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Food insecurity and eating behavior relationships among congregate meal participants in Georgia

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Abstract

This study explored relationships of food insecurity with cognitive restraint, uncontrolled eating, and emotional eating behaviors among congregate meal participants in northeast Georgia [n = 118, age 60 and older, mean (SD) age = 75 (8) years, 75% female, 43% Black, 53% obese (BMI ≥ 30)]. Food insecurity was assessed with a 6-item questionnaire scores ranged from 0 to 6 and were defined as high or marginal food security, FS, 0–1 (70%); low food security, LFS, 2–4 (20%); very low food security, VLFS, 5–6 (10%); and low and very low food security, LVLFS, 2–6 (30%). Eating behavior was assessed with an 18-item Three-Factor Eating Questionnaire R-18. In bivariate analyses food insecurity was consistently associated with cognitive restraint scores above the median split and to a lesser extent with uncontrolled eating scores ($p \leq 0.05$). No association was found between emotional eating and food insecurity. In multivariate linear and logistic regression analyses, food insecurity was consistently associated with cognitive restraint ($p \leq .05$) even when controlled for potential confounders (demographics, BMI and chronic diseases). Food insecurity was also associated with uncontrolled eating ($p \leq .05$), but the relationship was attenuated when controlled for potential confounding variables. Although cognitive restraint is defined as the conscious restriction of food intake to control body weight or promote weight loss, these findings suggest there may be other dimensions of cognitive restraint to consider in nutritional assessment and interventions among food insecure older adults.

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Keywords

Food insecurity; eating behaviors; older adults; congregate meal program; senior centers; Older Americans Act Nutrition Program

Introduction

Georgia ranks eighth in the prevalence of food insecurity behind seven other southern states (16.6% or higher, 2011–2013) (1). Although the prevalence of food insecurity is lower in households with older adults compared to the national average (8.7% vs. 14.3%, 2011–2013) (1), there is a particularly high prevalence of food insecurity among some subgroups of the older population such as congregate meal participants (18.7%, convenience sample in Georgia in 2007) (2). Food insecurity is of concern because of the important implications for healthcare costs, its association with chronic conditions such as obesity and hypertension, poor glycemic control for those with diabetes, and functional impairments (2–6).

Individuals that experience FI may change their eating behavior as a result of cyclic food restriction that alternates between having an adequate food supply and food scarcity, and over consume during periods when access to food is readily available. Previous studies (7, 8) have found that chronic cycles of food availability and deprivation have been associated with over-consumption and food restriction. Furthermore, food insecurity has been linked to mood/anxiety disorders (9) and depression (10), both of which may lead to changes in eating behaviors (11, 12). Three types of eating behavior that may be relevant to obesity and to FI are cognitive restraint (CR, the conscious restriction of food intake to prevent weight gain or promote weight loss), uncontrolled eating (UE, when an individual loses control over food intake and eats in response to external food cues such as the sight, smell and taste of food), and emotional eating (EE, eating in response to negative emotions such as depression or anxiety). These eating behaviors have been measured in obese individuals using a revised 18-item Three-Factor Eating Questionnaire (TFEQ-R18) revised by Karlsson et al (13) from the original version (14). Previous research in congregate meal participants used a modified and validated TFEQ-R18 questionnaire and demonstrated associations of certain eating behaviors with obesity (15).

Studies have shown that congregate meal participants in Georgia have a high prevalence of FI (2), a high prevalence of obesity (2), and that obesity is associated with FI (2) and eating behaviors (CR and EE) (15). Therefore, the aim of this study was to provide a comprehensive assessment of FI and eating behaviors in an older, low income, minority population. Specifically, we explored the relationship of FI with CR, UE, and EE behaviors among congregate meal participants in northeast Georgia who were 60 and older. It was hypothesized that of the three eating behaviors, emotional eating would have the strongest association with FI due to emotional stresses that people with FI may experience.

Methods

Study design

The Athens Community Council on Aging, the University of Georgia Institutional Review Board on Human Subjects, and the Georgia Department of Human Services Institutional Review Board on Human Subjects approved all methods and procedures. This study was cross-sectional and included questionnaires administered by trained interviewers for assessment of self-reported demographics, general health, eating behavior, and FI. The procedures were explained and the consent form was read to and also signed by each participant. Individuals were congregate meal participants age 60 and older (men, women, Whites, Blacks, $N = 123$), and were recruited from four senior centers affiliated with the Northeast Georgia's Area Agency on Aging. This study focuses on the 118 participants who had responses for all variables of interest with no missing data (excluded 5 individuals with missing data). The non-participants in this study ($n = 106$) were individuals who refused or were uninterested in the study, unavailable during the study period or unable to answer questions and/or understand the informed consent as determined by the interviewer. Compared to non-participants, participants were younger (77 and 75, respectively, $p = 0.01$) and more likely to be Black (30% and 43%, $p = 0.04$), while there was no statistical difference in gender (67% and 76% female, respectively, $p = 0.24$).

Food insecurity assessment

FI was assessed with questions from validated questionnaires used in national surveys (16) that were modified in these ways: 1) "I/we" was changed to "you" because questions were read to participants, 2) "couldn't afford to eat balance meals" was changed to "couldn't choose the right foods and meals for your health" because of higher sensitivity and importance of having the right foods for health among older people (17), 3) used 6 questions to decrease respondent burden and use of 6 questions was shown to be a valid approach (18), and 4) used timeframe of 30 days, rather than 1 year, which we showed was a valid approach to assessing the benefits of food assistance in food insecure older adults (18, 19). Scores ranged from 0 to 6 and were designated as high or marginal food security (score 0–1 = food secure or FS), low food security (scores 2–4 = low food security or LFS) and very low food security (scores 5–6 = very low food security or VLFS) (20). One point was given for a positive response ("often" or "sometimes") to the questions, *"The food that you bought just didn't last, and you didn't have money to buy more"* and *"You couldn't choose the right food and meals for your health because you couldn't afford them"* and also by a positive response ("yes" or "one or more days") to the questions, *"Did you ever cut the size of your meals or skip meals because there wasn't enough money for food?" "If yes, in the last 30 days, how many days did this happen?" "Did you ever eat less than you felt you should because there wasn't enough money to buy food?"* and *"Were you ever hungry but didn't eat because you couldn't afford enough food?"*

Eating behavior assessment

Eating behavior was assessed using the 18-item Three-Factor Eating Questionnaire R-18 (TFEQ-R18) that was adapted from the original 51-item questionnaire and answered on a 4-point Likert scale (maximum 4 points per question) in which higher values indicated the

potential presence of the eating behavior (13, 14). The TFEQ-R18 reduces respondent burden, increases relevancy, and was validated in congregate meal participants to assess CR, EE and UE behavior (21). The 18-item questionnaire was modified as previously described (15). Summary scores were created from the three eating behaviors by summing the responses that corresponded to CR (six questions, possible range of scores 6 to 24), UE (nine questions, possible range of scores 9 to 36) and EE (three questions, possible range of scores 3 to 12).

Statistical analysis

Data were analyzed using the Statistical Analysis System (SAS, Version 9.3, Cary, NC). Descriptive statistics including frequencies and means were calculated. Chi-square analyses were used to assess the bivariate associations between eating behaviors (median split) and FI (FS, LFS, and LVLFS), demographics (age, race/ethnicity, gender, and education), BMI (obese vs non-obese), and health conditions (diabetes, heart disease, high blood pressure, and arthritis). A series of regression models were used to evaluate the independent associations of FI [(summary score, 0–6; FS (0–1) vs. LVLFS (2–6); or FS (0–1) vs. LFS (2–4) vs. VLFS (5–6)] with eating behaviors (as continuous variables or with cut-points at the median split). Model 1 was a series of models that included the primary independent variable (FI) and the dependent variable (CR, UE or EE). Model 2 was a series of models that included the Model 1 variables and controlled for potential confounders including age (continuous), gender, race/ethnicity, education (continuous), BMI (continuous), and health conditions (diabetes, high blood pressure, heart disease, arthritis). Unstandardized regression coefficients (B) are presented for the continuous regression analyses. Odds ratios (OR), 95% confidence intervals (CI), and C statistics (measure of model fit) are shown for the logistic regression analyses. A level of $p \leq 0.05$ was accepted as statistically significant.

Results

The participants' mean age (SD) was 75(8), 75% were female, 57% were White, 43% were Black and 46% had 12 or more years of education. The prevalence of self-reported health problems was: diabetes 37%, high blood pressure 75%, heart disease 31% and arthritis 63% (n = 118, Table 1). About half of the participants were obese (53%), 30% had low or very low food security, and by definition about half of the participants were above the median split of the sample distribution for CR (54%), UE (52%), and EE (46%).

Chi-square analyses were conducted to examine associations of the three eating behaviors (median split) with demographics, health related variables, and FI (Table 2). Age, gender, race/ethnicity, heart disease and arthritis were not associated with any of the eating behaviors. Education ≥8 years was positively associated with EE and education ≥12 years was positively associated with both EE and CR. In regards to health conditions, having diabetes was associated with higher UE ($p \leq 0.05$), but not with CR or EE, while having high blood pressure was associated with higher CR and higher EE ($p \leq 0.05$), but not with UE. FI was positively associated with higher CR (3 of 3 measures, $p \leq 0.05$) and with higher UE (1 of 3 measures, FS and LFS vs. VLFS, $p \leq 0.05$), but not with EE.

Multivariate logistic regression analyses were conducted to determine the independent associations of FI (independent variable) with eating behaviors (dependent variable) when not controlled (Model 1) or when controlled (Model 2) for potential confounders including demographics, BMI and health conditions (Table 3). FI was consistently and significantly associated with CR in all but one model ($p \leq 0.001–0.05$) and model fit was improved in Model 2 that was controlled for potential confounders (improved C statistic). FI was significantly associated with UE in 6 of the 8 analyses for Model 1, but these associations were no longer statistically significant when controlled for potential confounders in Model 2. For the logistic regression analyses related to FS and LFS vs. VLFS, the CI for the OR is large which may be related to the relatively small number of individuals who were VLFS (n = 12). FI was not significantly associated with EE in any of these models (data not shown).

Discussion

To our knowledge, this was the first time the relationship among FI and eating behaviors (CR, UE, and EE) has been assessed in a sample of older adults, specifically congregate meal participants with a high prevalence of obesity (53%) and FI (30%). FI may be associated with certain eating behaviors because a lack of finances and other resources for food may disrupt eating patterns (1). Our results suggest that FI was consistently associated with CR, and this association was sustained when controlled for potential confounders. Although UE was significantly associated with FI in some analyses, this relationship was attenuated with the addition of potential confounders. Finally, EE was not significantly associated with any measure of FI. These associations occurred in this sample of older adults with a high prevalence of obesity (53%) and FI (30%).

CR is the conscious restriction of food intake to prevent weight gain or promote weight loss and has been shown to be associated with obesity and may be more likely due to rigid control (all or nothing approach to eating, dieting, and weight) as opposed to flexible control (graduated approach to eating, dieting, and weight in which foods that are fattening are eaten without guilt and in limited quantities) (13, 21). Rigid control of CR is associated with more disturbed eating patterns and is not beneficial in weight reduction or maintenance while flexible control is associated with more successful weight reduction and maintenance and less disturbed eating behavior (22), and Porter and Johnson (15) observed previously that CR was associated with obesity in this sample. Although CR is the restriction of food in an effort to control body weight, it is speculated that the association of CR with FI among these congregate meal participants may be due more to limiting food intake or limited food availability related to FI rather than to concerns about body weight, as CR was consistently associated with higher levels of FI. Some CR questions, although related to weight, also hint at limited food availability (*Do you deliberately take small helpings as a means of controlling your weight? Do you consciously hold back at meals in order not to gain weight? Do you not eat some foods because they make you fat?*), while others indicate limiting food more directly (*How frequently do you avoid “stocking up” on tempting foods? How likely are you to consciously eat less than you want? Do you feel you are restrained in your eating?*). Perhaps the association of FI with CR in these congregate meal participants supports the suggestion that factors other than limited financial resources contribute to FI and should be considered when assessing and addressing FI and CR in this population.

UE is when an individual loses control over food intake and eats in response to external food cues such as the sight, smell and taste of food, and can be conceptualized into three domains: “habitual” (refers to the susceptibility of an individual to overeat in response to daily life, “emotional” (when an individual tends to overeat in response to emotional states such as depression or anxiety), and “situational” (the susceptibility of an individual to overeat in response to environmental cues) (23). UE was significantly associated with FI in some, but not all analyses. Explanations for the association of FI with UE may be that some UE questions involve hunger (*Do you get so hungry that your stomach often seems like a bottomless pit? Are you always hungry so it’s hard for you to stop eating before you finish the food on your plate? Are you always hungry enough to eat at any time? How often do you feel hungry?*). The association of UE with FI was attenuated when controlling for other factors (e.g., BMI and chronic diseases); perhaps disease-related reductions in quality of life lead to UE behaviors in the habitual, emotional and/or situational domains, which may attenuate the associations of FI with UE.

It is difficult to compare the scores of CR, UE, and EE of this study with other studies, because questionnaires designed to assess these eating behaviors vary across studies, many studies focus on only obese populations, and most samples are not exclusively older adults and low-income. Angle et al (24) used the same questionnaire employed in the present study; however it focused only on Finnish females 17–20 years. Additionally, the TFEQ has other versions aside from the one used in the present study including the original version with 51 items and the TFEQ R-21 with 21 items (14, 25).

Although it was initially hypothesized that EE would have the strongest association with FI due to emotional stresses caused by the lack of access to adequate and nutritious food, this study found that EE was not associated with FI. The reason for this may be that there were only three questions in the EE subscale, only one of them included anxiety, and none of the questions explored limited food availability or hunger (*When you feel anxious, do you find yourself eating? When you feel blue, do you often overeat? When you feel lonely, do you console yourself by eating?*). Future research is needed to further explore the relationship between EE and FI.

Limitations and strengths

Eating behaviors and FI were self-reported; however, previous studies have shown that these self-reports provide useful information in the target population about FI (2, 26) and eating behaviors (27). The eating behavior questionnaire was a short form with only 18 questions, so some dimensions that may be relevant to FI could not be explored (e.g., flexible and rigid restraint in CR; habitual, emotional and situational in UE), which might be important to assess in future studies that examine relationships between FI and CR. Validation of the modified FI questions was beyond the scope of this study, however use of the 30 day time period was a valid approach and documented the benefits of food assistance in food insecure older adults (18) and the modified question, “couldn’t choose the right foods and meals for your health,” had improved sensitivity (17). This cross sectional study does not allow for causal inferences to be made. Finally, this study was conducted among congregate meal participants and may not reflect all older adult populations; however, this is also a strength

of the study in that the results may be applicable older adults participating in the Older American's Act Nutrition Program.

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TAKE AWAY POINTS

- Food insecurity continues to be a major concern for older adults, particularly those with numerous chronic health conditions including those who participate in Older American's Act Nutrition Programs (2, 3).
- Although CR is defined as the conscious restriction of food intake to control body weight or promote weight loss, these findings suggest there may be other dimensions of CR to consider in nutritional assessment and interventions among food insecure older adults. Healthcare professionals may need to ask in-depth questions to discern whether those at risk for obesity and/or FI are consciously restraining food intake for disease management, e.g., diabetes and other obesity-related conditions, or because they are food insecure.
- The association between FI and UE is likely due to the use of the word "hunger" in some of the questions and possibly may be capturing FI rather than this eating behavior. Additionally, the lack of a relationship between FI and EE may be due to limited financial resources to purchase food and not the absence of the eating behavior. Both UE and EE should be explored further to better understand their potential association with FI specifically in relation to cyclic food availability and restriction.
- In order to develop effective interventions for this high-risk population it is essential that researchers and policy makers understand the complexity of FI and CR among older adults, particularly in populations at risk for obesity.

Table 1

Characteristics of participants[1]

	n	Mean (SD) or %
Age (years)		75 (8)
Gender		
Male	29	25
Female	89	75
Race/ethnicity		
White	67	57
Black	51	43
Education (years)		
< 8	22	19
≥ 8	96	81
< 12	64	54
≥ 12	54	46
Chronic disease		
Diabetes	44	37
High blood pressure	88	75
Heart disease	36	31
Arthritis	74	63
Body mass index (kg/m^2)		31 (7)
Obesity (BMI ≥ 30, n = 118)	62	53
Eating behaviors (median)[2]		
Cognitive Restraint or CR (6 items, max = 24, median ≥ 10)	64	54
Uncontrolled Eating or UE (9 items, max = 36, median ≥ 13)	61	52
Emotional eating or EE (3 items, max = 12, median ≥ 4)	54	46
Food insecurity (6 items, max = 6)[3]		
Food insecurity scores 0–1 (“food secure” or FS)	83	70
Food insecurity scores 2–4 (“low food security” or LFS)	23	20
Food insecurity scores 2–6 (“low and very low food security” or LVLFS)	35	30
Food insecurity scores 5–6 (“very low food security” or VLFS)	12	10

[1] N = 118, unless otherwise noted.

[2] Eating behaviors: at the median split about one-half of the sample is below the median and one-half of the sample is above the median.

[3] Food insecurity (FI), 6 items, max = 6, higher scores indicate higher food insecurity, 0–1 = food secure or FS, 2–4 = low food security or LFS, 2–6 = low and very low food security or LVLFS, 5–6 = very low food security or VLFS.

Table 2

Bivariate characteristics: eating behaviors at the median split[1, 2]

		Eating behaviors					
		CR		UE		EE	
	n	Low	High	Low	High	Low	High
	118	%	%	%	%	%	%
Age (years)							
< 70	36	47	53	44	56	58	42
≥70	82	45	55	50	50	52	48
Gender							
Male	29	48	52	55	45	59	41
Female	89	45	55	46	54	53	47
Race/ethnicity							
White	67	48	52	54	46	54	46
Black	51	43	57	41	59	55	45
Education							
< 8 y	22	59	41	59	41	**77**	**23**
≥ 8 y	96	43	57	46	54	**49**	**51**
< 12 y	64	**56**	**44**	52	48	**64**	**36**
≥ 12 y	54	**33**	**67**	44	56	**43**	**57**
Diabetes							
No	74	50	50	**59**	**41**	55	45
Yes	44	39	61	**30**	**70**	52	48
Heart disease							
No	82	48	52	46	54	55	45
Yes	36	42	58	53	47	53	47
High blood pressure							
No	30	**63**	**37**	50	50	**70**	**30**
Yes	88	**40**	**60**	48	52	**49**	**51**
Arthritis							
No	44	57	43	55	45	59	41

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		Eating behaviors					
		CR		UE		EE	
	n	Low	High	Low	High	Low	High
	118	%	%	%	%	%	%
Yes	74	39	61	45	55	51	49
BMI							
Non-obese	56	**64**	**36**	**61**	**39**	**64**	**36**
Obese**Food insecurity**[3]	62	**29**	**71**	**37**	**64**	**45**	**55**
FS vs. LVLFS							
FS	83	**53**	**47**	53	47	54	46
LVLFS	35	**29**	**71**	37	63	54	46
FS and LFS vs. VLFS							
FS and LFS	106	**49**	**51**	**52**	**48**	54	46
VLFS	12	**17**	**83**	**17**	**83**	58	42
FS vs. LFS vs. VLFS							
FS	83	**53**	**47**	53	47	54	46
LFS	23	**35**	**65**	48	52	52	48
VLFS	12	**17**	**83**	17	83	58	42

[1]Eating behaviors: at the median split about one-half of the sample is below the median and one-half of the sample is above the median, respondents were grouped into “low” or “high” demonstration of the eating behavior according to the median split: CR ≥ 10, UE ≥ 13, EE ≥ 4.

[2]Significance level at $p \leq 0.05$. Statistically significant values are in bold.

[3]Food insecurity (FI), 6 items, max =6, higher scores indicate higher food insecurity, 0–1 = food secure or FS, 2–4 = low food security or LFS, 2–6 = low and very low food security or LVLFS, 5–6 = very low food security or VLFS.

Table 3

Associations of food insecurity[1] and eating behaviors[2] regression analyses models[3] (p-values) [4,5,6]

	Eating behaviour					
	Continuous			Median Split		
	CR	UE		CR		UE
Food Insecurity	**Unstandardized regression coefficient (B)**	**Unstandardized regression coefficient (B)**	**C statistic**	**OR (95% CI)**	**C statistic**	**OR (95% CI)**
FI Summary Score						
Model 1	0.66[5]	0.54[4]	0.58	1.31 (1.04, 1.65)[4]	0.57	1.26 (1.02, 1.57)[4]
Model 2	0.64[5]	0.40	0.82	1.56 (1.15, 2.10)[5]	0.75	1.25 (0.96, 1.62)
FS vs. LVLFS						
Model 1	1.90[4]	2.17[4]	0.60	2.82 (1.21, 6.60)[4]	0.57	1.91 (0.85, 4.29)
Model 2	1.62	1.76	0.82	4.23 (1.43, 12.6)[5]	0.74	1.86 (0.69, 4.97)
FS and LFS vs. VLFS						
Model 1	4.26[6]	2.95	0.56	4.81 (1.01, 23.0)[4]	0.56	5.39 (1.13, 25.8)[4]
Model 2	4.37[6]	2.28	0.82	14.5 (2.05, 102.7)[5]	0.74	5.15 (0.92, 28.9)
FS vs. LFS vs. VLFS						
Model 1	1.77[5]	1.63[4]	0.61	2.27 (1.20, 4.30)[4]	0.58	1.87 (1.04, 3.38)[4]
Model 2	1.73[5]	1.33	0.83	3.55 (1.57, 8.03)[5]	0.75	1.88 (0.92, 3.83)

N = 118

[1] Food insecurity (FI), 6 items, max =6, higher scores indicate higher food insecurity, 0–1 = food secure or FS, 2–4 = low food security or LFS, 2–6 = low and very low food security or LVLFS, 5–6 = very low food security or VLFS. In the various models the lower level of food insecurity = 0 and the higher level of food insecurity = 1.

[2] Eating behaviors: at the median split about one-half of the sample is below the median and one-half of the sample is above the median.

[3] Model 1 the dependent variable is eating behavior and independent variable is the specific measure of food insecurity. Model 2 the dependent variable is eating behavior and independent variable is the specific measure of food insecurity; model is controlled for age, gender, race, education (continuous), BMI (continuous), diabetes, hypertension, heart disease, and arthritis.

[4] Significance level at $p \leq 0.05$

[5] Significance level at $p \leq 0.01$

[6] Significance level at $p \leq 0.001$