Development and Validation of a Questionnaire to Assess Fruit and Vegetable Consumption at School Lunch

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Disclosure



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Children consume too few fruits and vegetables (FV)



- Fewer than 1 in 10 meet federal recommendations for daily FV consumption[1]
- Schools meal and snack programs are an opportunity to encourage FV consumption
  - Up to 50% of daily calories are consumed here[2]
- Valid, practical instruments are needed to assess the effectiveness of these programs[3]

1. *2015-2020 Dietary Guidelines for Americans*
2. Marriott et al. *J Acad Nutr Diet*. 2010
3. Tugault-Lafleur et al. *Adv Nutr.* 2017

Dietary assessment in the school lunch context



- Weighed plate waste, digital photography, and direct observations are widely used
  - Cost $0.92, $0.62 and $0.62 per observation[1], respectively

- Self-report methods offer several advantages, yet few validated instruments exist

Instrument	Population	Percent Agreement
Day in the Life Questionnaire[2]	4th – 5th grade	• 87-88% items on tray • 47% amounts eaten
School Lunch Recall Questionnaire[3]	3rd – 5th grade	• 84% items on tray • 0.63 serving inaccuracy

1. Kenney et al. *J Acad Nutr Diet.* 2015
2. Wallen et al.. *J Nutr Educ Behav*. 2011
3. Paxton et al. *J Acad Nutr Diet.* 2011

Objective



- Develop and validate a group-administered, paper-and-pencil questionnaire to assess FV consumption during lunch among 2nd and 3rd grade students participating in the NSLP

Methods



- 5 phase study conducted between May and June 2016

- 2nd and 3rd grade students
  - Phase 1-4: Convenience sample (n=3 schools)
  - Phase 5: FoodCorps sample (n=20 schools)

- Comparison between two dietary assessment methods
  - Questionnaire and digital photography

Digital photography



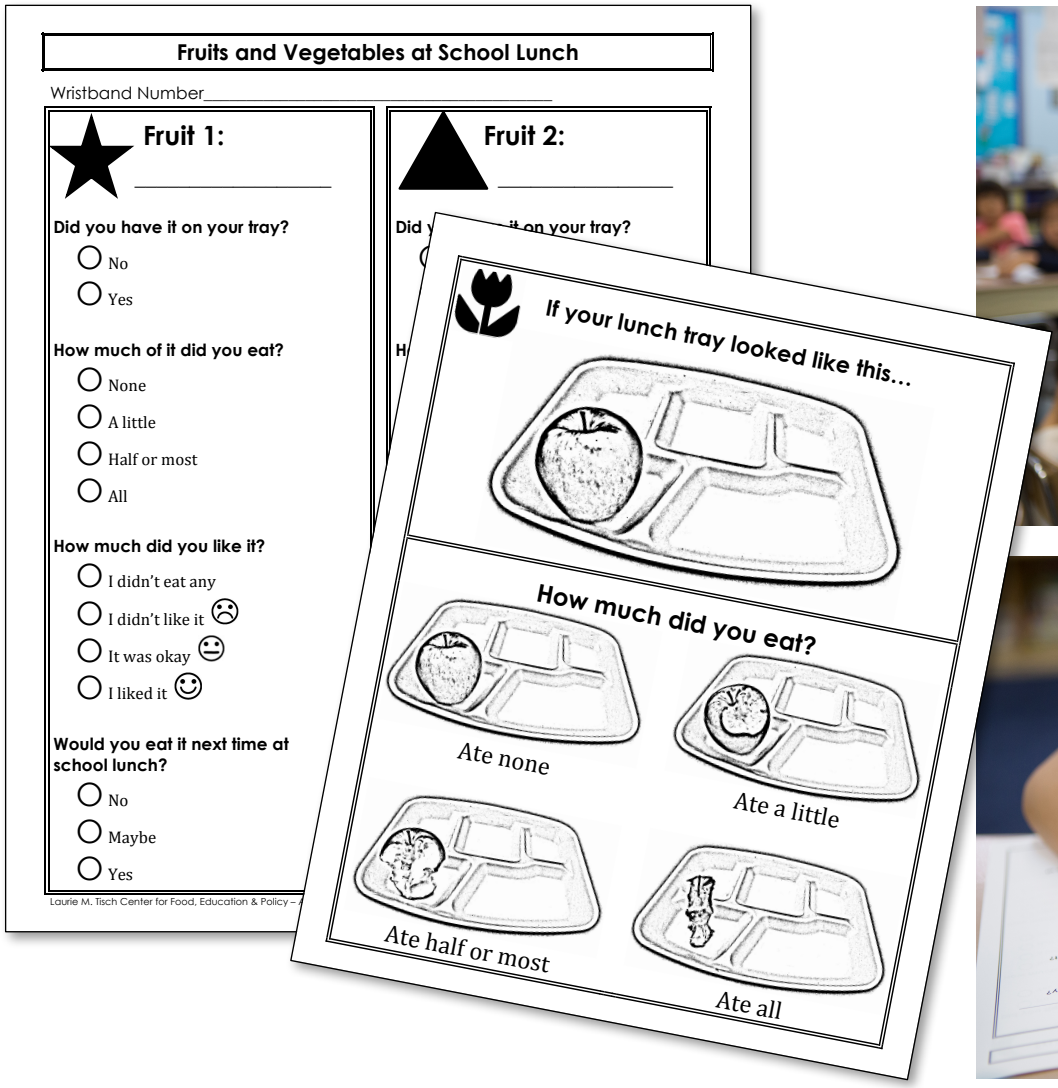




- Cameras placed on tripods at 60-degree angle
- Before- and after-meal photography protocol [1-2]
- IRR: 99% for on tray; 83% for amount consumed

1. Swanson et al., 2008
2. Taylor et al., 2014

Fruit and Vegetable Recall Questionnaire (FVRQ)

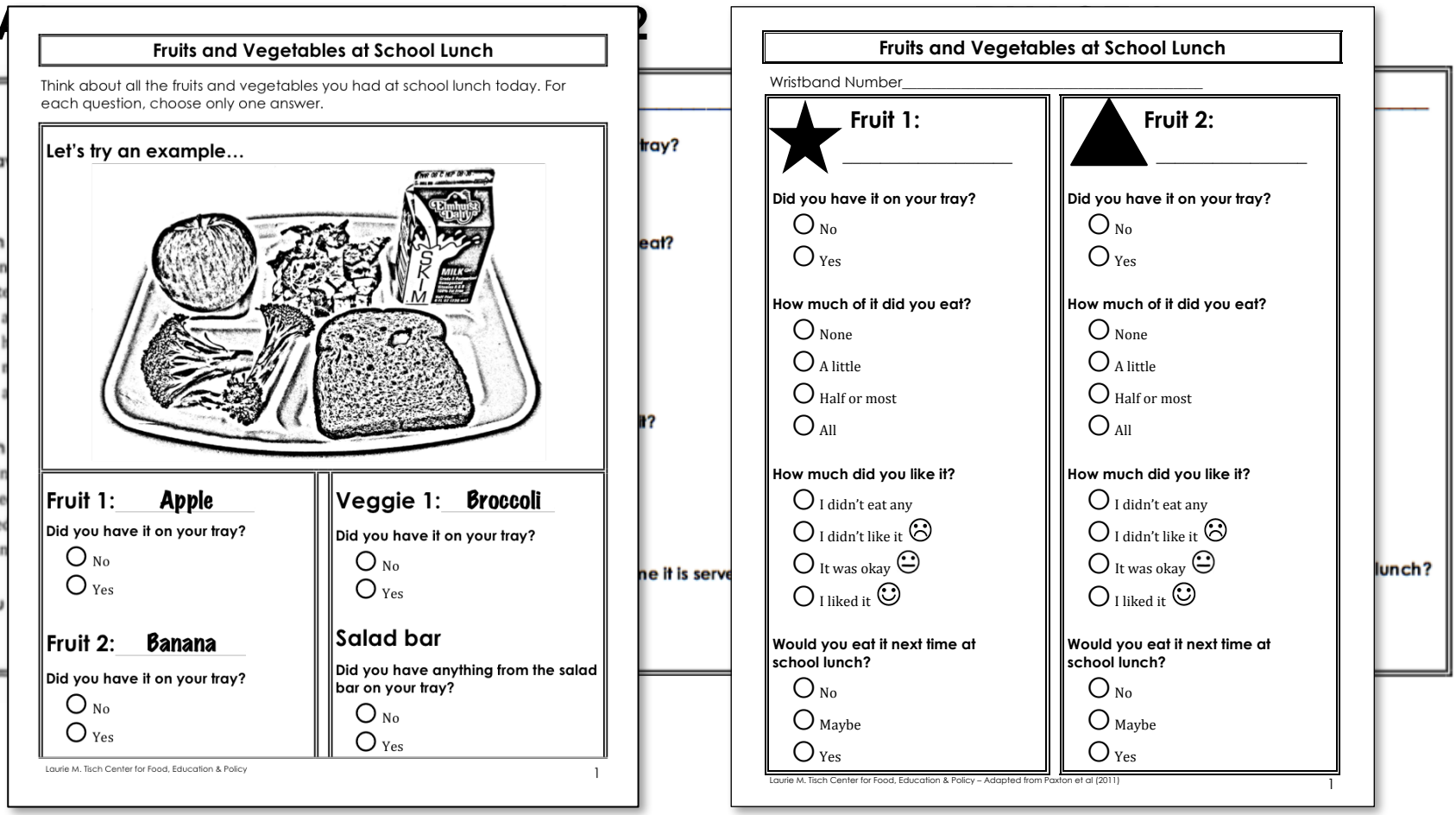






Refinement of the questionnaire





Fruits and Vegetables at School Lunch

Think about all the fruits and vegetables you had at school lunch today. For each question, choose only one answer.

Let's try an example…

Fruit 1: Apple

Did you have it on your tray?
- No
- Yes

Fruit 2: Banana

Did you have it on your tray?
- No
- Yes

Veggie 1: Broccoli

Did you have it on your tray?
- No
- Yes

Salad bar

Did you have anything from the salad bar on your tray?
- No
- Yes

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Fruits and Vegetables at School Lunch

Wristband Number_____

Fruit 1: _____

Did you have it on your tray?
- No
- Yes

How much of it did you eat?
- None
- A little
- Half or most
- All

How much did you like it?
- I didn't eat any
- I didn't like it ☹
- It was okay 😐
- I liked it ☺

Would you eat it next time at school lunch?
- No
- Maybe
- Yes

Fruit 2: _____

Did you have it on your tray?
- No
- Yes

How much of it did you eat?
- None
- A little
- Half or most
- All

How much did you like it?
- I didn't eat any
- I didn't like it ☹
- It was okay 😐
- I liked it ☺

Would you eat it next time at school lunch?
- No
- Maybe
- Yes

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PHASES 4-5

Data analysis



- Photo and questionnaire data matched to create "sets"
- Percent agreement
  - **Items on tray:** match, omission or intrusion
  - **Amount eaten:** match, overestimation, underestimation

- ICC for amount eaten between methods
- Pearson correlations between questionnaire items

Descriptive statistics



	Phase 1 *School A*	Phase 2 *School B*	Phase 3 *School B*	Phase 4 *School C*	Phase 5 *Schools D-W*
Participants	2nd grade	2nd grade	2nd grade	2nd grade	2nd-3rd grade
"Sets"	n=36	n=50	n=60	n=44	n=976
School-level data					
• **Male (%)**	53.5	49.1	49.1	49.5	51.4 (SD=3.4)
• **FRPL (%)**	100.0	89.4	89.4	49.8	74.6 (SD=21.1)
• **Black (%)**	30.1	70.0	70.0	13.2	40.1 (SD=32.0)
• **Hisp. (%)**	61.6	96.5	96.5	42.2	22.1 (SD=28.2)
• **White (%)**	3.8	2.4	2.4	37.9	29.4 (SD=33.9)
• **Salad bar**	No	No	No	Yes	40% (n=8)

Graziose et al. *In review.*

Good agreement between questionnaire and photographs



Phase	Item Type	Matches (%)	
		Item on Tray	Amount Eaten
Phase 1 (n=36 sets)	Fruit	78	61
	Vegetables	86	74
Phase 2 (n=50 sets)	Fruit	84	65
	Vegetables	86	64
Phase 3 (n=60 sets)	Fruit	90	86
	Vegetables	97	73
Phase 4 (n=44 sets)	Fruit	92	81
	Vegetables	94	86
Phase 5 (n=976 sets)	Fruit	88	73
	Vegetables	89	78

Graziose et al. *In review.*

Quantitative estimates of amounts eaten



- Good agreement (ICC>0.60) observed between methods for estimates of amount consumed (in cup equivalents)

	Total Items	Intra-class Correlation Coefficient (ICC)
• **Vegetables**	2,188	0.635
• **Fruit**	1,810	0.605

Graziose et al. *In review.*

Construct validity



- Excellent and moderate correlations among items linked by behavioral theory

	Amount Eaten	Preference	Intention
		Pearson r	
Fruit (n=1,810 items)			
• Amount eaten	1		
• Preference	0.893 **	1	
• Intention	0.484 **	0.503 **	1
Vegetables (n=2,188 items)			
• Amount Eaten	1		
• Preference	0.912 **	1	
• Intention	0.555 **	0.574 **	1

Graziose et al. *In review.*

Conclusions



- FVRQ is valid for measuring FV consumption at school lunch among **2nd and 3rd grade students**
- Researchers can use this self-report instrument in lieu of costly objective methods
- Future research should examine the sensitivity of the instrument prior to use in an evaluation setting

Thank you!

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