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Incorporating Whole Grain Foods into School Meals and Snacks

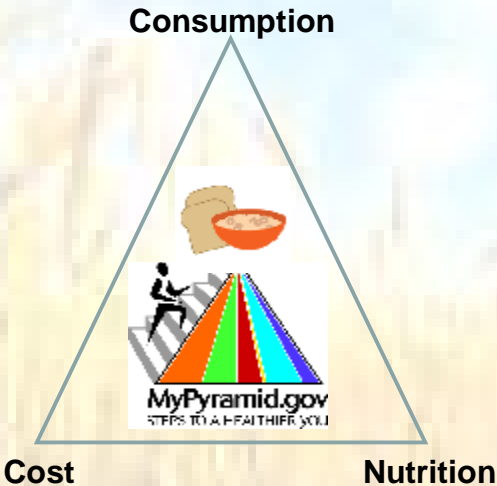
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Whole Grain Foods for School Lunch



Consumption

Cost Nutrition

MyPyramid.gov
STEPS TO A HEALTHIER YOU

Points of Interest

- Ø Principle's to encourage children to eat whole grains (WG):
 - § Familiar foods
 - § Availability
 - § Natural transition

- Ø Research projects: Consumption of WG foods in schools
 - § Partial WG foods (50:50 flour blend)
 - § Gradual introduction of WG foods
 - § After-school snacking program

Dietary Intake of Whole Grains

- Ø Less than 1 serving per day
- Ø Based on consumption data
 - § CSFII 1994-96 for US adults



Source: Cleveland et al, 2000, JACN 19:331S

Familiarity

Ø Focus groups with children indicated (Burgess-Champoux et al., 2006)

§ Taste

§ Familiarity

§ Appearance

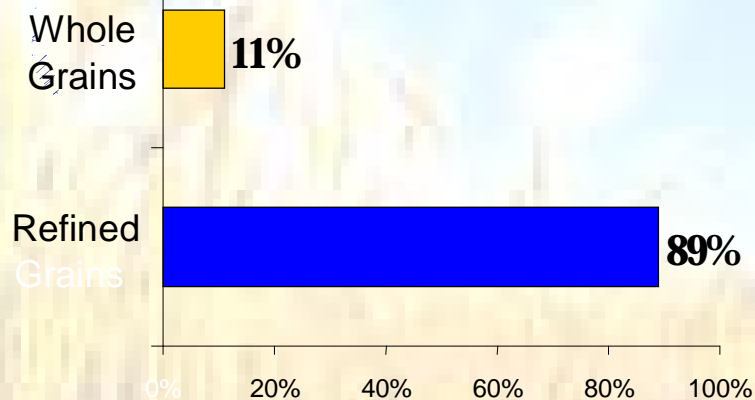
Ø Other factors affecting whole grain intake

§ Bitterness (Atwell, 2002; Cowart, 1981; Bell & Topper, 2006)

§ Color (Atwell, 2002)

§ Texture (Berg et al., 2003)

Availability of Whole Grains



NHANES 1999 - 2002

Natural Transition

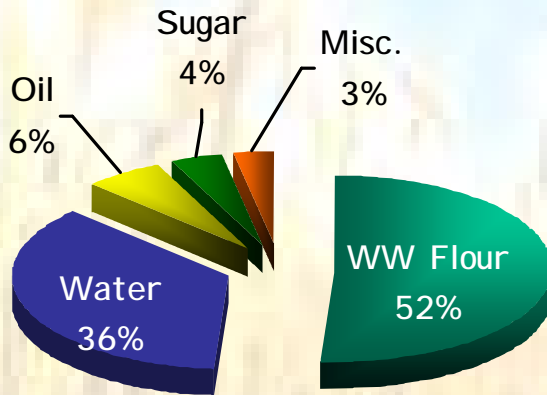
- ∅ Gradually introduce partial whole grains into the U.S. food supply
 - § Similar to the gradual transition from whole milk to skim milk
 - § Develop partial whole grain products with lower levels of whole grain flour
 - § Pizza, bread, rolls, crackers, cookies



Natural Transition

- § Gradual approach (Partial whole grain foods)
 - § Slowly increase the level of whole grain flour in foods over the course of time
- § Repeated exposures
 - § Acceptance of new foods may increase upon repeated exposures (Birch et al., 1998)
 - § Combining familiar and unfamiliar elements (Urbick, 2002)

Whole Grain Dinner Roll

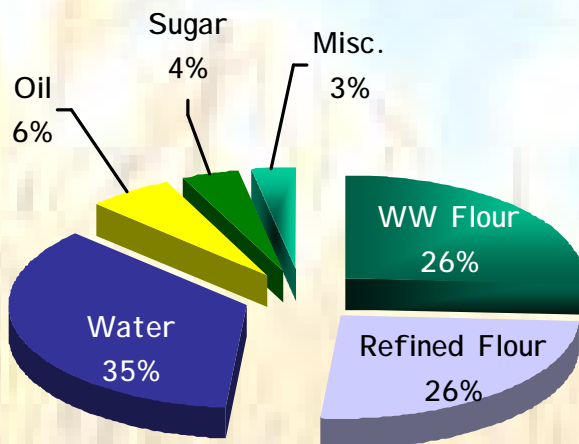


16 grams whole wheat flour per 30 gram roll

RESULT:
1 roll is one whole grain ounce equivalent

One whole grain serving = 16 grams whole grain

Partial Whole Grain Dinner Roll



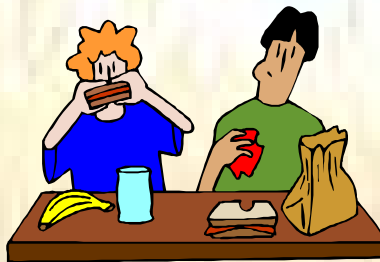
8 grams whole wheat flour per 30 gram roll

RESULT:
1 roll is 1/2 whole grain ounce equivalent

Partial = >0% but <51% whole wheat flour per product

Project I

School-based Partial Whole Grain Products



Students / School

Ø **Students / School**

§ 1st - 6th grades from one elementary school in Hopkins School District, MN

§ Enrollment: 324 boys and 314 girls

§ 69% (white)

31% (African American, Hispanic, or Asian)

§ 37% were eligible for free or reduced price school meals

§ ~ 550 lunch meals were served each day

Study Site: School Cafeteria



Ø Study Design

- RW pizza crust was offered 2 times
- The 50:50 blend pizza crust was offered 4 times
- Both types of pizza were made with a cheese topping, and served with a veg / salad

Plate Waste Procedure



§ Grain products offered on the serving line



§ Weigh 10 samples of grain product to determine mean weight



§ Children discard unfinished grain products into plate waste container

§ Waste is weighed

Pizza Products

Refined Wheat



100% refined red wheat flour

50:50 Blend



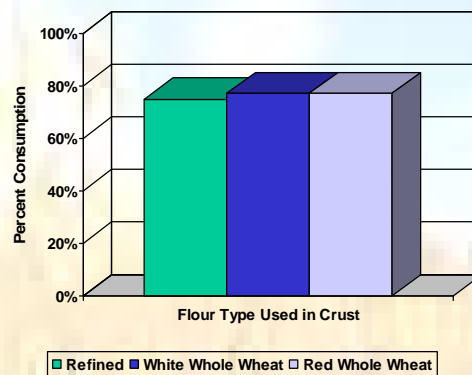
50% white whole wheat flour *
50% refined wheat flour

16 g whole grain = 1 serving

*Ultragrain, ConAgra Foods, Omaha, NE

Pizza - 50 / 50 Flour Blend

- Percent Consumption was determined from plate waste in grade schools.
- Pizza crust made with white or red whole wheat was just as acceptable as traditional crust from refined flour.

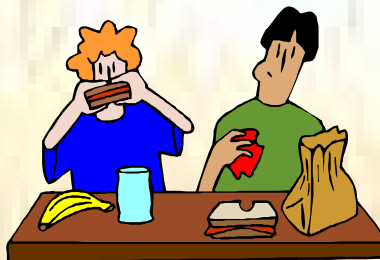


Summary

- Ø Pizza is an ideal food to introduce WG flour as the cheese topping and sauce, tends to mask any WG flavors in the crust.
 - § Children consumed nearly a full WG serving for lunch
 - § Nearly doubles daily WG intake for children
- Ø The use of lower levels of whole wheat flour in familiar grain foods is one approach to successfully increase WG intake in children
- Ø Additional research is needed to examine the gradual introduction of WG flour in various foods in school cafeterias

Project II

Gradual Whole Grain Intervention in Schools



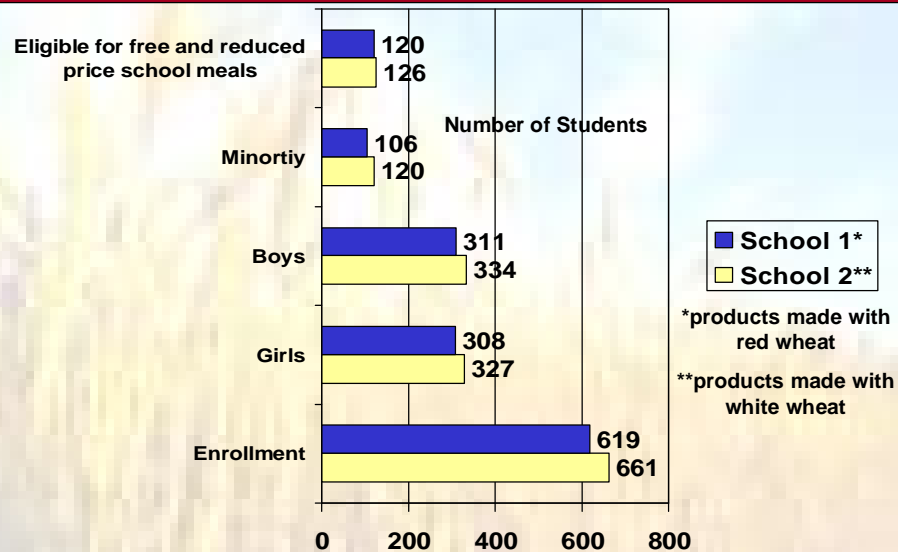
Intervention – Feasibility Study

Ø Objective – To incrementally increase the red and white whole wheat flour content of buns and rolls in elementary schools over a school year.

- Will WG intake change
- Will intake of bread products differ by
 - WG content
 - Bread type (roll/bun)
 - Accompanying foods offered - menu category



School Demographics



Whole Wheat Content

Ø Difference threshold testing – set incremental levels

§ Panel of 25 trained adult judges (Delk & Vickers, 2007)

§ Detect changes using color, texture and taste of rolls

- 7 levels for white whole wheat (WG flour as % of total flour)
– 0, 11, 23, 32, 45, 68, 90, & 100
- 15 levels for red whole wheat (WG flour as % of total flour)
– 0, 1, 2, 5, 7, 10, 14, 21, 26, 32, 38, 47, 59, 72, 91, & 100

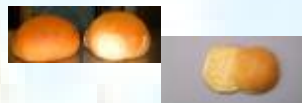


Products and Exposure

Ø **Products** (Great Northern Bakery, St. Paul, MN)

§ Hamburger buns (2 oz)

§ Dinner rolls (1.5 oz)



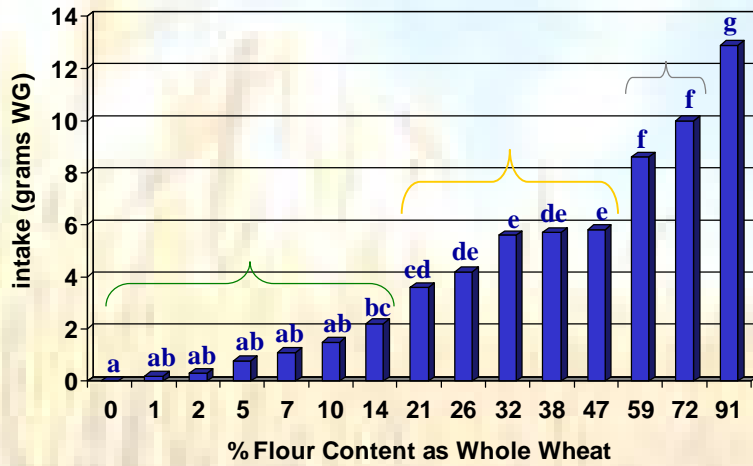
Ø **Exposure to products**

§ Red wheat products 3.8 times/level

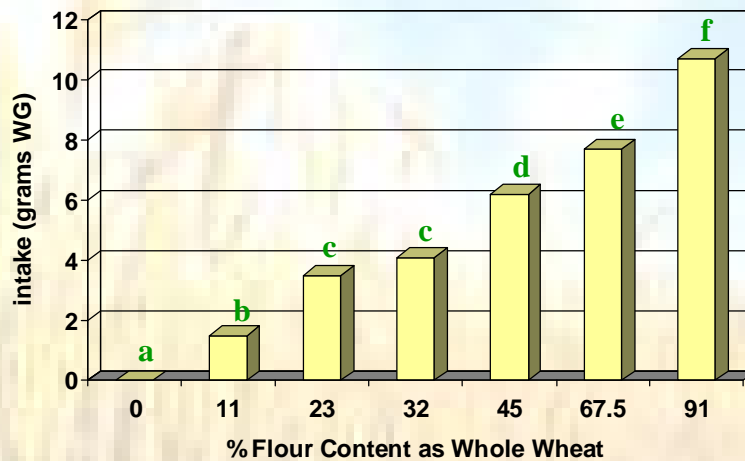
§ White wheat products 7.6 times/level

§ 75% of consumption of refined at baseline

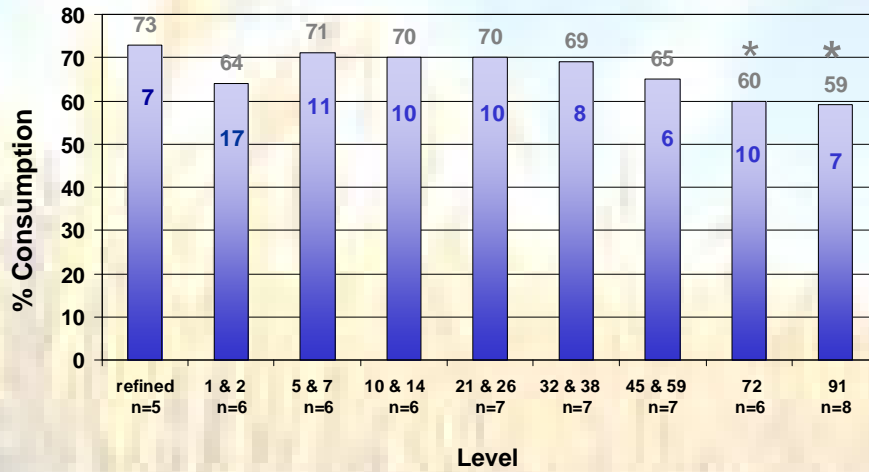
Grams WG per Child / Day (Red Wheat)



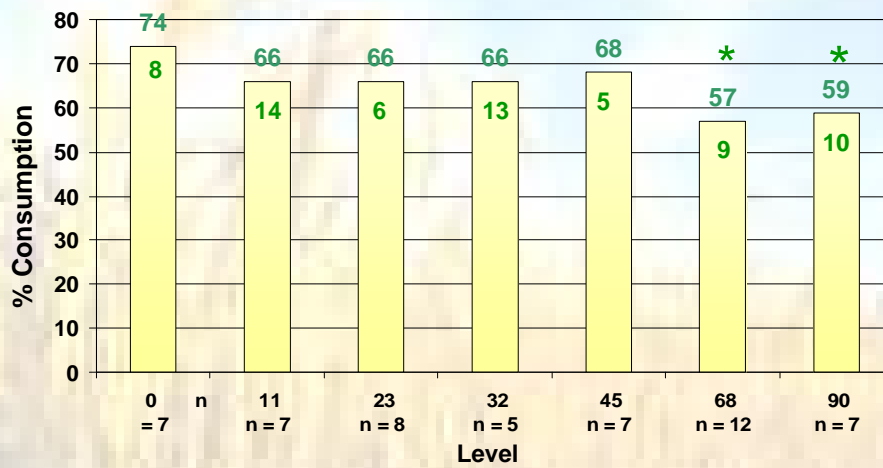
Grams WG per Child / Day (White Wheat)



Consumption Red Whole Wheat Products



Consumption White Whole Wheat Products

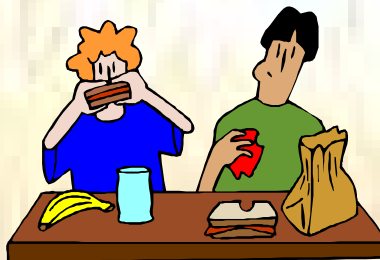


Summary

- Ø Mean g intake WG ↑ from 0 to > 10 g per child / day
- Ø Consumption compared to refined was maintained up to ~70% WG product for both red and white whole wheat
- Ø Accompanying foods affected consumption of bread products
- Ø Approach may be useful to increase WG consumption by children
 - § Needs to be replicated in larger number of schools with more children

Project III

After School Snacking Program



Snack Study A

∅ Purpose

To examine differences in consumption of WG and refined grain crackers available in the marketplace.

∅ Subjects

150 (K-6) students (after-school snack programs), Roseville elementary school, St Paul, MN
 > ~ 68% White children

∅ Products

| | |
|----------------------------|---------|
| Cheddar Cheese RG Goldfish | 0g/svg |
| Cheddar Cheese WG Goldfish | 8g/svg |
| Honey Maid Grahams WG | 5g/svg |
| 100% WW Honey Grahams | 26g/svg |

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Consumption (%) for Snack Products

| Snack Product (g WG) | Consumption (%) | WG consumed (g) |
|----------------------|--------------------------|-----------------|
| Goldfish 0g | 78 ± 4.3 ^a | 0 |
| Graham crax 5g | 80.2 ± 5.1 ^a | 4.01 |
| Goldfish 8g | 75.4 ± 5.2 ^a | 6.03 |
| Graham crax 26g | 52.0 ± 11.4 ^b | 13.52 |

Snack Study B

Ø Purpose

To determine an acceptable WG flour content in Graham crackers served to children in after-school snack programs

- 5g, 8g, 12g, or 16g/svg?
- Use of plate waste, taste tests, group interviews

Ø Hypothesis

There will be no difference in children's consumption for Graham crackers with 5, 8, 12 and 16g WG / svg

Methods

Ø Schools / Subjects

- § 100 children (grades K-6) from 4 after-school snack programs in the Roseville School District
- § White children accounted for ~ 68% of the total population, and ~1/3 were minorities

Ø Products

- § Graham crackers with 5g, 8g, 12g, 16g WG flour/svg (30g) developed by Kraft Global Foods, Inc.

Graham Snacks



Graham 5g Graham 8g Graham 12g Graham 16g

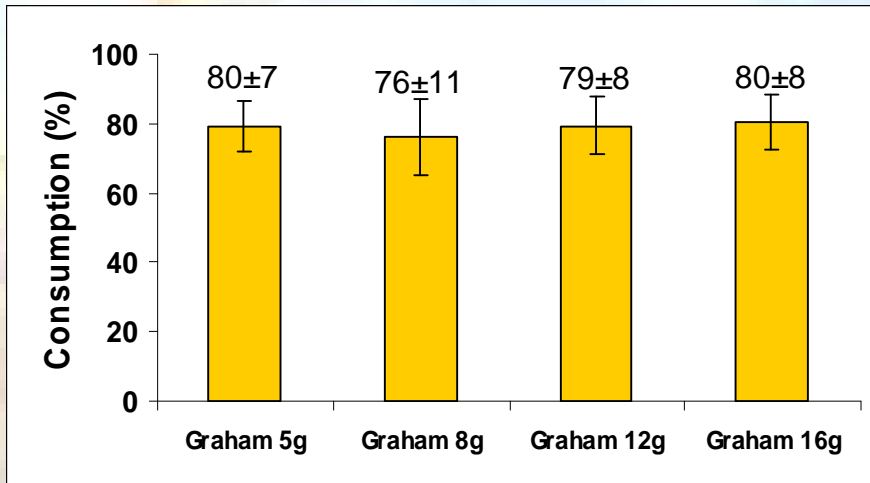
Crackers provided by Kraft Foods Global, Inc.

Graham Cracker Specifications

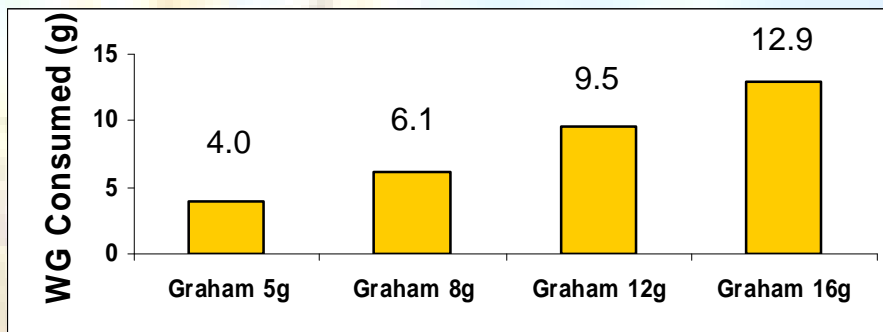
| Nutrient content per serving | Traditional Graham | Graham 5g | Graham 8g | Graham 12g | Graham 16g |
|------------------------------|--------------------|-----------|-----------|------------|------------|
| Serving Size (g) | 30 | 30 | 30 | 30 | 30 |
| Energy (kcal) | 130 | 133 | 131 | 130 | 128 |
| Total fat (g) | 3 | 4 | 4 | 4 | 4 |
| Total carbohydrate (g) | 24 | 22 | 22 | 22 | 22 |
| Total protein (g) | 2 | 2 | 2 | 2 | 2 |
| Dietary Fiber (g) | 1 | 1 | 1 | 2 | 2 |
| Sugars (g) | 7 | 7 | 7 | 7 | 6 |

Nutrient Specification for Tested Graham crackers provided by Kraft Foods Global, Inc.

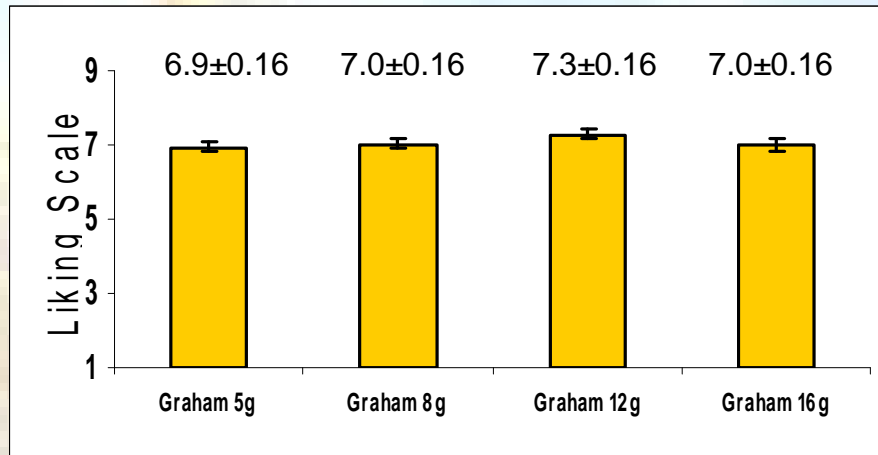
Whole Grain Consumption per Graham Snack (g)



Whole Grain Consumption per Graham Snack (g)



Taste Test Results for Graham Snack Liking



Summary

- Manufacturers may use these data for developing and marketing acceptable Graham crackers for after school snack programs
- WG products developed specifically for after school snack programs may help to increase WG consumption among elementary school children

School Lunch - Key Findings

- ü Product acceptability affected by whole grain inclusion level, flour color, flour particle size
- ü Achievable whole grain inclusion level affected by factors including product type and accompanying foods
- ü Demographic parameters are an important factor in introducing whole grain foods
- ü **Gradual incorporation works**
Add selected increments of whole grains to popular grain-based foods (breads, pizza, crackers, cookies, etc.)

Approaches to Increase Whole Grain Intake

- § Gradual approach - slowly increase whole grain content in popular grain foods
- § White whole wheat & other lighter-colored whole grains can be used to minimize changes in product appearance
- § Choose flour particle size to customize product appearance & texture
- § Choose grain type / mixtures to optimize end product flavor
- § Make partial whole grain foods more widely available in more types of foods
- § Develop innovative and novel whole grain products