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Lack of food access and food consumption patterns of late midlife women in southeast Michigan

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Cover Page Footnote

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INTRODUCTION

Food security is a crucial aspect of human life that affects individuals at every level, from local communities to the global stage (Food and Agriculture Organization of the United Nations, 2003; Huang, Rosenberg, Simonovich, & Belza, 2012). A key component of food security is food access, which has been previously defined by the Food and Agriculture Organization (FAO) of the United Nations as "access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet" (Food and Agriculture Organization of the United Nations, 2006). This is distinct from food availability, wherein the key is whether "sufficient quantities of food of appropriate quality" are available (Food and Agriculture Organization of the United Nations, 2006). In addition to the direct effects of food insecurity and inadequate food access on stunting and malnutrition, they have also been recognized as playing a role in poorer health outcomes for diseases, including cardiovascular disease, diabetes, and obesity (Weiser et al., 2009; World Hunger Education Service, 2016). In some cases, food insecurity results in patients postponing necessary medical care and medications (Kushel, Gupta, Gee, & Haas, 2006).

In 2015, 12.7 percent of U.S. households were considered food insecure, where they did not have access at all times to "enough food for an active, healthy life for all household members" (United States Department of Agriculture Economic Research Service, 2016). This translated to 15.8 million U.S. households (United States Department of Agriculture Economic Research Service, 2016). Rates were higher for households with women living alone (14.7 percent), non-Hispanic African American households (21.5 percent), and low-income households (32.8 percent). Food insecurity was highest for households in non-metropolitan areas (15.4 percent) and intermediate

for households in principal cities of metropolitan areas (14.1 percent) (United States Department of Agriculture Economic Research Service, 2016). While previous work has been done regarding food access in midlife and older adults (Huang et al., 2012), there is a paucity of research on women in midlife and the challenges they face regarding food access.

The study of nutrition in midlife has shown that this is a crucial transition period for health, especially cardiovascular disease (Lachman, 2015; Lachman, Teshale, & Agrigoroaei, 2015). Cardiovascular disease continues to account for approximately one-third of female deaths in the United States and elevated hypertension in midlife has also been associated with increased risk of dementia (Garcia, Mulvagh, Merz, Buring, & Manson, 2016; Nishtala et al., 2015). Premenopausal women on average have a lower incidence of cardiovascular disease than postmenopausal women; while some of this difference in risk is due to changes in estrogen levels, a large component is also due to diet (Stice, Lee, Pechenino, & Knowlton, 2014). Studies have demonstrated the efficacy of the Mediterranean diet in reducing and preventing the development of cardiovascular disease, as well as diabetes, obesity and other conditions (Widmer, Flammer, Lerman, & Lerman, 2015).

Previous work has considered the relationship between neighborhood food environment and fruit/vegetable intake in southeast Michigan; these studies were primarily conducted before the 2007-2008 economic recession (Izumi, Zenk, Schulz, Mentz, & Wilson, 2011; Zenk et al., 2009, 2014). The ripples of the recession significantly affected the local economy of southeast Michigan and culminated in Detroit filing for bankruptcy (Associated Press, 2014; Davey, 2013; Klinefelter, 2015). Since that time, studies have considered neighborhood environment role in

psychosocial stress-diet relationships but information on food access challenges faced by women in midlife in southeast Michigan is limited (Zenk et al., 2013).

This study addressed two primary questions: (1) What demographic factors are correlated with limited food access among late mid-life women in southeast Michigan? and (2) What is the relationship between food access and food consumption patterns?

METHODS

Study Sample

This study was conducted among participants at the Michigan site of the Study of Women's Health Across the Nation (SWAN), a multiethnic, multisite longitudinal cohort study initiated in 1996 (Sowers et al., 2000). Only the Michigan SWAN site conducted a site-specific ancillary study to assess food availability and eating behaviors as part of the Visit 15 Follow-up protocol in 2015-2016. A full description of recruitment and study design for all 7 clinical sites of the national SWAN has been previously published (Sowers et al., 2000). The baseline eligibility criteria included being aged 42–52 years, having an intact uterus and at least one ovary, no use of exogenous hormones affecting ovarian function within the 3 months prior to recruitment, menses in the past 3 months, and self-identification with a site's designated racial/ethnic group (African American or White at the Michigan site). The study was approved by the Institutional Review Board at each site, and written informed consent was obtained from all study participants.

The Michigan cohort comprises a population-based sample of African-American and White women living in southeast Michigan. By the 2015-2016 visit, 57 women had died and 79.8%

(n=388) of the still-living participants remained active in the cohort. Of the active cohort, 329 women (84.8%) participated in the 2015-2016 follow-up visit, 13 of whom had missing data for the Site-Specific Food and Technology Environment Questionnaire leaving 316 women as the analytic sample for this manuscript.

Outcome Measures and Covariates

The primary outcome of interest was perceived neighborhood access to adequate food shopping alternatives. Food access was assessed using the following question, adapted from a validated food environment questionnaire (Ma et al., 2013): "How much of a problem would you say that a lack of access to adequate food shopping is in your neighborhood? Please think of your neighborhood as the area within a 20-minute walk or about a 5-mile car ride from your home. Would you say it is a very serious problem, somewhat serious problem, minor problem or not really a problem?" For analysis, responses were dichotomized as food access is a problem, incorporating any level of reported problem, and food access is not a problem.

Participants were also asked to indicate how frequently they consumed specific foods (fresh fruits, fresh vegetables, whole grains, fresh beans, fresh nuts & seeds, lean meats, low-fat dairy, fried foods, and sweets/desserts) and meal types; (home-made meals, fast food meals, pre-packaged meals, take-out meals, and eat-in restaurant meals). Responses were: never, very rarely, rarely, occasionally, frequently, very frequently or always. Based on preliminary descriptive analyses of response frequencies, the responses were collapsed as follows: (1) very rarely or less (2) rarely or occasionally, and (3) frequently or more. Finally, participants

indicated what type of stores were present in their neighborhood and among those, where they did the majority of their food shopping.

Covariates included self-reported race/ethnicity and educational attainment, age, perceived economic stress, body mass index (BMI), marital status, employment status, and total physical activity. To assess perceived economic stress, women were asked whether it was very hard, somewhat hard or not hard at all to pay for basics such as food, housing, and medical care. Body mass index (BMI, kg/m^2) was calculated from weight and height measurements obtained by calibrated balance beam scale and stadiometer, respectively. BMI was classified into three groups based on the World Health Organization categories: underweight (<18.50 kg/m^2), normal weight (18.50-24.99 kg/m^2), overweight (25.00-29.99 kg/m^2), and obese (≥ 30 kg/m^2) (World Health Organization, n.d.). Total physical activity was measured at the prior visit by using a modified Baecke *et al*. questionnaire based on frequency of engaging in activities in the following domains: sports and exercise activity, non-sport leisure activity, and household and childcare activity (Baecke, Burema, & Frijters, 1982). Each domain has a score ranging from 1 to 5, with higher scores indicating more physical activity. Domain-specific scores were determined based on the average of individual items within each domain. The total physical activity score (range 3-15) is the sum of the domain-specific scores. The total physical activity score used in the analyses was dichotomized based on median-split.

Statistical Analyses

Analyses were conducted using SAS software, version 9.4 (SAS Institute Inc., 2012). Descriptive statistics and bivariate associations between food access and all covariates were

examined using chi-squared tests or Fisher's exact tests for categorical variables or t-tests for continuous variables. Multiple logistic regression analysis was used with forward selection to estimate the adjusted odds ratios (OR) and 95% confidence intervals for correlates of food access. Variables that were suggestive of a bivariate association ($p < 0.05$) were included in the initial multivariable models. The forward variable selection procedure was used to identify the most suitable multivariable models by including variables that were statistically significant correlates of food access after adjusting for other factors.

Demographics and food consumption variables were entered into separate logistic regression models, to assess likelihood of having lack of access to quality food. Then food consumption variables that were significantly associated with food access were added to the final demographic model, again using forward model procedures. The Hosmer and Lemeshow goodness-of-fit index was examined to check overall model fit (Hosmer, Jr., Lemeshow, & Sturdivant, 2013).

RESULTS

Overall, 20.9% of respondents indicated that lack of access to adequate food shopping in their neighborhood was a problem and 39.5% reported experiencing economic strain, finding it either somewhat or very hard to pay for basics. Women's median age at the 2015-2016 visit was 65 years and 60% of the women were obese (Table 1). Underweight women were excluded from subsequent analyses, as only two women met the underweight guideline.

Lack of access to adequate food shopping in neighborhood

Table 1 shows the characteristics of the study sample and the results of the bivariate relationship between participant characteristics and lack of food access. Among women who reported lack of food access, two-thirds (62.7%) experienced economic stress, while only one-third (33.3%) of those who reported no food access issues experienced economic stress ($p<0.0001$). Further, race/ethnic differences in food access were observed; 73% of women who reported lack of food access were African American ($p=0.02$). In Michigan-SWAN women, lack of food access also varied with BMI and was most common among women who were obese ($p=0.037$). Among women who reported no food access issues, 57.4% were obese, while 64.9% of those who reported having food access issues were obese.

Lack of food access was also more common among women who were ever married ($p=0.015$), but there was no statistically significant association between lack of food access and age, employment status, education, or total physical activity.

Food Consumption characteristics

Table 2 gives information on the distribution of food consumption characteristics by lack of food access and, given its relationship to food access, economic strain.

Women who reported lack of access to adequate food in their neighborhood consumed fresh fruits, fresh vegetables, and lean meats less frequently than those who did not report having a lack of access ($p=0.04$, $p=0.001$, $p=0.048$, respectively). Homemade meals were associated with lack of food access and economic strain ($p=0.02$ and $p=0.004$, respectively). Eighty-seven percent of respondents ate homemade meals ‘frequently or more’, however those who reported

lack of food access were more likely to report eating homemade meals 'rarely or occasionally' (15.2 % vs 8.0%) and 'very rarely or less' (7.6% vs 2.4%) compared to women who did not have food access issues (p=0.02). Fried food frequency was associated with lack of food access (p=0.02) and economic strain (p=0.04). Women who reported lack of access ate fried foods more frequently than women without access issues (12.1% vs 3.6%). Contrary to the stereotype (Fleischhacker, Evenson, Rodriguez, & Ammerman, 2011), the likelihood of consuming fast food meals did not differ between those who experienced economic strain and those who did not. However, dining at eat-in restaurants was less common among women who reported a lack of food access (p=0.04) and economic strain (p=0.03) where women who did not report access issues or economic strain were more likely to dine at eat-in restaurants. Economic strain also associated with less frequent consumption of fruits (p=0.007), vegetables (p=0.016), fresh nuts/seeds (p=0.012), and lean meats (p=0.048), (Table 2).

Lack of access and economic strain were not associated with differences in consumption of whole grains, fresh beans, low-fat dairy, or sweets/desserts. The majority of respondents reported eating pre-packaged meals and takeout meals 'rarely or occasionally' (Table 2). However, eating these types of meals was not associated with lack of food access or economic strain.

Risk factors for lack of access to adequate food shopping in neighborhood

Table 3 shows the final multivariable models including demographics only and demographics and eating behaviors. In the final demographic model, economic stress was associated with more than a 2.5 times higher odds of lack of food access (OR 2.86; 95% CI 2.53-5.33), as was being

African American (OR 2.49; 95% CI 1.20-5.17). For both of these variables, the odds of lack of food access was attenuated when adjusting for eating behavior variables (Table 3, Model 2).

When controlling for demographics and eating behavior variables, lack of food access was strongly association with a lack of eating fresh vegetables (p=0.0001). Individuals who ate vegetables occasionally or less or frequently had higher odds of lack of food access than those who ate fresh vegetables very frequently (OR 8.55; 95% CI 2.82-25.92) or always (OR 3.22; 95% CI: 1.33-8.29). However, those who reported eating fresh fruit occasionally or less were less likely to experience food access issues (OR 0.33; 95% CI 0.11-0.99). Women who ate at eat-in restaurants frequently or more were less likely to report lack of food access compared to women who ate at such restaurants occasionally (OR 0.40; 95% CI: 0.19-0.84) or less (OR 0.25; 95% CI: 0.07-0.86).

DISCUSSION AND KEY FINDINGS

This study presented several key findings related to nutrition and food access for women in late midlife.

1. In this Southeast Michigan cohort, women who had difficulty paying for the very basics, were African American, or were overweight or obese were significantly more likely to report lack of access to adequate food shopping in their neighborhood, even after adjusting for other demographic characteristics including age, education, and employment status. Our finding of a correlation between lack of food access, economic strain, and lack of eating fresh vegetables is consistent with previous findings that have found that individuals who live in areas without supermarkets pay more for food (Dubowitz et al., 2017; Walker, Keane, &

Burke, 2010). In contrast, a prior study found that low-income neighborhoods had fourfold as many grocery stores as the wealthiest neighborhoods (Moore & Roux, 2006). Several studies have shown an association between race and lack of food access or food insecurity, which supports our finding that African American women were more likely to report lack of access to quality food in their neighborhood (Bodor, Rice, Farley, Swalm, & Rose, 2010; Dubowitz et al., 2017; Fleischhacker et al., 2011; Freedman, Western, & Liese, 2013; Moore & Roux, 2006; Stuff et al., 2004). Similarly, our finding that obese women were significantly more likely to report that lack of food access was a problem is consistent with previous work that found obesity more prevalent in food insecure women (Adams, Grummer-strawn, & Chavez, 2003). Our finding also complements prior studies which have found associations between obesity and lack of food access in rural communities (Adams et al., 2003; Calancie et al., 2015; Johnson et al., 2014; Sharkey, Johnson, Dean, & Horel, 2011).

2. The frequency of homemade meals is significantly associated with both lack of access to food shopping in participants' neighborhoods and perceived economic stress. There is a distinct paucity of studies exploring the association of homemade meals and food access among women in midlife, particularly late midlife. One prior study found that older adults tended to eat more fruits and vegetables than the general population, but that study focused on geriatric individuals and found that the reported habits were heterogeneous and that the most nutritious foods were under-consumed (Nicklett & Kadell, 2013). Thus, our study furthers knowledge of how frequently women in late midlife report eating fruits and vegetables, which has been shown to significantly reduce cardiovascular disease incidence and all-cause mortality (Sharkey et al., 2011; Wang et al., 2014; Widmer et al., 2015).

3. We found in bivariate analysis that marital status was correlated with whether women had a perceived problem with lack of food access. In one previous study marital status was not significantly associated with limited access to healthy foods in low-income African-American households (Dubowitz et al., 2017). Marital status has been correlated with overall better health, including improved sleep for women in midlife (Nicklett & Kadell, 2013; Robles, Slatcher, Trombello, & McGinn, 2014; Troxel et al., 2010; Wang et al., 2014). Thus, more work will need to be conducted to further elucidate the relationship between marital status and food access, especially among minority women.

Strengths and limitations

This study had several strengths. No prior studies have sought to determine the characteristics of women in late midlife who have issues with food access in the southeastern Michigan area. The longitudinal sample included a relatively high prevalence of overweight and obese individuals. Additionally, since these women had been recruited and retained for multiple SWAN visits, they may have felt more comfortable sharing personal details about food access and economic stress with the interviewers. Study participant height and weight were measured in the office, which reduced bias from under-reporting weight and over-reporting height.

Limitations included the cross-sectional nature of the study and the relatively small sample size. Information on food access, economic stress, and food/meal type and frequency was collected via questionnaire, which relies on participant recall of sensitive information and estimated portions. Additionally, we could not assess food access and its association with being underweight, given that only two participants were underweight. Limited evidence suggests that

weight decline in midlife may be associated with lower cognitive abilities and osteopenia (Dahl et al., 2013; Tatsumi et al., 2016); however, there is a dearth of data regarding the relationship between being underweight in late midlife and lack of food access in high resource countries. Finally, the results may not be generalizable to populations dissimilar to this cohort. Nonetheless, these data enabled us to explore important differences within a small regional area.

CONCLUSION

Midlife provides a key opportunity to intervene and reduce cardiovascular disease and improve health. This study, in conjunction with prior literature, finds that women in late midlife in southeastern Michigan who are economically stressed, African American, or overweight are at increased risk for reporting lack of food access. Thus, future state and local policies and interventions should work toward mitigating food access issues.

Table 1: Demographic Characteristics for all SWAN-MI participants by Lack of Food Access (n=316) and How Hard to Pay for Very Basics (n=281), 2016

		Lack of Food Access		
Demographic Characteristics, n (%)	**All Respondents**	**Is a problem**	**Is not a problem**	**p-value**
Total	316	66	250	
How hard to pay for very basics[1]				<0.0001
Somewhat or very hard	111 (39.50)	37 (62.71)	74 (33.33)	
Not hard at all	170 (60.50)	22 (37.29)	148 (66.67)	
Age calculated for V15				0.9804
<65 years	168 (53.16)	35 (53.03)	133 (53.20)	
≥65 years	148 (46.84)	31 (46.97)	117 (46.80)	
Median ± SD	64.84 ± 2.80	64.95 ± 2.73	64.75 ± 2.83	

Ethnicity				0.0218
African American	191 (60.44)	48 (72.73)	143 (57.20)	
White	125 (39.56)	18 (27.27)	107 (42.80)	
Education[1]				0.2671
Less than or some high school	90 (29.51)	19 (29.23)	71 (29.58)	
High school	137 (44.92)	34 (52.31)	103 (42.92)	
≥ College	78 (25.57)	12 (18.46)	66 (27.50)	
Employment[1]				0.0652
Not working	177 (62.54)	43 (72.88)	134 (59.82)	
Currently working	106 (37.46)	16 (27.12)	90 (40.18)	
Marital status[1]				0.0154
Single/never married	46 (14.84)	16 (24.24)	30 (12.30)	

Married/post-married	264 (85.16)	50 (75.76)	214 (87.70)	
BMI[1]				0.0365
Underweight (<18.5)*	2 (0.71)	1 (1.75)	1 (0.45)	
Normal (18.5-24.9)	43 (15.36)	12 (21.05)	31 (13.90)	
Overweight (25.0-29.9)	70 (25.00)	7 (12.28)	63 (28.25)	
Obese (≥30.0)	165 (58.93)	37 (64.91)	128 (57.40)	
Total physical activity, range 3-15[1]				0.9702
<6.95	138 (48.94)	29 (49.15)	109 (48.88)	
≥6.95	144 (51.06)	30 (50.85)	114 (51.12)	
Median ± SD	6.95 ± 1.88	6.95 ± 2.10	6.95 ± 1.82	

[1]*Missing for Lack of Food Access: How hard to pay for very basics, n=35; Education, n=11; Employment, n=33; Marital status, n=6; BMI, n=36; Total physical activity, n=34*

**Underweight individuals not included in further analyses due to n=2; Fisher's exact test p=0.0284 including underweight*

Table 2: Meal and Food Type Frequency by lack of Food Access (n=316) and How Hard to Pay for Very Basics (n=316), 2016

Meal Type Frequency, n (%)	All Respondents	Lack of Food Access		p-value	How Hard to Pay for Very Basics		p-value
		Is a problem	Is not a problem		Somewhat or very hard	Not hard at all	
	316	66	250		66	250	
Homemade meals				0.0208			0.0041
Very rarely or less	11 (3.48)	5 (7.58)	6 (2.40)		8 (7.21)	2 (1.18)	
Rarely or occasionally	30 (9.49)	10 (15.15)	20 (8.00)		15 (13.51)	12 (7.06)	
Frequently or more	275 (87.03)	51 (77.27)	224 (89.60)		88 (79.28)	156 (91.76)	
Fast food meals				0.2034			0.1818
Very rarely or less	135 (42.72)	32 (48.48)	103 (41.20)		46 (41.44)	73 (42.94)	
Rarely or occasionally	149 (47.15)	25 (37.88)	124 (49.60)		49 (44.14)	84 (49.41)	
Frequently or more	32 (10.13)	9 (13.64)	23 (9.20)		16 (14.41)	13 (7.65)	

Pre-packaged meals				0.1908		0.7009
Very rarely or less	110 (34.81)	21 (31.82)	89 (35.60)		37 (33.33)	60 (35.39)
Rarely or occasionally	132 (41.77)	24 (36.36)	108 (43.20)		45 (40.54)	73 (42.94)
Frequently or more	74 (23.42)	21 (31.82)	53 (21.20)		29 (26.13)	37 (21.76)
Take-out meals				0.1259		0.8395
Very rarely or less	103 (32.59	24 (36.36)	79 (31.60)		37 (33.33)	54 (31.76)
Rarely or occasionally	170 (53.80)	29 (43.94)	141 (56.40)		59 (53.15)	96 (56.47)
Frequently or more	43 (13.61)	13 (19.70)	30 (12.00)		15 (13.51)	20 (11.76)
Eat-in restaurant meals				0.0386		0.0344
Very rarely or less	81 (25.63)	24 (36.36)	57 (22.80)		32 (28.83)	41 (24.12)
Rarely or occasionally	184 (58.23)	36 (54.55)	148 (59.20)		69 (62.16)	94 (55.29)
Frequently or more	51 (16.14)	6 (9.09)	45 (18.00)		10 (9.01)	35 (20.59)

Food Type Frequency, n (%)

	316	66	250		66	250
Fresh fruits[2]				0.0414		0.0071
Occasionally or less	69 (21.84)	19 (28.79)	50 (20.00)		35 (31.53)	27 (15.88)
Frequently	65 (20.57)	18 (27.27)	47 (18.80)		22 (19.82)	36 (21.18)
Very frequently or always	182 (57.59)	29 (43.94)	153 (61.20)		54 (48.65)	107 (62.94)
Fresh vegetables[2]				0.0006		0.0159
Occasionally or less	69 (21.84)	24 (36.36)	45 (18.00)		35 (31.53)	30 (17.65)
Frequently	75 (23.73)	19 (28.79)	56 (22.40)		28 (25.23)	42 (24.71)
Very frequently or always	172 (54.43)	23 (34.85)	149 (59.60)		48 (43.24)	98 (57.65)
Whole grains[2]				0.6022		0.1206
Occasionally or less	106 (33.54)	25 (37.88)	81 (32.40)		44 (39.64)	50 (29.41)
Frequently	89 (28.16)	19 (28.79)	70 (29.00)		31 (27.93)	46 (27.06)
Very frequently or always	121 (38.29)	22 (33.33)	99 (39.60)		36 (32.43)	74 (43.53)

Fresh beans[2,3]				0.4917		0.7827
Occasionally or less	206 (65.40)	47 (71.21)	159 (63.85)		73 (65.77)	113 (66.86)
Frequently	68 (21.59)	11 (16.67)	57 (22.89)		25 (22.52)	33 (19.53)
Very frequently or always	41 (13.02)	8 (12.12)	33 (13.25)		13 (11.71)	23 (13.61)
Fresh nuts and seeds[2]				0.0605		0.0124
Occasionally or less	176 (55.70)	45 (68.18)	131 (52.40)		73 (65.77)	86 (50.59)
Frequently	76 (24.05)	10 (15.15)	66 (26.40)		16 (14.41)	49 (28.82)
Very frequently or always	64 (20.25)	11 (16.67)	53 (21.20)		22 (19.82)	35 (20.59)
Lean meats[2]				0.0477		0.0244
Occasionally or less	110 (34.81)	31 (46.97)	79 (31.60)		47 (42.34)	46 (27.06)
Frequently	98 (31.01)	19 (28.79)	79 (31.60)		28 (25.23)	60 (35.29)
Very frequently or always	108 (34.18)	16 (24.24)	92 (36.80)		36 (32.43)	64 (37.65)
Low-fat dairy[2]				0.3027		0.0696

Occasionally or less	172 (54.43)	36 (54.55)	136 (54.40)	68 (61.26)	81 (47.65)
Frequently	59 (18.67)	16 (24.24)	43 (17.20)	16 (14.41)	38 (22.35)
Very frequently or always	85 (26.90)	14 (21.21)	71 (28.40)	27 (24.32)	51 (30.00)
Fried foods[2]			0.0233		0.0437
Occasionally or less	261 (82.59)	50 (75.76)	211 (84.40)	91 (81.98)	141 (82.94)
Frequently	38 (12.03)	8 (12.12)	30 (12.00)	9 (8.11)	23 (13.53)
Very frequently or always	17 (5.38)	8 (12.12)	9 (3.60)	11 (9.91)	6 (3.53)
Sweets/desserts[2]			0.1153		0.176
Occasionally or less	180 (56.96)	45 (68.18)	135 (54.00)	63 (56.76)	95 (55.88)
Frequently	87 (27.53)	13 (19.70)	74 (29.60)	26 (23.42)	53 (31.18)
Very frequently or always	49 (15.51)	8 (12.12)	41 (16.40)	22 (19.82)	22 (12.94)

[2]*Missing for How Hard to Pay for Very Basics: Fresh beans, n=36; All other variables, n=35*

[3]*Missing for Lack of Food Access: Fresh beans, n=1*

Table 3: Characteristics associated with lack of access to quality food after multivariate logistic regression modelling

Risk Factor	Model 1, demographics only			Model 2, demographics + food/meal type frequency		
	OR	**95 % CI**	***P-value***	**OR**	**95 % CI**	***P-value***
How hard to pay for very basics						
Not hard at all	1.00			1.00		
Somewhat or very hard	2.86	2.53-5.33	0.001	2.71	1.37-5.35	0.004
Ethnicity						
White	1.00			1.00		
African American	2.49	1.20-5.17	0.014	2.33	1.08-5.03	0.032
Fresh vegetables						
Very frequently or always	-	-	-	1.00		
Frequently	-	-	-	3.32	1.33-8.29	.0103

Occasionally or less	-	-	-	8.55	2.82-25.92	0.0001
Fresh fruit						
Very frequently or always	-	-	-	1.00		
Frequently	-	-	-	1.261	0.51-3.12	0.616
Occasionally or less	-	-	-	0.330	0.11-0.99	0.048
Eat-in restaurant meals						
Occasionally or less	-	-	-	1.00		
Frequently	-	-	-	0.396	0.19-0.84	0.015
Very frequently or always	-	-	-	0.252	0.07-0.86	0.028

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