What are children eating at school lunch?

Bethany Yon, PhD

Nutrition and Food Sciences
University of Vermont
Burlington, VT
Disclosures

Research Funding includes:

- USDA/Vermont Agriculture Experiment Station/Hatch Funds
- Dairy Research Institute
- New England Dairy and Promotion Board
- Bickford Scholar Research Fund
- Vermont Agency of Natural Resources
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

<table>
<thead>
<tr>
<th>Individual</th>
<th>Aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Label Student Trays</td>
<td></td>
</tr>
<tr>
<td>- Establish baseline weights (5-10 random samples)</td>
<td></td>
</tr>
<tr>
<td>- Observe/count/weigh student selections</td>
<td></td>
</tr>
<tr>
<td>- Collect trays and weigh remaining food</td>
<td></td>
</tr>
<tr>
<td><strong>S-W = Consumption</strong></td>
<td></td>
</tr>
<tr>
<td>S=weight of selected food(s)</td>
<td></td>
</tr>
<tr>
<td>W=weight of student waste</td>
<td></td>
</tr>
<tr>
<td>P-U-W / N = Consumption</td>
<td></td>
</tr>
<tr>
<td>P=weight of prepared food(s)*</td>
<td></td>
</tr>
<tr>
<td>U=weight of unserved food(s)*</td>
<td></td>
</tr>
<tr>
<td>W=weight of student waste</td>
<td></td>
</tr>
<tr>
<td>N=number of students</td>
<td></td>
</tr>
<tr>
<td>*Relies on Production records</td>
<td></td>
</tr>
</tbody>
</table>
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 & New School Meals 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 (SES, 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><strong>White milk shipment a</strong></td>
<td>124 ±10</td>
<td>151 ±10*</td>
</tr>
<tr>
<td><strong>Flavored milk shipment a</strong></td>
<td>303 ±24</td>
<td>388 ±24*</td>
</tr>
<tr>
<td><strong>Total milk shipment a</strong></td>
<td>421 ±30</td>
<td>537 ±30*</td>
</tr>
<tr>
<td><strong>Milk shipment/student a,b</strong></td>
<td>0.90 ±0.03</td>
<td>1.1 ±0.01*</td>
</tr>
</tbody>
</table>

a. Average daily units ± SE shipped based on two months shipment data, adjusted for declines in NSLP participation.
b. 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.
Percent of elementary student lunch trays with fruit and/or vegetables when optional versus required

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

* p < .01

Public Health Reports, Sept/Oct 2015
### Farm to School/Non-Farm to School

#### 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 \((1/3 \text{ cup vs } 1/4 \text{ cup, } p<.0001)\)

#### 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></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>Mean amount of FV consumed by pre-school children (cups)</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>
<td></td>
</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.
Acknowledgements

RACHEL K JOHNSON, RD, PHD, MPH
SARAH AMIN, PHD, MPH
JENNIFER TAYLOR, MS
ALAN HOWARD, MS
JEFFREY PRIEST, PHD
OUR SCHOOL NUTRITION DIRECTORS
UVM’S DIETARY ASSESSMENT TEAM

The University of Vermont