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# Evaluating the Impact of Governmental Partners on School Nutrition and Physical Activity Policies: A Survey of Florida School Principals

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## Cover Page Footnote

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KEYWORDS
Governmental partners, health, school nutrition, school principal engagement

ABSTRACT
For decades, U.S. schools have implemented policies aimed at improving student nutrition and physical activity. Governmental agencies have led these efforts with funding and regulation, and implementation supported by health and agriculture agencies and university extension services at state and local levels. To understand the roles of these agencies in school health, and other factors leading to the implementation of school health policies, we surveyed school principals in Florida in 2018 on topics related to school nutrition and physical activity policies. Depending on the wellness policy, prevalence varied from 6 percent (Safe Routes to School) to 66 percent (wellness coordinator). Poisson regression results indicated a significantly higher number of nutrition and physical activity policies for schools working with a partner, non-charter schools, and schools with higher principal engagement. These results highlight a need for greater resources (particularly governmental health and agricultural agencies and university extension services) to improve school health policy adoption in Florida.

## BACKGROUND

As of 2016, 18.5 percent of U.S. children ages 2 through 19 are estimated to be obese with rates differing by household income and geography (Hales et al. 2017; Ogden et al. 2018a, 2018b). Moreover, the incidence of type 2 diabetes among 10 to 19-year olds in the U.S. increased 7 percent annually between 2002 and 2012 with the greatest increases occurring among racial and ethnic minority groups (Mayer-Davis et al. 2017).

In response to these health concerns, the U.S. Congress passed the Healthy-Hunger Free Kids Act of 2010 (HHFKA) which regulates nutrition in schools and funds programs to improve school nutrition. HHFKA specifically addressed school meal nutrition standards (larger, more diverse servings of fruits and vegetables, whole grain requirements, and low-fat dairy) and mandated school district level wellness policies (Mansfield and Savaiano 2017). Previous research has demonstrated the impact of changes made through HHFKA, including a longitudinal study finding improved nutrition of meals with no changes in school meal participation (Johnson, Podrabsky, and Rocha 2016).

Schools provide a suitable setting for public health interventions related to diet and physical activity among youth. HHFKA was focused on interventions in schools as they serve breakfast and lunch to millions of American youth daily. It is estimated that U.S. students consume between 35 and 40 percent of their daily energy intake in schools (Institute of Medicine 2012). Additionally, some states have instituted their own policies related to physical activity in schools. In 2017, Florida mandated, for example, that elementary schools offer 20 minutes of recess daily – adding to an existing requirement for 30 minutes of physical education daily.

School-level policies related to nutrition and physical activity have proven to be effective ways to improve student health. For example, offering recess before meal times (rather than after) has been demonstrated to improve fruit intake among students in intervention schools (Chapman et al. 2017). Similarly, school fundraisers have been identified as settings where unhealthy foods are brought into schools, in turn increasing student consumption of unhealthy foods and beverages which can be prevented with a school policy on the nutrition of foods used for fundraisers (Caparosa et al. 2014). Participation in Safe Routes to Schools has been found to significantly increase the number of students walking or bicycling to schools, and participation in the Healthier U.S. Schools Challenge has been found to be improve diet among students

with the program in their school (Hur, Marquart, and Reicks 2014; McDonald et al. 2014).

A quality diet and regular physical activity among school-aged children – as promoted by these policies – can provide benefits later in life. According to the 2008 Physical Activity Guidelines for Americans, youth with regular physical activity have lower odds of several chronic diseases later in life (U.S. Department of Health and Human Services 2008). Moreover, Miedema and colleagues (2015) found through a longitudinal cohort study that a higher intake of fruits and vegetables among young adults corresponded with lower odds of coronary atherosclerosis at follow-up 20 years later.

Beyond the benefits these policies provide to students' physical health at present and later in life, there is also evidence to suggest that students with regular physical activity and proper nutrition are likely to experience improved academic achievement. Using data from a longitudinal study, Asigbee et al. (2018) found significantly higher reading, math, and science scores among students with higher levels of physical activity and higher quality diets while controlling for student socioeconomic status, age, and gender.

Although previous research has created an evidence base and addressed the links between school wellness policies and student health, limited research exists on the implementation of these policies. This research was conducted to better understand the adoption of these policies by schools and identify any disparities between schools in implementation rates and what factors may lead to schools successfully implementing evidence-based policies related to nutrition and physical activity.

Specifically, this research addresses the effect of schools working with three different types of governmental partners: health agencies, agricultural agencies, and university extension services. In Florida, each of these agencies provides support to schools for implementing policies related to nutrition and physical activity. We hypothesize that working with one of these partners will improve the school health environment because of time constraints facing school staff and expertise and resources gained from partner agencies. Therefore, the purpose of this study is to understand the effect on school wellness environments when schools have a governmental partner while also measuring the effect of school-level demographic characteristics and principal engagement on the outcome of the school's wellness environment. School wellness environments are measured using an aggregate of regularly

recommended school wellness policies and measured according to schools' adoption of individual policies.

Past research has identified the need for school-governmental partnerships in order to improve student health. Gross and Cinelli (2004) identified ways for the dietetics workforce to improve school nutrition, including serving on school committees, removing barriers and stigma associated with nutrition programs, offering recommendations and technical assistance, conducting trainings for school staff, teaching nutrition education to students, and establishing wellness programs. In our study, the agencies we have identified that serve as partners are known to employ dieticians and those with expertise in nutrition. After conducting a qualitative survey, Choi and Nadow (2004) concluded that schools cannot improve student health without the cooperation and input of the community and that schools provide the venue for government and community-based organizations to work together to improve student health.

Florida provides a research setting that may be more uniform in the operation of these agencies compared to other states. In Florida, local public health services are operated at the state level but through a shared-services model. Comparatively, the majority of states have local health departments that are considered decentralized, in that they are led by local governments (Centers for Disease Control and Prevention 2018). SNAP-Education (established by HHFKA and the largest federal obesity prevention program which addresses obesity for youth and adults through nutrition education and policy, system, and environmental change) in Florida is delivered by one implementing agency, the University of Florida's Cooperative Extension Service. However, to the point of governmental work not being standard across all areas, Florida's SNAP-Education implementing agency provides services in only 41 of the state's 67 counties (UF/IFAS Extension Family Nutrition Program 2019).

## METHODS

### *Participants*

Using the Florida Department of Education's (FDOE) 2017-2018 Master School Identification file, 3,155 public school principals across the state with valid emails were sent an invitation to the survey. Principals were emailed up to five times over a two-month period in 2018 with invitations to participate. Schools were excluded if they were categorized by FDOE as a virtual school, a school serving a correctional institution, a hospital/homebound school, or adult general education. Inclusion criteria

included having at least 10 students and having matching secondary data from the National Center for Education Statistics' (NCES) Common Core of Data file in which the most recent school year available was 2016-2017. The inclusion criteria of a school having at least 10 students enrolled was used to avoid the inclusion of specialty schools. Once data was merged, individual level school information including contact information and school name was removed for de-identification of the data.

*Instrumentation*

A 38-item survey was developed on the topics of principal engagement in school nutrition and physical activity policies, implementation of specific policies, and school's collaboration with partners in this work. This survey was modeled after previous work, which surveyed Florida principals on these topics in 2014. The original survey was developed through a literature review of Farm-to-School evaluation methods and with input from the Florida Department of Agriculture and Consumer Services (Israel, Freer, and Galindo-Gonzalez 2014). Face validity was established by relying on the expertise of staff from the University of Florida Institute of Food and Agricultural Sciences who have backgrounds in program evaluation and working directly with schools on the policies named in the survey. Surveys were delivered to principals via email and administered online using Qualtrics.

Variables analyzed in this research include those (1) related to specific nutrition and physical activity policies, (2) indicating principal engagement in said policies, and (3) reporting on working with governmental partners on school wellness. Governmental partners included the Florida Department of Health, Florida Department of Agriculture and Consumer Services, University of Florida Extension Family Nutrition Program, University of Florida Extension 4-H, and the University of Florida Extension Expanded Food Nutrition Education Program.

*Procedure*

A summary variable was created of ten questions related to nutrition and physical activity policies. All questions were either asked in a binary format (yes, no) or recoded to be binary (for example, one question asks where students eat breakfast but the policy of interest was whether schools allow students to consume breakfast in classrooms). These ten questions ask principals if their schools: allow students to consume breakfast in classrooms, have a wellness coordinator, participate in Safe Routes to

School, participate in Healthier U.S. Schools Challenge, have a policy on using food as a reward, have a policy on food being used in school fundraisers, offer recess before lunch, have a nutrition education requirement, offer staff training on wellness policies, and have a school garden. Answers that were “no” were coded as 0, while answers that were “yes” were coded as 1. Therefore, the potential range of the summary variable is 0 to 10.

A series of five questions using a five-point Likert scale queried principals on their engagement in specific school wellness activities and was used to create a summary variable of principal engagement with a possible range of 5 to 25. The five questions asked about their level of involvement (coded as 1 for “not at all involved” to 5 for “extremely involved”) in school nutrition policies, school food service, wellness policies, wellness activities, and garden activities.

Multiple imputation was conducted using SPSS Statistics 23 to impute data for missing responses (n = 5 imputations) using Markov chain Monte Carlo method in order to include all responses in analyses (see Schafer and Graham 2002). Multiple imputation was only used for the 10 variables making up the school policy summary variable and the five principal involvement questions.

Additionally, school level demographic variables were used as predictors in the model. The FDOE Master School Identification file included data on the level of the school (elementary, middle, high, or combination) and whether schools are classified as charter schools, a variable used in this study, according to Florida state statute. Charter schools are distinct from private schools, as charter schools are considered public under Florida statute. Additions to secondary data ascertained from the National Center for Education Statistics’ Common Core of Data included combining races other than African American and White (American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander and two or more races) into an “other race” variable. Additionally, NCES data included the percent of student by Hispanic ethnicity, percent of students by sex, number of students enrolled at the school, percent of students eligible for free and reduced-price lunch, and the school’s locale code. Locale codes include City, Suburb, Town, and Rural. Within those classifications, there are three more levels depending on the size of the locale (for example, small, midsize, or large city) for a total of 12 possible locale codes. For this analysis, we used only the four categories of city, suburb, town, or rural.

*Data Analysis*

Analysis of the data was conducted using SAS version 9.4 and produced descriptive and inferential statistics. First, we compared the demographic characteristics of response schools to non-response schools using two-independent sample t-tests for continuous variables and chi-square tests for categorical variables. Next, we compared school level demographic characteristics to whether each of the ten school health policies were implemented using chi-square tests and two independent sample t-tests. Post-hoc tests were completed for the categorical variables as there were four categories within the locale and school level variables.

In preparation for conducting regression analyses, the collinearity of the data was assessed by calculating conditional indexes. A Poisson regression analysis was conducted using the summary variable which compiled each school's number of physical activity and nutrition policies. Post-hoc analyses were conducted using Poisson regression analysis, in which locale differences were more closely examined. Each of the four locales was used as the reference in four separate analyses, and then city and suburb locales were combined to compare to town and rural locales. Logistic regressions were also conducted for each of the ten policy variables. Independent variables for all regressions included school level demographic characteristics and the principal engagement summary variable. School level categories for the logistic regression of having a Healthier U.S. School Challenge policy were collapsed into two categories due to quasi-separation (UCLA Institute for Digital Research and Education n.d.).

## RESULTS

Of the 3,155 principals with a valid email, 270 responses met criteria and were included in the analyses (representing a response rate of 8.6 percent, based on AAPOR's (2016) RR2 formula). Response and non-response schools were similar in school characteristics with no statistically significant differences ($p<.05$) between the groups in the proportion of students who were Black or other races, female, or eligible for free lunch (Table 1). There were also no differences between the groups in regards to enrollment, the teacher/student ratio, the number of charter schools, nor the level of schools represented (primary, middle, high, and other).

Table 1: Summary of School Characteristics for Response and Non-Response Schools

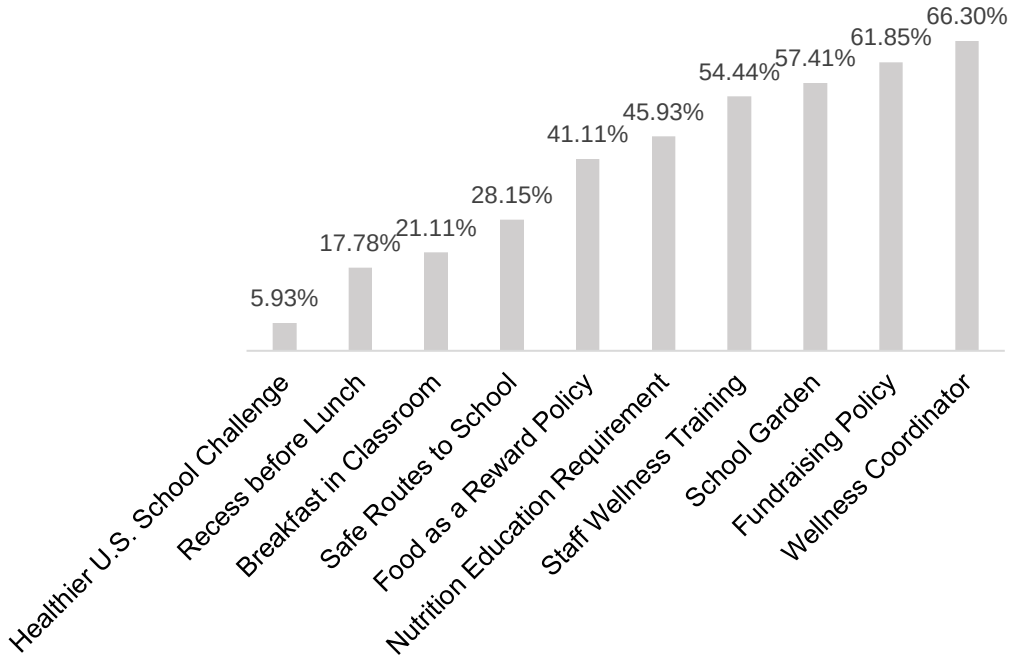
| | Response Schools [95% CI] (N=270) | Non-Response Schools [95% CI] (N=3,568) | *p*-value |
|---|---|---|---|
| Race & Ethnicity (%)[1] | | | |
| *Black* | 25.42 [22.57, 28.28] | 26.88 [26.04, 27.71] | 0.36 |
| *Other* | 6.50 [5.95, 7.06] | 6.08 [5.93, 6.24] | 0.15 |
| *White* | 41.12 [38.05, 44.18] | 36.73 [35.87, 37.60] | 0.01 |
| *Hispanic* | 26.95 [24.13, 29.77] | 30.30 [29.49, 31.12] | 0.03 |
| Female (%)[1] | 48.09 [47.22, 48.97] | 46.83 [46.47, 47.19] | 0.06 |
| Locale (N)[2] | | | |
| *City* | 68 [25.19] | 1,014 [28.42] | |
| *Suburb* | 116 [42.96] | 1,948 [54.60] | <.01 |
| *Town* | 40 [14.81] | 161 [4.51] | |
| *Rural* | 46 [17.04] | 445 [12.47%] | |
| Enrollment (N)[1] | 739.64 [674.52, 804.75] | 729.51 [710.74, 748.27] | 0.78 |
| Teacher/Student Ratio (N)[1] | 15.98 [15.20, 16.76] | 16.49 [15.80, 17.19] | 0.68 |
| Free Lunch Eligible (%)[1] | 57.63 [54.88, 60.38] | 56.03 [55.21, 56.86] | 0.31 |
| School Level (N)[2] | | | |
| *Primary* | 167 [61.85] | 2,049 [57.43] | |
| *Middle* | 33 [12.22] | 548 [15.36] | 0.10 |
| *High* | 48 [17.78] | 551 [15.44] | |
| *Other* | 22 [8.15] | 420 [11.77] | |
| Charter School (yes) (N)[2] | 39 [14.44] | 600 [16.82] | 0.31 |

*1 = Two-Independent Sample T-Tests; 2 = Chi-Square Tests*

Statistically significant differences were found between the two groups in the proportion of Hispanic and White students. Response schools had a higher proportion of White students and lower proportion of Hispanic students. Additionally, there were significant overall differences in schools' locations with response schools having a higher percentage of schools located in rural and town locales compared to non-response schools having a higher percentage of schools located in city and suburb locales.

The prevalence levels of the ten policies related to nutrition and physical activity are shown in Figure 1 and demonstrate the varying degrees to which these policies are implemented. At the high end, over 65 percent of schools report having a school wellness coordinator. At the low end, less than 6 percent of schools report participating in the Healthier U.S. Schools Challenge. The eight other policies vary between prevalence levels of 18 percent and 62 percent. The mean number of total policies for schools in the sample was 4.0 (SD = 1.84). Additionally, 41 percent of

Figure 1: Prevalence of School Nutrition and Physical Activity Policies (N=270)




schools reported working with a governmental partner. The mean principal engagement score was 13.45 (SD=4.79).

Comparisons of school characteristics with the dichotomous school health policy variables are shown in Table 2 and Table 3. Differences in policy implementation were also identified by the racial make-up of schools. Schools that allowed breakfast in the classroom had a higher proportion of Black students compared to schools that did not. Conversely, schools reporting a policy on using food as a reward had a lower proportion of Black students compared to schools that did.

The assessment of continuous school-level variables with school health policies indicated significant differences for several comparisons (Table 2). Significant differences were found in the implementation of several policies by school enrollment. Schools that reported allowing breakfast in classrooms tended to have a smaller enrollment, with a mean enrollment of 634.6 compared to a mean enrollment of 767.7 for schools that do not allow breakfast in classrooms. Significant differences in enrollment were also found in comparing schools offering recess before lunch to schools that do not (smaller schools were more likely to do this than were larger schools), and in schools having a wellness coordinator

Table 2: Differences between Schools with Wellness Policies Compared to Schools without Wellness Policies (mean difference) by Selected School Attributes

| | ---------- Race ---------- | | | Ethnicity | Sex | Number of Students | Percent Free Lunch Eligible |
|---|---|---|---|---|---|---|---|
| | Percent Black | Percent White | Percent Other | Percent Hispanic | Percent Female | | |
| Breakfast in Classroom | 9.19* | -3.98 | -0.10 | -5.11 | 1.54 | -133.10* | 11.24* |
| Food as a Reward Policy | -6.23* | 1.30 | 0.36 | 4.57 | -0.37 | -20.83 | -2.24 |
| Fundraising Policy | -2.66 | -2.42 | -0.25 | 5.33** | -1.44 | 48.70 | -3.85 |
| Healthier U.S. School Challenge | 8.05 | -4.10 | 2.23* | -6.18 | -2.37** | -47.38 | 1.50 |
| Nutrition Education Requirement | 5.33** | -5.42** | 0.19 | -0.11 | 0.62 | 152.40** | 3.22 |
| Recess before Lunch | 4.06 | -5.08 | 0.16 | 0.87 | 0.78 | -291.40* | 14.25* |
| Safe Routes to School | -2.47 | -4.04 | 0.50 | 6.01** | 1.97** | -47.75 | 9.64* |
| School Garden | 1.64 | -3.88 | -0.41 | 2.65 | 0.46 | 36.48 | 3.49 |
| Staff Wellness Training | 2.44 | -1.23 | -0.14 | -1.07 | 1.22 | 20.58 | 0.92 |
| Wellness Coordinator | -3.20 | -2.77 | 0.49 | 5.49** | 0.24 | 217.9* | 0.08 |

*P*-Value of Two-Independent Sample T-Tests *denotes *P*-Value < 0.05, **denotes P-Value < 0.10

compared to schools that do not (larger schools were more likely to have one than were smaller schools).

Schools with breakfast allowed in classrooms had a higher proportion of students eligible for free lunch compared to schools that do not. Similarly, schools with recess before lunch and a Safe Routes to School program had a significantly higher proportion of free lunch eligible students.

Table 3 displays the comparison of school policy implementation with the categorical school-level variables of locale and school level. Allowing breakfast in the classroom was more likely in schools in city locales and town locales compared to schools in suburb locales. Schools in suburb locales were more likely to have a fundraising policy compared to schools in town locales and more likely to have a school garden compared to schools in town locales. Schools in city locales were also more likely to have a nutrition education requirement compared to schools

Table 3: Differences between Schools with Wellness Policies Compared to Schools without Wellness Policies by Selected School Attributes and Having a Governmental Partner (N=270)

| | Locale | | | | | School Level | | | | | Charter Status | | Governmental Partner | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | City | Suburb | Town | Rural | *p-Value* | Primary | Middle | High | Other | *p-Value* | Yes | *p-Value* | Yes | *p-Value* |
| Breakfast in Classroom[2,6] | 30.88% | 13.79% | 27.50% | 19.57% | 0.03 | 24.55% | 12.12% | 12.50% | 27.27% | 0.14 | 7.69% | 0.03 | 27.93% | 0.02 |
| Food as a Reward Policy | 36.76% | 44.83% | 40.00% | 39.13% | 0.73 | 42.51% | 39.39% | 37.50% | 40.91% | 0.93 | 41.03% | 0.99 | 48.65% | 0.04 |
| Fundraising Policy[6] | 66.18% | 68.10% | 47.50% | 52.17% | 0.05 | 61.08% | 51.52% | 64.58% | 77.27% | 0.27 | 64.10% | 0.75 | 67.57% | 0.11 |
| Healthier U.S. School Challenge | 8.82% | 5.17% | 7.50% | 2.17% | 0.48 | 7.78% | 0 | 4.17% | 4.55% | 0.33 | 2.56% | 0.34 | 11.71% | <.01 |
| Nutrition Education Requirement[3] | 58.82% | 44.83% | 32.50% | 41.30% | 0.04 | 46.71% | 36.36% | 54.17% | 36.36% | 0.34 | 35.90% | 0.17 | 57.66% | <.01 |
| Recess before Lunch[B] | 17.65% | 18.10% | 15.00% | 19.57% | 0.96 | 23.35% | 09.09% | 06.25% | 13.64% | 0.02 | 28.21% | 0.07 | 23.42% | 0.04 |
| Safe Routes to School[B] | 23.53% | 31.03% | 35.00% | 21.74% | 0.38 | 34.73% | 18.18% | 16.67% | 18.18% | 0.02 | 15.38% | 0.06 | 38.74% | <.01 |
| School Garden[6] | 54.41% | 65.52% | 42.50% | 54.35% | 0.06 | 59.28% | 48.48% | 58.33% | 54.55% | 0.70 | 48.72% | 0.24 | 74.77% | <.01 |
| Staff Wellness Training[B] | 61.76% | 47.83% | 47.50% | 47.83% | 0.38 | 59.88% | 51.52% | 43.75% | 40.91% | 0.11 | 28.21% | <.01 | 73.87% | <.01 |
| Wellness Coordinator[1] | 72.06% | 52.17% | 70.00% | 52.17% | 0.14 | 68.86% | 66.67% | 62.50% | 54.55% | 0.54 | 41.03% | <.01 | 78.38% | <.01 |

*1=City v. Rural, 2=City v. Suburb, 3=City v. Town, 4=Rural v. Suburb, 5=Rural v. Town, 6=Suburb v. Town*

*A=Primary v. Middle, B=Primary v. High, C=Primary v. Other, D=Middle v. High, E =Middle v. Other, F=High v. Other*

in rural locales. Primary level schools were more likely to offer recess before lunch compared to high schools in addition to being more likely to have a Safe Routes to School program and offer staff wellness training.

In addition, charter schools were significantly less likely to implement several policies compared to non-charter schools. Of all charter schools, 7.69 percent reported offering breakfast in the classroom compared to 23.38 percent of non-charter schools offering breakfast in the classroom. Charter schools were also less likely to report offering staff wellness training compared to non-charter schools and having a wellness coordinator compared to non-charter schools.

Finally, schools that reported working with a governmental partner were significantly more likely to have implemented nine out of ten policies included in this analysis compared to schools not working with a governmental partner. The only non-significant result found was for implementation of a fundraising policy (p=.11). The relationship between schools working with a governmental partner and school-level characteristics was also examined. Schools that reported working with a governmental partner had a higher proportion of Black students compared to schools not working with a governmental partner. Schools working with a governmental partner also had lower enrollment compared to schools not working with a governmental partner. Schools working with a governmental partner also had a ten-percentage point higher rate of students eligible for free lunch and were more likely to be primary schools compared to middle schools and high schools.

The odds ratios from the Poisson regression results (Table 4) indicate significant effects ($p < .05$) for three variables on the outcome of the school nutrition and physical activity summary variable. Working with a governmental partner was associated with an increased count of nutrition and physical activity policies. An increase in principal engagement also was associated with an increased count in the number of nutrition and physical activity policies. Charter schools, compared to public non-charter schools, were associated with a lower count in the number of nutrition and physical activity polices. No other variables displayed significant effects. The model was assessed using a goodness-of fit chi-squared test, which was not statistically significant, and the test indicated an appropriate model fit. Post-hoc analyses examining locale differences found no statistically significant differences when other reference variables were set and when locales were grouped.

Table 4: Poisson Regression Results Predicting the Number of School Nutrition and Physical Activity Policies Reported by Schools (N=270)

| | Odds Ratio [95% CI] | *p-Value* |
|---|---|---|
| Intercept | 2.17 [1.26, 3.81] | <.01 |
| Working with Governmental Partner (yes) | 1.44 [1.26, 1.65] | <.01 |
| Principal Engagement | 1.03 [1.01, 1.04] | <.01 |
| Percent Black | 1.00 [0.99, 1.00] | 0.31 |
| Percent Hispanic | 1.00 [1.00, 1.00] | 0.98 |
| Percent Other Race | 1.00 [0.98, 1.02] | 0.87 |
| Percent Female | 1.00 [0.99, 1.00] | 0.86 |
| Number of Students | 1.00 [1.00, 1.00] | 0.19 |
| Percent Free Lunch Eligible | 1.00 [1.00, 1.01] | 0.35 |
| Charter School (yes) | 0.73 [0.59, 0.90] | <.01 |
| *Locale* | | |
| City vs. Suburb | 1.05 [0.86, 1.23] | 0.59 |
| Rural vs. Suburb | 0.87 [0.71, 1.06] | 0.17 |
| Town vs. Suburb | 0.91 [0.74, 1.12] | 0.39 |
| *Level* | | |
| Middle vs. Primary | 0.83 [0.67, 1.03] | 0.09 |
| High vs. Primary | 0.90 [0.71, 1.12] | 0.35 |
| Other vs. Primary | 0.92 [0.72, 1.17] | 0.51 |

Logistic regression results (Table 5) identified how working with a governmental partners and other school characteristics affect adoption of specific nutrition and physical activity policies. Working with a governmental partner was a statistically significant variable for six of the ten policies: schools having a food as a reward policy, participation in the Healthier U.S. Schools Challenge, having a nutrition education requirement, having a school garden, providing staff wellness training, and having a wellness coordinator. Principal engagement was a statistically significant variable in logistic regression analyses for three of the ten policies. A school's racial, ethnic, and sex make-up did not have statistically significant effects on schools' implementation of a policy, outside of a school's proportion of female students in which a higher proportion of female students corresponded with lower odds of the school participating in Healthier U.S. Schools Challenge and higher odds of the school participating in Safe Routes to School. Charter schools were significantly less likely to have a school garden, provide staff wellness training, participate in Safe Routes to School, and have a wellness coordinator compared to non-charter schools. No geographic differences

Table 5: Logistic Regression Results for Each Nutrition and Physical Activity Policy (N=270)

| | Breakfast in Classroom | | Food as a Reward | | Fundraising | |
|---|---|---|---|---|---|---|
| | Odds Ratio [95% CI] | *p-Value* | Odds Ratio [95% CI] | *p-Value* | Odds Ratio [95% CI] | *p-Value* |
| Intercept | 0.02 [0.00, 0.33] | 0.01 | 0.55 [0.06, 5.96] | 0.61 | 6.44 [0.59, 95.27] | 0.14 |
| Governmental Partner | 1.38 [0.70, 2.75] | 0.35 | 1.77 [1.01, 3.11] | 0.04 | 1.72 [0.96, 3.13] | 0.07 |
| Principal Engagement | 0.98 [0.90, 1.05] | 0.53 | 1.05 [0.99, 1.11] | 0.08 | 1.05 [0.99, 1.12] | 0.13 |
| Percent Black | 1.00 [0.98, 1.02] | 0.75 | 0.99 [0.97, 1.00] | 0.19 | 0.99 [0.97, 1.00] | 0.25 |
| Percent Hispanic | 1.00 [0.97, 1.01] | 0.43 | 1.00 [0.99, 1.02] | 0.50 | 1.00 [0.99, 1.02] | 0.63 |
| Percent Other Race | 1.02 [0.93, 1.11] | 0.67 | 1.02 [0.95, 1.10] | 0.64 | 0.95 [0.88, 1.02] | 0.14 |
| Percent Female | 1.03 [0.99, 1.09] | 0.23 | 1.00 [0.98, 1.01] | 0.87 | 0.98 [0.94, 1.02] | 0.32 |
| Number of Students | 1.00 [1.00, 1.00] | 0.50 | 1.00 [1.00, 1.00] | 0.42 | 1.00 [1.00, 1.00] | 0.66 |
| Free Lunch Eligible (%) | 1.02 [1.00, 1.05] | 0.04 | 1.00 [0.98, 1.01] | 0.53 | 0.99 [0.97, 1.00] | 0.18 |
| Charter School (yes) | 0.34 [0.07, 1.16] | 0.11 | 0.68 [0.29, 1.56] | 0.37 | 1.02 [0.43, 2.47] | 0.96 |
| *Locale* | | | | | | |
| City vs. Suburb | 2.24 [0.95, 5.41] | 0.07 | 0.92 [0.45, 1.90] | 0.82 | 1.38 [0.65, 2.97] | 0.40 |
| Rural vs. Suburb | 1.20 [0.40, 3.46] | 0.74 | 0.89 [0.39, 1.99] | 0.80 | 0.49 [0.21, 1.15] | 0.10 |
| Town vs. Suburb | 1.98 [0.70, 5.56] | 0.19 | 0.92 [0.45, 1.90] | 0.82 | 0.43 [0.18, 1.00] | 0.05 |
| *Level* | | | | | | |
| Middle vs. Primary | 0.50 [0.13, 1.49] | 0.25 | 1.00 [0.43, 2.29] | 0.99 | 0.66 [0.29, 1.52] | 0.33 |
| High vs. Primary | 0.54 [0.14, 1.79] | 0.33 | 1.22 [0.49, 3.02] | 0.66 | 1.05 [0.42, 2.67] | 0.92 |
| Other vs. Primary | 1.19 [0.33, 4.03] | 0.78 | 1.07 [0.39, 2.89] | 0.89 | 2.46 [0.80, 8.74] | 0.13 |
| | Recess Before Lunch | | Safe Routes to School | | School Garden | |
| Intercept | 0.05 [0.00, 1.21] | 0.06 | 0.00 [0.00, 0.02] | <.01 | 0.12 [0.01, 1.32] | 0.09 |
| Governmental Partner | 1.49 [0.71, 3.15] | 0.29 | 1.61 [0.85, 3.05] | 0.14 | 3.56 [1.94, 6.66] | <.01 |
| Principal Engagement | 0.97 [0.89, 1.06] | 0.54 | 1.13 [0.15, 1.22] | <.01 | 1.15 [1.07, 1.23] | <.01 |
| Percent Black | 0.99 [0.96, 1.01] | 0.24 | 0.99 [0.97, 1.00] | 0.21 | 1.00 [0.98, 1.02] | 0.90 |
| Percent Hispanic | 0.99 [0.97, 1.01] | 0.44 | 1.00 [0.98, 1.02] | 0.88 | 1.00 [0.98, 1.01] | 0.64 |
| Percent Other Race | 1.04 [0.94, 1.15] | 0.46 | 1.08 [0.99, 1.16] | 0.07 | 0.99 [0.91, 1.07] | 0.77 |
| Percent Female | 1.01 [0.96, 1.06] | 0.67 | 1.07 [1.01, 1.16] | 0.04 | 1.01 [0.97, 1.06] | 0.61 |
| Number of Students | 1.00 [1.00, 1.00] | 0.05 | 1.00 [1.00, 1.00] | 0.80 | 1.00 [1.00, 1.00] | 0.60 |
| Free Lunch Eligible (%) | 1.04 [1.02, 1.06] | <.01 | 1.03 [1.00, 1.05] | <.01 | 1.01 [0.99, 1.02] | 0.54 |
| Charter School (yes) | 2.25 [0.78, 6.38] | 0.13 | 0.18 [0.05, 0.54] | <.01 | 0.36 [0.14, 0.89] | 0.03 |
| *Locale* | | | | | | |
| City vs. Suburb | 0.85 [0.32, 2.20] | 0.74 | 0.61 [0.26, 1.41] | 0.25 | 0.43 [0.19, 0.94] | 0.04 |
| Rural vs. Suburb | 0.95 [0.29, 2.94] | 0.93 | 0.61 [0.21, 1.65] | 0.35 | 0.53 [0.22, 1.28] | 0.16 |
| Town vs. Suburb | 0.58 [0.17, 1.81] | 0.36 | 1.63 [0.61, 4.37] | 0.33 | 0.33 [0.13, 0.81] | 0.02 |
| *Level* | | | | | | |
| Middle vs. Primary | 0.51 [0.11, 1.80] | 0.34 | 0.42 [0.14, 1.15] | 0.11 | 0.85 [0.35, 2.07] | 0.73 |
| High vs. Primary | 0.82 [0.17, 3.12] | 0.78 | 0.53 [0.14, 1.72] | 0.31 | 1.62 [0.60, 4.42] | 0.34 |
| Other vs. Primary | 0.36 [0.07, 1.36] | 0.16 | 0.66 [0.11, 2.92] | 0.60 | 0.83 [0.29, 2.52] | 0.73 |

Table 5: Logistic Regression Results for Each Nutrition and Physical Activity Policy (continued)

| | Healthier U.S. Schools Challenge | | Nutrition Education Requirement | |
|---|---|---|---|---|
| | Odds Ratio [95% CI] | *p-Value* | Odds Ratio [95% CI] | *p-Value* |
| Intercept | 1.40 [0.00, 353.40] | 0.91 | 0.04 [0.01, 0.41] | 0.01 |
| Governmental Partner | 9.54 [2.38, 54.95] | <.01 | 2.08 [1.17, 3.71] | 0.01 |
| Principal Engagement | 1.00 [0.86, 1.15] | 0.96 | 1.12 [1.06, 1.20] | <.01 |
| Percent Black | 1.02 [0.98, 1.06] | 0.26 | 1.00 [0.99, 1.02] | 0.66 |
| Percent Hispanic | 1.00 [0.96, 1.04] | 0.97 | 1.00 [0.98, 1.01] | 0.66 |
| Percent Other Race | 1.11 [0.97, 1.27] | 0.10 | 1.00 [0.94, 1.08] | 0.81 |
| Percent Female | 0.88 [0.78, 0.99] | 0.03 | 1.00 [0.96, 1.04] | 0.92 |
| Number of Students | 1.00 [1.00, 1.00] | 0.13 | 1.00 [1.00, 1.00] | 0.02 |
| Free Lunch Eligible (%) | 0.99 [0.96, 1.03] | 0.60 | 1.00 [0.99, 1.02] | 0.27 |
| Charter School (yes) | 0.69 [0.03, 5.43] | 0.76 | 0.64 [0.26, 1.50] | 0.31 |
| *Locale* | | | | |
| City vs. Suburb | 1.25 [0.30, 5.21] | 0.76 | 1.48 [0.71, 3.11] | 0.30 |
| Rural vs. Suburb | 0.65 [0.03, 5.64] | 0.73 | 1.02 [0.44, 2.37] | 0.97 |
| Town vs. Suburb | 2.82 [0.41, 18.56] | 0.27 | 0.70 [0.28, 1.70] | 0.44 |
| *Level* | | | | |
| Middle vs. Primary | | | 0.77 [0.32, 1.83] | 0.56 |
| High vs. Primary | 0.21 [0.02, 1.13] | 0.10 | 1.24 [0.47, 3.24] | 0.66 |
| Other vs. Primary | | | 0.80 [0.27, 2.22] | 0.67 |
| | Staff Wellness Training | | Wellness Coordinator | |
| Intercept | 16.98 [1.10, 463.23] | 0.07 | 0.43 [0.02, 5.12] | 0.51 |
| Governmental Partner | 4.95 [2.67, 9.49] | <.01 | 3.14 [1.66, 6.14] | <.01 |
| Principal Engagement | 1.03 [0.97, 1.10] | 0.33 | 1.05 [0.99, 1.13] | 0.13 |
| Percent Black | 1.00 [0.98, 1.02] | 0.72 | 0.99 [0.98, 1.01] | 0.50 |
| Percent Hispanic | 0.99 [0.98, 1.01] | 0.46 | 1.01 [0.99, 1.03] | 0.27 |
| Percent Other Race | 0.94 [0.87, 1.01] | 0.10 | 1.00 [0.92, 1.09] | 0.99 |
| Percent Female | 0.96 [0.91, 1.00] | 0.12 | 1.00 [0.96, 1.04] | 0.92 |
| Number of Students | 1.00 [1.00, 1.00] | 0.36 | 1.00 [1.00, 1.00] | 0.01 |
| Free Lunch Eligible (%) | 0.99 [0.97, 1.00] | 0.15 | 0.99 [0.98, 1.01] | 0.56 |
| Charter School (yes) | 0.25 [0.09, 0.62] | <.01 | 0.29 [0.11, 0.71] | 0.01 |
| *Locale* | | | | |
| City vs. Suburb | 1.33 [0.61, 2.91] | 0.48 | 1.75 [0.77, 4.08] | 0.18 |
| Rural vs. Suburb | 0.66 [0.27, 1.57] | 0.35 | 0.64 [0.26, 1.56] | 0.32 |
| Town vs. Suburb | 0.60 [0.24, 1.47] | 0.27 | 1.52 [0.60, 4.00] | 0.39 |
| *Level* | | | | |
| Middle vs. Primary | 0.74 [0.31, 1.78] | 0.51 | 0.82 [0.33, 2.13] | 0.68 |
| High vs. Primary | 0.42 [0.16, 1.10] | 0.08 | 0.40 [0.14, 1.06] | 0.07 |
| Other vs. Primary | 0.23 [0.06, 0.74] | 0.02 | 0.75 [0.27, 2.17] | 0.59 |

were identified when schools located in rural, city, and town locales were compared to suburban locales for each policy. Schools with a larger proportion of students eligible for free lunches were significantly more likely to allow breakfast to be consumed in classrooms, offer recess before lunch, and participate in Safe Routes to School.

## DISCUSSION

The results demonstrate the importance of Florida schools in working with governmental public health and agriculture or university extension partners to improve the school health environment. Additionally, descriptive statistics reveal the overall low prevalence of evidence-based policies designed to improve diet and physical activity among students in Florida schools. The results also revealed that schools that have governmental partners for school wellness were different than schools that do not in regards to the racial make-up of a school's students and school size. Moreover, the difference in free and reduced lunch rates between schools working with a governmental partner and those not is likely partially attributable to the program requirements offered by partners that require working with low-income populations (U.S. Department of Agriculture 2017). However, these differences were accounted for in regression analyses which demonstrated significant independent effects of the hypothesized variable (working with a governmental partner) on school health policy prevalence, in addition to significant effects for non-demographic variables such as school principal engagement, school level, and charter school status.

While it may be expected that schools working with a governmental partner and schools with higher principal engagement should have improved school health environments, previous literature has found that a large percentage of U.S. schools are implementing programs aimed at reducing obesity. However, the specific programs being implemented may encourage weight stigma and are not evidence-based nor evaluated programs (Kenney et al. 2017). Therefore, we included only policies focused on improving nutrition and physical activity among students or improving knowledge of nutrition among students and staff.

Identifying specific policies associated with having a governmental partner indicates that some policies may not require having a partner in order for schools to implement them. It may also be plausible that governmental partners are not able to convince schools to implement such policies, or that the governmental partners are not advocating such policies. Further research may consider barriers to implementation of

specific policies and the exact mechanisms of how governmental partners work with schools to implement wellness policies. Further research may also consider taking a longitudinal approach as Franks and colleagues (2007) have previously identified the importance of stakeholders to participate throughout multiple phases of school health promotion program development and dissemination (Franks et al. 2007).

Chi-square tests identified differences in the adoption of specific wellness policies based on locality. However, the locality variables were not statistically significant when used in regression analyses outside of the logistic regression for having a school garden where schools in city locales were less likely to have a garden than schools in suburban locales. The lack of locale differences in regression analyses may indicate the importance of other, more proximate covariates in their relationship with the policy outcomes.

An unexpected finding was the significant role of charter school status in the prevalence of school health policies, in which charter schools had a lower prevalence of school health policies in the summary variable used in the Poisson regression analysis compared to non-charter schools. This is contrary to previous research which has shown higher compliance among charter schools for school nutrition and physical activity policies (Snelling et al. 2017). According to Snelling et al. and their comparison of school health policies between charter and non-charter schools in Washington, D.C., the higher prevalence among charter schools may be attributable increased autonomy among charter schools and school size. For our analysis of Florida schools, school size was controlled for in regression results and it is possible the autonomy of charter schools may negatively affect the implementation of school health policies in Florida.

*Limitations*

Limitations for this research include a low response rate and associated small response sample which can lead to underpowered statistical tests. However, for surveys that were started but not completed, multiple imputation was used to impute a full set of responses for each respondent to help address the latter issue. Although the response rate to the survey was comparatively low[1] it does not necessarily follow that a survey with a low response rate has greater nonresponse bias that one with a high response rate (Groves and Peycheva 2008). It is likely that more principals with an interest in nutrition and health and those managing schools with governmental partners would participate in the survey than those without an interest or governmental partners. But as long as enough

responses across the distributions are included in the analysis, multivariate regression models examining the relationships will be unbiased (Coppock and McClellan 2019; Pasek 2016) and we think our data meets this condition. With that said, reported point estimates of policy participation might be higher than in the population and should be used with caution. In addition, differences in respondents compared to non-respondents were not significant for many of the measured secondary variables but were different for the proportion of a school's White students. This, however, also was controlled for in regression analyses.

Another limitation includes potential social desirability bias as many survey questions referred to programs that may be mandated by organizations schools report to, such as school district offices. Although respondents were told at the beginning of the survey that their responses would be de-identified, this statement may not have mitigated all potential social desirability bias. Finally, the survey did not address whether schools had implemented any of these policies as a result of a district-wide requirement.

*Conclusions*

Despite the limitations, this study had a number of strengths. By developing and administering a new survey, we were able to estimate the effect of working with a governmental partner on nutrition and physical activity policy and program implementation. While previous work has utilized national surveys, such as the School Health Profiles Principal Survey, the survey design does not allow for the ascertainment of the effect of working with a public health or agricultural governmental partner on implementation of nutrition and physical activity policies within schools. Also contrary to national school principal surveys related to health, we were able to measure principal engagement using an index of five questions which queried a principal's engagement in different nutrition and physical activity policies and program within their schools.

A future direction for survey research on this topic should aim to measure principal knowledge of nutrition and physical activity as it may potentially confound results relating to the effect of partners on school wellness. Additionally, surveys should consider determining the intensity of governmental partner engagement in school wellness as it is likely wide ranging. Future research may also involve moving beyond surveys and conducting environmental scans of school health environments to gain accurate measures of school health policies and to the intensity they are being implemented. Finally, future research on school policies related to

nutrition and physical activity may consider collecting and analyzing individual level student nutrition and physical activity behavior data in addition to biometric data in order to determine the most effective policies for different types of schools.

Considering the importance of diet and physical activity on youth academic achievement and health, this study raises concerns about low adoption rates among Florida schools of recommended, evidence-based policies designed to improve physical activity levels and diet among students. Our findings highlight the need for governmental partners to be engaged in working with schools on nutrition and physical activity because of low policy adoption rates among schools not working with partners. These findings also demonstrate the need for information dissemination between school principals and public health and agriculture agencies.

The results raise important considerations for schools in improving student health related to diet and physical activity. First, the significantly higher prevalence of school health policies for schools working with a governmental partner should cause schools to seek out public health and agricultural partners to improve diet and physical activity behavior among students. Because of time constraints facing school staff, a feasible way to implement evidence-based policies in schools is through the use of a partner with expertise in public health or agriculture.

Second, partners should be focused on reaching out to schools through a more systematic method to ensure all schools receive information on how school environments can be changed to improve student health. Federal legislation, such as HHKFA, requires work to be focused on low-income populations. While the reasoning behind this is sound, it may leave behind a large number of schools from implementing the recommended policies to reduce child obesity and improve nutrition and physical activity.

Moreover, school district offices should consider serving as the gateway between the expertise and resources of partners and the implementation of policies in schools. Previous research has found that the implementation of a food as a reward policy in classrooms was predicted by a district-wide policy being in place (Turner, Chiriqui, and Chaloupka 2012). Partners would be able to deliver expertise to schools at a higher rate by providing trainings at a school district level compared to doing so for individual schools.

Finally, charter schools should pay particular attention to the results of this study. After controlling for several variables including school demographics and working with a partner, charter schools have a

significantly lower adoption rate of nutrition and physical activity policies. This has the potential to create a large disparity in the health of students in public versus charter schools. While the primary mission of schools may not be student diet and physical activity, decades of research has shown the clear link between students' diet and physical activity and academic achievement (Florence, Asbridge, and Veugelers 2008; Alvarez-Bueno et al. 2017; Faught et al. 2017). By partnering with governmental partners who employ public health experts and often receive funding to conduct obesity prevention work with schools, schools can implement recommended policies and create environments that improve the health of students.

## ENDNOTES

[1] Like many busy professionals, getting principals to participate in surveys is challenging. We found studies using similar procedures reported response rates ranging from 7 percent to 24 percent (e.g., Dodson 2020; Kenney et al. 2017; Ray, Pijanowski, and Lasater 2020; Smith-Millman and Flaspohler 2019); many omit an assessment of nonresponse bias (Kano et al. 2008).

## HUMAN SUBJECTS APPROVAL STATEMENT

This study was approved by the University of Florida Institution Review Board, approval #201800679.

## DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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