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## Effects of a Peer Developed Nutrition Education Intervention on the Fruit and Vegetable Intake in Elementary School Children

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# **Effects of a Peer Developed Nutrition Education Intervention on the Fruit and Vegetable Intake in Elementary School Children**



Honors Thesis

Sydney Marie Antolini

Department: Health and Sports Science

Advisor: Diana Cuy Castellanos, Ph.D.

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## **Abstract**

To promote consumption and decrease plate waste, it is important to find innovative ways to encourage fruit and vegetable intake in children. In this study, collaborating with and educating students on nutrition brought attention to the issue and raised awareness in the school system of the need for better nutrition education.

## **Disclaimer**

This research was funded by the Honors Department at the University of Dayton.

## **Dedication or Acknowledgements**

Thank you to Dr. Cuy Castellanos, Snowhill Elementary School, Christian Narcelles, and The University of Dayton Honors Program for their support and participation in this study.



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## Abstract

**Background:** The Center for Disease Control estimates that nearly one in three children in the United States are overweight or obese. Under the Healthy, Hunger Free Kids Act 2010, school systems operating under the School Lunch Program are required to provide 1 fruit and 1 vegetable to children during lunch to help improve the nutritional quality of lunches and address obesity. However, plate waste is high and efforts need to be made to increase consumption and decrease waste.

**Objective/Hypothesis:** The purpose of this study is to examine a peer developed nutrition education intervention that aims to increase fruit and vegetable intake in students and decrease plate waste.

**Methods:** In collaboration with a six-grade student from Snowhill Elementary School, a children's story, emphasizing the importance of fruit and vegetables was created and read to second and third grade children. Fruit and vegetable consumption and plate waste were measured pre- and post-intervention to determine its effect on intake.

**Results:** Baseline data in 21 children indicated vegetable intake (.70 cups/day) was below the recommended dietary intake (1-1.5 cups/day). After the nutrition intervention, there was a 54% decrease in fruit plate waste and 43% decrease in vegetable plate waste; however, the results revealed no significant increase in fruit and vegetable consumption post-intervention (n=10).

**Conclusions:** To promote consumption and decrease plate waste, it is important to find innovative ways to encourage fruit and vegetable intake in children. In this study, collaborating with and educating students on nutrition brought attention to the issue and raised awareness in the school system of the need for better nutrition education.

## Introduction

According to the Center for Disease Control, 7% of children (ages 6-11) were obese in 1980, but this percentage increased to 18% in 2012. Similarly, the percentage of adolescents (ages 12-19) who were obese increased from 5% to nearly 20% in the same period (CDCP 2013). As obesity in children and adolescents has nearly tripled in the last

30 years, school systems, government agencies, and policy makers are attempting to control and contain this epidemic.

Early in 2013, the United States Department of Agriculture (USDA) launched a new program called “Healthy, Hunger Free Kids Act,” designed to improve the nutritional quality of school lunches in the United States. While these guidelines were created to mirror the 2010 Dietary Guidelines for Americans, schools that operated on free or reduced lunch are required to follow them. The new standards required that lunches must provide at least 1 fruit and 1 vegetable (vegetables coming from a range of colors, oranges, dark greens, reds, etc.), saturated fat would continue to be capped at 10% of overall calories, sodium would need to be reduced by 25-50% over the next decade, and all grains offered must eventually be whole grain (USDA 2014). While these new guidelines are a step in the right direction, there are still some problems associated with them, namely, the consumption of fruits and vegetables.

In evaluating relevant studies previously conducted, it is clear that providing different fruits and vegetable options in school cafeterias is not enough for increased consumption. While school systems are making valid efforts in increasing the consumption, more often than not, the disposal is also increasing. How can the gap between fruit and vegetable consumption and disposal be narrowed in school cafeterias? While some interventions have addressed this issue through increased exposure, tastings, and incentives, one area of research that is missing is through education. Will education on the health benefits of fruits and vegetables, specifically through that of a peer, increase the consumption and decrease the disposal of fruits and vegetables in school cafeterias?

Through this project, the implementation of a peer developed nutrition education intervention will be explored to identify the methods in which fruit and vegetable intake can be increased in elementary school cafeterias. Conducting multiple plate waste studies and facilitating fruit and vegetable screeners can assess the amount of fruit and vegetables consumed/wasted in elementary school children. By analyzing the differences from pre to post intervention, the effects of a peer developed nutrition education tool can

be identified. As education is the foundation for improvement and progression, nutrition education provides hope for terminating the childhood obesity epidemic that spreads throughout the nation.

## **Materials and Methods**

### *Nutrition Quest Block Kids Food Screener*

The primary researcher sent Nutrition Quest Block Kids Food Screener home with students who had completed consent forms. Students were sent a questionnaire and directions (see Appendix) pre intervention, 1-week post intervention, and 1-month post intervention. Only students who had completed the first questionnaire were given a second questionnaire 1-week post intervention. Furthermore, only students who had completed the first and second questionnaire were given a third questionnaire 1-month post intervention.

### *Plate Waste Study*

In conjunction with the fruit and vegetable screener, the primary investigator conducted an initial, pre-intervention plate waste study to assess the amount of fruit and vegetables consumed during a typical lunch period. While there are different methods to obtain data for a plate waste study, such as visual, physical, collective, and individual, the most accurate form of data collection is physical, i.e. weighing the amount of food wasted and comparing it to the amount/weight of food served.

In conducting the plate waste study, a menu of items offered obtained from the cafeteria prior to the study was measured to determine the mass being served (grapes and salad). After the lunch period, the students discarded their waste into pre-weighed trashcans. Students were asked to discard grapes into bin #1, salad into bin #2, and all other waste into trashcans. When the set number of students for the lunch period had discarded their food, the tubs were weighed. The difference between the tub weight and food weight was

calculated and recorded as food "wasted." This number was then be divided by total amount served to determine percent wasted for both fruit and vegetable.

One-week post intervention, another plate waste study was conducted on 2nd and 3rd grade students. The same protocol was followed from the previous plate waste study and the percent wasted and consumed was calculated. The last plate waste study was conducted one-month post intervention to assess any final differences in percent wasted and consumed.

### *Intervention*

In working with a 6<sup>th</sup> grade student from Snowhill Elementary, Christian Narcelles, who participates in a gifted school program, the primary investigator (PI) was able to collaborate with and mentor Christian on the health benefits of different fruits and vegetables as he created a 2nd grade reading level book for his peers. The PI and Christian met bimonthly to formulate a creative book that emphasized healthy eating, labeled "Jake's Food Tales." The story follows Jake, a young student who faces "healthy" and "unhealthy" food choices for his afternoon snack. The conclusion of the story emphasizes the importance of choosing fruits and vegetables and the health benefits that they promote.

As the printing of the "Jake's Food Tales" continued, the primary investigator obtained Institutional Review Board Approval and site authorization from the Principal at Snowhill elementary, Jason Clark (See Appendix). Additionally, parental consent forms were drafted and approved by IRB and Mr. Clark (See Appendix). Upon approval, parental consent forms were sent home with 2nd and 3rd grade students and returned to the primary investigator.

After the initial plate waste study and fruit and vegetable questionnaire had been conducted, Christian presented his book, "Jakes Food Tales," to all 2nd and 3rd grade classrooms. Each presentation featured Christian reading his book and answering questions from his peers in relation to healthy fruit and vegetable choices.



## Results

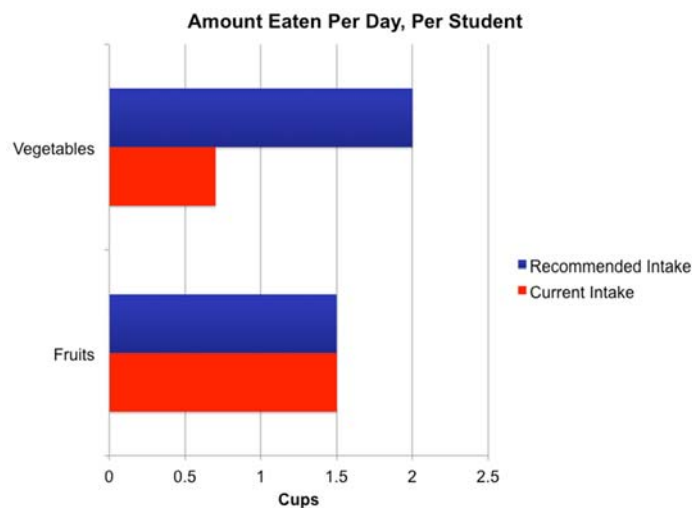
### *Demographics of Subjects*

Second and third grade students from Snowhill Elementary School in Springfield, OH participated as test subjects for this study. One hundred and fifty second and third grade students participated in the plate waste study. Out of the 150 students, 21 completed the Nutrition Quest Block Kids Food Screeners at baseline, 10 one-week post-intervention and 5 one-month post-intervention.

### *Nutrition Quest Block Kids Food Screener*

As indicated by the Nutrition Quest Block Kids Food Screener, baseline data in 21 children found fruit intake (1.50 cups/day) was at the recommended dietary intake (1.5 cups/day), but vegetable intake (.70 cups/day) was below the recommended dietary intake (2-2.5 cups/day) (See fig 1.1). Because the return on questionnaires was limited to 10 students 1-week post intervention and 5 students 1-month post intervention, data on fruit and vegetable consumption there was limited statistical power to examine change across time periods.

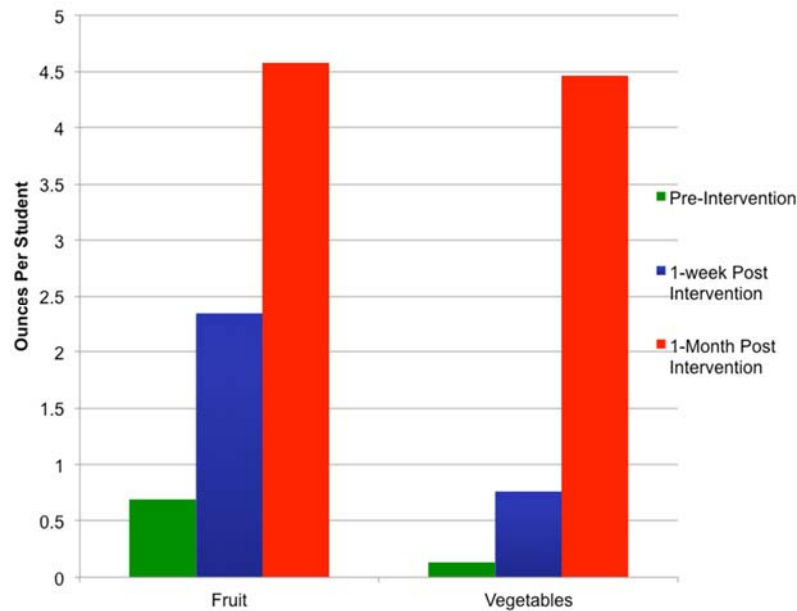
**Block Kids Food Screener: Baseline Data (Fig. 1)**



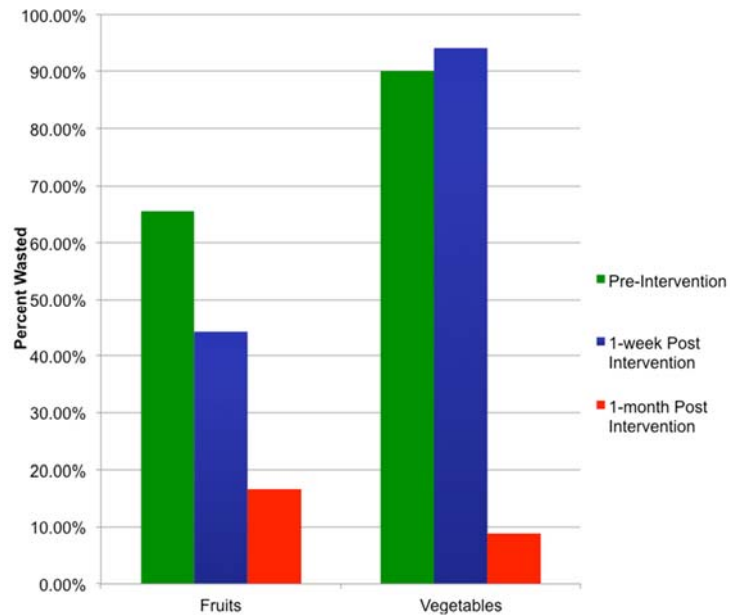
### *Plate Waste Study*

The average ounces of fruits consumed per student was 0.68 pre-intervention (Table 1.1), but increased to 2.34 ounces 1-week post intervention (Table 1.2) and 4.58 ounces 1-month post intervention (Table 1.3). The average ounces of vegetables consumed per student were 0.129 pre-intervention (Table 1.1), but increased to 0.76 ounces 1-week post intervention (Table 1.2) and 7.46 ounces 1-month post intervention (Table 1.3, Fig. 1.2).

**Ounces Eaten Per Student (Fig. 1.2)**



For fruit, percent plate waste pre-intervention was 65.5% (Table 1.1), but decreased to 44.2% 1-week post intervention (Table 1.2) and 16.6% 1-month post intervention (Table 1.3). For vegetables, percent plate waste pre-intervention was 90.1% (Table 1.1), 94.1% 1-week post intervention (Table 1.2), and 8.9% 1-month post intervention (Table 1.3, Fig. 1.3). The physical plate waste studies, conducted during school lunch periods, revealed a decrease in both fruit and vegetable plate waste and an overall increase in amount consumed per student.

**Total Percent Wasted (Fig. 1.3)**

**Plate Waste (Table 1.1) Pre-Intervention (February 23, 2015)**

Salad:

<b>Taken:</b> 9.1 oz.	<b>Disposed:</b> 8.2 oz.	<b>Consumed:</b> 0.9 oz.	<b>Percent Wasted:</b> 90.1%
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Grapes:

<b>Taken:</b> 210 oz.	<b>Disposed:</b> 137.6 oz.	<b>Consumed:</b> 72.4 oz.	<b>Percent Wasted:</b> 65.5%
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**Plate Waste (Table 1.2): 1-week Post-Intervention (March 3, 2015)**

Salad:

<b>Taken:</b> 22.1 oz.	<b>Disposed:</b> 20.8 oz.	<b>Consumed:</b> 1.3 oz.	<b>Percent Wasted:</b> 94.1%
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Peaches:

<b>Taken:</b> 390.6 oz.	<b>Disposed:</b> 172.8 oz.	<b>Consumed:</b> 217 oz.	<b>Percent Wasted:</b> 44.2%
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**Plate Waste (Table 1.3): 1-month Post-Intervention (March 23, 2015)**Salad:

<b>Taken:</b> 123 oz.	<b>Disposed:</b> 11 oz.	<b>Consumed:</b> 112 oz.	<b>Percent Wasted:</b> 8.9%
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Bananas:

<b>Taken:</b> 500.5 oz.	<b>Disposed:</b> 83.2 oz.	<b>Consumed:</b> 417 oz.	<b>Percent Wasted:</b> 16.6%
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**Discussion**

While the use of fruit and vegetable questionnaires (Nutrition Quest Block Food Kids Screeners) provided limited data, the physical plate waste studies conducted during school lunch periods revealed a decrease in both fruit and vegetable plate waste and an overall increase in amount consumed per student. This decrease in plate waste and increase in consumption narrows the gap between disposal and intake, allowing fruits and vegetables to play more of a role in school cafeterias.

To promote consumption and decrease plate waste, it is important to find innovative ways to encourage fruit and vegetable intake in children. Developing interventions that are creative, interactive, and relatable will allow children to understand the importance of fruits and vegetables so that they can make healthy choices on their own. In this study, collaborating with and educating students on nutrition brought attention to the issue and raised awareness in the school system of the need for better nutrition education. Not only did the students participate and engage in the intervention/study, but also the teachers,

cafeteria workers, and school administrators were actively involved in the implementation of the study.

Furthermore, encouraging peer education and implementation allows for children to gain a different perspective to nutrition that is different than traditional methods (i.e. education from teachers, adults etc.) Allowing children to engage in the development of nutrition education materials not only educates the students who create the materials, but also the students participating in the lesson. Learning from a peer creates a different dynamic to education that may be more relatable for students to understand.

In this study there were several limitations and barriers. Working with school systems, specifically children, raises issues regarding IRB approval and students as research participants. Obtaining consent from both the school and parents provided limited subjects and the physical return on consent forms was difficult to facilitate. Sending forms home with students, rather than actively engaging with parents, created a disconnect between the students and what the research was trying to accomplish.

As the Nutrition Quest Block Kids Food Screener was sent with the children to be completed at home, the return on questionnaires was limited to 5 students for all questionnaire collection (pre-intervention, 1-week post, and 1 month post). Data collection could be more reliable and representative of all the subjects had the questionnaire been proctored at school by a trained facilitator. The questionnaires also included information for all food consumption, not just fruits and vegetables; therefore, the collection of information was unnecessary and overwhelming for many students of that age range to complete.

Across the three plate waste studies, the type of fruit being served varied from study to study, which may have contributed to the amount of fruit consumed (i.e. popularity of one fruit over another). Further, the other items being served during the lunch period could have influenced the amount of fruit and vegetables consumed and wasted on that

particular day. Consistency across the studies could have accounted for these variables to isolate fruit and vegetable consumption/disposal.

While there are numerous studies that have addressed a variety of intervention methods (i.e. incentives, tastings, exposure), combining these interventions with peer education, could have a much greater impact on the consumption of fruits and vegetables for children. There is not necessarily one solution that will eliminate all fruit and vegetable disposal and encourage children to eat everything on their lunch tray; rather, different combinations of intervention methods should be researched to understand the best possible effect. Further, different populations may have different needs. Snowhill Elementary School includes mostly middle-high income families. Addressing the needs of different populations (i.e. socioeconomic status, ethnicity, location) is going to require different intervention methods to address the issues of that specific population.

## **Conclusion**

To promote consumption and decrease plate waste, it is important to find innovative ways to encourage fruit and vegetable intake in children. In this study, collaborating with and educating students on nutrition brought attention to the issue and raised awareness in the school district of the need for better nutrition education. Furthermore, incorporating peer development into nutrition education has the potential to create a greater impact on children who struggle to make healthy food choices.

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doi:10.1016/j.jneb.2012.06.001



## Appendix

### I. IRB Approval

January 7, 2015

**Sydney Antolini**

University of Dayton

300 College Park

Dayton, OH 45469

SUBJECT: "Effects of Peer Developed Nutrition Education Intervention on Fruit and Vegetable Intake in Students"

Dear Sydney,

The subject proposal has been reviewed through expedited procedures, as described in **45 CFR 46.110 Category (7)**.\* I am pleased to **approve** your IRB Application, and you may begin your data collection immediately.

#### REMINDERS TO RESEARCHERS:

- If this study is not completed by **(1/6/2018)** you are required to seek re-approval from the IRB prior to that time. You can find the Application for Renewal/Closure on the IRB web site (see link below).
- The IRB must approve all changes to the protocol prior to their implementation, unless such a delay would place your participants at an increased risk of harm. In such situations, the IRB is to be informed of the changes as soon as possible.
- The IRB is to be informed immediately of any ethical issues that arise in your study. Adverse Event forms can be found on the IRB web site.
- You must maintain all study records, including consent documents, for three years after the study closes. These records should always be stored securely on campus.
- It is the researcher's responsibility to notify the IRB when this study is closed. You can find the Application for Renewal/Closure on the IRB web site.

Please let me know if you have any questions. Best of luck in your research!

Best regards,

**Mary S. Connolly, PhD**

Chair, Institutional Review Board (IRB)

Office for Research

University of Dayton

Dayton, OH 45469

(937) 229-3493

Email: [IRB@udayton.edu](mailto:IRB@udayton.edu)

## II. Instructions for Completion/Parental Consent Forms:

Dear Parent/Guardian:

My name is Sydney Antolini and I am a Junior Dietetics major at the University of Dayton. I am asking for your permission to include your child in my research “The effect of a peer developed nutrition education intervention on fruit and vegetable intake in elementary school children.” This consent form verifies that you agree to complete the following fruit/vegetable questionnaire with your child as a part of the data collection. This questionnaire will help to determine how many fruits and vegetables the children are eating and how their consumption is affected by nutrition education.

Instructions for completion:

In order for the results to be processed please make sure of the following:

- The answers to the questionnaire **must be recorded in a #2 pencil**. Ink will not be read at all and will be seen to the scanner as missing.
- Fill in the answer bubbles completely. Do not simply make a checkmark or an ‘X’ over the bubble.
- Do not skip any questions. Be sure to fill in the sex and age. The program cannot analyze the data correctly without the age and sex. You do NOT have to write your name on questionnaire. All information is kept confidential.
- Note that for the food list there is both a frequency section and portion section. Both answers should be filled out. Mark ‘Never’ in the frequency section for foods not eaten; do not just skip. (If a food is never eaten, they do not have to mark the portion size section).
- Do not staple anything to questionnaire.
- Do not fold, may stray marks or punch holes on the questionnaire.
- Please answer honestly and carefully. Your contribution is crucial to the success of this study!

Thank you again for completing this questionnaire. Please return the completed questionnaire and consent form to your child’s teacher by **Wednesday, March 25<sup>th</sup>**. I really appreciate your help! If you have any questions, feel free to email me at [antolinis1@udayton.edu](mailto:antolinis1@udayton.edu).

### **Documented Consent:**

I have read this form and decided that my child will participate in the project described above. I understand that I can withdraw my child at any time.

\_\_\_\_\_  
Printed name of Child

\_\_\_\_\_  
Printed name of Parent/Guardian

\_\_\_\_\_  
Signature/Date

III. Nutrition Quest Kids Block Food Screener:

**ID NUMBER**

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00

Think about everything you ate or drank last week. Remember what you had for breakfast, lunch, dinner, after school, while watching TV, at bedtime, and on the weekend.

Please write your name in this box. *Use a pencil to complete this survey.*

	HOW MANY DAYS LAST WEEK DID YOU EAT OR DRINK IT?						HOW MUCH IN ONE DAY?		
	None last week	1 day last week	2 days last week	3-4 days last week	5-6 days last week	Every day last week			
Cereal, like corn flakes, Frosted Flakes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							1 bowl	2 bowls	3 bowls
Cooked cereal, like oatmeal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
Eggs, breakfast sandwiches or breakfast burritos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							1 egg	2 eggs	3 eggs
Breakfast bars, granola bars, Protein bars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							1/2	1	2
Glasses of milk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							1 glass	2 glasses	3+glasses
Real fruit juice, like orange juice, apple juice, or Mexican fruit drinks like licuados (DO NOT include soda)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							1 glass	2 glasses	3+glasses
Drinks like Coke or 7-Up, Sunny Delight, Hawaiian Punch, or aguas frescas (DO NOT include diet soda)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							1 bottle	2 bottles	3+bottles
Apples, bananas, or oranges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							1/2	1	2
Applesauce, fruit cocktail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
Any other fruit, like strawberries, grapes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
French fries, hash browns, taier tete	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
Other potatoes, like mashed or boiled	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
Ketchup or salsa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
Lettuce salad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
Tomatoes, including on salad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							1/4 tomato	1/2 tomato	1 tomato
Green beans or peas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
Other vegetables, like corn, carrots, greens, broccoli	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
Vegetable soup, tomato soup, any soup or stew with vegetables in it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot
Chili beans, pinto beans, black beans, including in burritos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							A little	Some	A lot