RESEARCH
Original Research

A Comparison of Fruit and Vegetable Intake Estimates from Three Survey Question Sets to Estimates from 24-Hour Dietary Recall Interviews

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ARTICLE INFORMATION

Article history:
Accepted 17 April 2013
Available online 17 July 2013

Keywords:
Fruit
Vegetable
Dietary assessment
Validity
Adolescents

2212-2672/$36.00
doi:10.1016/j.jand.2013.05.013

ABSTRACT

Background Fruit and vegetable (F/V) intake surveillance can provide information critical to the design and evaluation of interventions and the assessment of progress toward national intake objectives. The CDC's Youth Risk Behavior Surveillance System (YRBSS) assesses F/V intake among high school students using six questions about the frequency of intake in times per day. It is not known whether F/V intake frequency in times per day can be used as a proxy for intake in servings per day.

Objective To compare F/V intake estimates based on responses to three sets of survey questions, including the standard set of six YRBSS questions, with criterion F/V intake in servings per day based on data from 24-hour dietary recall interviews.

Participants/setting Study participants were 610 high school students who completed an in-class questionnaire and three telephone-administered 24-hour dietary recall interviews. The questionnaire asked students how many times they consumed 100% fruit juice and ate fruit, carrots, potatoes, green salad, and other vegetables during the "past 7 days" (set 1), the number of times they did so "yesterday" (set 2), and the number of cup-equivalents of fruits and vegetables they consumed per day (set 3).

Main outcome measure Mean estimated F/V intake either as "times/day" or "servings/day" and the percentage of students whose estimated F/V intake was $\geq$1, $\geq$2, and $\geq$3 times/day or servings/day.

Statistical analyses performed *t* tests and corrected Pearson correlations were used to compare F/V intake estimates based on survey question responses with estimates based on responses to the 24-hour dietary recall interviews.

Results Mean F/V intake estimates (in times/day or servings/day) based on responses to all sets of survey questions were significantly more than servings/day estimates based on responses to the 24-hour dietary recall interviews, and the percentages of students meeting each intake cutpoint were also more. Of the three sets of survey questions, the standard YRBSS questions produced estimates and percentages that were most consistently closest to 24-hour dietary recall interview estimates.

Conclusions For brief self-administered questionnaires of high school students, the current YRBSS questions are recommended for monitoring F/V intake even though mean intake estimates in times/day will likely be higher than, and are not a proxy for, mean intake estimates in servings/day.
J Acad Nutr Diet. 2013;113:1165-1174.

ALTHOUGH DIETS RICH IN FRUITS AND VEGETABLES reduce the risk for some types of cancer,[1-3] cardiovascular disease,[4] stroke,[5] and obesity,[6-8] fruit and vegetable (F/V) intake is insufficient for many Americans.[9] Surveillance of F/V intake is critical both in designing and evaluating public health interventions to promote healthy eating and in monitoring progress toward meeting national F/V intake objectives.[9]

Many dietary intake assessment methods are available, but the methods least susceptible to measurement error (eg, laboratory methods, multiple 24-hour dietary recall interviews) are expensive to administer and time-consuming for respondents, making them impractical for most population-level surveillance systems.[10] These systems tend to rely instead on short self-administered questionnaires. Previous studies[11-13] of the validity of such questionnaires used to assess F/V intake generally found moderate agreement between

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Table 1. Three sets of survey questions for assessing fruit and vegetable intake: Question and response option wording, coding, and intake values—National Youth Physical Activity and Nutrition Study, 2010

Survey Question	Response Options		
	Wording (for each question)	Coding	Intake value
Set 1: Past 7 days			
1. During the past 7 days, how many times did you drink 100% fruit juices such as orange juice, apple juice, or grape juice? (Do not count punch, Kool-Aid[a], sports drinks, or other fruit-flavored drinks.)	A. I did not (__) during the past 7 days	A=0	0 times/day
	B. 1 to 3 times during the past 7 days	B=2/7	0.29 times/day
	C. 4 to 6 times during the past 7 days	C=5/7	0.71 times/day
2. During the past 7 days, how many times did you eat fruit? (Do not count fruit juice.)	D. 1 time per day	D=1	1 time/day
	E. 2 times per day	E=2	2 times/day
3. During the past 7 days, how many times did you eat green salad?	F. 3 times per day	F=3	3 times/day
4. During the past 7 days, how many times did you eat potatoes? (Do not count French fries, fried potatoes, or potato chips.)	G. 4 or more times per day	G=4	4 times/day
5. During the past 7 days, how many times did you eat carrots?			
6. During the past 7 days, how many times did you eat other vegetables? (Do not count green salad, potatoes, or carrots.)			
Set 2: Yesterday			
1. Yesterday, how many times did you drink 100% fruit juices such as orange juice, apple juice, or grape juice? (Do not count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks.)	A. 0 times	A=0	0 times/day
	B. 1 time	B=1	1 time/day
	C. 2 times	C=2	2 times/day
2. Yesterday, how many times did you eat fruit? (Do not count fruit juice.)	D. 3 times	D=3	3 times/day
	E. 4 times	E=4	4 times/day
3. Yesterday, how many times did you eat green salad?	F. 5 or more times	F=5	5 times/day
4. Yesterday, how many times did you eat potatoes? (Do not count French fries, fried potatoes, or potato chips.)			
5. Yesterday, how many times did you eat carrots?			
6. Yesterday, how many times did you eat other vegetables? (Do not count green salad, potatoes, or carrots.)			

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