

Pictures in Lunch Tray Compartments and Vegetable Consumption
Among Children in Elementary School Cafeterias

Marla Reicks, Ph.D.

Department of Food Science and Nutrition, University of Minnesota

Joseph P. Redden, Ph.D.

Department of Marketing, University of Minnesota

Traci Mann, Ph.D.

Department of Psychology, University of Minnesota

Elton Mykerezi, Ph.D.

Department of Applied Economics, University of Minnesota

Zata Vickers, Ph.D.

Department of Food Science and Nutrition, University of Minnesota

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Corresponding Author: Traci Mann, 75 East River Road, Department of Psychology,
University of Minnesota, Minneapolis, MN 55455. mann@umn.edu. Phone: 612-625-5838.

To the Editor: To increase healthy eating among children, the United States government has recommended providing more vegetables in school lunches,¹ and schools are attempting to comply.² Children, however, are still far from consuming sufficient amounts.² We attempted to increase vegetable consumption by placing pictures of vegetables in school lunch tray compartments. We expected these pictures to indicate to the children that others typically select and place vegetables in those compartments and that they should do so too.^{3,4}

Methods. Vegetable consumption was compared on a *control* day (2/7/11) and an *intervention* day (5/9/2011) in an elementary school of approximately 800 students in Richfield, Minnesota. Approximately 75% of students in this school district are racial or ethnic minorities, and 72% are eligible for free or reduced price lunches. Waiving of informed consent and all study procedures were approved by the University of Minnesota Institutional Review Board.

Cafeteria procedures were typical, and the same meal was served, on both days. Students helped themselves to pre-portioned servings of applesauce, orange slices, green beans, and carrots. Kitchen staff served the rest of the meal. On the *intervention* day (but not the *control* day) we placed photographs of carrots and green beans in tray compartments. After lunch, we collected and weighed all the uneaten vegetables from the containers, tables, and floor.

The total amount of carrots (green beans) *taken* each day was calculated by multiplying the mean weight of a portion of carrots by the number of students that took carrots. The total amount *eaten* was calculated by subtracting the weight of the uneaten waste from the total amount taken. The mean amount eaten *per student exposed* to the intervention was calculated by dividing the total amount of carrots consumed by the number of students present in the cafeteria, whether they took carrots or not. Intervention and control days were compared using two-sample tests of proportions (percent taking each vegetable) or two-sample mean comparisons (grams

consumed). Analyses were computed in MS Excel 2010 using two-tailed tests and a $p < .01$ cutoff for statistical significance.

Results. The intervention increased the percent of students taking green beans from 6.3% to 14.8% (see Table 1; $z = 5.04$, $p < 0.001$), and the percent of students taking carrots from 11.6% to 36.8% ($z = 10.70$, $p < 0.001$). The amount of green beans eaten by students who took them did not differ between the control day ($M = 19.0\text{g}$) and the intervention day ($M = 19.1\text{g}$; $t(136) = .08$, $p = .93$). Overall, the intervention significantly increased the amount of green beans consumed per student exposed to it (from $M = 1.2\text{g}$ to $M = 2.8\text{g}$; $t(1311) = 38.00$, $p < 0.001$). The amount of carrots eaten by students who took them was significantly higher on the control day ($M = 31.0\text{g}$) than the intervention day ($M = 27.1\text{g}$; $t(313) = 5.28$, $p < .001$), but overall, the intervention significantly increased carrot consumption per exposed student (from $M = 3.6\text{g}$ to $M = 10.0\text{g}$; $t(1311) = 87.18$, $p < 0.001$).

Comment. Placing photographs in cafeteria lunch trays requires no special training and incurs minimal costs and labor (in this study, about \$3 and 20 minutes per 100 trays), but leads to increases in vegetable consumption within the range of those found in more expensive interventions, including those that require multiple classroom sessions with trained instructors, or parent involvement⁵. The number of students taking vegetables and the amounts consumed, however, remain low and do not yet meet government recommendations. In addition, these findings came from just two days in one school, so further research is needed to assess how well the effects generalize to other settings and persist over time.

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Study concept and design: Mann, Mykerezi, Redden, Reicks, Vickers

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Table 1. Amount of vegetables taken and consumed

	Control Day N = 666 eating lunch	Intervention Day N = 647 eating lunch	P Value†	Difference [95% CI]
Number taking beans	42	96		
Percent taking beans	6.3 (0.9)	14.8 (1.4)	<.001	8.5 [5.2; 11.8]
Grams eaten per student taking beans	19.0 (9.2)	19.1 (6.0)	0.93	0.1 [-2.5; 2.7]
Grams eaten per student eating lunch	1.2 (0.6)	2.8 (0.9)	<.001	1.6 [1.5; 1.7]
Number taking carrots	77	238		
Percent taking carrots	11.6 (0.01)	36.8 (0.02)	<.001	25.2 [22.7; 27.7]
Grams eaten per student taking carrots	31.0 (8.4)	27.1 (4.4)	<.001	-3.9 [-5.4;-2.4]
Grams eaten per student eating lunch	3.6 (0.8)	10.0 (1.6)	<.001	6.4 [6.3; 6.5]

Notes: Standard errors in parentheses.

†Indicates two-tailed comparison between groups by two-sample Z-tests for variables with binary outcomes (% taking beans, carrots) and t-tests for variables with continuous outcomes (all others).