What are children eating at school lunch?

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Have the new school meal regulations resulted in increased food waste?

Popular Media: Yes

Research: Yes and No
How do we know what children eat at school?

Objective Meal Observations:

- Weighed Plate Waste
- Direct Observation
- Digital Imaging
# Weighed Plate Waste Methods

## Individual

### Salad Bar evaluation  
(Adams, JADA 2005)

- Label Student Trays
- Establish baseline weights (5-10 random samples)
- Observe/count/weigh student selections
- Collect trays and weigh remaining food

\[ S - W = \text{Consumption} \]

\[ S = \text{weight of selected food(s)} \]

\[ W = \text{weight of student waste} \]

## Aggregate

### Food Pairings  
(Ishdorj, Food & Nutri Sciences 2015).

\[ \frac{P - U - W}{N} = \text{Consumption} \]

\[ P = \text{weight of prepared food(s)*} \]

\[ U = \text{weight of unserved food(s)*} \]

\[ W = \text{weight of student waste} \]

\[ N = \text{number of students} \]

*Relies on Production records*
Direct Observation & Digital Imaging

- Determination of average serving weights
- Selection image
- Plate waste image
  - Percentage consumed estimated using a five or six-point scale

- Farm to School Program evaluation (Yoder, JNEB 2014 & Public Health Nutr 2015)
- Foods brought from home (Hubbard, J Acad Nutr Diet 2014)
- New School Meal Regulations (Schwartz, Childhood Obes 2015)

*J Acad Nutr Diet, Sept 2014*
Children’s Milk Consumption (grades 3-5)

- 10 elementary schools (7 northeast, 3 south)
- Individual WPW
- Overall, no change in milk consumption (~6.0 oz at lunch)
- Differences between and within schools (grade, sex, milk packaging)

2010: 150-170 calories, 0-1% fat, 22-27gm total sugars
2013: 110-130 calories, 0% fat, 18-22 gm total sugars

In Press: Preventing Chronic Disease
Mixed Models Analyses

Student eligibility for Free/Reduced Priced Meals increased ($p<.01$)

NSLP Participation decreased 5.5 points (adjusting for increases in Free/Reduced eligibility)
- Overall milk shipment increased.
- 74% of milk shipments were flavored milk.

### Milk Shipment before/after USDA updated regulations

<table>
<thead>
<tr>
<th></th>
<th>Spring 2010</th>
<th>Spring 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>White milk shipment</td>
<td>124 ±10</td>
<td>151 ±10*</td>
</tr>
<tr>
<td>Flavored milk shipment</td>
<td>303 ±24</td>
<td>388 ±24*</td>
</tr>
<tr>
<td>Total milk shipment</td>
<td>421 ±30</td>
<td>537 ±30*</td>
</tr>
<tr>
<td>Milk shipment/student</td>
<td>0.90 ±0.03</td>
<td>1.1 ±0.01*</td>
</tr>
</tbody>
</table>

- Average daily units ± SE shipped based on two months shipment data, adjusted for declines in NSLP participation.
- Estimated based on average daily student attendance.
* $p<0.01$
What is the impact of the new FV requirements?

Two Northeast elementary schools enrolled 2011-2013

- Spring 2012 (Pre-Rule)
- 10 school visits (498 tray observations)
- Methods:
  - Digital Imaging
  - Direct Observation
  - Weighed Plate Waste

- Spring 2013 (Post-Rule)
- 11 school visits (944 tray observations)
- Methods:
  - Digital Imaging

The University of Vermont’s Review Board approved the study, waiving written consent. Parents, teachers, staff and administrators were notified of the study.
**Consumption**

- FV consumption decreased ~1 TBSP (12%)
- FV waste increased ~2 TBSP (56%) (mostly fruit)
- Vegetable consumption was stable

![Bar graph showing consumption trends](chart.png)

*Percent of elementary student lunch trays with fruit and/or vegetables when optional versus required*

*Public Health Reports, Sept/Oct 2015*
Farm to School

- FTS children selected more whole/unprocessed FV than non-FTS ($p=.05$)
- Fruit selection increased slightly more on FTS trays ($p=.08$)
- FTS children consumed more vegetables than non-FTS (1/3 cup vs 1/4 cup, $p<.0001$)

Non-Farm to School

- Compared to 2011/12, non-FTS students selected larger amounts of vegetables & consumed slightly more when FV were required ($p=.08$)
### Nudging: Preschoolers’ Fruit and Vegetable Snack Consumption

30 consecutive days of data collection  Spring 2015: 10 days Baseline, 10 days Intervention: “FV Mentors” + Teacher Verbal Cues, 10 days Follow-up: can behavior change be sustained?

<table>
<thead>
<tr>
<th></th>
<th>Class A (n=15, 33.3% WIC)</th>
<th>P</th>
<th>Class B (n=16, 0% WIC)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean amount of FV consumed by pre-school children (cups)</td>
<td>Baseline cups (95% CI)</td>
<td>Intervention cups (95% CI)</td>
<td>Follow-up cups (95% CI)</td>
<td>Baseline cups (95% CI)</td>
</tr>
<tr>
<td></td>
<td>0.16 (0.10,0.22)</td>
<td>0.27 (0.17,0.37)</td>
<td>0.33 (0.28,0.38)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mean amount of FV consumed by FV Mentors (cups)</td>
<td>0.61 (0.39,0.82)</td>
<td>0.68 (0.30, 1.06)</td>
<td></td>
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</tr>
</tbody>
</table>
Opportunities – Universal Recycling/Composting

- Aggregate Waste Method simplified

- Food scrap weights can be compared to:
  - Menu/Entrée selection
  - Pre/Post Intervention
Next Steps & Recommendations

• Digital Imaging methods continue to evolve as an evaluation tool.

• Strategies/resources needed to ensure children choose foods they will eat & eat what they choose.
  - Farm to School
  - Staff training

• What is the role of the Cafeteria Environment?
  - Time in service line/at table
  - Recess before Lunch
  - Smarter Lunchrooms
Conclusions

- **Healthy Hunger-Free Kids Act Successes:**
  - Children are drinking lower fat milk, including fat-free flavored milk with less added sugars.
  - More children are selecting FV with school lunch, and in larger amounts.
  - Children eat more vegetables with Farm to School exposure.
  - A new generation of children exposed to healthier foods in WIC, CACFP, School Meals and Smarter Snacks.
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