

Current Research

Food Security Status and Produce Intake and Behaviors of Special Supplemental Nutrition Program for Women, Infants, and Children and Farmers' Market Nutrition Program Participants

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ABSTRACT

Objective This study identified differences between women from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)– and WIC/Farmers' Market Nutrition Program–participating households regarding household food security status, fruit and vegetable intake and behaviors, perceived diet quality, and education level; and assessed the relationship between household food security status and perceived diet quality and perceived health.

Design, subjects/setting Cross-sectional survey of women from Athens County, Ohio (WIC, n=829; Farmers' Market Nutrition Program, n=246) living in WIC households.

Results Of 228 participants completing the food security portion of the survey, 61 (26.8%) were living in food secure households, while 47 (20.6%), 75 (32.9%), and 45 (19.7%) were living in households at risk for (marginal) food insecurity, with low food security, and with very low food security, respectively. For the entire sample, food insecurity was associated with poorer diet quality ($r=-0.248$, $P<0.001$). Food security status ($\chi^2=2.117$, $P=0.548$) did not differ between groups. Farmers' Market Nutrition Program reported higher education levels ($P=0.027$). Unlike fruit intake (t test, $P=0.769$), vegetable intake servings were greater among Farmers' Market Nutrition Program (2.2 ± 1.2), compared to WIC (1.9 ± 1.0) (t test, $P=0.040$). Both perceived benefit ($\chi^2=4.574$,

$P=0.032$) and perceived diet quality ($\chi^2=7.219$, $P=0.027$) were greater for Farmers' Market Nutrition Program.

Conclusions Farmers' Market Nutrition Program participants exhibit more indicators of a healthful diet, but appear not to be more food secure. Nutrition education regarding the benefits of fresh produce intake can help to improve diet quality and increase Farmers' Market Nutrition Program participation.

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Food security refers to the ready availability of nutritionally adequate and safe foods for all people, at all times, for an active, healthful life (1). At some time in 2005, 11.0% of all US households were food insecure. During 2003 to 2005, Ohio's average rate of household food insecurity was 12.6% (2). Regionally, rural Appalachian Ohio households might have even higher rates (3-5).

US households in rural areas (12.0%), and those with children under the age of 6 (16.7%), are particularly vulnerable to food insecurity, as are households with children and incomes <1.85 of the income-to-poverty ratio (34.2%) (2). In fact, households with incomes <1.85 of the income-to-poverty ratio, regardless of their composition, experience food insecurity to a greater degree than those with higher incomes (28.3% vs 5.2%) (2).

Food insecurity can impact both nutritional and non-nutritional outcomes (6). Adult women from food insecure homes have decreased consumption of fruits and vegetables (7-11), which can lead to increased rates of chronic disease (12). In addition, food insecurity is negatively associated with health status (5,13-18).

Food assistance programs in the United States seek to alleviate food insecurity–related dietary and health problems. More specifically, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) strives to safeguard the health of women, infants, and children up to age 5 years who are at nutrition risk and living at or below 185% of the federal poverty level. Studies have shown WIC to be an effective means of decreasing participant rates of food insecurity, while positively influencing nutrient intakes (19).

WIC food packages do not currently include fresh fruits and vegetables (with the exception of carrots, for qualifying women) as a source of nutrition. In April 2005, the National Academy of Science's Institute of Medicine issued new recommendations to the US Department of

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Table 1. Constructs comprising the framework for the tool to assess psychosocial indicators of fruit and vegetable intake^a

Construct	Scoring range
Perceived benefit	0-1
Perceived self-efficacy	0-1
Perceived control	0-1
Perceived diet quality	0-1
Stages-of-change continuum for fruit intake	1-5
Stages-of-change continuum for vegetable intake	1-5

^aSource: reference (22).

Agriculture Food and Nutrition Service for them. Upon approval, new food packages would include a monthly food voucher for fresh or processed fruits and vegetables for participants (20). Currently, the WIC Farmers' Market Nutrition Program provides clients with coupons redeemable for fresh fruits and vegetables at approved farmers' markets and roadside stands. The Ohio WIC Farmers' Market Nutrition Program began operating in 1992. In fiscal year 2005, the Ohio WIC Farmers' Market Nutrition Program served 31,160 participants in 47 counties. Limited research has been conducted on the effectiveness of the Farmers' Market Nutrition Program at increasing participant fruit and vegetable intake. A recent study in California, however, summarized that, "given a targeted subsidy at farmers' markets, low-income consumers make wise, varied, and nutritious choices from available produce, with the potential for dietary improvement" (21).

Therefore, using an Ohio sample, the purposes of this research were to identify differences between women from WIC- and WIC/Farmers' Market Nutrition Program-participating households regarding household food security status, fruit and vegetable intake and behaviors, perceived diet quality, and education level; and assess the relationship between household food security status and perceived diet quality. The psychosocial indicators related to fruit and vegetable intake are listed in Table 1 (22).

METHODS

The Institutional Review Board at Ohio University and the Ohio Department of Health approved this study prior to data collection. Surveys were mailed to the female head of household or adult woman managing the communication with the WIC office of all households participating in the Athens County, OH WIC program (n=1,076) in November 2005 (Farmers' Market Nutrition Program vouchers had expired on October 31, 2005).

Two survey versions were used, one for those enrolled in WIC alone (WIC group) and one for enrolled in both WIC and Farmers' Market Nutrition Program (Farmers' Market Nutrition Program group). Both contained demographic questions, as well as previously validated survey tools [US Household 18-item Food Security Survey Module, to measure the level of household food security status (23), a 13-item Tool to Assess Psychosocial Indicators of Fruit and Vegetable Intake in Low Income Communities (22), a 7-item Food Behavior Checklist for a Limited

Resource Audience (24), a 1-item perceived health question (25), and a 7-item measure of social capital (26)]. The survey sent to Farmers' Market Nutrition Program participants also included close-ended questions regarding Farmers' Market Nutrition Program participation, satisfaction, and behavior. This report summarizes the food security, fruit and vegetable intake and behavior, and education level data.

A cover letter from the Director of the Athens County WIC program was sent with the surveys to describe the purposes and voluntary nature of the study, along with a postage-paid return envelope. Surveys were labeled and mailed from the Athens County WIC office by authorized WIC staff only, in order to ensure client confidentiality. No follow-up phone calls or postcards were sent, and participants were not compensated.

Data were entered into the Statistical Package for the Social Sciences (SPSS version 13.0, 2004, Chicago, IL). Missing data and nonapplicable responses were scored as missing data. A *P* value <0.05, set a priori, was considered statistically significant. Results should be considered exploratory in nature as *P* values are not adjusted for multiple testing. The χ^2 test for independence was conducted when multiple answers to survey questions were possible to determine if group status was independent from response. With quantitative responses, independent sample *t* tests were performed to determine if a difference in means existed for WIC compared to Farmers' Market Nutrition Program (two-sided *P* value reported.) Lastly, Spearman correlation was used for quantitative associations between two variables.

RESULTS

At the time of the study, 1,076 households (representing 1,742 Athens County residents) were receiving WIC benefits, with 23% (n=246) choosing to participate in Farmers' Market Nutrition Program. Of those surveyed, 235 surveys were returned (22% overall response rate; Farmers' Market Nutrition Program Group, n=65, 26.4% response rate; WIC Group, n=170, 20.4% response rate). Sample size is not consistent for all variables, however, because not all respondents answered all survey questions.

Table 2 summarizes participant characteristics. Of the single women with children, 51.5% (n=50) had another adult, over the age of 18 years, living in the household. Overall, average household size was 3.69±1.30 members. No differences (*P*>0.05) were noted between groups for characteristics measured.

Although ethnicity of respondents was not measured, the Athens County WIC office served mostly non-Hispanic white (93%) individuals in March 2006, along with African-American (3.9%), Asian (1.2%), and Hispanic (0.09%) individuals (Heidi Anderson, personal communication, March 2006). It is likely that our sample represented a similar ethnic profile.

Women participating in Farmers' Market Nutrition Program reported higher levels of education. Almost all Farmers' Market Nutrition Program respondents (95.2%, n=63) reported having at least a high school diploma or equivalent (general equivalency diploma), while 84% (n=169) of WIC respondents reported having a high school diploma or general equivalency diploma (*P*=0.027).

Table 3 summarizes the food security status of partic-

Table 2. Participant characteristics by program participation group for women living in households participating in Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Participation Alone or in Both WIC and Farmers' Market Nutrition Program (FMNP) (WIC/FMNP)^a

Characteristic	Both Groups (n=235)		WIC (n=170)		WIC/FMNP (n=65)	
	Frequency	%	Frequency	%	Frequency	%
Marital status						
Married	130	55.3	91	53.5	39	60.0
Single/never married	77	32.8	59	34.7	18	27.7
Divorced	18	7.7	13	7.6	5	7.7
Separated	9	3.8	6	3.5	3	4.6
Pregnant	34	14.5	25	14.7	9	14.1
Breastfeeding	25	10.6	14	8.3	11	17.2
Married with children	122	51.9	84	49.4	38	58.5
Single ^b women with children	97	44.2	72	43.4 ^c	25	38.5
No other adult in the house	47	48.5	34	47.2	13	52.0
Other adult in the house	50	51.5	38	52.7	12	48.0

^aVariation in number of subjects is due to missing data.

^bSingle includes women who are divorced, separated, or never married.

^cn=166, rather than 170, for subjects with both marital and number of children data.

Table 3. Household food security and food security among children status of women living in households participating in Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Participation Alone or in Both WIC and Farmers' Market Nutrition Program (FMNP) (WIC/FMNP)

Household Food Security						
Food security status level	Both Groups (n=228) ^a		WIC (n=167)		WIC/FMNP (n=61)	
	Frequency	%	Frequency	%	Frequency	%
Food security	61	26.8	48	28.7	13	21.3
At risk for (marginal) food insecurity	47	20.6	34	20.4	13	21.3
Low food security ^b	75	32.9	51	30.5	24	9.3
Very low food security ^c	45	19.7	34	20.4	11	18.0
Food Security among Children						
Food security among children ^d	Both Groups (n=231) ^a		WIC (n=169)		WIC/FMNP (n=62)	
	Frequency	%	Frequency	%	Frequency	%
Food security among children ^d	182	78.8	134	79.3	48	77.4
Low food security among children ^d	48	20.8	35	20.7	13	21.0
Very low food security among children ^d	1	0.4	0	0	1	1.6

^aVarying participant numbers for food security and hunger measures are due to missing responses for some questions.

^bLow food security was previously categorized as "food insecure without hunger" (2,23).

^cVery low food security was previously categorized as "food insecure with hunger" (2,23).

^dChild food security status has been categorized into a dichotomous variable previously (2,23), with households being categorized as "insufficient evidence of hunger/very low food security among children" or "clear evidence of hunger/very low food security among children," based upon 0-4 and 5-8 positive responses, respectively, to the child items of the food security survey module (23). In this study, the food security among children, low food security among children, and very low food security among children groups were categorized, based upon 0-1, 2-4, and 5-8 positive responses, respectively, to the child items of the food security survey module (23).

ipant households (n=228). Groups did not significantly differ ($\chi^2=2.117$, $P=0.548$).

Daily vegetable servings for women from the Farmers' Market Nutrition Program group (2.23 ± 1.18) was significantly greater than those for the WIC group (1.91 ± 0.98 ; t test, $P=0.040$). Daily fruit intake did not

differ (Farmers' Market Nutrition Program, 1.69 ± 0.97 ; WIC, 1.64 ± 1.21 ; t test, $P=0.769$). No other variations in behaviors related to fruit and vegetable intake (fruit and vegetable variety, eating two or more servings of vegetables at a main meal, and eating fruits and vegetables as snacks) were significantly different ($P>0.05$).

Of the six constructs on Table 1, women from Farmers' Market Nutrition Program showed higher scores in four (perceived benefit, perceived diet quality, and stages of change continuums for both fruit and vegetable intake). Perceived benefit of fruit and vegetable intake also significantly differed between groups ($\chi^2=4.574$, $P=0.032$), with 83.1% of women from Farmers' Market Nutrition Program having a maximum perceived benefit score, while only 69.2% of the WIC group respondents had such a score. Both stages-of-change continuums with regard to fruit ($\chi^2=12.171$, $P=0.007$) and vegetable ($\chi^2=10.238$, $P=0.017$) intake significantly differed. For fruit, 78.5% of Farmers' Market Nutrition Program participants were actively trying to increase intake compared to 58.9% for WIC. For vegetable stages of change, 83.1% of Farmers' Market Nutrition Program participants fell within the action category, compared to 74.1% for WIC. There were no significant differences in the other two constructs.

For the entire sample, food insecurity was negatively associated with perceived diet quality ($r=-0.248$, $P<0.001$). Women from these households had a greater perceived diet quality ($\chi^2=7.219$, $P=0.027$), with 30.8% of Farmers' Market Nutrition Program respondents indicating "Very Good or Excellent" diet, compared to 15.9% for nonparticipants.

DISCUSSION

Studies show that low-income, rural, women with children are at increased risk for experiencing food insecurity (2,4,27). WIC households might also be at increased risk for experiencing food insecurity (2,27,28). Yet, no studies have been conducted regarding the household food security status of Farmers' Market Nutrition Program participants.

Studies on Farmers' Market Nutrition Program's effectiveness to increase fruit and vegetable consumption behaviors have been somewhat inconclusive. Several studies suggest positive effects on attitudes, beliefs, consumption, and shopping habits with regard to fruits and vegetables (21,29-31). However, at least one study has reported no evident effect on fruit and vegetable consumption (32).

In our study, differences between groups were found in several psychosocial indicators and behaviors, with women living in Farmers' Market Nutrition Program households demonstrating positive increases in all substantially different categories. However, household food security status or perceived health status did not differ based on Farmers' Market Nutrition Program participation. Yet, among the entire sample, food insecurity was negatively associated with perceived health and perceived diet quality.

Despite all being eligible to participate in Farmers' Market Nutrition Program, women with higher levels of education were more likely to be from households participating in Farmers' Market Nutrition Program. Low education attainment has long been associated with poor diet quality (33). Results reinforce the need for continued nutrition education to food assistance program recipients.

The 2005 US food security estimates highlighted that 11.0% of all households, and 39.5% of those receiving WIC benefits, experienced some level of food insecurity (2). In this study, 52.6% ($n=122$) of respondents were from

households experiencing food insecurity within the previous 12 months. An additional 20.6% ($n=47$) were from households "at risk" for food insecurity. Several reasons might account for these levels of food insecurity. First, nationally, food insecurity is more prevalent in households with children under the age of 6 years (16.7%) than for those without children (8.5%). Food insecurity further increases among low-income households (<1.30 of the income-to-poverty ratio) with children (40.6%) (2). In addition, households with WIC-eligible incomes (<1.85 of the income-to-poverty ratio) experience food insecurity more than those with higher incomes (28.5% vs 5.2%) (2).

Household food security status did not differ between groups. The small scale of food benefits received by Farmers' Market Nutrition Program participants (\$18 per WIC recipient, per season) does not likely represent an adequate amount of relief to alleviate or substantially improve household food insecurity. Furthermore, this study's design does not permit cause-and-effect conclusions.

Mean daily servings of vegetables for the Farmers' Market Nutrition Program participants were greater than for nonparticipants. Mean fruit intake did not differ. This trend is inconsistent with the higher stages of change scores for fruit intake for the Farmers' Market Nutrition Program group. A higher stages of change score suggests that either steps are being taken to increase consumption of fruits and vegetables, or that an optimal intake has already been achieved.

In this study, women who participated in the Farmers' Market Nutrition Program had a greater perceived diet quality, greater perceived benefit of fruit and vegetable intake, and were at an advanced stages of change with regard to fruit and vegetable intake. Yet, there were no substantial differences in the other two psychosocial construct measurements (self-efficacy and perceived control). Women who were more informed about the benefits of fruit and vegetable intake may have been more likely to participate in the Farmers' Market Nutrition Program. This study was conducted at the end of the Farmers' Market Nutrition Program season, therefore, it is unclear whether the increased perceived diet quality was a result of participating in Farmers' Market Nutrition Program, or a reason for participating. It is possible that women who initially perceived they had higher quality diets were more likely to participate.

Farmers' Market Nutrition Program participants were at an advanced stages of change regarding both fruit and vegetable intake, reporting more frequently being in the "action" phase of the stages-of-change continuum. Again, from these data, it is difficult to conclude whether this was a result of participation in the Farmers' Market Nutrition Program, or a reason for participation. The high cost of fresh fruits and vegetables, items not typically offered in the current WIC food packages, might have motivated participants who were already trying to increase their fruit and vegetable consumption to participate. Conversely, the Farmers' Market Nutrition Program might have increased participant awareness of the availability of fresh, local, and seasonal fruits available at farmers' markets and, therefore, affected intake habits.

Self-efficacy and perceived control with regard to fruit and vegetable intake did not differ between groups. This

suggests that the women did not differ in their confidence, ability, or knowledge of how to prepare fruits and vegetables, or their level of control over meal preparation (22). Therefore, differences observed in the other constructs (perceived benefits, perceived diet quality, fruit and vegetable stages of change continuums, and number of vegetable servings per day) might not have been a result of these factors, which are usually addressed through nutrition education efforts. All of the respondents were living in households receiving WIC benefits, which includes some type of nutrition education for participants. These results suggest that WIC nutrition education efforts should not only focus on fruit and vegetable preparation, but should also focus on the benefits of increased fruit and vegetable intake.

All WIC food packages include fruit juice. While it was not measured, in view of the study by Herman and others (21), it is possible that Farmers' Market Nutrition Program participants' fresh fruit intake was greater than that of nonparticipants. Alternately, lack of difference in fruit intake might have been a result of the small scale of food benefits received from the Farmers' Market Nutrition Program. Overall, it is difficult to assess whether differences are a result of program participation or "self-selection" of women with greater previous vegetable consumption habits.

Previous studies show that food insecurity is negatively associated with diet quality, variety, and nutrient intake (7-11,34). In our study, food insecurity was negatively associated with poorer perceived diet quality. Overall, the participants of this study might not represent the targeted sample, women living in WIC households from Athens County, OH, because of the nonprobability sampling strategy and the possibility that women with a greater interest in nutrition may have been more likely to complete the survey. In addition, although this study was conducted in a rural Appalachian county, Ohio University is located in Athens, possibly skewing education levels and not representing the entire region or state accurately. This may also have resulted in an overestimation of fruit and vegetable intake in both groups. Yet, these results support that food insecurity is negatively associated with perceived diet quality. In addition, our findings support the need to explore the impact of the Farmers' Market Nutrition Program on food insecurity and fruit and vegetable intake behaviors. Limitations of the study include that some members of the sample may have had lower rates of literacy than average for the United States, which may have posed a limitation because of the self-administered nature of the survey. Finally, this survey was only conducted at the end of the Farmers' Market Nutrition Program season rather than using a pre- and posttest design; therefore, results may not be attributed to participation in the program.

CONCLUSIONS

Food insecurity is negatively associated with reported poorer perceived diet quality among women living in households receiving WIC benefits. Participation in Farmers' Market Nutrition Program is positively associated with indicators of increased fruit and vegetable intake, as well as higher levels of formal education. Continued research on this topic is necessary to fully understand the factors that

contribute to food security status, perceived diet quality, behaviors related to fruit and vegetable intake, and outcomes of women living in WIC households participating in Farmers' Market Nutrition Program. Researchers should attempt to increase the sample size and limit response bias by administering the survey on location at the WIC office. A pretest/posttest methodology would strengthen a follow-up study and would facilitate measuring behaviors both before and after participation in the Farmers' Market Nutrition Program. In-person interviews would also limit response bias due to limited literacy level. In addition, it would be helpful to note the type of nutrition education each participant received to determine which methods are the most influential on the outcomes measured.

Despite attempts to create a food and nutrition safety net, food insecurity and poor diet quality exist at unsettling levels throughout the United States, particularly among specific populations, including rural, low-income women with children. Providing nutrition education to all food assistance program participants, including the benefits associated with the recommended intake of fruits and vegetables, as well as the availability and affordability of fresh produce, must be a priority. Equal access to quality nutrition education and a safe, nutritionally adequate food supply by all Americans can be achieved through the continuation and improvement of programs, such as WIC and Farmers' Market Nutrition Program.

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References

1. Anderson S. Core indicators of nutritional state for difficult to sample populations. *J Nutr.* 1990;102:1559-1660.
2. Nord M, Andrews M, Carlson S. *Household Food Security in the United States*, 2005 (ERR-29). Washington, DC: US Department of Agriculture, Economic Research Service; 2006.
3. Holben DH, Pheley A. Diabetes risk and obesity in food insecure households in rural Appalachian Ohio. *Prev Chronic Dis.* 2006;3. Available at: http://www.cdc.gov/pcd/issues/2006/jul/05_0127.htm. Accessed September 17, 2007.
4. Holben DH, McClincy MC, Holcomb JP, Dean KL, Walker CE. Food security status of households in Appalachian Ohio with children in Head Start. *J Am Diet Assoc.* 2004;104:238-241.
5. Pheley A, Holben DH, Graham A, Simpson C. Food security and perceptions of health status: A preliminary study in rural Appalachia. *J Rural Health.* 2002;18:447-454.
6. Holben DH. Position of the American Dietetic Association: Food insecurity and hunger in the United States. *J Am Diet Assoc.* 2006;106:446-458.
7. Cristofar SP, Basiotis PP. Dietary intakes and selected household characteristics of women ages 19-50 years and their children ages 1-5 years by reported perception of food sufficiency. *J Nutr Educ.* 2006;24:53-58.
8. Dixon LB, Winkleby MA, Radimer KL. Dietary intakes and serum nutrients differ between adults from food-insufficient and food sufficient families: Third National Health and Nutrition Examination Survey, 1988-1994. *J Nutr.* 2001;131:1232-1246.
9. Kendall A, Olson CM, Frongillo EA Jr. Relationship of hunger and food insecurity to food availability and consumption. *J Am Diet Assoc.* 1996;96:1019-1024.
10. Rose D, Oliveira V. Nutrient intakes of individuals from food insufficient households in the United States. *Am J Public Health.* 1997;87:1956-1961.
11. Tarasuk VS, Beaton GH. Women's dietary intakes in the context of household food insecurity. *J Nutr.* 1999;129:672-679.

12. Steinmetz KA, Potter JD. Vegetables, fruit, and cancer prevention: A review. *J Am Diet Assoc.* 1996;96:1027-1039.
13. Alaimo K, Olson CM, Frongillo EA. Family food insufficiency, but not low family income, is positively associated with dysthymia and suicide symptoms in adolescents. *J Nutr.* 2002;132:719-725.
14. Alaimo K, Olson CM, Frongillo EA, Briefel RR. Food insufficiency, family income and health in US preschool and school-aged children. *Am J Public Health.* 2001;91:781-786.
15. Casey PH, Szeto K, Lensing S, Bogle M, Weber J. Children in food-insufficient, low-income families. Prevalence, health, and nutrition status. *Arch Pediatr Adolesc Med.* 2001;155:508-514.
16. Murphy JM, Wehler CA, Pagano ME, Little M, Kleinman RE, Jellinek MS. Relationship between hunger and psychosocial functioning in low-income American children. *J Am Acad Child Adolesc Psychiatry.* 1998;37:163-170.
17. Siefert K, Heflin CM, Corcoran ME, Williams DR. Food insufficiency and the physical and mental health of low-income women. *Women Health.* 2001;32:159-177.
18. Stuff JE, Casey PH, Szeto KL, Gossett JM, Robbins JM, Simpson PM, Connell C, Bogle ML. Household food insecurity is associated with adult health status. *J Nutr.* 2004;134:2330-2335.
19. Oliveira RD. Nutrient intakes of individuals from food insufficient households in the United States. *Am J Public Health.* 1997;87:1956-1961.
20. Institute of Medicine of the National Academies. *WIC Food Packages: Time for a Change.* Washington, DC: Committee to Review WIC Food Packages, Food and Nutrition Board; April 2005.
21. Herman DR, Harrison GG, Jenks E. Choices made by low-income women provided with an economic supplement for fresh fruit and vegetable purchase. *J Am Diet Assoc.* 2006;106:740-744.
22. Townsend MS, Kaiser LL. Development of a tool to assess psychosocial indicators of fruit and vegetable intake for 2 federal programs. *J Nutr Educ Behav.* 2005;37:170-184.
23. Bickel G, Nord M, Price C, Hamilton W, Cook J. *Guide to Measuring Household Food Security: Revised 2000.* Alexandria, VA: US Department of Agriculture, Food and Nutrition Service; 2000.
24. Townsend MS, Kaiser LL, Allen LH, Block JA, Murphy SP. Selecting items for a food behavior checklist for a limited-resource audience. *J Nutr Educ Behav.* 2003;35:69-82.
25. Ware JJ, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care.* 1992;30:473-483.
26. Sampson R, Raudenbush S, Earls F. Neighbors and violent crime—A multilevel study of collective efficacy. *Science.* 1997;277:918-924.
27. Gorimani ET, Holben DH. WIC program participants in rural Appalachia may be prone to food insecurity: A pilot study. *J Am Diet Assoc.* 1999;99:A25.
28. Iowa Department of Public Health. Extent of food insecurity among Iowa WIC participants. (2004, August). Available at: <http://www.idph.state.ia.us/wic>. Accessed June 8, 2006.
29. Balsam A, Webber D, Oehlke B. The farmers' market coupon program for low-income elders. *J Nutr Elderly.* 1994;24:35-42.
30. Farrell MM, Wilson JF, Martinez ME, John AT. "Get Fresh Get Results": Farmers' Market Nutrition Program enhances nutrition knowledge in low income community. *J Am Diet Assoc.* 2000;100:A57.
31. Havas S, Langenberg P, Ballesteros M, Feldman R. Final results of WIC 5 A Day promotion program. *Am J Public Health.* 1998;88:1161-1167.
32. Anliker J, Winne M, Drake L. An evaluation of the Connecticut farmers' market coupon program. *J Nutr Educ.* 1992;24:185-191.
33. Thiele S, Mensink GB, Beitz R. Determinants of diet quality. *Public Health Nutr.* 2004;7:29-37.
34. Skalicky A, Meyers AF, Adams WW, Yang Z, Cook JT, Frank DA. Child food insecurity and iron deficiency anemia in low-income infants and toddlers in the United States [serial online]. *Matern Child Health J.* 2006;10:177-185.