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

To the Editor: To increase healthy eating among children, the US government has recommended providing more vegetables in school lunches, and schools are attempting to comply. Children, however, still consume insufficient amounts of vegetables. We attempted to increase vegetable consumption by placing photographs of vegetables in school lunch tray compartments. We expected these photographs to indicate to the children that others typically select and place vegetables in those compartments and that they should do so too.

Methods. Vegetable consumption was compared on a control day (February 7, 2011) with an intervention day (May 9, 2011) in an elementary school (kindergarten through fifth grade) 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. All study procedures were approved by the University of Minnesota institutional review board, which also waived informed consent.

Cafeteria procedures were typical and the same meal was served on both days. Students helped themselves to proportioned 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 taken each day was calculated by multiplying the mean weight of a portion of carrots by the number of students who 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. Green bean outcomes were calculated the same way. Intervention and control days were compared using 2-sample tests of proportions (percentage taking each vegetable) or 2-sample mean comparisons (grams consumed). Two-tailed tests were computed using Microsoft Excel 2010; a P value of less than .05 was the cutoff for statistical significance.

Results. The intervention was associated with an increase in the percentage of students taking green beans from 6.3% (42/666) to 14.8% (96/647) (Table; z = 5.04, P < .001), and the percentage of students taking carrots from 11.6% (77/666) to 36.8% (238/647) (z = 10.70, P < .001). The amount of green beans eaten by students who took them did not differ between the control day (mean of 19.0 g) and the intervention day (mean of 19.1 g; t_{1311} = 0.08, P = .93). Overall, the intervention was associated with a significant increase in the amount of green beans consumed per student exposed (from mean of 1.2 g to 2.8 g; t_{1311} = 38.00, P < .001). The amount of carrots eaten by students who took them was significantly higher on the control day (mean of 31.0 g) than the intervention day (mean of 27.1 g; t_{1311} = 5.28, P < .001), and the intervention was associated with a significant increase in the carrot consumption overall per exposed student (from mean of 3.6 g to 10.0 g; t_{1311} = 87.18, P < .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 was associated with an increase 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 in-

**Table. Amount of Vegetables Taken and Consumed During Lunch at an Elementary School Cafeteria**

<table>
<thead>
<tr>
<th></th>
<th>Control Day (n = 666)</th>
<th>Intervention Day (n = 647)</th>
<th>Difference (95% CI)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Took green beans, No. (95% CI) [%]</td>
<td>42 (30 to 54) (6.3]</td>
<td>96 (78 to 114) (14.8]</td>
<td>8.5% (5.2% to 11.8%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Amount eaten per student, mean (95% CI), g</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Among those who took green beans</td>
<td>19.0 (16.2 to 21.8]</td>
<td>19.1 (17.9 to 20.3]</td>
<td>0.1 g (-2.5 g to 2.7 g]</td>
<td>.93</td>
</tr>
<tr>
<td>Among those who ate lunch</td>
<td>1.20 (1.15 to 1.25]</td>
<td>2.8 (2.7 to 2.9]</td>
<td>1.6 g (1.5 g to 1.7 g]</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Took carrots, No. (95% CI) [%]</td>
<td>77 (61 to 93) (11.6]</td>
<td>238 (214 to 262) (36.8]</td>
<td>25.2% (22.7% to 27.7%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Amount eaten per student, mean (95% CI), g</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Among those who took carrots</td>
<td>31.0 (29.1 to 32.9]</td>
<td>27.1 (26.5 to 27.7]</td>
<td>-3.9 g (-5.4 g to -2.4 g]</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Among those who ate lunch</td>
<td>3.6 (3.5 to 3.7]</td>
<td>10.0 (9.9 to 10.1)</td>
<td>6.4 g (6.3 g to 6.5 g]</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*Calculated using 2-sample 2 tests for variables with binary outcomes (percentage taking green beans and percentage taking carrots) and t tests for variables with continuous outcomes (all others).
volvement. The number of students taking vegetables and the amounts consumed, however, remained low and did not yet meet government recommendations. In addition, these findings were obtained from just 2 days in 1 school, so further research is needed to assess how well the effects generalize to other settings and persist over time.

Marla Reicks, PhD
Joseph P. Redden, PhD
Traci Mann, PhD
Elton Mykerezi, PhD
Zata Vickers, PhD

Author Affiliations: Departments of Food Science and Nutrition (Drs Reicks and Vickers), Marketing (Dr Redden), Psychology (Dr Mann) (mann@umn.edu), and Applied Economics (Dr Mykerezi), University of Minnesota, Minneapolis.

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Author Contributions: Dr Mykerezi had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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

Acquisition of data: Reicks, Redden, Vickers.

Analysis and interpretation of data: Reicks, Redden, Mann, Mykerezi, Vickers.

Drafting of the manuscript: Reicks, Redden, Mann, Vickers.

Critical revision of the manuscript for important intellectual content: Reicks, Redden, Mann, Mykerezi, Vickers.

Statistical analysis: Mykerezi, Vickers.

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