

FOOD WASTE

AMONG ELEMENTARY
SCHOOL CHILDREN:
OPPORTUNITIES &
CHALLENGES



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LEARNING OBJECTIVES

- 1) Review total food waste and food waste by food component among elementary school children, based on a study conducted in Montgomery County, Virginia, following the implementation of the new NSLP nutrition standards;
- 2) Understand implications of food waste, including nutrition and cost;
- 3) Discuss opportunities to decrease food waste and improve food intake among young children.

NEW NUTRITION STANDARDS FOR THE NATIONAL SCHOOL LUNCH PROGRAM (NSLP)

Focus on food-based menu planning

5 meal components, standardized to serving sizes and calories based upon age and grade-level:

- Fruits
- Vegetables
- Whole grains
- Low-fat dairy
- Protein

Daily serving of fruit and vegetable

Weekly serving of dark green, red/orange, beans/peas, starchy, and other vegetables

Offer versus serve

*... Yet School Nutrition
Directors reported more food
waste*

GOAL OF THIS STUDY

The aim of this study was to assess the cost of food waste by food and beverage category within the NSLP among early elementary students (pre-kindergarten and kindergarten).

- They represent a relatively “new” audience given their length of time and exposure to the NSLP.
- Strategies to improve consumption and waste within the NSLP may be more effective within this age group.

PARTICIPANTS

- **One pre-kindergarten and four kindergarten classes** from a single public elementary school were recruited to participate in the study.
- **48.93% eligibility** for free and reduced price school lunch for 2012-2013.

PROCEDURES

- One full week in March 2013.
- School nutrition staff standardized, pre-weighed, and served each food item on the menu into individual containers, with the exception of fruit and vegetable juices and milk, which were purchased in cartons.
- Menu items were then weighed and recorded each day by the research staff.
- Each child had 30 minutes to eat.

OBSERVATIONAL CHECKLIST

- An observational checklist was used to record which *NSLP food and beverages were served* to each student enrolled in the study classrooms.
- Each observational checklist was tailored to reflect the meal components of the day's specific menu.

Class: _____ Male _____ Female _____ Student(s) (if needed): _____ Date: _____
 Recorder: _____

Number in Class: _____ Table #: _____ Grade: _____
 # School Lunches: _____ Male: _____ Female: _____
 # Packed Lunches: _____ Male: _____ Female: _____

Packed Lunch

Food/Item	Side	Beverage
Apple	Apple	Apple
Banana	Banana	Banana
Orange	Orange	Orange
Apple Juice	Apple Juice	Apple Juice
Orange Juice	Orange Juice	Orange Juice
Water	Water	Water
Milk	Milk	Milk
...

Instructions: Please view each child on your table's lunch and mark with an X the foods that child has. If 2 boxes, mark quantity, if 3 boxes - for fruits and vegetables only, use coding guidelines to determine consumption.

Other items and quantity: _____

School Lunch

Food/Item	Side	Beverage
...

Coding for Fruit and Vegetable Columns:
 1 = whole food consumed
 1/2 = 1/2 of food consumed
 1/4 = 1/4 of food consumed
 0 = none consumed

Circle: Male Female Identifier (if needed): _____

Date: _____
Recorder: _____

Number in Class: _____ Table #: _____ Grade: _____
School Lunches: _____ Male: _____ Female: _____
Packed Lunches: _____ Male: _____ Female: _____

Instructions: Please view each child on your tables' lunch and mark with an X the foods that child has. If 2 boxes, mark quantity, if 3 boxes - for fruits and vegetables only, use coding guidelines to determine consumption.

OBSERVATIONAL CHECKLIST

Packed Lunch

		Sides	X
Sandwich		Yogurt Tube	
PB & J on WHITE		Yogurt Cup	
PB & J on WHEAT		Yogurt - Activa	
Grilled Cheese on WHITE		Chips - Baked (pkg)	
Grilled Cheese on WHEAT		Chips - Harvest Grain (pkg)	
Turkey on WHITE		Chips - Dorito (pkg)	
Turkey on WHEAT		Chips - BBQ (pkg)	
Ham on WHITE		Chips - Cheetos (pkg)	
Ham on WHEAT		Chips - Regular (pkg)	
Bologna on WHITE		Pretzels (pkg)	
Bologna on WHEAT		Goldfish (pkg)	
Tuna on WHITE		Cheez-its (pkg)	
Tuna on WHEAT		Cheese Stick	
Toppings		Nutri-Grain Bar	
Lettuce		Crackers & Cheese	
Tomato		Crackers & Cheese Dip (pkg)	
Cucumbers		Popcorn (pkg)	
Cheese (not Gr Cheese)		Mixed Nuts	
Mayo		Trail Mix (mnm's, etc)	
Mustard		Almonds	
Lunchables/Food Kits		Peanuts	
Crackers/HAM/Cheese		Beverages	
Crackers/Turkey/Cheese		Milk Box - Horizon 1% Plain	
Pizza Kit		Milk Box - Horizon 1% Vanilla	
Nachos Kit		Milk Box - Horizon Chocolate	
Chicken Nuggets Kit		Milk - Cup from Home (White)	
BumbleBEE Tuna Kit		Milk - Cup from Home (Choc)	
Leftovers		Capri Sun - Fruit Punch	
Pizza - Cheese		Capri Sun - Wild Cherry	
Pizza - Pepperoni		Capri Sun - Apple	
Pasta (red sauce/noodles)		Capri Sun - Grape	
Mac & Cheese		Fruitables - Berry	
Fruit		Fruitables - Apple	
	X	Amt	Code
Grapes			
Apple - Whole			
Apple - Slices			
Applesauce Cup			
Orange - Whole			
Orange - Slices			
Orange - Mandarin Cup			
Banana - Whole			
Banana - Half			
Strawberries			
Raisins			
Mixed Fruit Cup			
Vegetable			
Carrots			
Celery			
Cucumbers			
Cherry Tomatoes			
Ranch Dip for Veggies			

Coding for Fruit and Vegetable Columns:
1 = entire food consumed
½ = ½ of food consumed
< < = half consumed
0 = none consumed

Dessert	X
Jello Pudding - Chocolate	
Jello Pudding - Vanilla	
Jello Pudding - Butterscotch	
Jello Cup	
Jello w/ Fruit Cup	
Rice Krispies (pkg)	
Gummy Bears	
Mini Candy Bar	
Fruit Snacks (pkg)	
Cookies - Oreo	
Cookies - Choc Chip	

Other items and quantity:

School Lunch

Main Tray	X
Corndog Nuggets	
Toasted Cheese	
Chef Salad	
PB & J	
Crackers (for soup)	

	X	Code
Tomato Soup		
Celery sticks w/dip		
Lima Beans		
Additional Options		
Tossed Salad		
Canned Fruit		

Beverages	X
Milk - White FF (TruMoo)	
Milk - White (1%) (PET)	
Milk - Choc FF (TruMoo)	
Milk - Straw FF (TruMoo)	
Juice - Apple (SunCup)	
Juice - Orange (PET)	

Other items and quantity:

FOOD WASTE MEASURES



- Bins were prepared to collect food by each food and beverage appearing on the school's daily menu (i.e., each different main entrée, fruit, vegetable, and milk).
- When students completed their meal, the research team collected school lunch trays and separated foods and beverages into their respective bins.

FOOD WASTE MEASURES

- The research team computed the edible portion of apples and plums by weighing the cores separately, averaging, and subtracting from mean fruit weight.
- Beverages were poured out of the cartons into the bins.
- At the end of each lunch period for each class, bins were weighed in grams and recorded by two independent research staff.

Food Waste Log

Main Entrée (1): _____ Day & Date: _____

Weight of Bin WITH Garbage Bag (g): _____ Initials: _____

Classroom	Number of Trays	ENTER Bin Weight (g) AFTER Adding Food
1		
2		
3		
4		
5		
6		

Notes:

FINAL WEIGHTS (g) (After all classrooms completed)

Scale 1: _____ Scale 2: _____

COST OF FOOD WASTE

FOOD WASTE

- Based on difference between food served (g) and wasted (g)
- Computed for each NSLP food category and beverage

RECIPES, PURCHASE ORDERS, INVENTORY SHEETS

- Cost per serving calculated for each menu item for beverage categories

COST OF STUDENT GENERATED FOOD WASTE

- Total price for actual cost of food
- By food category and beverage

SAMPLE ITEMS FROM MENU

ENTREE	VEGETABLE	FRUIT
Tacos	Side salad	Applesauce
Veggie wrap	Corn	Plums
Hot dog with chili	Beans	Oranges
Grilled cheese, cheese sticks	Green peas	Apples
Cheese quesadilla	Broccoli with ranch dip	Strawberries
Chicken filet sandwich	Coleslaw	Pears
Hamburger	Green beans	Peaches
Chef, taco salad	Glazed sweet potatoes	Orange juice
Peanut butter and jelly	Tomato juice	Apple juice

*in addition to non-fat chocolate and strawberry milk and low-fat plain milk

SCHOOL LUNCHES

In total, 304 school lunches were observed during the study period.



FOOD WASTE RESULTS

FOOD GROUP	PROPORTION WASTED OVER 5 DAYS
Entrée	51.0%
Vegetables	51.4%
Fruit	33.0%
Milk	45.5%
Total	45.3%

- Vegetables were wasted in the greatest amount, followed by main entrée, and milk .
 - Fruit had the lowest level of waste.
- Of 4,988 ounces of food and beverages served, 2,261.2 ounces (45.3%) of food were wasted during one full school week or **141.2** pounds.

FOOD WASTE BY DAY AND FOOD CATEGORY (OUNCES/STUDENT)

	Monday	Tuesday	Wednesday	Thursday	Friday
Main Entrée	0.131	0.058	0.105	0.094	0.064
Fruit	0.039	0.024	0.038	0.043	0.041
Vegetable	0.033	0.025	0.033	0.026	0.027
Milk	0.148	0.103	0.145	0.126	0.119
TOTAL	0.357	0.212	0.332	0.299	0.260

*Monday had the highest level of waste and Tuesday the lowest

Main entrée: .058 - .131 ounces

Fruit: .024 - .043 ounces

Vegetables: .025 - .033 ounces

Milk: .103 - .148 ounces

FOOD WASTE BY FOOD TYPE

Category	Monday	Tuesday	Wednesday	Thursday	Friday
Main Entrée	Taco; Veggie wrap; Chef salad; PBJ* sandwich	Hot dog; Grilled cheese sandwich; Taco salad; PBJ sandwich	Cheese quesadilla; Chicken filet sandwich; Chef salad; PBJ sandwich	Asian chicken salad; Quiche; Chicken fajita salad; PBJ sandwich	Hamburger and bun; Cheesesticks; Chef salad; PBJ sandwich
Fruit	Applesauce; Plums; Oranges; Apple; Apple juice; Orange juice	Strawberries; Pears; Applesauce; Apple juice; Orange juice	Peaches; Plums; Pears; Apple juice; Orange juice	Mixed fruit; Apples; Plums; Apple juice; Orange juice	Apple; Applesauce; Apple juice; Orange juice
Vegetable	Refried beans; Broccoli; Corn; Side salad	Vegetable beef broth; Green peas; Coleslaw; Tomato juice; Side salad	Sweet potatoes; Green beans; Sandwich condiments: lettuce, tomato, pickles; Spinach; Side salad	Chinese veggies; Mashed potatoes; Garlic broccoli; Side salad	Potato medley; Great northern beans; Red pepper strips; Side salad
Milk	Low-fat unflavored milk; Strawberry non-fat milk; Chocolate non-fat milk	Low-fat unflavored milk; Strawberry non-fat milk; Chocolate non-fat milk	Low-fat unflavored milk; Strawberry non-fat milk; Chocolate non-fat milk	Low-fat unflavored milk; Strawberry non-fat milk; Chocolate non-fat milk	Low-fat unflavored milk; Strawberry non-fat milk; Chocolate non-fat milk

*Yellow denotes highest day of waste

HIGHEST FOOD WASTE ITEMS (ON A GIVEN DAY)

FOOD GROUP	FOOD ITEM	PERCENT WASTED
Entrée	Quiche (only 3)	94.7%
	Chef salad (15)	88.4%
	Taco salad	67.1%
Vegetables	Side salad (every day)	96.4%
	Sweet potatoes	71.7%
Fruit	Apple (whole)	69.5%
	Plums	65.0%
Milk	Unflavored milk	94.2%

LOWEST FOOD WASTE ITEMS (ON A GIVEN DAY)

FOOD GROUP	FOOD ITEM	PERCENT WASTED
Entrée	Veggie wrap (1)	4.9%
	Asian chicken	22.2%
	Hot dog	28.8%
	PBJ	34.9% - 52.90%
Vegetables	Mashed potatoes	17.7%
	Green peas	33.3%
	Broccoli	48.1%
Fruit	Pears	7.7%
	Plums	8.7%
	Applesauce	12.3%
Milk	Flavored milk	33.2%

FOOD ITEMS WITH HIGHEST AND LOWEST TOTAL LEVELS OF WASTE

LEVELS OF WASTE	ENTRÉE	VEGETABLE	FRUIT
Lowest	Veggie Wrap (Mon, \$0.03)	Broccoli (Mon, \$0.12)	Pears (Tues, Wed, \$0.10)
Highest	Asian Chicken (Thurs, \$21.51)	Side Salad (Mon-Fri, \$38.24)	Whole Red Apple (Mon, Thurs, Fri, \$4.21)

- Unflavored and flavored milk totals for week are:
 - Unflavored - \$4.54
 - Flavored - \$21.99

• **Highest costs waste also most popular items**

DIRECT COST OF FOOD WASTE FOR ONE WEEK

(BASED ON COST OF FOOD ONLY, NOT LABOR, DISPOSAL, AND OTHER COSTS)

ENTREES	VEGETABLES	FRUITS	UNFLAVORED MILK	FLAVORED MILK	TOTAL
\$101.61	\$66.36	\$25.90	\$4.13	\$21.99	\$219.99

\$0.72 per child (average)

\$1,943 for K-5* (entire school division)

\$251,890 per school year* (K-5 for 180 school days)

**based on 40% NSLP participation and total K-5 student enrollment of 4,859 for 2013-2014*

LIMITATIONS

Food waste not collected or computed for other grades or for packed lunches.

- **Packed lunches are not the property of the school, required parental consent**

Only one school at elementary level within the school division was studied (relatively small sample).

May not be able to generalize to different geographic locations or other menus.

Cost of food wasted in kitchen (prepared but not served) was not included in total cost.

- **Likely negligible because batch cooking done and menu count down each morning in elementary school**

Food waste from reimbursable vs. non-reimbursable meals was not determined.

- **Does food (in)security influence waste?**

HOW DOES THIS STUDY COMPARE TO FOOD WASTE FROM OTHER STUDIES?

In general, food waste (and the cost of food waste) in our study was higher than in other studies conducted prior to implementation of the new standards.

- Washington, DC (1979) – 25-45% food waste (across all foods)
- Southern Illinois (rural)(2003) – 36% of non-soy enhanced meals and 48% of soy-enhanced meals
- Frankfurt, KY (2005) – 19% meat, 20% milk, and 27% main dish, including vegetables (females); 16% meat, 12% milk, and 16% main dish (males); whole apples (62%) vs applesauce (23%)
- Boston, MA (2013) – Cost: \$432,349 for 4 schools for one year (based on food waste for 4 days) (computed by multiplying total food budget by 26.1%)
 - \$.26/student per day
 - Ours: \$.72/student per day - \$251,890

HOW DOES THIS STUDY COMPARE TO FOOD WASTE FROM OTHER STUDIES?

But... a study published recently found higher levels of food waste before the new standards.

- 18 elementary schools – **70%** fruits and vegetables thrown away (compared to 33.0% for fruit and 51.4% for vegetables for our study)
 - Our range for fruit: 21.3-42.3%
 - Our range for vegetable: 26.1-80.0%
- They also estimated that \$31.6 million is spent each day on fruits and vegetables, \$3.8 million a year of this produce is thrown away
- They also found that when fruit was sliced waste decreased

IS FOOD WASTE HIGHER THAN BEFORE?

Another recent study by Harvard found that food consumption of *entrees and vegetables increased significantly* and milk decreased after implementation of the new standards (4 schools, grades 1 – 8).

- Food waste still high: 60-75% for vegetables and 40% for fruit
- Majority of students Hispanic (83.0%)

UNDER EMBARGO UNTIL MARCH 4, 2014, 12:01 AM ET

Impact of the New U.S. Department of Agriculture School Meal Standards on Food Selection, Consumption, and Waste

Juliana F.W. Cohen, ScM, ScD, Scott Richardson, MBA, Ellen Parker, MBA, MSW, Paul J. Catalano, ScD, Eric B. Rimm, ScD

Table 4. Meal consumption before and after implementation of the new USDA standards for school meals for all students (N=5936)^a

Meal component	Mean pre ^b	Mean post ^b	Difference (post – pre)	p-value
Entrée (% consumed)	63.4	73.6	10.2	< 0.0001
Milk (% consumed)	62.4	50.1	-12.3	< 0.0001
Vegetable (% consumed)	25.8	40.3	14.5	< 0.0001
Vegetable (cups)	0.13	0.30	0.17	< 0.0001
Fruits (% consumed)	59.1	56.9	-2.2	0.05
Fruits (cups)	0.44	0.45	0.01	0.29

Note: The change in vegetable consumption is .17 cups = 2.7 tbsp = 3-4 bites

WHY IS SO MUCH FOOD WASTED?

TIME TO EAT (NOT AN ISSUE FOR MCPS, BUT...)

TYPES OF FOOD – I.E. NUMBER OF BITES REQUIRED (SALAD)

LACK OF EXPOSURE TO VEGETABLES AT HOME

LUNCH = SOCIAL TIME

**LUNCHROOM CHARACTERISTICS (NOISE, POSITIVE ADULT
NUDGING)**

HOW CAN WE ENCOURAGE CHILDREN TO EAT WELL AND WASTE LESS?

THE MILLION \$ DOLLAR QUESTION

SCHOOL NUTRITION PROGRAMS ARE DOING ENOUGH

QUESTIONS

OPPORTUNITIES

Other factors that influence food waste beyond the NSLP?? (i.e. preferences, length of time to eat, timing of meal, cafeteria/school characteristics).

Numerous educational opportunities are possible to encourage children to eat more lunch and waste less!

- **Beyond healthy eating**
- **Financial accountability**
- **Environmental stewardship**

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ANY QUESTIONS?

THANK YOU

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Click the “Evaluate Your Sessions” link.

THANK YOU!