed that within intervention schools, the work of the SHC may have been important in the implementation of school policies and curricular programs. Because of the large number of respondents and the limited choices for key behaviors in the MYDAUS survey, we limited our behavioral analyses to 3 questions asking about: soda consumption, TV viewing, and cigarette smoking. In intervention schools, several policies were associated with student behaviors, whereas in nonintervention schools only 1

policy was associated with any behavior, indicating that perhaps the work of the SHC may have been important not only in the development of policies but also in the implementation, enforcement, and coordination of those policies and whether they made a difference for students as found previously.<sup>29,30</sup>

Students in intervention schools were also less likely to watch 2 or more hours of TV per day if they were taught about the benefits of physical activity and fitness in a required health education course, whereas nutrition and physical activity health education curricula were associated with improved student nutrition and physical activity behaviors in intervention schools, an outcome reinforced by previous findings and recommendations.<sup>29,30</sup> Perhaps, the work of the SHC may have additionally helped facilitate the success of the health education courses by reinforcing those messages through other school environments outside of class. However, this type of association did not hold for tobacco-use prevention education. We hypothesize that this may be due to the relative saturation of tobacco cessation interventions in Maine schools, both intervention and nonintervention, over many years, whereas physical activity and nutrition interventions are relatively new in this setting.

### Limitations

The question on the MYDAUS survey used as a proxy for physical activity only asked about TV viewing. Ideally such a question would assess total screen time from not only TV, but computer and video game time. Additionally, the MEProfiles questions concerning students' ability to purchase foods and beverages before, during, or after school included milk with candy, soda, etc. However, it would be beneficial if milk was not included with this group of beverages. It would also be beneficial if multiple questions related to physical activity and nutrition were present in the survey. Conclusions drawn can only be based on associations due to the nature of the analyses—no causation can be inferred. Although statistical procedures such as propensity score matching can be used to approximate causal effects, they have been shown to provide incorrect impact estimates in certain situations.<sup>41</sup> We note that due to the size of the MYDAUS survey, the power to detect differences is extremely high and the reader should be careful to not equate statistical significance with practical significance. A smaller sample randomly selected from intervention and nonintervention schools with a higher response rate may help validate our findings. It would also be valuable to replicate this analysis in a quasi-experimental design setting to help ensure that the cross-sectional differences we have seen are not due to fundamental differences between the intervention and nonintervention schools (ie, confounding effects for which we were unable to control).

### Conclusions

Key components of Maine's unique HMPSHC model (eg, SHCs assigned to enhance school policies and their implementation) may be worth replicating and testing in other settings. Further analyses looking at baseline data prior to the HMPSHC intervention and tracking changes through time since its inception may provide additional important information.

### IMPLICATIONS FOR SCHOOL HEALTH

School health coordinators, as part of a CSHP framework, may play an important role in policy development and policy implementation to promote healthy student behaviors. Success of health education curricula may also, in part, depend on the successful implementation of other school policies and a coordinated, comprehensive approach to school health such as that found with the HMPSHC intervention. Maine's model, which attempts to address the 3 leading risk factors for chronic disease simultaneously (physical activity, nutrition, and tobacco use), uses several unique strategies:

1. pays a school health coordinator to lead a school wellness team;
2. carries out a yearly wellness plan;
3. focuses on multiple ecological intervention points (staff, classroom, school policy, etc); and
4. uses the 8 components of coordinated school health.

Schools should provide a consistent environment that is conducive to healthful eating and regular physical activity<sup>29</sup> and school officials may play important roles in the implementation of key components of a coordinated HMPSHC intervention. A dedicated SHC, teacher or school administrator with time to champion school health could play the role of an SHC. This person could lead a school wellness team to work on school policies and environments related to improved physical activity and nutrition. Our study demonstrated that it may be important that messages taught in health and physical education are reinforced through school policies (eg, cafeteria point of purchase prompts) and environments (eg, posters, artwork, marketing) as has been suggested.<sup>29,30</sup> SHCs or a school health champion can involve students in changing school policies and environments (eg, through their involvement in school wellness committees and/or engaging teachers to provide students opportunities to create artwork for display in cafeterias or classrooms). Principals can support such efforts by creating dedicated school health time for existing staff as well as facilitating discussions at staff meetings to educate teachers on classroom opportunities. Principals can also support the formation of school wellness teams. Superintendents can help advocate

for school health positions and policies at the school district level that SHCs or school health champions can implement or enforce. Our data support physical education and health education teachers stressing the importance of healthy eating, physical activity, and limiting screen time. Other classroom teachers can help reinforce these messages through changing classroom environments and innovative curricular activities.

### Human Subjects Approval Statement

This study was determined to be exempt by Colby College's Institutional Review Board.

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