

# Cool Intentions: Adding Refrigerators to Elementary Classrooms Improves Fruit and Vegetable Access in a Pilot Study

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## INTRODUCTION

Providing nutritious food in schools is essential to encourage children to eat healthfully.<sup>1,2</sup> The 2010 Healthy Hunger Free Kids Act led to significant changes in the nutritional quality of school meals.<sup>3</sup> The Healthy Hunger Free Kids Act also led to more stringent regulations regarding snacks offered in schools, which is important to consider given that 40% of US students consume at least 1 school-offered snack daily, typically consisting of sweets, chips, and grain products.<sup>4</sup> Parents also send snacks and meals to school with their children. Some research indicates that parent-packed meals are less healthy than school meals.<sup>5-8</sup>

Having parents send healthier foods (snacks and meals) to school, most notably fresh fruits, vegetables, and low-fat dairy products, may require refrigerated storage. This study tested whether providing refrigerators in classrooms for parent-packed snacks could improve the nutritional quality of snacks available for student consumption.

## INTERVENTION

This pilot study took place at an elementary school in Madison, WI, for a 10-week period in kindergarten through third-grade classrooms

starting in September of the 2013–2014 school year. A total of 53.6% of enrolled students were eligible for free and reduced-price meals. The school was ethnically diverse: 43.9% of students were white, 23.6% black or African American, 20.1% were Hispanic, and 12.4% were multiracial.

The parent-provided snack program began when funding for the school snack program decreased and the school began asking parents to donate snacks to their children's class. Teachers distributed snacks to children during the school day, typically mid-morning, and were responsible for storing and maintaining donated snacks.

Fifteen kindergarten through grade 3 classrooms (403 students) in the school were randomly assigned to receive a 1.7-ft<sup>3</sup> refrigerator (n = 8) or to serve as a control without a refrigerator (n = 7) at the beginning of the school year through a randomized block design that balanced refrigerator assignments across grades to the extent feasible. The research team ruled out differences in gender, race/ethnicity, and eligibility for free and reduced-price meals across refrigerator and non-refrigerator classrooms through discussion with school administrators. At the beginning of the school year, all parents classrooms received a notice in their child's backpack describing the voluntary

snack program. Notices were identical except that mailings for children in refrigerator classrooms explained that a refrigerator had been installed in the classroom for snack storage. No recommendations were made to parents about snack type or donation frequency. During the study, all parents received multiple reminders to donate snacks, and parents in the refrigerator classroom were reminded of the presence of the refrigerator.

Teachers were instructed to log detailed information about snacks, including brand, size or weight, and donation date. Snacks were scored using the NuVal Nutritional Guidance System, LLC scoring system, (NuVal LLC, Quincy, MA) which used the Overall Nutritional Quality Index that measured nutritional quality based a food's overall impact on health.<sup>9</sup> A poststudy survey was administered to all participating teachers to assess perceptions of the snack types donated, snacks that students enjoyed most, and overall teacher satisfaction with the refrigerators.

## RESULTS

Over the 10-week study period, a total of 260 snacks were donated: 113 to control classrooms and 147 to treatment classrooms. The Figure shows the percentage of snacks donated to each classroom type by category (beverages, dairy; fruits and vegetables, salty snacks and crackers, and sweets and baked goods). In refrigerator classrooms, 19.7% of snacks were fresh fruits and vegetables, compared with 3.5% in non-refrigerator classrooms ( $\chi^2 = 15.1$ ;  $P < .001$ ). The share of salty snacks and crackers and sweet and baked goods was 21 percentage points lower in the refrigerator compared with the non-refrigerator classroom types ( $\chi^2 = 20.9$ ;  $P < .001$ ). The mean NuVal score for the refrigerator classrooms was significantly greater than

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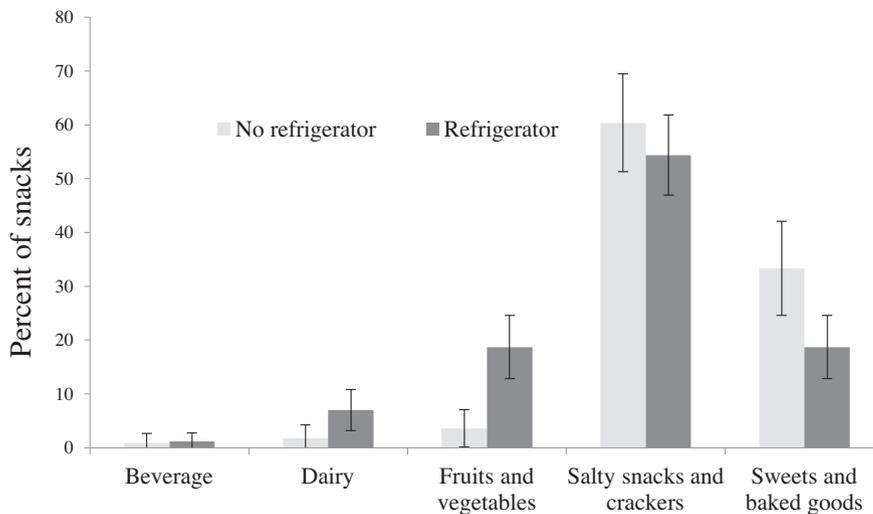
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**Figure.** Percentage of parent-packed snacks by category for refrigerator and non-refrigerator classrooms. Black bars indicate 95% confidence intervals of estimated proportions.

that of the non-refrigerator classrooms (14.2;  $t = 4.59$ ;  $P < .001$ ). No difference was observed between grades in mean NuVal score or mixture of donated snacks by category.

The response rate for the poststudy survey of teachers was 67% ( $n = 10$ : 4 from non-refrigerator and 6 from refrigerator classrooms). All teachers in refrigerator classrooms reported using the refrigerator to store parent-donated snacks. Using a Likert-type, 5-point scale in which 1 = *strongly did not enjoy* and 5 = *strongly enjoyed*, teachers were asked how much they enjoyed having the refrigerator in their classroom. All refrigerator classroom teachers strongly enjoyed having the refrigerator in their classroom (a score of 5). In addition, 67% of teachers in the refrigerator classrooms perceived a difference in the types of snacks being donated to the classroom compared with the prior school year, before the intervention began. All teachers in both classrooms reported that the most common snack donated was salty snacks and crackers. In refrigerator classrooms, teachers reported that produce was the second most commonly donated snack, whereas in the non-refrigerator classrooms, the second most commonly donated item was cookies. When asked

what type of snacks students were most excited about eating during snack time, all teachers in the refrigerator classrooms reported fresh produce or dairy products. In contrast, 86% of non-refrigerator classroom teachers reported cookies and fruit gummies.

## DISCUSSION

Mini-refrigerators offer a low-cost (<\$100) and convenient option for increasing access to fresh produce and other healthy foods in schools. Schools could use mini-refrigerators in classrooms and school cafeterias where snacks are sold. Larger refrigerators can be used to store parent-packed lunches. Because this was a pilot study, replication is needed on a larger scale over a longer period and with measurement of student consumption.

## NOTES

This study was exempt from human subjects review by the University of Wisconsin-Madison and was approved by the Madison Metropolitan School District External Research Committee. Informed consent was received for all teachers in participating classrooms, but it was not required from

either the parents or children. The study was supported by a grant from the University of Wisconsin-Madison Graduate School. The authors gratefully acknowledge the cooperation of Kathy Costello, principal, Thoreau Elementary School, Madison Metropolitan School District, Madison, WI; and the editorial assistance of Jennifer Zahradnick, Tufts University.

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