

December 2019

Adult Food Insecurity is Associated with Heavier Weight Preferences among Black Women

Layton Reesor-Oyer

University of Houston, lmreesor@uh.edu

Nadia Garcia Marroquin

University of Houston, ngarciamarroquin@uh.edu

Daphne C. Hernandez

University of Houston, dhernandez26@uh.edu

Follow this and additional works at: <https://newprairiepress.org/hbr>



Part of the [Women's Health Commons](#)



This work is licensed under a [Creative Commons Attribution-Noncommercial 4.0 License](#)

Recommended Citation

Reesor-Oyer, Layton; Garcia Marroquin, Nadia; and Hernandez, Daphne C. (2019) "Adult Food Insecurity is Associated with Heavier Weight Preferences among Black Women," *Health Behavior Research*: Vol. 2: No. 4. <https://doi.org/10.4148/2572-1836.1066>

This Research Article is brought to you for free and open access by New Prairie Press. It has been accepted for inclusion in Health Behavior Research by an authorized administrator of New Prairie Press. For more information, please contact cads@k-state.edu.

Adult Food Insecurity is Associated with Heavier Weight Preferences among Black Women

Abstract

Food insecurity is related to overweight/obesity among women. However, it is unknown whether food insecurity impacts individuals' desired body composition, and whether this relationship differs by race/ethnicity similar to perceived ideal weight status. This study aims to evaluate whether food insecurity is related to elevated preferred weight status (e.g., overweight/obese versus normal weight) among black, white, and Hispanic women classified as overweight/obese. Four waves of NHANES data (2007–2014) were merged and yielded a total of 907 black, 1,271 white, and 1,005 Hispanic non-pregnant adult (age 20 to 59) women classified as overweight/obese. Participants self-reported their preferred weight status, adult-level food security, and demographic covariates. Covariate-adjusted logistic regression models stratified by race/ethnicity evaluated the role of food insecurity related to preferred weight status. Among black women, those who were food insecure were at 51% increased odds of preferring an overweight/obese weight status (OR: 1.51; 95% CI: 1.08 – 2.13; $p = .02$) relative to their food secure counterparts. Among white and Hispanic women, those who were food insecure had similar odds of preferring an overweight/obese weight status (White: OR: 1.07; 95% CI: 0.68 – 1.71; $p = .76$; Hispanic: OR: 0.95; 95% CI: 0.66 – 1.37; $p = .77$) relative to their food secure counterparts. Food insecurity results in the desire to be heavier among black women classified as overweight/obese. However, it does not impact white and Hispanic women classified as overweight/obese. Practitioners must consider weight preferences prior to providing obesity prevention information, particularly among food insecure black women.

Keywords

overweight, obesity, race, Hispanic, white, Resource Scarcity Hypothesis, women

Acknowledgements/Disclaimers/Disclosures

The preparation of this manuscript was supported by the Research and Extension Experiential Learning for Undergraduate (REEU) Program of the National Institute of Food and Agriculture, USDA, Grant # 2017-67032-26021, where Ms. Garcia is an undergraduate mentee of Dr. Hernandez. Ms. Reesor is a doctoral candidate for the degree in kinesiology at the University of Houston and is mentored by Dr. Hernandez.

Adult Food Insecurity is Associated with Heavier Weight Preferences among Black Women

Layton Reesor-Oyer*

Nadia Garcia Marroquin

Daphne C. Hernandez, PhD, MSED, FAAHB

Abstract

Food insecurity is related to overweight/obesity among women. However, it is unknown whether food insecurity impacts individuals' desired body composition, and whether this relationship differs by race/ethnicity similar to perceived ideal weight status. This study aims to evaluate whether food insecurity is related to elevated preferred weight status (e.g., overweight/obese versus normal weight) among black, white, and Hispanic women classified as overweight/obese. Four waves of NHANES data (2007–2014) were merged and yielded a total of 907 black, 1,271 white, and 1,005 Hispanic non-pregnant adult (age 20 to 59) women classified as overweight/obese. Participants self-reported their preferred weight status, adult-level food security, and demographic covariates. Covariate-adjusted logistic regression models stratified by race/ethnicity evaluated the role of food insecurity related to preferred weight status. Among black women, those who were food insecure were at 51% increased odds of preferring an overweight/obese weight status (OR: 1.51; 95% CI: 1.08 – 2.13; $p = .02$) relative to their food secure counterparts. Among white and Hispanic women, those who were food insecure had similar odds of preferring an overweight/obese weight status (White: OR: 1.07; 95% CI: 0.68 – 1.71; $p = .76$; Hispanic: OR: 0.95; 95% CI: 0.66 – 1.37; $p = .77$) relative to their food secure counterparts. Food insecurity results in the desire to be heavier among black women classified as overweight/obese. However, it does not impact white and Hispanic women classified as overweight/obese. Practitioners must consider weight preferences prior to providing obesity prevention information, particularly among food insecure black women.

*Corresponding author can be reached at: lmreesor@uh.edu

Introduction

Sixty-seven percent of U.S. adult women are overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014), however race/ethnic disparities exist (black women: 82%, white women: 63%, Hispanic women: 77%; Ogden et al., 2014). Further, disparities also exist by income category. Overall, 45% of women at or below 130% of the federal poverty line (FPL) are classified as obese, compared to 30% of women at or above 350% FPL (Ogden et al., 2017). This is problematic as low-income adults have fewer resources to address overweight/obesity and the associated health comorbidities (e.g., arthritis, diabetes; Mokdad et al., 2003), along with the staggering cost of health care (Finkelstein, Trogon, Cohen, & Dietz, 2009).

Some research has suggested that a contributor to overweight/obesity among low-income populations is food insecurity (Franklin et al., 2012; Gooding, Walls, & Richmond, 2012; Pan, Sherry, Njai, & Blanck, 2012), with racial/ethnic differences being apparent (Hernandez, Reesor, & Murillo, 2017). Food insecurity is the lack of availability or access to healthful food because of insufficient money or other resources (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2019). Currently, 7% of U.S. adults in households with children experience food insecurity (Coleman-Jensen et al., 2019). The paradoxical relationship has led to the suggestion that an increase in

weight is a physiological response to ensure survival in an environment with a limited food supply (Dhurandhar, 2016). However, interventions which increase food resources among food insecure individuals have been ineffective at decreasing overweight/obesity status (Jones & Frongillo, 2006; Leroy, Gadsden, Gonzalez de Cossio, & Gertler, 2013).

The Resource Scarcity Hypothesis suggests that the perception of an unstable food environment results in positive energy balance and excess weight gain (Dhurandhar, 2016). It has been suggested that the threat of food insecurity results in the up regulation of appetite and increased desire to overconsume fattening foods, particularly among women (Dhurandhar, 2016; Laran & Salerno, 2013). In food environments that are unstable or have low access to healthy food (and with high cost), access to high-calorie foods that are less expensive has been observed (Drewnowski, 2004). There is a higher cost associated with a healthier diet, which exceeds what the average individual currently spends on food, with differences existing by race/ethnicity (Fulgoni & Drewnowski, 2019). However, it is unknown whether the perception of an unstable food environment impacts individuals' *desired* body composition. It is possible that in addition to physiological responses, food insecurity contributes to individuals, particularly women, desiring a heavier body composition alongside their desire to consume excess calories. It is also possible that this relationship differs by race/ethnicity, as perceived ideal weight status differs by race/ethnicity. Black women have the heaviest ideal weight status followed by Hispanic women, with white women having the lowest ideal weight status (Gordon, Castro, Sitnikov, & Holm-Denoma, 2010).

Previous studies have found that those who misperceive their weight status (e.g., believe they are normal or underweight when they are overweight/obese) were less likely to engage in weight management behaviors (Duncan et al., 2011). It is possible that those who desire an overweight/obese weight status may be even less likely to engage in weight management behaviors. Further, they may actually engage in obesogenic behaviors for the purpose of obtaining their desired weight status. Thus it is important to investigate food insecurity as a correlate of elevated desired preferred weight status.

The purpose of this study was to evaluate whether adult food insecurity is related to preferred weight status (e.g., overweight/obese vs normal weight) among black, white, and Hispanic women classified as overweight/obese. Building upon the Resource Scarcity Hypothesis (Dhurandhar, 2016) and previous studies indicating that blacks and Hispanics have heavier weight preferences (Gordon et al., 2010), it was expected that adult food insecurity would be significantly correlated with having an overweight/obese preferred weight status among black and Hispanic, but not white women.

Methods

Data and Sample

Four waves of NHANES data (2007–2014) were merged and yielded a total of 40,617 adults and children. The sampling design and data collection procedures for this data set have been previously described (Johnson, Dohrmann, Burt, & Mohadjer, 2014). The initial sample was reduced to a non-pregnant, non-older-adult, female sample (ages 20 to 59) ($n = 9,260$). Further, the analytical sample was reduced to only include black, white, and Hispanic women ($n = 989$ excluded) who were classified as having an overweight/obese weight status ($n = 2,707$ excluded). Additionally, individuals who had missing data on the dependent variable ($n = 1,889$),

independent variable ($n = 29$), or control variables ($n = 451$) were excluded from the analytical sample. Finally, desiring an underweight weight status is qualitatively different from desiring a healthy or overweight/obese weight status. Due to the extremely limited sample size, those who indicated they preferred an underweight weight status ($n = 12$) were excluded. The final sample consisted of 907 black, 1,271 white, and 1,005 Hispanic women classified as overweight/obese.

Those who were eliminated due to missing data differed from the analytical sample in the following ways. A greater number of individuals excluded from the analytical sample preferred an overweight/obese weight status ($p < .001$), were employed ($p < .01$), had greater income ($p < .01$), and had higher BMIs ($p < .05$). Individuals who were eliminated due to missing data did not differ from the analytical sample in terms of food insecurity, age, nativity, marital status, education, health insurance, and physical activity engagement ($p > .05$).

Measures

Preferred weight status. Participants were asked to report how much they would like to weigh (pounds). This number was used along with their measured height to calculate their preferred body mass index (BMI; kg/m^2) category according to CDC guidelines (Centers for Disease Control and Prevention, 2015). The dependent variable consisted of preferring an overweight or obese BMI versus a normal weight BMI. Desiring an underweight BMI is qualitatively different from the above categories and excluded from the dependent variable ($n = 12$).

Adult food insecurity. Adult food security was self-reported using the USDA 10-item adult food insecurity scale (Coleman-Jensen et al., 2019). Participants were considered food insecure if they responded affirmatively to 3 or more items (Coleman-Jensen et al., 2019)

Demographic covariates. Participants self-reported their age (years), race/ethnicity (Hispanic, black, white), nativity status [foreign-born vs. native born (reference)], marital status [single vs. married/cohabitating (reference)], education [less than a high school degree vs. high school degree or greater (reference)], employment [unemployed vs employed (reference)], household income based on FPL [poor ($< 100\%$ FPL), working poor ($100\text{--}199\%$ FPL), near poor ($200\text{--}299\%$ FPL), higher income ($\geq 300\%$ FPL; reference)], health insurance status [uninsured vs. insured (reference)], and physical activity [meets vs. does not meet (reference) the CDC guidelines of 150 weekly minutes of moderate to vigorous physical activity (U.S. Department of Health and Human Services, 2018)]. Height and weight were directly assessed and BMI was calculated (kg/m^2) according to CDC guidelines (Centers for Disease Control and Prevention, 2015).

Analytic Plan

Means, standard errors, and frequencies of participant characteristics were computed by race/ethnicity and adult food insecurity status. One-way ANOVA and chi-square analyses were used to identify differences in participant characteristics by adult food insecurity status. Three covariate-adjusted logistic regression models stratified by race/ethnicity were conducted to evaluate the role of adult food insecurity related to preferred weight status (overweight/obese vs. normal) among adult women classified as overweight/obese. Survey procedures were used to account for the NHANES sampling design. Analyses were conducted using STATA version 15.0 statistical software (StataCorp LP, College Station, Texas).

Results

In general food insecure women were more disadvantaged than those who were food secure (Table 1). They had a higher prevalence of single marital status, lower educational attainment, higher rates of unemployment, lower income, and greater rates of being uninsured compared to those who were food secure. In addition, food insecure women had higher BMIs than food secure women.

The multivariate logistic regression model indicated that among black women, those who were food insecure were at 51% increased odds of preferring an overweight/obese weight status (OR: 1.51; 95% CI: 1.08 – 2.13; $p = .02$) relative to their food secure counterparts (Table 2). In contrast, food insecurity was not related to preferring an overweight/obese weight status among white and Hispanic women. Those who were food insecure had similar odds of preferring an overweight/obese weight status (White: OR: 1.07; 95% CI: 0.68 – 1.71; $p = .76$; Hispanic: OR: 0.95; 95% CI: 0.66 – 1.37; $p = .77$) relative to their food secure counterparts.

In addition, those with lower education (less than high school) were at increased odds of preferring an overweight/obese weight status (Black: OR: 1.49; 95% CI: 1.03 – 2.15; Hispanic OR: 1.79; 95% CI: 1.27 – 2.50). Among black women, meeting the physical activity guidelines was associated with decreased odds of preferring an overweight/obese weight status (OR: 0.70; 95% CI: 0.50 – 0.97). BMI was also positively associated with preferring an overweight/obese weight status among all race/ethnicities (Black: OR: 1.09; 95% CI: 1.05 – 1.12; White OR: 1.16; 95% CI: 1.12 – 1.19; Hispanic OR: 1.16; 95% CI: 1.12 – 1.21). Among white women, being foreign born was associated with increased odds of preferring an overweight/obese weight status (OR: 2.30; 95% CI: 1.12 – 4.72). Among Hispanic women, age was positively associated with preferring an overweight/obese weight status (OR: 1.03; 95% CI: 1.01 – 1.04).

Discussion

Building on the Resource Scarcity Hypothesis (Dhurandhar, 2016), we found that adult food insecurity is associated with preferring an overweight/obese versus normal weight status among black, but not white nor Hispanic women classified as overweight/obese. This finding partially supported our hypothesis that food insecurity would be associated with a preferred overweight/obese weight status among black and Hispanic women, but not white women.

Our findings suggest that the perception of an unstable food environment is associated with the desire to be heavier (even among those who are already classified as too heavy) among black women, but not Hispanic nor white women. Previous research has concluded that the threat of food insecurity results in the up regulation of appetite and increased desire to overconsume fattening foods, particularly among women (Dhurandhar, 2016; Laran & Salerno, 2013). The desire to be heavier in combination with the up regulation of appetite may facilitate excess weight gain when food insecure black women have access to excess calories.

Contrary to our hypothesis, bivariate and regression model findings indicate that adult food insecurity is not associated with overweight/obese weight status preference among Hispanic women. It is probable that cultural differences in ideal weight status account for these differences as previous studies found that black women had the heaviest preferred weight status compared to white and Hispanic women (Gordon et al. 2010). For instance, a greater percentage of food insecure black women preferred an overweight/obese weight status compared to food insecure Hispanic women ($p < .001$; results not shown). Further, food insecure black women had the

Table 1

Characteristics of Participants by Race and Food Insecurity Status among US Adult Women: National Health and Nutrition Examination Survey 2007-2014, M (SE) or %

	Black Women (n = 907)		White Women (n = 1,271)		Hispanic Women (n = 1,005)	
	Food Secure (n = 675)	Food Insecure (n = 232)	Food Secure (n = 1,011)	Food Insecure (n = 260)	Food Secure (n = 722)	Food Insecure (n = 283)
	%	%	%	%	%	%
Dependent Variable						
Heavier weight preference	68%	78%**	42%	49%	58%	64%
Independent Variable						
Food insecurity	0%	100%	0%	100%	0%	100%
Demographic characteristics						
Nativity						
Foreign born	10%	12%	4%	3%	58%	69%**
Native born	90%	88%	96%	97%	42%	31%
Marital status						
Single	57%	68%**	31%	48%**	36%	41%
Married/cohabiting	43%	32%	69%	52%	64%	59%
Education						
Less than high school	14%	27%**	10%	22%***	38%	56%***
High school education or more	86%	73%	90%	78%	62%	44%
Employment						
Unemployed	33%	56%***	30%	49%***	38%	51%***
Employed	67%	44%	70%	51%	62%	49%
Health Insurance						
Has no health insurance	21%	31%***	13%	32%***	42%	56%**
Has health insurance	79%	69%	87%	68%	58%	44%
Meets Physical Activity Guidelines	40%	36%	49%	44%	41%	43%
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Age	39.99 (0.53)	39.42 (0.72)	42.56 (0.44)	39.25 (0.77)**	38.53 (0.34)	38.17 (0.77)
Income (Federal Poverty Line)	2.49 (0.10)	1.31 (0.10)***	3.37 (0.09)	1.59 (0.11)***	2.14 (0.07)	1.07 (0.04)***
Body Mass Index	34.46 (0.34)	35.78 (0.40)*	32.07 (0.23)	33.71 (0.60)*	31.75 (0.21)	33.00 (0.44)*

Note. *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 2

Adjusted Odds Ratios and 95% CI for Estimating Overweight/Obese Weight Preference Associated with Food Insecurity among US Adult Women: National Health and Nutrition Examination Survey 2007-2014

Characteristics	Black Women (n = 907)	White Women (n = 1,271)	Hispanic Women (n = 1,005)
Independent Variable			
Food insecurity	1.51 (1.08 - 2.13)*	1.07 (0.68 - 1.71)	0.95 (0.66 - 1.37)
Demographic characteristics			
Nativity			
Foreign born	1.13 (0.73 - 1.75)	2.30 (1.12 - 4.72)*	1.33 (0.98 - 1.81)
Native born	1.00	1.00	1.00
Marital status			
Single	0.80 (0.59 - 1.10)	1.08 (0.79 - 1.48)	1.11 (0.81 - 1.52)
Married/cohabiting	1.00	1.00	1.00
Education			
Less than high school education	1.49 (1.03 - 2.15)*	1.11 (0.73 - 1.69)	1.79 (1.27 - 2.50)***
High school education or more	1.00	1.00	1.00
Employment			
Employed	1.27 (0.94 - 1.72)	0.77 (0.58 - 1.01)	1.04 (0.74 - 1.47)
Unemployed	1.00	1.00	1.00
Health Insurance			
Has no health insurance	0.92 (0.66 - 1.28)	0.93 (0.66 - 1.32)	0.80 (0.58 - 1.12)
Has health insurance	1.00	1.00	1.00
Meets Physical Activity Guidelines	0.70 (0.50 - 0.97)*	0.87 (0.66 - 1.15)	1.04 (0.75 - 1.44)
Age	0.99 (0.98 - 1.01)	1.01 (1.00 - 1.02)	1.03 (1.01 - 1.04)**
Income (Federal Poverty Line, FPL)	0.93 (0.84 - 1.04)	1.03 (0.94 - 1.13)	0.95 (0.83 - 1.09)
Body Mass Index	1.09 (1.05 - 1.12)***	1.16 (1.12 - 1.19)***	1.16 (1.12 - 1.21)***

*** $p < .001$, ** $p < .01$, * $p < .05$.

greatest percentage who desired an overweight/obese weight status, followed by Hispanic women; white women had the lowest percentage who desired an overweight/obese weight status. Thus, desired weight status of food insecure women by race/ethnicity group followed a similar pattern as previous research regarding ideal weight status (Gordon et al., 2010).

In addition, food insecure black women were heavier (higher BMI) compared to food insecure Hispanic women ($p < .001$), but food insecure Hispanic women had similar BMIs as white women ($p > .05$). It is possible that actual BMI status is a key factor in explaining these results. Potentially, women chose preferred BMIs that were close to their actual BMI because they felt this weight was attainable. Future studies using qualitative interviews may be able to provide insight as to why differences exist by race/ethnicity.

Limitations

The current cross-sectional design allowed us to establish that food insecurity is correlated with overweight/obese weight status preference among black women; yet, the cross-sectional nature of the data prevents us from establishing adult food insecurity as a predictor of weight status preferences. Longitudinal studies are needed to determine whether changes or duration in adult food insecurity status precipitate changes in preferred weight status. Longitudinal data is also needed to determine the mechanisms that contribute to this relationship existing. For example, high levels of perceived stress have been associated with physiological changes that include high levels of cortisol secretion and weight gain (Wisman & Capehart, 2010). Exploring stress as a mechanism of the proposed relationship in this manuscript could further explain the association. In addition, differences existed between those included in the analytical sample and those excluded due to missing data; this limits the generalizability of our study findings. Despite the limitations, this study examines a novel aspect of the food-insecurity obesity paradox among women who are overweight/obese in a nationally representative dataset.

Implications for Health Behavior Practice

This study indicates that food insecure black women prefer a heavier weight status. This is problematic for women's health, as food insecurity has been linked to obesity-related comorbidities (Gucciardi, Vahabi, Norris, Del Monte, & Farnum, 2014; Seligman, Laraia, & Kushel, 2010). Policies and programs aimed at improving nutrition and preventing obesity among individuals at risk for food insecurity, such as the Supplemental Nutrition Assistance Program – Education (SNAP-ED) program, must consider the preferred weight status of participants, particularly among black women. Our findings indicate that black women who meet the PA guidelines were at decreased odds of preferring an overweight/obese weight status. Promoting a healthier diet and increased physical activity without mentioning weight may be an ideal strategy to influence health behaviors among those who are not interested in weight management. Increasing physical activity and fitness are known to improve health, outside of weight management. Research indicates that fitness is a better indicator of cardiovascular disease risk than weight status (Ortega, Ruiz, Labayen, Lavie, & Blair, 2018). If weight management is a goal, then it is necessary for practitioners to consider women's weight preferences, in addition to their food and physically activity preferences, prior to providing nutrition and obesity prevention information. Although food insecure black women were at increased odds of preferring an overweight/obese weight status, they might still be receptive to weight loss goals within their

preferred category. Even small amounts of weight loss (e.g., 3%) can have an impact on the health of those who are overweight/obese (Swift et al., 2016). Taking into consideration a holistic view of health behavior preferences may be more effective at creating behavior change among populations who may be resistant to weight management education.

Acknowledgments

The preparation of this manuscript was supported by the Research and Extension Experiential Learning for Undergraduate (REEU) Program of the National Institute of Food and Agriculture, USDA, Grant # 2017-67032-26021, where Ms. Garcia is an undergraduate mentee of Dr. Hernandez. Ms. Reesor is a doctoral candidate for the degree in kinesiology at the University of Houston and is mentored by Dr. Hernandez.

References

- Centers for Disease Control and Prevention. (2015). Healthy weight: Assessing your weight. Retrieved from <http://www.cdc.gov/healthyweight/assessing/>
- Coleman-Jensen, A., Rabbitt, M. P., Gregory, C. A., & Singh, A. (2019). *Household Food Security in the United States in 2018, ERR-270*. Retrieved from <https://www.ers.usda.gov/publications/pub-details/?pubid=94848>
- Dhurandhar, E. J. (2016). The food-insecurity obesity paradox: A resource scarcity hypothesis. *Physiology & Behavior*, 162, 88-92. <https://doi.org/10.1016/j.physbeh.2016.04.025>
- Drewnowski, A. (2004). Obesity and the food environment: Dietary energy density and diet costs. *American Journal of Preventive Medicine*, 27(3), 154-162. <https://doi.org/10.1016/j.amepre.2004.06.011>
- Duncan, D. T., Wolin, K. Y., Scharoun-Lee, M., Ding, E. L., Warner, E. T., & Bennett, G. G. (2011). Does perception equal reality? Weight misperception in relation to weight-related attitudes and behaviors among overweight and obese US adults. *The International Journal of Behavioral Nutrition and Physical Activity*, 8, 20. <https://doi.org/10.1186/1479-5868-8-20>
- Finkelstein, E. A., Trogdon, J. G., Cohen, J. W., & Dietz, W. (2009). Annual medical spending attributable to obesity: Payer- and service-specific estimates. *Health Affairs*, 28(Suppl 1), w822-831. <https://doi.org/10.1377/hlthaff.28.5.w822>
- Franklin, B., Jones, A., Love, D., Puckett, S., Macklin, J., & White-Means, S. (2012). Exploring mediators of food insecurity and obesity: A review of recent literature. *Journal of Community Health*, 37(1), 253-264. <https://doi.org/10.1007/s10900-011-9420-4>
- Fulgoni, V., & Drewnowski, A. (2019). An Economic gap between the recommended healthy food patterns and existing diets of minority groups in the US National Health and Nutrition Examination Survey 2013-14. *Frontiers in Nutrition*, 6, 37. <https://doi.org/10.3389/fnut.2019.00037>
- Gooding, H. C., Walls, C. E., & Richmond, T. K. (2012). Food insecurity and increased BMI in young adult women. *Obesity*, 20(9), 1896-1901. <https://doi.org/10.1038/oby.2011.233>
- Gordon, K. H., Castro, Y., Sitnikov, L., & Holm-Denoma, J. M. (2010). Cultural body shape ideals and eating disorder symptoms among white, Latina, and black college women. *Cultural Diversity and Ethnic Minority Psychology*, 16(2), 135-143. <https://doi.org/10.1037/a0018671>

- Gucciardi, E., Vahabi, M., Norris, N., Del Monte, J. P., & Farnum, C. (2014). The intersection between food insecurity and diabetes: A review. *Current Nutrition Reports*, 3(4), 324-332. <https://doi.org/10.1007/s13668-014-0104-4>
- Hernandez, D. C., Reesor, L. M., & Murillo, R. (2017). Food insecurity and adult overweight/obesity: Gender and race/ethnic disparities. *Appetite*, 117, 373-378. <https://doi.org/10.1016/j.appet.2017.07.010>
- Johnson, C. L., Dohrmann, S. M., Burt, V. L., & Mohadjer, L. K. (2014). National health and nutrition examination survey: Sample design, 2011-2014. National Center for Health Statistics. *Vital and Health Statistics*, 2(162), 1-33.
- Jones, S. J., & Frongillo, E. A. (2006). The modifying effects of Food Stamp Program participation on the relation between food insecurity and weight change in women. *The Journal of Nutrition*, 136(4), 1091-1094. <https://doi.org/10.1093/jn/136.4.1091>
- Laran, J., & Salerno, A. (2013). Life-history strategy, food choice, and caloric consumption. *Psychological Science*, 24(2), 167-173. <https://doi.org/10.1177/0956797612450033>
- Leroy, J. L., Gadsden, P., Gonzalez de Cossio, T., & Gertler, P. (2013). Cash and in-kind transfers lead to excess weight gain in a population of women with a high prevalence of overweight in rural Mexico. *The Journal of Nutrition*, 143(3), 378-383. <https://doi.org/10.3945/jn.112.167627>
- Mokdad, A. H., Ford, E. S., Bowman, B. A., Dietz, W. H., Vinicor, F., Bales, V. S., & Marks, J. S. (2003). Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA*, 289(1), 76-79. <https://doi.org/10.1001/jama.289.1.76>
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA*, 311(8), 806-814. <https://doi.org/10.1001/jama.2014.732>
- Ogden, C. L., Fakhouri, T. H., Carroll, M. D., Hales, C. M., Fryar, C. D., Li, X., & Freedman, D. S. (2017). Prevalence of obesity among adults, by household income and education - United States, 2011-2014. *Morbidity and Mortality Weekly Report (MMWR)*, 66(50), 1369-1373. <https://doi.org/10.15585/mmwr.mm6650a1>
- Ortega, F. B., Ruiz, J. R., Labayen, I., Lavie, C. J., & Blair, S. N. (2018). The fat but fit paradox: What we know and don't know about it. *British Journal of Sports Medicine*, 52(3), 151-153. <https://doi.org/10.1136/bjsports-2016-097400>
- Pan, L., Sherry, B., Njai, R., & Blanck, H. M. (2012). Food insecurity is associated with obesity among US adults in 12 states. *Journal of the Academy of Nutrition and Dietetics*, 112(9), 1403-1409. <https://doi.org/10.1016/j.jand.2012.06.011>
- Seligman, H. K., Laraia, B. A., & Kushel, M. B. (2010). Food insecurity is associated with chronic disease among low-income NHANES participants. *The Journal of Nutrition*, 140(2), 304-310. <https://doi.org/10.3945/jn.109.112573>
- Swift, D. L., Johannsen, N. M., Lavie, C. J., Earnest, C. P., Blair, S. N., & Church, T. S. (2016). Effects of clinically significant weight loss with exercise training on insulin resistance and cardiometabolic adaptations. *Obesity*, 24(4), 812-819. <https://doi.org/10.1002/oby.21404>
- U.S. Department of Health and Human Services. (2018). *Physical Activity Guidelines for Americans* Washington, DC: President's Council on Sports, Fitness & Nutrition.
- Wisman, J. D., & Capehart, K. W. (2010). Creative destruction, economic insecurity, stress, and epidemic obesity. *American Journal of Economics and Sociology*, 69(3), 936-982. <https://doi.org/10.1111/j.1536-7150.2010.00728.x>