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Associations of food insecurity and psychosocial measures with diet quality in adults aging with HIV

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Abstract

People aging with HIV face social stressors which may negatively affect their overall nutrition. Here, we assess relationships between self-reported measures of depression, perceived stress, social support, and food insecurity with diet quality in older adults with HIV. A retrospective analysis of self-reported data from parent study at The University of Alabama at Birmingham 1917 HIV Clinic was performed. The study sample consisted of sixty people living with HIV (PLWH) with controlled HIV infection (<50 copies/mL), aged 50 years or older who participated in a cross-sectional microbiome study. Dietary intake was measured using the NHANES 12-month Food Frequency Questionnaire (FFQ) and three Automated Self-Administered (ASA) 24-hr diet recalls to calculate diet quality scores using the Mediterranean Diet Score (MDS); alternative Healthy Eating Index (aHEI); and the Recommended Food Score (RFS) indices. Food insecurity was measured with the Food Security Questionnaire (FSQ). Participants completed the following psychosocial scales: (1) depression – Patient Health Questionnaire-8 (PHQ8); (2) perceived stress – Perceived Stress Scale (PSS-10); (3) social support – Multidimensional Scale of Perceived Social Support (MSPSS). Linear regression models were used to investigate relationships among variables controlling for gender and income. The cohort was characterized as follows: Mean age 56 ± 4.6 years, 80% African-American, and 32% women. Mean body mass index (BMI) was 28.4 ± 7.2 with 55% reporting food insecurity. Most participants reported having post-secondary education (53%), although 77% reported annual incomes <$20,000. Food insecurity was independently associated with measures of poor dietary intake: aHEI ($\beta = -0.08$, $p = .02$) and MDS ($\beta = -0.23$, $p < 0.01$) and with low dietary intake of fibre ($\beta = -0.27$, $p = .04$), vitamin E ($\beta = -0.35$, $p = .01$), folate ($\beta = -0.31$, $p = .02$), magnesium ($\beta = -0.34$, $p = .01$) and copper ($\beta = -0.36$, $p = .01$). These data indicate food insecurity is associated with poor diet quality among PLWH. Clinical interventions are needed to improve food access for PLWH of low SES.

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Disclosure statement
No potential conflict of interest was reported by the authors.

Keywords

HIV; diet quality; food insecurity; aging

Introduction

Nearly one-half of all people living with HIV (PLWH) in the United States are 50+ years of age (Costagliola, 2014; Mahy, Autenrieth, Stanecki, & Wynd, 2014). Although antiretroviral therapy (ART) has greatly increased life expectancy, psychosocial and economic stressors remain a threat to healthy aging (Chambers et al., 2014; Costagliola, 2014; Deeks, Lewin, & Havlir, 2013; Rueda, Law, & Rourke, 2014). The prevention of diet-related chronic diseases in this population has thus become a major public health concern (Cahill & Valadez, 2013; Hunt, 2014; Smit et al., 2015).

Socioeconomic and psychosocial factors are associated with poor diet quality. Excess perceived stress adversely influences aging (Prenderville, Kennedy, Dinan, & Cryan, 2015; Webel et al., 2014) and diet quality, although these findings have not been consistently demonstrated across demographic groups (Carson et al., 2015; Isasi et al., 2015). Complicating these interactions, perceived stress in older PLWH is interrelated with mood disorders and social support (Emlet, 2006; Emlet & Farkas, 2002; Emlet, Gerkin, & Orel, 2009). Depression has also been linked to dietary quality (Leung, Epel, Ritchie, Crawford, & Laraia, 2014; Leung, Epel, Willett, Rimm, & Laraia, 2015). Thus, for older PLWH, there are likely multiple factors affecting diet and its impact on health.

In order to reduce morbidity and mortality among older PLWH, the interplay between psychosocial factors and dietary intake requires further elucidation. In this analysis, we evaluate the associations between socioeconomic and psychosocial factors and measures of dietary intake and diet quality. We hypothesized psychosocial stressors are associated with poor nutrition quality among PLWH.

Methods

Study population

Participants were recruited for a cross-sectional parent study investigating gut dysbiosisfrom the UAB 1917 HIV Clinic. Enrolled participants were aged 50 and over, on ART for >1 year, with suppressed HIV viremia (<50 cp/mL) for >6 months. Participants were excluded if they (1) used antibiotic therapy in the 30 days prior to their study visit; or (2) reported using proton pump inhibitors more than once per week, because of potential alterations to gut flora. Due to limited representation of other racial groups in the clinic, we limited recruitment to patients who self-identified as either African-American or white. Trained study staff assisted with all measurements and questionnaires. The study was approved by the Institutional Review Board (IRB) at the University of Alabama at Birmingham, and all participants provided written informed consent.

Diet-related measures

Dietary Intake: Two measures were used to characterize dietary intake.

Food Frequency Questionnaire (FFQ): Participants completed the 2003–2004 National Health and Nutrition Examination Survey (NHANES) FFQ. The 139-item survey measures consumption of specific food items over 12 months and was used to compute the Recommended Food Score (RFS) diet quality scores for this study sample (Subar et al., 2006).

Diet Recall: Three 24-hour dietary recalls were conducted using the National Cancer Institute's Automated Self-Administered 24-Hour Recall tool (NCI ASA-24), Beta Version (Subar et al., 2012). This tool uses the "gold standard" multiple-pass methodology (Beer-Borst & Amado, 1995; Jaceldo-Siegl et al., 2010; Jaceldo-Siegl et al., 2011).

Diet Quality: Dietary intake data were used to calculate the alternative Healthy Eating Index (aHEI) (Guenther et al., 2014), Mediterranean Diet Score (MDS) (Mila-Villarroel et al., 2011) and Recommended Food Score (RFS). The diet quality concept has been validated in studies predicting cardiometabolic disease risk in PLWH (Atkins et al., 2014; de Koning et al., 2011; Panagiotakos, Pitsavos, & Stefanadis, 2006; Tsiodras et al., 2009).

Alternative Healthy Eating Index (aHEI).: The 12-item aHEI measures adherence to US Dietary Guidelines. The aHEI scoring methodology is density-based (per 1,000 calories) and uses least restrictive standards, taking into account demographic factors (Guenther, Reedy, & Krebs-Smith, 2008; Guenther et al., 2014). The index has a maximum score of 100.

Mediterranean Diet Score (MDS).: Adherence to a Mediterranean diet may produce salutary effects among PLWH (Panagiotakos et al., 2006; Tsiodras et al., 2009). The MDS is a binary assessment measuring intake of 14 food groups. One point is awarded for each "YES" that corresponds to the recommended consumption thresholds for each food category.

Recommended Food Score (RFS).: The RFS measures diet variety within the NHANES FFQ. (Fung et al., 2005). Scores are calculated by awarding one point for weekly consumption of foods associated with a lower risk of chronic disease (Assmann et al., 2015). The maximum RFS score is 51. There have been few published studies using the RFS to evaluate diet quality in PLWH.

Socioeconomic status

Food Security: Food Security was assessed at baseline using a validated two-item food security questionnaire (FSQ). Participants were categorized as either food secure (FSQ = 0), or food insecure (FSQ >0) (Young, Jeganathan, Houtzager, Di Guilmi, & Purnomo, 2009).

Other SES Indicators: Participants were then asked to identify marital status, education level, income, and food assistance enrollment (yes/no).

Psychological measures

Perceived Stress: The Perceived Stress Scale (PSS-10) has adequate internal test-retest reliability (Cronbach's alpha = .88) and is positively correlated with a variety of self-report and behavioural indices of stress in adult populations (Andreou et al., 2011; Cohen, Kamarck, & Mermelstein, 1983; Lee, 2012). Scores can be used to infer relative stress levels or within-group comparisons, with higher scores indicating greater perceived stress (possible range 0–40).

Depression

The Patient Health Questionnaire (PHQ8) is the PHQ9 survey with the suicide question removed. The PHQ8 has adequate internal test-retest reliability (Cronbach's alpha = .88) and is positively correlated with a variety of self-report and behavioural indices of depression in the general and study populations (Kroenke et al., 2009; Monahan et al., 2009). Scores can be used to infer relative depression levels or within-group comparisons, with higher scores indicating greater level of depression (possible range 0–24).

Perceived social support

The Multidimensional Scale of Perceived Social Support (MSPSS) was used to assess perceptions of support from three sources: friends, family, and significant others. The MSPSS and its associated subscales have adequate internal test-retest reliability (Cronbach's alpha = .91; friends = .80; family = .86; significant other = .76) and are positively correlated with a variety of self-report and behavioural indices of perceived social support in the general and study populations (Dahlem, Zimet, & Walker, 1991; Galvan, Davis, Banks, & Bing, 2008). Scores may be used to infer relative perceptions of support or within-group comparisons, with higher scores indicating greater perceived support (possible range 0–4).

Anthropometric measures

Weight to the nearest 0.1 kg and height to the nearest 0.1 cm were measured by trained staff according to a standardized protocol. Weight was measured in indoor clothing, without shoes, on a calibrated digital scale (Seca 847, Hanover, MD). Height was measured using a calibrated stadiometer (Seca 217, Hanover, MD). BMI was calculated as weight (kg)/height (m^2).

Statistical analysis

The respective values for education, income, and marital status were each reclassified and collapsed into tripartite categories for clarity. For continuous measures, we performed a median-split to categorize participants into categories for comparison. Comparisons of demographic variables and diet quality by perceived stress group were made using chi-square or fisher tests, *t*-tests, or Mann–Whitney analysis. Correlations of diet quality with psychological factors and food security were assessed using Spearman correlation. Linear regression models were used to evaluate the relationship of diet quality with food security, perceived stress, depression, and social support after adjusting for covariates. Some values were log-transformed to approximate a normal distribution. Statistical analyses were performed using SAS version 9.4 with a significance level of $p < 0.05$.

Results

Demographics

We enrolled 60 PLWH with mean age of 56 ± 4.6 years, 32% women, and 80% Black (Table 1). Mean CD4 count was 528.3 ± 350.1 c/mm3 and all participants had plasma HIV viral load < 50 cp/mL. The majority (77%) reported household income < $20,000; 47% reported having a high school education or less; and only two (3%) participants were currently married. Mean body mass index (BMI) was 28.43 ± 7.21 kg/m^2 with 58% of participants classified as overweight or obese. When asked about food security, 55% reported being food insecure, and 60% received food assistance from one or more sources. Participants reported dietary intake of 2241.75 ± 905.28 kcals/day, with the following diet quality scores: 10.58 ± 6.83 (RFS); 4.08 ± 1.70 (MDS) and 46.78 ± 11.73 (aHEI) (**see** Table 1).

Psychosocial measures

The mean values for psychosocial measures are also shown in Table 1. This study sample was characterized by a mean perceived stress score of 15.70 ± 7.63 and a mean depression score of 6.81 ± 5.75. The mean perceived social support score was 3.13 ± 0.58, with scores of 3.01 ± 0.69, 3.21 ± 0.73, and 3.16 ± 0.73 on the friends, significant other and family subscales, respectively. Correlations among psychosocial and economic measures are shown in Table 2. Among the psychosocial and economic measures, food insecurity was positively correlated with perceived stress ($r = 0.31$, $p = .01$) and participation in food assistance programmes ($r = 0.27$, $p = 0.04$, not shown in table). Additionally, we found food insecurity to be inversely correlated with the MPSS friends subscale ($r = -0.29$, $p = 0.02$), indicating that persons with higher perceived stress and who required food assistance were more likely to be food insecure while social support from friends was protective against food insecurity. Perceived stress was also observed to be positively associated with female gender ($r = 0.32$, $p = .03$) and depression ($r = 0.67$, $p < .01$).

Diet quality

Associations between survey instruments and diet quality are shown in Table 3. Food insecurity was found to be inversely correlated with diet quality on the aHEI ($r = -0.28$, $p = 0.03$) and MDS ($r = -0.42$, $p < .01$) indices during univariate analysis. No significant correlations were found between diet quality and other parameters of interest. The association of food insecurity with the aHEI ($\beta = -0.08$, $p = .03$) and MDS ($\beta = -0.23$, $p < .01$) indices remained significant after multivariate analysis controlling for gender and income.

Micronutrients

Associations between socioeconomic variables and micronutrient intake are shown in Table 4. After multivariate analysis controlling for gender and income, only the FSQ scale measuring food insecurity remained significantly associated with the micronutrients listed in Table 4. Average daily intakes of nutrients stratified by food security status are shown in Table 5.

Discussion

This study evaluated associations of psychosocial and socioeconomic factors with dietary measures in a cross-section of older PLWH. Food insecurity was associated with lower diet quality irrespective of gender or income while no significant associations were observed between diet quality and measures of psychosocial wellness in multivariate analyses. Our findings are consistent with previous studies in the general population (Hanson & Connor, 2014; Leung et al., 2014; Sirotin, Hoover, Shi, Anastos, & Weiser, 2014). More importantly, we provide preliminary evidence food security may be more closely associated with diet quality in older PLWH than psychological measures, although these factors were commonly reported by our cohort. Furthermore, our findings support the evaluation of food insecurity as a screening tool during clinical evaluations or when designing interventions.

The FSQ is a simple, validated survey that could be used to screen patients who may be food insecure (Young et al., 2009). Our findings suggest food security may be used as a preliminary predictor of general nutritional deficiencies, such fruit and vegetable intake. Similarly, Leung *et al* also reported food insecure uninfected adults had diets low in fruits and vegetables with higher consumption of highly palatable, high-fat content foods (Leung et al., 2014). Since fruit and vegetable intake are known to be associated with decreased risk for chronic disease in aging populations, (Assmann et al., 2015; Panagiotakos et al., 2006) minimizing barriers to healthier foods may be a cost effective preventive strategy for attenuating disease risk. Our findings highlight the need for further explorations on the relationship between dietary intake and economic factors with health outcomes in this population.

Although we did not observe an association of diet quality with psychosocial measures, the importance of mental health in PLWH is well documented (Bekele et al., 2013; Brody et al., 2014; Cardoso et al., 2013). Previous studies have demonstrated perceived stress, depression, and perceived social support are all key factors driving longevity in this population (Bekele et al., 2013; Hand, Phillips, & Dudgeon, 2006; Shacham, Nurutdinova, Satyanarayana, Stamm, & Overton, 2009; Webel et al., 2014; Whitehead, Hearn, & Burrell, 2014). Balbin *et al* found that low perceived stress scores were associated with long-term survival in PLWH while Lutgendorf *et al* reported that perceived stress and social support mediates anxiety and depression and is associated with symptom frequency and disease progression in PLWH (Balbin, Ironson, & Solomon, 1999; Lutgendorf et al., 1997). Perceived stress scores in our sample were consistent with those observed in studies evaluating the effects of perceived stress in PLWH and the general population (Ezzati et al., 2014; Rubin et al., 2016). Therefore, we have no evidence to conclude our cohort was atypical in that regard.

We further hypothesized gender would influence outcomes in diet quality. Previous studies have reported divergent responses to psychological stress reported in male and female PLWH, therefore we expected similar results in our sample with respect to diet (Rubin et al., 2016; Whitehead et al., 2014). While our results did confirm a significant correlation between gender and perceived stress, we found no significant associations of gender with diet quality in this population. This may be due to our small sample diminishing our ability to detect potential gender-specific associations of psychosocial factors with diet quality. Adams *et al* and Sirontin *et al* both found in independent studies that food insecurity is associated with obesity in women (Adams, Grummer-Strawn, & Chavez, 2003; Sirotin et al., 2014). In our sample we found women who were food insecure and reported lower perceived stress consumed more calories per day, while women who were food secure and reported less perceived stress had higher BMI. This suggests perceived stress may have an inverse relationship with both dietary intake and diet quality in women

Unexpectedly, we did not find significant associations of food security with the Recommended Food Score (RFS) diet quality index. The RFS is designed to measure dietary diversity within the NHANES FFQ and there is evidence dietary diversity in food insecure settings can improve health outcomes in both the general and HIV positive populations (Fielden et al., 2014; Gebremedhin et al., 2017; Kant, Schatzkin, & Ziegler, 1995; Palermo, Rawat, Weiser, & Kadiyala, 2013). While the RFS diet quality scores in our sample did confirm a general lack of dietary diversity, we also expected their diet quality would be associated with food insecurity, as had been the case with the MDS and aHEI indices. The lack of association may be attributed to self-report error and potential recall bias in reporting foods consumed over the past year. Although other studies have validated self-reported diet measures in the general population (Burrows et al., 2015; Carroll et al., 2012; Freedman et al., 2015; George et al., 2012; Subar et al., 2015), we hypothesize the prevalence of food insecurity in our population may have further complicated some of the inherent limitations of self-report instruments.

We also reported an inverse association of food insecurity with dietary intake of fibre, folate, magnesium, copper, and vitamin E. These micronutrients have important roles in healthy aging. (Curhan et al., 2015; Hruby, Meigs, O'Donnell, Jacques, & McKeown, 2014; Hruby, O'Donnell, et al., 2014a; Kirsh et al., 2006; Malavolta et al., 2015; Welch et al., 2016; Wu et al., 2013). Although there is not currently a defined dietary pattern associated with food insecure PLWH, the micronutrients associated with food insecurity are found in common staple foods such as greens, beans, nuts, apples, breakfast cereals and bread that would likely not be consumed by persons who are food insecure. In our study sample, we found participants reporting higher food insecurity did consume more cooked breakfast cereals and oatmeal but not the other foods (data not shown). This may be attributed to easier access to inexpensive, calorie-dense breakfast products. Our findings would likely be of interest to clinicians, social workers, and community outreach providers in assessing nutritional adequacy of food assistance programmes.

There were limitations in our study. The study design was cross-sectional, which limited our ability to infer causality. Also, the sample size limited the number of covariates we controlled for, and was insufficient to test for possible mediating/moderating effects between diet quality and the psychosocial variables measured. Additionally, no corrections for multiple comparisons were done. In future studies, we would like to see more comprehensive measures of psychosocial wellness that include healthcare professionals. Our data collection was limited to measures of perceived support from close acquaintances and family members, not clinical caregivers (Hong et al., 2014; Kalichman, Grebler, et al., 2014; Kalichman, Hernandez, et al., 2014a). The relationship between resilience and diet quality in aging PLWH is an area warranting further investigation. We believe our lack of evidence for a conclusive association of psychological measures with diet quality may be primarily attributed to homogeneity within our sample, which was 80% minority and 68% male, all within the same age group and geographic location (Whitehead et al., 2014). The homogeneity may have limited our ability to draw conclusions for the larger population of PLWH. However, this paper is one of the few to measure these variables among male African-American in the South. Also, the use of self-reported instruments for dietary intake was another limitation, although surveys have been validated in the literature (Subar et al., 2015). Additionally, approximately 92% of the patient population at this clinic have an HIV viral load <200 copies/mL and 100% of study participants presented with an undetectable viral load; thus we cannot be certain that diet quality and psychosocial measures would be equivalent in PLWH with a detectable viral load (Willig et al., 2015).

In conclusion, older PLWH who experience food insecurity are likely to have poorer diet quality, compared to their food secure counterparts. Our findings suggest food insecurity as measured by the FSQ is more closely associated with diet quality than instruments measuring psychological wellness. This information may be of interest to clinicians, dietitians and social workers planning outreach interventions for reducing preventable diseases in this population.

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Table 1.

Demographic characteristics (mean (SD) or (%)) of the study population.

Characteristics	**Study Sample (*n* = 60)**
Age, mean years (SD)	55.87 (4.63)
Anthropometrics	
BMI (kg/m^2), mean (SD)	28.39 (7.21)
Women, %	31.67
Race, %	
White	20
African-American	80
Education, %	
< High School Diploma	20.00
High school diploma	26.67
> High School Diploma	53.33
Income, %	
<$10,000/year	41.67
= $10-$19,999/year	35.00
≥ $20,000/year	23.33
Food Security %	
Food Secure	45.00
Food Insecure without Hunger	18.33
Food Insecure with Hunger	36.67
Marital status, %	
Married	3.33
Never Married	51.67
Other	45.00
Mean CD4 Count (c/mm^3) (SD)	528.30 (350.08)
Psychosocial Measures	
Perceived Stress Score (range 0–40), mean (SD)	15.70 (7.63)
Social Support Score (range 0–4), mean (SD)	3.13 (.582)
Friends	3.01 (0.58)
Significant Other	3.21 (0.73)
Family	3.16 (0.73)
Depression Score (range 0–24), mean (SD)	6.81 (5.75)
Diet Quality Scores	
Recommended Food Score (RFS, range 0–51), mean (SD)	10.58 (6.83)
Mediterranean Diet Score (MDS, range 0–14), mean (SD)	4.08 (1.70)
Alternative Healthy Eating Index (aHEI, range 0–100), mean (SD)	46.78 (11.73)

Table 2.

[€]Correlation matrix among key variables.

Scale	PHQ8 Correlation coefficient *p*-value	PSS Correlation coefficient *p*-value	MPSS Correlation coefficient *p*-value	FSQ Correlation coefficient *p*-value
PHQ8	1.00	**0.67**	−0.18	0.12
		<.01	0.19	0.40
PSS	**0.67**	1.00	−0.23	**0.31**
	<.01		0.07	**0.01**
MPSS	−0.18	−0.23	1.00	−0.11
	0.19	0.07		0.41
Friends	**−0.28**	**−0.30**	**0.79**	**−0.29**
	0.03	**0.02**	**<.01**	**0.02**
Significant	−0.16	−0.12	**0.85**	−0.08
Other	0.23	0.35	**<.01**	0.53
Family	−0.09	−0.04	**0.80**	−0.14
	0.50	0.74	**<.01**	0.30
FSQ	0.12	0.31	−0.11	1.00
	0.40	0.01	0.41	

PHQ8: Patients Health Questionnaire (8 questions); PSS: Perceived Stress Scale; MPSS: Multidimensional Scale of Perceived Social Support; FSQ: Food Security Questionnaire.

[€]Unadjusted values.

Table 3.

[¥]Associations between diet quality and psychosocial survey instruments.

Diet Quality Index	PHQ8 Beta Estimate *p*-value	PSS Beta Estimate *p*-value	MPSS Beta Estimate *p*-value	FSQ Beta Estimate *p*-value
aHEI	−0.02	0.01	−0.14	**−0.08**
	0.67	0.37	0.33	**0.03**
MDS	0.01	0.01	−0.24	**−0.23**
	0.87	0.40	0.37	**<0.01**
RFS	−0.19	−0.02	0.06	0.09
	0.46	0.36	0.91	0.46

[¥]Log adjusted values used in linear regression analysis controlling for gender and income.

PHQ8: Patients Health Questionnaire (8 questions); PSS: Perceived Stress Scale; MPSS: Multidimensional Scale of Perceived Social Support; FSQ: Food Security Questionnaire; aHEI: alternative Healthy Eating Index; MDS: Mediterranean Diet Score; RFS: Recommended Food Score.

Table 4.

[ꝁ]Associations between micronutrient intake and survey instruments.

Micronutrient	PHQ8 Beta Estimate *p*-value	PSSB Beta Estimate *p*-value	MPSS Beta Estimate *p*-value	FSQ Beta Estimate *p*-value
Fibre	−0.24	−0.23	0.17	**−0.14**
	0.41	0.07	0.19	**0.04**
Vitamin E	−0.41	−0.01	0.26	**−0.14**
	0.26	0.50	0.35	**0.04**
Folate	−0.19	<0.01	0.16	**−0.13**
	0.17	0.59	0.49	**0.02**
Copper	−0.23	<0.01	0.14	**−0.18**
	0.14	0.90	0.28	**0.01**
Magnesium	−0.11	<0.01	0.16	**−0.14**
	0.42	0.94	0.47	**0.01**

PHQ8: Patients Health Questionnaire (8 questions); PSS: Perceived Stress Scale; MPSS: Multidimensional Scale of Perceived Social Support; FSQ: Food Security Questionnaire.

[ꝁ]Adjusted values.

Table 5.

[£]Average daily nutrient intake in the study population stratified by food security status.

Mean Nutrient Intake (SD)	Study Sample (n = 60)	Food Secure Group (n = 27)	Food Insecure Group (n = 33)	p-value
Total (kcal/day)	2241.75 (905.28)	2391.35 (890.98)	2119.34 (911.97)	0.19
Fat (g/day)	91.23 (42.84)	100.48 (42.10)	83.67 (42.58)	0.10
Carbohydrate (g/day)	262.10 (105.59)	265.50 (81.43)	259.32 (123.09)	0.34
Protein (g/day)	87.00 (32.93)	94.10 (34.01)	81.19 (31.35)	0.13
Fibre (g/day)	16.90 (8.02)	18.66 (8.59)	15.47 (7.34)	0.14
Vitamin E (mg/day)	7.87 (4.14)	9.23 (5.04)	6.76 (2.84)	**0.05**
Folate (µg DFE/day)	413.61 (167.29)	466.62 (157.03)	370.23 (165.08)	**0.02**
Copper (mg/day)	1.33 (0.64)	1.55 (0.69)	1.15 (0.55)	**.001**
Magnesium (mg/day)	274.44 (108.92)	307.61 (106.92)	247.30 (104.38)	**0.02**

Wilcoxon Rank Sums Two-sided Test used to evaluate between-group differences in dietary intake.

[£]Unadjusted values.