Nutrient Intakes of Food Insufficient and Food Sufficient Adults in the Southern Region of the United States and the Impact of Federal Food Assistance Programs

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Introduction

Food insecurity is the target of federal food and nutrition assistance programs such as the food stamp program (FSP) and the Special Supplemental Program for Women Infants, and Children (WIC). According to the Economic Research Service (ERS) (Nord et al. 1999) , average food insecurity rates for several Southern states between 1996-1998 were higher than the national average of 9.7%. In particular, the three Lower Mississippi Delta (LMD) states of Arkansas, Louisiana and Mississippi had prevalence estimates for food insecurity of 12.6%, 12.8% and 14% respectively. These three states also had higher than national average rates of hunger. Heavy reliance of this region on federal food and social assistance programs (Smith and Scholle 1996) underscores the need to understand the impact that these programs have on food security and nutrient intakes of those who participate in them.

Studies of the impact of food insecurity and hunger (food insufficiency) on food and nutrient intakes, using both primary and secondary data, have revealed lower intakes of several nutrients among women of child-bearing age, the elderly, poor Northeastern Caucasian women, and low-income Canadian women (Cristofar and Basiotis 1992;Kendall et al. 1996;Rose and Oliveira 1997;Tarasuk and Beaton 1999) . However, little has been done to date to try to define the food insecurity-related nutritional problems of specific regions of the U.S. such as the South. Factors unique to the South and to particular regions within the South warrant the investigation of the effects of food insecurity/insufficiency on nutrient intakes in this region.

The FSP and WIC are two of the 14 federal food and nutrition assistance programs aimed at ensuring food security for low-income families. Studies of the effectiveness of these two programs point to the importance of food assistance programs in improving food acquisition and diet quality of low-income families in general (Basiotis et al. 1998;Fraker 1990) . However, no published studies have attempted to determine the impact of food assistance programs such as the FSP or WIC have on nutrient intakes of individuals from food insecure/insufficient households in the Southern region of the U.S. Surveys such as the third National Health and Nutrition Examination Survey (NHANES III) may be useful as a starting point in examining the impact of these two food and nutrition assistance programs on nutrient intakes of food insufficient individuals in the Southern region.

Therefore, the goal of this research was to examine the nature of food insufficiency among a Southern population using NHANES III data and the impact of food assistance programs on this phenomenon. In order to meet this goal, five research questions were determined:

1. Do food insufficient adults have significantly different nutrient intakes than food sufficient adults when controlling for other influences on nutrient intakes namely, education level, smoking status, age, gender of the household head, and body size?

2. What is the association between food insufficiency and nutrient intakes among these adults?

3. Are there significant differences in nutrient intakes of food insufficient adults based on participation in food assistance programs when controlling for other influences on nutrient intakes namely, education level, smoking status, age, gender of the household head, and body size?

4. Does the number of food assistance programs participated in by the family influence nutrient intake?

5. What is the association between participation in food/nutrition assistance programs and nutrient intakes among these adults?

Methods & Methods

Sample. NHANES III was a cross-sectional representative sample of the U.S. civilian, non-institutionalized population. It was conducted in two phases from 1988-1994 and included 31,311 persons two months of age and older who lived in a household (not

homeless). The survey consisted of two components. The first was a household interview that consisted of a family questionnaire designed to gather socio-demographic information on each family member as well as household food sufficiency. The second component was an interview and examination conducted in a mobile examination center. Standardized procedures and instruments were used for all interviews and examinations conducted by NHANES III personnel (National Center for Health Statistics 1996) .

The sample for this study was drawn from persons residing in the Southern region of the U.S. who participated in NHANES III. Only adults aged 18 years and older were included in this study. Food sufficiency status of the household was determined from answers to the family interview food sufficiency questions. Participants were classified as food insufficient if the respondent to the family questionnaire described the food in the household as "sometimes" or "often" not enough to eat and food sufficient if described as "enough" to eat. Dietary intake for participants in NHANES III was obtained by a 24-hour recall. Since the unit of analysis was primarily the household, when more than one adult member of a household provided dietary intake information, only one was selected for the analysis. Participation in the FSP and WIC was also determined from answers to the family interview questionnaire. After excluding persons with unreliable reports, the final sample consisted of 7,197 adults.

Statistical Analysis. Log transformation of the nutrient data was conducted to convert the skewed data to an approximated Gaussian distribution. The data were converted to a STATA readable file. The "svy" modules in STATA 6.0 (StataCorp 1999) were used to perform data analyses adjusting for strata, pseudo sample unit, and sampling weights to account for the complex sampling design as instructed by the National Center for Health Statistics *Analytic and Reporting Guidelines* (National Center for Health Statistics 1996) . Least square means were calculated for each nutrient. Chi square analysis was used to test for differences between groups based on demographic characteristics. Analysis of variance (ANOVA) adjusted for potential confounding factors such as education level, smoking status, age group, gender of the household head, and body size, was performed to test the difference in nutrient intakes between food insufficient and food sufficient adults. This procedure was also used to test the difference between nutrient intakes of food insufficient participants and non-participants in food and nutrition assistance programs. Ninety-five percent confidence intervals (95% CI) were estimated for each mean. Nutrient data were reverse-transformed for reporting purposes. Multiple regression analysis was used to examine the relationship of food insufficiency and the potential confounding factors noted above to nutrient intakes of adults. This procedure was also used to examine the relationship of participation in food and nutrition assistance programs to nutrient intakes of food insufficient adults.

Results

Comparison of select demographic characteristics of the food sufficient (FS) to the food insufficient (FI) groups are shown in Table 1. The mean age of the FI group was significantly lower than the mean age of the FS group ($p \leq .05$). Mean household size of the FI group was larger than that of the FS group ($p \leq .05$). The mean poverty index ratio of the FI group was significantly lower than the FS group ($p \leq .05$). There was no difference between the body mass index of the FI and the FS groups.

Results of the chi square analysis for the FI and FS groups revealed significant differences in the proportion of adults reporting food sufficiency and insufficiency based on specific demographic characteristics. Results are presented in Table 2. Non-whites were more likely to report food insufficiency than whites [$\chi^2(n=7197, df=1)\chi^2=28.14, p< .001$]. Those with formal educational attainment less than high school made up the largest proportion of the food insufficient group [χ^2 $(n=7148, df=2)\chi^2=45.93, p< .001$]. Male-headed households made up a smaller proportion of the food insufficient group [$\chi^2(n=7197, df=1)\chi^2=3.949, p=.05$]. A larger proportion of those participating in only one food/nutrition assistance program reported food insufficiency [χ^2 $(n=7170, df=2)\chi^2=120.23, p< .001$] compared to those not participating and those participating in two programs. A larger proportion of those in the 18-39 year old age group reported food insufficiency [$\chi^2(n=7197, df=2)\chi^2=28.04, p< .001$] compared to the other age groups.

Table 3 summarizes the least square mean nutrient intakes of food sufficient and food insufficient adults. All nutrients analyzed in the NHANES III dataset were examined, however only those for which confidence intervals indicate a significant difference at the $p \leq .05$ level are presented. The percentage of calories supplied by carbohydrate was higher in the FI group compared to the FS group. Mean intake of fiber was lower in the FI compared to the FS group. Intakes of vitamins A (both as RE and IU), carotene, folate, potassium, and magnesium were also lower in the FI group compared to the FS group.

Table 4 summarizes the results of the multiple regression analysis of the association of food insufficiency to nutrient intakes. Only nutrients for which there was a significant relationship with food insufficiency are shown. Food insufficiency had a negative relationship with the nutrients shown with the exception of percent of calories from carbohydrate. As food insufficiency increased, the intake of the nutrients for which there was a significant relationship, decreased. However, as food insufficiency increased with regard to carbohydrate, the intake of that nutrient also increased.

Table 5 presents characteristics of the food insufficient adults based on participation in FSP and WIC. There were no differences in mean age, household size or body mass index between the groups. Significant differences existed by program participation for mean poverty index ratio (PIR) with those not participating having a PIR of 1.9 (1.55, 2.26) compared to .98 (.81, 1.15) for those participating in one program and .71 (.51,.91) for those participating in two programs.

Results of the chi square analysis revealed significant differences in the proportion of food insufficient adults participating in food assistance programs based on demographic characteristics. Table 6 summarizes these results. There was no significant difference in program participation by race. Those with educational attainment beyond high school made up the smallest proportion of single program participants while those with less than a high school education made up the largest proportion [χ^2(n=445, df=4)χ^2=17.60, p=.001]. Female-headed households made up the largest proportion of two program participants compared to male-headed households [χ2(n=450, df=1)χ2=11.98, p=.003]. Those in the 60+ age group made up the smallest proportion of two program participants while those in the 18-39 year old group made up the largest proportion [χ2(n=452, df=4)χ2=16.01, p=.003].

Results of the comparison of nutrient intakes of food insufficient adults based on program participation are shown in Table 7. Significant differences in mean nutrient intakes were found for four nutrients between non-participants and the participants in one program only. Due to large variation in the intakes of those participating in two programs, confidence intervals for this group were wide and did not indicate any significant differences between it and the two other groups. Calorie intake of the group participating in one program was lower than the group not participating in any programs even after controlling for education level, smoking status, age, household head and body size. In addition, mean intakes of total, saturated and polyunsaturated fat were lower in the group participating in one program compared to the group not participating in any food/nutrition assistance programs.

Results of the analysis of the relationship between food/nutrition assistance program participation and nutrient intakes are presented in Table 8. Food/nutrition program participation had a significant positive relationship only with percent of calories from protein and sodium intake. As the number of food program participated in increased, so did the consumption of these nutrients.

Discussion

We chose to focus on the Southern region from the NHANES III survey due to a lack of region-specific data for the effects of food insufficiency on dietary intakes as well as heavy reliance of specific sub-regions in the South on federal food and social assistance programs. The NHANES survey design is a complex stratified sampling design that is intended to be nationally representative. The Southern sites chosen for inclusion in NHANES III were in Florida and Texas. Therefore, there are limitations associated with generalizing these findings to the Southern region as a whole. In addition, the nationally representative nature of NHANES III may attenuate regional differences in diets even when separating food insufficiency and nutrient intakes by region. Nor can these data answer questions about food insufficiency and nutrient intakes of specific sub-regions in the South such as the lower Mississippi Delta region. However, this analysis does provide a starting point from which scientists and policy makers can develop more specific questions as to the impact of food insecurity/insufficiency and food assistance programs on diet and even health.

We found that those reporting FI were younger, had larger household sizes and lower poverty index ratios than the FS. The poverty index ratio is an overall indicator of poverty that takes into account not only income of the family, but also the size of the family in relation to the federal poverty levels (National Center for Health Statistics, 1996). As would be expected, those reporting insufficient food due to limited resources were much poorer than those not reporting food insufficiency. Results of the chi square analysis revealed that those most likely to report food insufficiency were either younger, non-white, female-headed households, had less than a high school education or participated in only one food/nutrition program. These findings are similar to those of other researchers using national survey data (Alaimo et al. 1998) (Cristofar and Basiotis 1992) as well as primary, regional data (Olson et al. 1997) .

We noted a significantly higher percentage of calories from carbohydrate among the food insufficient compared to the food sufficient residing in the Southern region of NHANES III. The mean carbohydrate intake, though trending to be higher in the food insufficient, was not significantly different from the food sufficient (data not shown). Cristofar and Basiotis (Cristofar and Basiotis 1992) 1 found significantly lower intakes of carbohydrate among women ages 19-50 reporting food insufficiency “often” compared to those reporting food sufficiency or “occasional” food insufficiency in the 1985-86 Continuing Survey of Food Intake by Individuals. In their subjects, percent of calories from carbohydrate was similar at all three levels of food sufficiency. Their sample included women from all four geographic regions of the United States.

Our data also showed significantly lower intakes of dietary fiber among the Southern food insufficient compared to the food sufficient. This finding combined with the finding

of a higher percentage of calories from carbohydrate would suggest that simple carbohydrates are responsible for the higher percentage of calories from carbohydrate rather than complex carbohydrates. Further investigation of the source of this higher percentage of calories from carbohydrate combined with lower intakes of fiber among the food insufficient residing in the Southern region is needed in order to determine the impact on micronutrient intakes. Future investigations should include the food frequencies collected from a sub-sample of the NHANES III population as well as the "foods file" of the NHANES III dataset.

We also noted lower intake of several nutrients among the food insufficient when compared to the food sufficient. This is consistent with the findings of other researchers who have studied food insufficiency and nutrient intake using the Continuing Survey of Intake by Individuals data (Cristofar and Basiotis 1992;Rose and Oliveira 1997) . Dixon et al (Dixon et al. 2000) used the entire NHANES III dataset to examine food and nutrient intake and serum nutrients of low-income adults from all four geographic regions of the U.S. participating in the survey. They found the food insufficient more likely to have low intakes of meat, fruit, and vegetables than the food sufficient. Likewise food insufficient adults were more likely to consume less the 50% of the recommended daily allowance of vitamins A, C, B_6, B_{12}, folate, and the minerals calcium, magnesium, iron, and zinc. In our Southern region sample from NHANES III, both food sufficient and food insufficient adults had mean intakes less than 50% of the recommended daily allowance (RDA) of only vitamin A, carotene, and folate. The mean intake of magnesium was 50% lower than the RDA for men, but only about 2/3s the RDA for women. In addition we found significantly lower intakes of potassium among the food insufficient compared to the food sufficient, a mineral not found to be lower in the Dixon et al sample. However, the mean intake of potassium in our food insufficient was at the 1989-estimated minimum requirement (National Research Council. Subcommittee on the Tenth Edition of the RDAs 1989) .

The reason for differences in our study and that of Dixon et al is that the emphasis of our study was on nutrient differences between groups (multivariate analysis) rather than on the likelihood of intakes below recommended levels based on logistic regression analysis. Our nutrient data would also suggest that food insufficient adults residing in the Southern region defined by the NHANES III survey consume less fruits, vegetables and legumes (sources of fiber, vitamin A, Carotene, folate, magnesium, and potassium). Future investigations should use the "foods file" and the food frequencies from NHANES III to verify this hypothesis.

In general, the results of the multiple regression analysis examining the relationship between food insufficiency and nutrient intakes agreed with findings from other studies

showing lower intakes of specific nutrients as food insufficiency increases (Cristofar and Basiotis 1992;Kendall, Olson, and Frongillo 1996;Kendall, Olson, and Frongillo 1996;Rose and Oliveira 1997;Tarasuk and Beaton 1999) . Our data showed significant negative relationships between food insufficiency and intakes of percent calories from total, saturated, and monounsaturated fat, mean intakes of total, saturated and monounsaturated fat, vitamins A, riboflavin, folate, and the mineral potassium even when controlling for confounding factors. Although our data did not show significant differences in the intake of % calories from total, saturated, monounsaturated fat, mean intakes of total, saturated, monounsaturated fat or riboflavin, these nutrients did trend to be lower in the food insufficient group compared to the food sufficient group (data not presented). We did find lower intakes of vitamins A and folate and the mineral potassium. Likewise, regression analysis indicated a significant positive relationship between food insufficiency and percent of calories from carbohydrate that was confirmed by the higher mean percent of calories from carbohydrate among the food insufficient using multivariate analysis (ANOVA adjusted for confounding factors). As discussed earlier, this finding is contrary to the findings of other researchers and it is not clear whether this is an artifact of the present study's sample size or a true regional difference in dietary habits.

When comparing the characteristics of food insufficient adults participating in none, one, or two food/nutrition assistance programs we found some important differences that may help in interpreting our results. First, the mean poverty index ratio (PIR) was significantly higher among those not participating in any program (1.9) compared to those participating in one (.98) or two programs (.71). One of the criteria for participation in food assistance programs is an income that is within a defined limit of the poverty line. This limit is ≤ 185% of poverty (PIR ≤ 1.85) for participation in WIC and ≤ 130% of poverty (PIR ≤ 1.3) for participation in FSP. Consequently many of those not participating in a food assistance program but reporting food insufficiency in our sample were not eligible for the programs.

As with the comparison of the demographics of the food sufficient to the food insufficient, there were similar findings among the food insufficient when comparing the demographics of those participating and not participating in food/nutrition assistance programs. Those most likely to participate in food assistance programs were either younger, or female-headed households, or those with less than a high school education. However, with this group there was no significant difference in the proportion of whites and non-whites that did or did not participate in food/nutrition assistance programs.

We found that those who participated in only one program had significantly lower intakes of calories, total fat, saturated fat and polyunsaturated fat than those who did not

participate in any food/nutrition assistance program. The group participating in one program had a significantly lower mean PIR than the group not participating. Perhaps the group participating in one program had to rely heavily on food assistance for the acquisition of food with little income to devote to supplementing food purchases. It would be beneficial for future investigations to examine the frequency of reported FI between these two groups to determine if those participating in one program are chronically FI. If this, indeed, is the case we could assume that the single program group does rely heavily on food assistance for the bulk of their diet. However there was no significant difference in nutrient intakes between those who participated in two programs and those that participated in one program or did not participate in any program. This is an unusual finding in light of the finding that those participating in two food/nutrition assistance programs had much lower mean PIR scores than either those participating in one program or those not participating in any program. Much of this could possibly be explained by the wide confidence intervals around the mean nutrient intakes as noted previously. However those participating in two programs could also have had better mean intakes due to their participation in WIC. The emphasis of this program is on foods that provide specific nutrients often lacking in the diets of low-income women and their children. Nevertheless, future studies to elucidate the effects of participation in food assistance programs on nutrient intakes of food insufficient adults (particularly those residing in the South) should include econometric theory and models to help explain the differences in participants and non-participants.

Another possible explanation for the finding that the non-participating group had better nutrient intakes than the group participating in one program could be the education level of the non-participating group. In general, those not participating in food/nutrition assistance programs had a higher educational attainment than the groups participating in programs. Bowman et al (1998) created a measure of dietary quality called the Healthy Eating Index (HEI) for various demographic groups in the U.S. using data from the 1994-96 CSFII. They found that those with educational attainment of high school or less had lower HEI scores (poorer quality diet) than those with education beyond high school. Our findings are somewhat comparable in that those with less than high school education reported food insufficiency more frequently and the food insufficient had lower intakes of several nutrients compared to the food sufficient. In addition the less educated were participating in food assistance programs in higher proportion compared to the better-educated subjects.

In our study, those participating in two programs were receiving additional education related to nutrition through their involvement in WIC that might possibly contribute to the finding of no difference between the intakes of non-participants and participants in two programs. The majority of the one-program participants were FSP participants. At the time of NHANES III (1988-1994), the Food Stamp Nutrition Education Program (now called the Family Nutrition Program) was an optional program in only 21 states and

was not available in the two Southern states sampled for the NHANES III survey (Joy and Doisy 1996) . This could have contributed to the lower nutrient intakes of the one-program participants based on the "education hypothesis." The Family Nutrition Program is now funded in all states. This will allow future research to better estimate the effects of participation in FSP on nutrient intakes of food insufficient adults by having a reference group without the benefit of nutrition education such as the sample from NHANES III.

Results of regression analysis investigating the relationship of food assistance program participation to nutrient intakes among Southern food insufficient adults indicated a positive association between food assistance program participation and intakes of sodium and percentage of calories from protein after controlling for confounding factors. This relationship was not seen in the nutrient differences of the participants and non-participants in that neither of the participating groups had higher mean intakes of percent calories from protein or sodium compared to the non-participating group. Again, the wide confidence intervals associated with the two-program group may have attenuated this effect in the multivariate analysis. However, the finding of a positive relationship between food program participation and sodium intake deserves further investigation due to the possible adverse effects of high sodium diets on health. Future studies of the relationship between both food insufficiency and food/nutrition program assistance participation and nutrient intakes should consider an analytic approach such as path analysis or structural equation modeling to clarify the relationships among the many variables associated with both food insufficiency and food/nutrient intake.

One of the outcomes of this research will be to use the information, knowledge and skills gained from it to develop more region-specific investigations that will extend our understanding of food insecurity's effects on nutrition and health outcomes. Eventually we hope to have a comprehensive model of the relationships between food insecurity/insufficiency, nutrition and health outcomes in Southern populations.

Table 1: Characteristics of Food Sufficient and Food Insufficient Adults Residing in the Southern Region of NHANES III

Characteristic	N	Mean	SE	95% CI
***Age**				
FS	6741	42.3	.62	40.96 - 43.57
FI	456	35.8	1.54	32.51 - 38.99
***Household Size**				
FS	6741	3.1	.05	2.98 - 3.18
FI	456	3.9	.22	3.41 - 4.34
Body Mass Index				
FS	6721	26.5	.16	26.12 - 26.79
FI	454	26.5	.54	25.31 - 27.59
***Poverty Index Ratio**				
FS	6151	2.89	.09	2.69 - 3.10
FI	407	1.56	.09	1.35 - 1.76

*Significant at the $p \leq .05$ level

Table 2: Proportion of Adults Reporting Food Sufficiency and Food Insufficiency by Demographic Characteristics

Characteristic	Food Sufficient		Food Insufficient	
	N	%	N	%
***Race**				
White	4173	61.9	225	49.3
Non-white	2568	38.1	231	50.7
***Education**				
<High School	2982	44.5	266	59.4
High School	2043	30.5	123	27.5
>High School	1675	25.0	59	13.1
***Head of Household**				
Male	3217	47.7	196	42.9
Female	3524	52.3	260	57.1
***Food Program Participation**				
None	5375	80.0	263	58.2
One Program	995	14.8	138	30.5
Two Program	348	5.2	51	11.3
***Age Group**				
18-39 years	2848	42.3	247	54.2
40-59 years	1809	26.8	112	24.6
60 + years	2084	30.9	97	21.2

*Significant at the $p \leq .05$ level with chi square

Table 3: Least square mean nutrient intakes of food sufficient and food insufficient adults residing in the Southern Region of NHANES III*

Nutrient	Mean	SE	N	95% CI
% Kcal from Carbohydrate				
Food Sufficient	49.51	.48	6715	48.48 - 50.55
Food Insufficient	52.15	.63	456	50.79 – 53.49
Fiber (g)				
Food Sufficient	14.41	1.01	6715	14.14 – 14.69
Food Insufficient	12.43	1.04	456	11.46 – 13.48
Vitamin A (RE)				
Food Sufficient	571	1.02	6710	542 – 601
Food Insufficient	412	1.05	456	369 – 460
Vitamin A (IU)				
Food Sufficient	3361	1.03	6713	3169 – 3565
Food Insufficient	2424	1.04	456	2211 – 2660
Carotene				
Food Sufficient	189	1.04	6714	174 – 205
Food Insufficient	137	1.06	456	122 – 154
Folate (mcg)				
Food Sufficient	221.63	1.02	6715	213.58 – 229.98
Food Insufficient	177.15	1.05	456	158.86 – 197.35
Magnesium (mg)				
Food Sufficient	256.72	1.01	6715	253.15 – 260.60
Food Insufficient	220.52	1.06	456	195.39 – 248.89
Potassium (mg)				
Food Sufficient	2448	1.01	6713	2407 – 2487
Food Insufficient	2096	1.04	456	1910 - 2303

*Adjusted for education level, smoking status, age group, gender of household head, and body size. All reported nutrient intakes are significantly different at $p \leq .05$ level between groups.

Table 4: Characteristics of Food Insufficient Adults Participating in Food Assistance Programs

Characteristic	N	Mean	SE	95% CI
Age				
No Program	263	35.9	1.93	31.53 - 40.25
One Program[a]	138	36.9	1.21	34.16 - 39.63
Two Programs[b]	51	28.9	1.82	24.67 - 33.26
Household Size				
No Program	263	3.6	.28	2.94 - 4.22
One Program[a]	138	4.3	.18	3.86 - 4.67
Two Programs[b]	51	4.7	.64	3.19 - 6.20
Body Mass Index				
No Program	262	27.4	.56	26.05 - 28.69
One Program[a]	137	24.4	1.08	21.91 - 26.79
Two Programs[b]	51	25.6	1.33	22.49 - 28.79
***Poverty Index Ratio**				
No Program	236	1.9	.16	1.55 - 2.26
One Program[a]	123	.98	.07	.81 - 1.15
Two Programs[b]	45	.71	.08	.51 - .91

*Significant at the $p \leq .05$ level

[a]Those participating in either WIC or FSP

[b]Those participating in both WIC and FSP

Table 5: Proportion of Food Insufficient Adults Participating in Food Assistance Programs by Demographic Characteristics

Characteristic	None		One Program		Two Programs	
	N	%	N	%	N	%
Race						
White	132	50.2	74	46.4	22	56.9
Non-white	131	49.8	64	53.6	29	43.1
***Education**						
< High School	137	53.1	97	70.8	30	60.0
High School	74	28.7	32	23.4	16	32.0
>High School	47	18.2	8	5.8	4	8.0
***Head of Household**						
Male	130	49.4	51	37.0	14	27.5
Female	131	50.6	87	63.0	37	72.5
***Age Group**						
18-39 years	142	54.0	65	47.1	39	76.5
40-59 years	60	22.8	40	28.9	10	19.6
60 + years	61	23.2	33	24.0	2	3.9

*Significant at $p < .05$ with chi square

Table 6: Least square mean nutrient intakes of food insufficient adults from the Southern Region of NHANES III based on food assistance program participation*

Nutrient	Mean	SE	N	95% CI
Total Calories				
No Program	2092_{a}	1.06	263	1823 – 2403
One Program	1699_{b}	1.03	138	1602 – 1804
Two Programs	$1904_{a,b}$	1.12	51	1450 – 2502
Fat (g)				
No Program	75.11_{a}	1.08	263	63.49 – 88.94
One Program	51.62_{b}	1.08	138	42.82 – 62.24
Two Programs	$67.97_{a,b}$	1.72	51	45.33 – 102.00
Saturated Fat (g)				
No Program	24.80_{a}	1.07	263	21.43 – 28.70
One Program	18.28_{b}	1.07	138	15.58 – 21.46
Two Programs	$23.52_{a,b}$	1.72	51	17.22 – 32.17
Polyunsaturated Fat (g)				
No Program	16.69_{a}	1.08	263	13.84 – 20.15
One Program	10.46_{b}	1.09	138	8.57 – 12.76
Two Programs	$13.70_{a,b}$	2.43	51	7.72 – 24.31

*Adjusted for education level, smoking status, age group, head of household sex, and body size. Means with different subscripts are significantly different at the $p \leq .05$ level for each nutrient.

Table 7: Unstandardized coefficients and standard errors of food insufficiency as a predictor of nutrient intakes among adults in the southern region of NHANES III. *

Nutrient	Coef.	SE	T	P	95% CI
% Kcal from Fat	-2.01	.66	-3.06	.009	-3.42 - -0.59
% Kcal from Saturated Fat	-0.75	.21	-3.66	.003	-1.19 - -0.31
% Kcal from Mono. Fat	-0.77	.29	-2.69	.018	-1.39 - -1.55
% Kcal from Carbohydrate	2.64	.63	4.21	.001	1.29 - 3.99
Total Fat	-0.08	.02	-3.37	.005	-0.13 - -0.03
Saturated Fat	-0.08	.03	-2.69	.017	-0.14 - -0.16
Monounsaturated Fat	-0.09	.03	-3.53	.003	-0.14 - -0.03
Vitamin A (IU)	-0.17	.06	-2.98	.01	-0.29 - -0.05
Vitamin A (RE)	-0.18	.06	-3.05	.009	-0.31 - -0.05
Riboflavin	-0.06	.02	-2.77	.015	-0.11 - -0.01
Folate	-0.15	.04	-3.47	.004	-0.24 - -0.06
Potassium	-0.11	.04	-2.59	.021	-0.19 - -0.02

*Adjusted for education level, smoking status, age group, sex of head of household, and BMI.

Table 8: Unstandardized coefficients and standard errors of food program participation as a predictor of nutrient intakes among food insufficient adults*

Nutrient	Coef.	SE	T	P	95% CI
% Kcal from Protein	0.92	.36	2.55	.031	0.10 - 1.74
Sodium	0.14	.06	2.29	.047	0.002 - 0.27

*Adjusted for education level, smoking status, sex of head of household, age group, and BMI.

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