The Fresh Fruit and Vegetable Program: Monitoring and Evaluation in Indiana Schools

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Obesity: Causes Consequences and Policy Changes
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NHANES surveys show:

- for adults aged 20-74 y the prevalence of obesity increased from 15.0% (1976-1980) to 32.9% (2003-2004)

- for 2-5 y, the prevalence of overweight increased from 5.0% to 13.9%

- for 6-11 y, prevalence increased from 6.5% to 18.8%

- for 12-19 y, prevalence increased from 5.0% to 17.4%
In Indiana

Overweight and Obesity (BMI)
Indiana - 2006

BRFSS (CDC, 2007)
Indiana kids

<table>
<thead>
<tr>
<th></th>
<th>At risk for overweight</th>
<th>Overweight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>14.9</td>
<td>9.2</td>
</tr>
<tr>
<td>Males</td>
<td>13.6</td>
<td>20.5</td>
</tr>
<tr>
<td>Total</td>
<td>14.3</td>
<td>15</td>
</tr>
</tbody>
</table>

n=1526, 49.1% females, 50.9% males

% Overweight in US by state

YRBSS, 2005
Increased risks for:

- Hypertension
- Dyslipidemia
- Type 2 diabetes
- Coronary heart disease
- Stroke
- Gallbladder disease
- Osteoarthritis
- Sleep apnea & respiratory problems
- Some cancers
Healthy People 2010
Reduce the prevalence of obesity in adults to < 15%

Increase fruit and vegetable intake
5-A-Day program → National Fruit and Vegetable Program

How Many Fruits & Vegetables Do You Need?
Every body is different. Enter your age, sex and level of physical activity to find the amount that’s right for you.

http://www.fruitsandveggiesmatter.gov/
Average fruit and vegetable consumption per day
Nationwide vs Indiana — 2005
Response: 5+ times a day
## Indiana 9-12th graders' self-reports of Fruit & Vegetable intake (%) [YRBSS, 2005]

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ate F&amp;V 5+ servings/day during the past 7 days</td>
<td>15.5</td>
<td>13.2</td>
<td>17.7</td>
</tr>
<tr>
<td>Ate Fruit 1+ times over past 7 days</td>
<td>84.3</td>
<td>85.7</td>
<td>83.0</td>
</tr>
<tr>
<td>Drank 100% juice 1+ times over past 7 days</td>
<td>78.3</td>
<td>77.1</td>
<td>79.5</td>
</tr>
<tr>
<td>Ate carrots 1+ times over past 7 days</td>
<td>48.2</td>
<td>48.3</td>
<td>48.1</td>
</tr>
<tr>
<td>Ate potatoes 1+ times over past 7 days</td>
<td>72.0</td>
<td>70.8</td>
<td>73.2</td>
</tr>
<tr>
<td>Ate green salad 1+ times over past 7 days</td>
<td>65.3</td>
<td>67.3</td>
<td>63.4</td>
</tr>
<tr>
<td>Ate other vegetables 1+ times over past 7 days</td>
<td>82.3</td>
<td>83.9</td>
<td>80.8</td>
</tr>
</tbody>
</table>
School Food Services
National School Lunch Program & School Breakfast Programs

• Offer foods consistent with most recent Dietary Guidelines:
  • eat a variety of foods
  • choose a diet with plenty of grain products,
  • …vegetables and fruits
  • choose a diet with moderate in sugars and salt
  • choose a diet with 30% or less of calories from fat and
  • less than 10% of calories from saturated fat

• ALSO: on average over week, at least 1/3 of RDA for
  • protein, iron, calcium, Vit A & C

• 4 menu planning tools available

School Breakfast similar except only ¼ of RDA for protein, etc, & 5 menu planning approaches
Goals:

- Create healthier school environments by providing healthier food choices
- Expand variety of fruits and vegetables children experience
- Increase children’s fruit and vegetable consumption
- Make a difference in children’s diets to impact their present and future health

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2002: Pilot FFVP (4 s & 1 ITO; 207 schools, 2002-2003 s year; $ for F & V)

2004: FFVP (permanent for previous units under NSL Act: + added 4 states, & 2 ITOs $ for F & V, beginning in 2004-2005 255/state and ITO)

2005: FFVP added one time funding to 6 additional states
Fresh Fruit and Vegetable Program
Highlights

• Most schools use classrooms or a combination of classrooms and kiosks to deliver f and v to children

• Fruits and Vegetables included are: fresh or dried fruits, also vegetables
  • Does not include processed or preserved fruits and vegetables, like canned, frozen or vacuum packed
  • Does not include dip for fruits, fruit leather, jellied fruit OR full-strength or purchased freshly squeezed fruit or vegetable juices
  • Trail mixes or fruit mixtures with candy
  • Fruit desserts made with cookie dough crust or fruit tarts

• Limits include: dips for vegetables, fresh squeezed juice for nutrition education in the classroom or fruit smoothies no more than 1x/wk

• “Buy American” requirement (exception is bananas)

• Monthly reporting forms are required to state for reimbursement
Reimbursable Costs

OPERATING

- Acquiring, delivering, preparing and serving FV
- E.g. Buying food
- Buying nonfood items like napkins, paper plates, cleaning supplies, etc
- Value added services, ready-made produce trays, delivery charges
- Salaries and fringe benefits to employees that do
- washing/chopping/distributing product, clean up

ADMINISTRATIVE

- Limited to 10% of school’s total grant
- Planning the program (salaries and fringes)
- Managing the paperwork
- Obtaining equipment (e.g. refrigerators)
- Expenses for nutrition education and promotion activities that are nonfood supplies and materials for classroom lessons, fieldtrips etc
Study 1 & 2: Two year surveillance of the USDA Fruit and Vegetable Pilot in Indiana

Thiagarajah, Foland, Fisher, & Fly 2005;
Thiagarajah, Foland, Morris, Rose, & Fly 2004

2002-2003 & 2003-2004 school years

25 schools (Public: 10 elementary, 8 middle, 6 high school; 1 Private)
Students in selected grades were evaluated

20/25 schools continued to the next year using remaining funds

Distribution: kiosks, salad bars, field trips,
before/after school practices as morning/afternoon snacks

Data was obtained from questionnaires – 11 items (2 versions)

Questionnaires were administered 4 times:
before program began (Fall 2002)
late in school year (Spring 2003)
before 2nd year program began (Fall 2003)
late in school year (Spring 2004)
## Results: Demographics, %

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Fall 2002</th>
<th>Spring 2003</th>
<th>Fall 2003</th>
<th>Spring 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asians</td>
<td>2.2</td>
<td>2.4</td>
<td>2.9</td>
<td>2.1</td>
</tr>
<tr>
<td>Black</td>
<td>1.9</td>
<td>1.1</td>
<td>1.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Hispanic</td>
<td>3.3</td>
<td>3.6</td>
<td>3.4</td>
<td>4.2</td>
</tr>
<tr>
<td>White</td>
<td>87.6</td>
<td>88.7</td>
<td>88.9</td>
<td>88.0</td>
</tr>
<tr>
<td>Others</td>
<td>5</td>
<td>4.1</td>
<td>3.7</td>
<td>4.0</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Boys</td>
<td>49.4</td>
<td>49.1</td>
<td>50</td>
<td>49.7</td>
</tr>
<tr>
<td>Girls</td>
<td>50.6</td>
<td>50.9</td>
<td>50.0</td>
<td>50.3</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Fall 2002</th>
<th>Spring 2003</th>
<th>Fall 2003</th>
<th>Spring 2004</th>
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<td>4</td>
<td>16.2</td>
<td>15.3</td>
<td>17</td>
<td>16.9</td>
</tr>
<tr>
<td>5</td>
<td>9.4</td>
<td>9.4</td>
<td>8.8</td>
<td>10.2</td>
</tr>
<tr>
<td>9</td>
<td>25.1</td>
<td>28.5</td>
<td>27.4</td>
<td>29.5</td>
</tr>
<tr>
<td>10</td>
<td>26.4</td>
<td>24.8</td>
<td>24.6</td>
<td>23.7</td>
</tr>
<tr>
<td>11</td>
<td>22.9</td>
<td>21.9</td>
<td>22.2</td>
<td>19.7</td>
</tr>
</tbody>
</table>

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*Only grades 4, 5, 9, 10, and 11 from 10 of the original 25 schools in the 2002-2003 survey were included in the analysis because only these schools administered all four surveys. These students were surveyed in 2003-2004 as students in grades 5, 6, 10, 11, and 12 respectively.

*Data from 2331 students from Fall 2002 survey, 2391 students from Spring 2003 survey, 2298 students from Fall 2003 and 1982 students from Spring 2004 survey were included in the analysis.*
Fruit and Vegetable Pilot
Form for 4th grade

We are conducting a survey to learn more about Indiana students’ eating habits. You can help us by answering the following questions.

Directions:
Please write down your school name in the box next to question 1. For questions 2-10, mark an “X” in the box next to your answer. Mark only one answer for each question.

1. What school do you go to? [ ]

2. What grade are you in? [ ] 4th [ ] 5th [ ] 6th

3. Are you a boy or a girl? [ ] boy [ ] girl

4. How do you describe yourself? [ ]
   - Asian
   - African American, non Hispanic
   - Hispanic or Latino
   - White, non Hispanic
   - Other

5. Yesterday, did you eat any vegetables? Vegetables are all cooked and uncooked vegetables, salads, and baked and mashed potatoes. Do not count French fries or chips.
   [ ] No, I didn’t eat any vegetables yesterday.
   [ ] Yes, I ate vegetables 1 time yesterday.
   [ ] Yes, I ate vegetables 2 times yesterday.
   [ ] Yes, I ate vegetables 3 or more times yesterday.

6. Yesterday, did you eat fruit? Do not count fruit juice.
   [ ] No, I didn’t eat any fruit yesterday.
   [ ] Yes, I ate fruit 1 time yesterday.
   [ ] Yes, I ate fruit 2 times yesterday.
   [ ] Yes, I ate fruit 3 or more times yesterday.

7. I like to try new foods.
   [ ] Almost always or always
   [ ] Sometimes
   [ ] Almost never or never

8. How many total servings of fruits and vegetables should you eat each day?
   [ ] At least 2
   [ ] At least 3
   [ ] At least 4
   [ ] At least 5
   [ ] I don’t know

9. Yesterday, did you eat French fries or chips? Chips are potato chips, tortilla chips, Cheetos®, corn chips, or other snack chips.
   [ ] No, I didn’t eat any French fries or chips yesterday.
   [ ] Yes, I ate French fries or chips 1 time yesterday.
   [ ] Yes, I ate French fries or chips 2 times yesterday.
   [ ] Yes, I ate French fries or chips 3 or more times yesterday.

10. Yesterday, did you eat sweet rolls, doughnuts, cookies, brownies, pies, or cake?
    [ ] No, I didn’t eat any of the foods listed above yesterday.
    [ ] Yes, I ate one of these foods 1 time yesterday.
    [ ] Yes, I ate one of these foods 2 times yesterday.
    [ ] Yes, I ate one of these foods 3 or more times yesterday.

11. Yesterday, did you eat any candy? Do not count brownies or cookies.
    [ ] No, I didn’t eat any candy yesterday.
    [ ] Yes, I ate candy 1 time yesterday.
    [ ] Yes, I ate candy 2 times yesterday.
    [ ] Yes, I ate candy 3 or more times yesterday.

Please turn to the other side.

Thank you very much for your help!
Results: Mean self-reported vegetable intake
Results: Mean self-reported fruit intake
Results: Mean self-reported candy intake
Prevalence of responses to willingness to taste new foods

Prevalence of responses to knowledge of recommended fruit and vegetable servings
Summary

• Increasing the availability of fruits and vegetables in these schools appeared to improve frequency of fruit and vegetable intake in the first year of the program.

• In the second year, improvement was also observed but the increase in frequency of intake was less compared to first year for most grades.

• Increase in frequency of intake was greater for fruits than vegetables.

• There were no gender differences in frequency of intake of low nutrient dense foods in elementary school students, however high school boys reported more frequent intake of low nutrient dense foods than high school girls.

• Study of different strategies used in school environments may offer insight to maximize fruit and vegetable intake, while limiting low nutrient density foods.

• This study results shows that availability of fruit and vegetable in the school environment may improve the intake of fruit and vegetables.
**Study 3**

Shertzer, Thiagarajah, Foland & Fly, 2006  
Shertzer, Thiagarajah, Bai, Foland, & Fly, 2006

School year 2004/2005: Difficulty with administration of pretest left only snapshot students late in this school year

This study was intended to note fruit and vegetable consumption and related behaviors, attitudes, and knowledge of students participating in the FFVP.

18 school; grades 4, 5, 6, 7, 8

Questionnaire redesigned to include 27 items: Multiple questions addressed fruit and vegetable intake  
Including now fruit juice, and 7 items on vegetables
Results/Discussion

Indiana school children, in grades 4-8, at the FFVP implementation schools reported eating fruits 2.8 ± 0.03 times/day and vegetables 3.6 ± 0.05 times/day (mean ± standard error).

Frequency of fruit juice and vegetable consumption varied by ethnic group, but whole fruit consumption did not.

Programs to increase vegetable intake are important in African American, Hispanic, and White students.

Whole fruit consumption should be encouraged in all populations, and African American and Hispanic groups should be persuaded to replace a portion of their fruit juice consumption with whole fruit to comply with the US Dietary Guidelines 2005 recommendations.
Shertzer, Foland, Graves, Middlestadt, Hightower-King & Fly, unpublished – submitted to Experimental Biology 2008

- Evaluation of Indiana program efforts to increase FV availability and improve intake of students in 4th-8th grades for the 06-07 school year was conducted by choosing 6/25 schools by convenience, administering questionnaires to teachers and students, and examining FV purchase records.

- Teachers (n=142) reported participation and perceptions by internet survey.
- Students reported “yesterday” intake (portions/day) and demographics at baseline (n=1,227) and follow-up (n=1,051)
- Data were analyzed using t-test, Mann-Whitney, Kruskal-Wallis, and Chi Square.

RESULTS
- FV were offered to students in classes 2-5 times/week.
- Offerings differed among schools but overall were 81.6% fresh F, 15.8% V, 2.6% dry F.
- Student (94%) and teacher (96%) participation (p=.032) and F (p=.006) and V (p=.014) quality were high but varied by school.
- Students improved whole F intake (1.68±1.13 vs 1.16±1.14; mean times ± SD; p<.001); those at schools with >20% V increased intake of certain V (p=.02).

- Availability of fresh FV improves intake but depends on implementation.

- Programs should offer more V to improve V intakes, serve high quality F and encourage teacher modeling to improve F intakes.

Supported by Indiana Department of Education & Indiana University.
Study 5: Ongoing

Shepherd, Goodman, Folland, Graves, Ali, Morris, Thiagarajah, Shertzer & Fly  in progress

22/25 schools – Comprehensive grades: 4th - 12th grades
Addition of 3 control schools
Questionnaires expanded to include:
  • knowledge question on importance of daily fruit and vegetable
  • breakfast/lunch patterns
  • Expanded questions with multiple fruits and vegetables
  • Increasing frequency of intake from 3+ to 4 x/day
  • Belief about health of their diet
  • variety in diet

• Determinants related to eating fruits and vegetables
  • asking parents to buy fruits and vegetable
  • parent, mother and father daily fruit and vegetable intake-modeling
  • Home availability
  • Preferences
  • Parental rules to force consumption
  • Intention to eat fruits and vegetables

• Intention to reduce intake of high energy/low nutrient dense foods

• Examination of mandated school wellness policies
Final Thoughts

- Fruit and vegetable intake may improve with this program, increasing availability of vegetables is a concern

- School environment impacts the program success

- Future considerations:
  - Determining which audience (grades) is most receptive to changes in this program is important

  - Obtaining comprehensive data of dietary intake of these students may be useful determining the impact of this program on diet pattern.
Thanks to the following:

- Indiana Department of Education Division of School and Community Nutrition
  - Elizabeth Foland
  - Lisa Graves

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  - Marissa Goodman

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  - Ginman Bai
  - Amanda Hodges
  - Bethany Weber
  - April Heyer
  - Juhy Ali
  - Kayla Morris

&
All the Indiana FFVP schools