**Introduction**

Food insecurity, or the state of having insufficient dietary resources to maintain a healthy, active lifestyle, affects approximately 10 to 15% of United States households (~14.3 million) annually (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2018). Minority households and those that are headed by a single parent are more likely to experience food insecurity, although these associations may be partially confounded by household income and education (Gundersen & Ziliak, 2018). Food insecurity can include a variety of behaviors such as skipping meals or repeatedly eating the same foods due to lack of dietary resources, but the most common experiences of food insecurity reported in the U.S. are worry over ability to afford food and not being able to make purchased food last (Coleman-Jensen et al., 2018). Consistent with these experiences, dietary intake within food insecure households often follows a cyclical pattern mirroring availability of Supplemental Nutrition Assistance Program (SNAP) benefits (Castellari, Cotti, Gordanier, & Ozturk, 2017; Wilde & Ranney, 2000). This cycle may contribute to increased odds of overweight and obesity among individuals with food insecurity, potentially through physiological and metabolic changes (Dinour, Bergen, & Yeh, 2007) or increased compensatory eating, especially in combination with consumption of lower cost, energy dense foods (Drewnowski, 2004). However, there appears to be effect modification by sex, as several studies have observed an association between food insecurity and overweight/obesity in adult women only (Franklin et al., 2012; Gooding, Walls, & Richmond, 2012; Hernandez, Reesor, & Murillo, 2017; Martin & Lippert, 2012).

A growing body of literature suggests that food insecurity may also be associated with eating disorders (EDs) such as bulimia nervosa (BN) and binge eating disorder (BED) and disordered eating behaviors. Whereas the lifetime prevalences of BN and BED in the general U.S. population are estimated to be approximately 1% and 3%, respectively (Hudson, Hiripi, Pope, & Kessler, 2007), internet and community-based samples drawn from food-insecure populations have found prevalences of clinically significant ED ranging from 6 – 17% (Becker, Middlemass, Gomez, & Martinez-Abrego, 2019; Becker, Middlemass, Taylor, Johnson, & Gomez, 2017; Lydecker & Grilo, 2019; Rasmusson, Lydecker, Coffino, White, & Grilo, 2019). The mechanism underlying the association between food insecurity and EDs is not well understood, but may be underpinned by high levels of weight stigma and overvaluation of weight and shape among food insecure populations (Becker et al., 2017), or confounding by traumatic event exposure and associated comorbid psychopathology (e.g. depression) (Becker et al., 2018; Leung, Epel, Willett, Rimm, & Laraia, 2015). Moreover, because previous research on food insecurity and disordered eating has largely been drawn from non-representative convenience samples, it is unknown whether results are generalizable to the U.S. population overall. The objective of the current study was to investigate whether beliefs about weight, current weight control behaviors, and depression vary as a function of food insecurity in a representative sample of the U.S. population.

**Methods**

*Study Sample*

For this secondary analysis, we used data from the publicly available National Health and Nutrition Examination Survey (NHANES). The methods and design of NHANES have been described in detail elsewhere (Curtin et al., 2013; Johnson, Dohrmann, Burt, & Mohadjer, 2014). Briefly, NHANES is a nationally representative multi-stage probability sample conducted every two years by the National Center for Health Statistics and Centers for Disease Control and Prevention. In order to ensure representativeness, NHANES oversamples minority, low-income, and older individuals, although individuals of all ages are eligible to participate. The cross-sectional survey assesses a wide variety of health topics, including weight control behaviors, mental health, drug and alcohol use, and functional limitations, although specific questions vary according to participant age and year of interview. Surveys are completed in-person at NHANES mobile examination centers using audio computer-assisted self-interview systems. Additionally, trained NHANES staff conduct physical examinations of respondents, obtaining in-person measurements of weight, height, and waist circumference, among other biometrics.

In the present study, we restricted our analyses to respondents age 18 and over in the 2007 (*N* = 4,625), 2009 (*N* = 5,001), and 2011 (*N* = 4,796) waves of NHANES. Although data for later waves (2013 - 2014 and 2015 – 2016) are available, the structure of the questionnaire assessing weight perception changed somewhat between 2011 and 2013, such that respondents in later years were asked only about weight loss behaviors, rather than both weight loss behaviors and behaviors to not gain weight. Because we were interested in both types of weight control behaviors, we focused on earlier waves of data. Response rates for the selected years ranged from 72 – 79%.

**Measures**

*Food Insecurity*

Household food insecurity was assessed using the 18-item U.S. Food Security Survey Module (Bickel, Mark, Cristofer, William, & John, 2000). Participants were asked a series of questions regarding worry about affording and obtaining food, behaviors to stretch food supply (e.g. skipping meals and fasting), and consequences of not being able to afford food (e.g. hunger and weight loss). Depending on the question, responses were given as binary (yes = 1/no = 0) or ordinal (never = 0/sometimes = 1/often = 2) answers, and composite scores were derived by summing all scale items. Scores ranged from 0 to 18. In maintaining consistency with previous studies (Becker et al., 2017; Rasmusson et al., 2019), we operationalized food insecurity as a three level variable representing food secure (a score of 0 at the household level), marginally food insecure/food insecurity without hunger (one to two affirmative responses and no hunger), and highly food insecure/food insecurity with hunger (three or more affirmative responses or hunger reported).

*Weight Perception and Desired Weight*

After self-reporting their current weight, participants were asked two questions regarding weight perception: “Do you consider yourself now to be overweight, underweight, or about the right weight?” and “Would you like to weigh more, less, or about the same?” We operationalized two weight perception variables, weight consideration and desired weight, respectively, from responses to these questions.

Participants also self-reported their weight a year prior to the interview, and, if their previous weight was more than 10 pounds greater than their current weight, were asked if the change was intentional. Those who had not lost weight or had done so unintentionally were also asked if they had tried to lose weight or to not gain weight at any point in the past year and, if so, what methods they used to accomplish this (e.g. used laxatives, dieted, exercised). Due to a skip pattern in the survey, questions about weight control methods were not asked of participants who had lost weight unintentionally, had not tried to lose weight, or had not tried to not gain weight in the past year. We dummy coded a five-level weight action variable based on responses to weight control questions as lost weight intentionally, lost weight unintentionally, tried to lose weight (but did not), tried to not gain weight, and none of the above. Because no questions were asked about attempts to gain weight, individuals in the ‘none of the above’ category include both those who did not try to control their weight and those who tried to gain weight.

*Specific Weight Control Behaviors*

*Depression*

Current depressive symptoms was assessed using the nine-item Patient Health Questionnaire (PHQ-9) (Kroenke, Spitzer, & Williams, 2001). PHQ-9 scores range from zero to 27, with higher scores representing greater depression severity. Per scoring guidelines, we operationalized depression as a score of 10 or more, which roughly corresponds to moderate depression or greater (Kroenke et al., 2001).

*Covariates*

We used weight and height measured in the NHANES mobile clinics to calculate BMI using the formula weight in kilograms divided by height in meterssquared, and coded BMI category as follows: < 18.5kg/m2 as underweight, 18.5 – < 25 kg/m2 as normal weight, 25 – < 30 kg/m2 as overweight, 30 – < 35 kg/m2 as obesity, class I, 35 – 40 kg/m2 as obesity, class II, and ≥ 40 kg/m2 as obesity, class III. Race/ethnicity was coded according as a four-level dummy variable (Non-Hispanic White, Non-Hispanic Black, Hispanic/Latino, or other). To accommodate potential nonlinearity in the associations between age and weight perception, we also categorized age into quartiles. Family income-to-poverty ratio was coded as less than or equal to 100% of the federal poverty line (FPL), 101 - 200% FPL, 201 – 300 % FPL, 301 – 400% FPL, and greater than 400% FPL. We also coded missing or ‘refused’ as a sixth income category, given that individuals missing income data often differ systematically from those providing income information (Kim, Egerter, Cubbin, Takahashi, & Braveman, 2007). We dummy coded education as high school degree or less, some college, and college degree or higher.

**Statistical Analyses**

\_\_\_\_Descriptive stuff\_\_\_\_\_

To determine the strengths of association among weight consideration, desired weight, weight control, food insecurity, and BMI category, we first constructed a matrix of pairwise polychoric correlations between the five variables. We then computed unadjusted associations between food insecurity and weight consideration, desired weight, and weight control using three individual multinomial logistic regressions (Model 1). In Model 2, we adjusted for BMI category only, and in Model 3 further adjusted for race, age category, education, and household income. To accommodate potential effect modification, we fit models separately by sex, and, given the complex sampling methodology of NHANES, all analyses were adjusted for survey design.

Data management and analysis were performed in R, version 3.6.1, and RStudio, version 1.2.5019 (R Core Team, 2019), using the RNHANES (Susmann, 2016) and dplyr (Wickham, Francois, Henry, & Müller, 2015) packages for data management, the survey package (Lumley, 2004) for design-based analyses and the nnetpackage (Ripley & Venables, 2016) for multinomial logistic regression.

**Results**

References

Becker, C. B., Middlemass, K., Johnson, C., Taylor, B., Gomez, F., & Sutherland, A. (2018). Traumatic event exposure associated with increased food insecurity and eating disorder pathology. *Public Health Nutrition*, *21*(16), 3058–3066. doi: 10.1017/S1368980018001738

Becker, C. B., Middlemass, K. M., Gomez, F., & Martinez-Abrego, A. (2019). Eating Disorder Pathology Among Individuals Living With Food Insecurity: A Replication Study. *Clinical Psychological Science*, *7*(5), 1144–1158. doi: 10.1177/2167702619851811

Becker, C. B., Middlemass, K., Taylor, B., Johnson, C., & Gomez, F. (2017). Food insecurity and eating disorder pathology. *International Journal of Eating Disorders*, *50*(9), 1031–1040. doi: 10.1002/eat.22735

Bickel, G., Mark, N., Cristofer, P., William, H., & John, C. (2000). *Guide to Measuring Household Food Security, Revised March 2000*.

Castellari, E., Cotti, C., Gordanier, J., & Ozturk, O. (2017). Does the Timing of Food Stamp Distribution Matter? A Panel-Data Analysis of Monthly Purchasing Patterns of US Households. *Health Economics*, *26*(11), 1380–1393. doi: 10.1002/hec.3428

Coleman-Jensen, A., Rabbitt, M. P., Gregory, C., & Singh, A. (2018). *Household Food Security in the United States in 2018*. 47.

Curtin, L. R., Mohadjer, L. K., Dohrmann, S. M., Kruszon-Moran, D., Mirel, L. B., Carroll, M., … Johnson, C. L. (2013). National Health and Nutrition Examination Survey: Sample design, 2007-2010. *Vital and Health Statistics. Series 2, Data Evaluation and Methods Research*, (160), 1–23.

Dinour, L. M., Bergen, D., & Yeh, M.-C. (2007). The Food Insecurity–Obesity Paradox: A Review of the Literature and the Role Food Stamps May Play. *Journal of the American Dietetic Association*, *107*(11), 1952–1961. doi: 10.1016/j.jada.2007.08.006

Drewnowski, A. (2004). Obesity and the food environment: Dietary energy density and diet costs. *American Journal of Preventive Medicine*, *27*(3), 154–162.

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. doi: 10.1007/s10900-011-9420-4

Gooding, H. C., Walls, C. E., & Richmond, T. K. (2012). Food Insecurity and Increased BMI in Young Adult Women. *Obesity*, *20*(9), 1896–1901. doi: 10.1038/oby.2011.233

Gundersen, C., & Ziliak, J. P. (2018). Food Insecurity Research in the United States: Where We Have Been and Where We Need to Go. *Applied Economic Perspectives and Policy*, *40*(1), 119–135. doi: 10.1093/aepp/ppx058

Hernandez, D. C., Reesor, L. M., & Murillo, R. (2017). Food insecurity and adult overweight/obesity: Gender and race/ethnic disparities. *Appetite*, *117*, 373–378. doi: 10.1016/j.appet.2017.07.010

Hudson, J. I., Hiripi, E., Pope, H. G., & Kessler, R. C. (2007). The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biological Psychiatry*, *61*(3), 348–358. doi: 10.1016/j.biopsych.2006.03.040

Johnson, C. L., Dohrmann, S. M., Burt, V. L., & Mohadjer, L. K. (2014). *National health and nutrition examination survey: Sample design, 2011-2014*. US Department of Health and Human Services, Centers for Disease Control and ….

Kim, S., Egerter, S., Cubbin, C., Takahashi, E. R., & Braveman, P. (2007). Potential Implications of Missing Income Data in Population-Based Surveys: An Example from a Postpartum Survey in California. *Public Health Reports*, *122*(6), 753–763.

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9. *Journal of General Internal Medicine*, *16*(9), 606–613. doi: 10.1046/j.1525-1497.2001.016009606.x

Leung, C. W., Epel, E. S., Willett, W. C., Rimm, E. B., & Laraia, B. A. (2015). Household Food Insecurity Is Positively Associated with Depression among Low-Income Supplemental Nutrition Assistance Program Participants and Income-Eligible Nonparticipants. *The Journal of Nutrition*, *145*(3), 622–627. doi: 10.3945/jn.114.199414

Lumley, T. (2004). Analysis of Complex Survey Samples. *Journal of Statistical Software*, *9*(1), 1–19. doi: 10.18637/jss.v009.i08

Lydecker, J. A., & Grilo, C. M. (2019). Food insecurity and bulimia nervosa in the United States. *International Journal of Eating Disorders*, *52*(6), 735–739. doi: 10.1002/eat.23074

Martin, M. A., & Lippert, A. M. (2012). Feeding her children, but risking her health: The intersection of gender, household food insecurity and obesity. *Social Science & Medicine*, *74*(11), 1754–1764. doi: 10.1016/j.socscimed.2011.11.013

R Core Team. (2019). R: A language and environment for statistical computing (Version 3.6.1). Retrieved from https://www.R-project.org/

Rasmusson, G., Lydecker, J. A., Coffino, J. A., White, M. A., & Grilo, C. M. (2019). Household food insecurity is associated with binge-eating disorder and obesity. *International Journal of Eating Disorders*, *52*(1), 28–35. doi: 10.1002/eat.22990

Ripley, B., & Venables, W. (2016). Nnet (Version 7.3-12). Retrieved from ftp://mi.mirror.garr.it/mirrors/CRAN/web/packages/nnet/nnet.pdf

Susmann, H. (2016). RNHANES: Facilitates Analysis of CDC NHANES Data. (Version 1.1.0). Retrieved from https://CRAN.R-project.org/package=RNHANES

Wickham, H., Francois, R., Henry, L., & Müller, K. (2015). dplyr: A grammar of data manipulation. *R Package Version 0.4*, *3*.

Wilde, P. E., & Ranney, C. K. (2000). The Monthly Food Stamp Cycle: Shopping Frequency and Food Intake Decisions in an Endogenous Switching Regression Framework. *American Journal of Agricultural Economics*, *82*(1), 200–213. doi: 10.1111/0002-9092.00016

Coefficient SE t value Pr(>|t|)

lost weight: intentional.(Intercept) -0.9648898 0.0623994 -15.4631 0.0041561 \*\*

lost weight: unintented.(Intercept) -2.6536430 0.0801155 -33.1227 0.0009102 \*\*\*

tried to lose weight (but didnt).(Intercept) -0.0952528 0.0452810 -2.1036 0.1701079

tried to not gain.(Intercept) -1.1901415 0.0811038 -14.6743 0.0046118 \*\*

lost weight: intentional.fsWithHunger1 0.1167037 0.2832698 0.4120 0.7203073

lost weight: unintented.fsWithHunger1 1.0967565 0.1608329 6.8192 0.0208348 \*

tried to lose weight (but didnt).fsWithHunger1 -0.3844948 0.2344701 -1.6398 0.2427164

tried to not gain.fsWithHunger1 -0.6381793 0.3119088 -2.0460 0.1773793

lost weight: intentional.fsWithHunger2 -0.0537582 0.1283099 -0.4190 0.7159456

lost weight: unintented.fsWithHunger2 1.0290332 0.1556553 6.6110 0.0221242 \*

tried to lose weight (but didnt).fsWithHunger2 -0.2655651 0.1073735 -2.4733 0.1318944

tried to not gain.fsWithHunger2 -0.3720607 0.1566034 -2.3758 0.1407132

lost weight: intentional.factor(Race)1 0.0016402 0.0777805 0.0211 0.9850903

lost weight: unintented.factor(Race)1 0.7659821 0.1394762 5.4918 0.0315932 \*

tried to lose weight (but didnt).factor(Race)1 -0.1703928 0.0900653 -1.8919 0.1990467

tried to not gain.factor(Race)1 -0.5875712 0.1723408 -3.4094 0.0763133 .

lost weight: intentional.factor(Race)2 -0.2814876 0.1202796 -2.3403 0.1441324

lost weight: unintented.factor(Race)2 0.2187030 0.1379772 1.5851 0.2538228

tried to lose weight (but didnt).factor(Race)2 -0.2762048 0.0660462 -4.1820 0.0526995 .

tried to not gain.factor(Race)2 -0.3781817 0.1273159 -2.9704 0.0971073 .

lost weight: intentional.factor(Race)3 -0.7552101 0.1959639 -3.8538 0.0612139 .

lost weight: unintented.factor(Race)3 0.1296656 0.2416225 0.5366 0.6452190

tried to lose weight (but didnt).factor(Race)3 -0.3682688 0.0980067 -3.7576 0.0640906 .

tried to not gain.factor(Race)3 -0.4577237 0.1599835 -2.8611 0.1035367

lost weight: intentional.fsWithHunger1:factor(Race)1 0.0143018 0.3885973 0.0368 0.9739846

lost weight: unintented.fsWithHunger1:factor(Race)1 -0.6677652 0.2679344 -2.4923 0.1302663

tried to lose weight (but didnt).fsWithHunger1:factor(Race)1 -0.0953794 0.3335513 -0.2860 0.8018127

tried to not gain.fsWithHunger1:factor(Race)1 0.7940871 0.4951954 1.6036 0.2499967

lost weight: intentional.fsWithHunger2:factor(Race)1 0.2028931 0.1835456 1.1054 0.3841638

lost weight: unintented.fsWithHunger2:factor(Race)1 -0.5062971 0.1864048 -2.7161 0.1130283

tried to lose weight (but didnt).fsWithHunger2:factor(Race)1 0.2364114 0.1542411 1.5327 0.2650478

tried to not gain.fsWithHunger2:factor(Race)1 0.6717298 0.2903113 2.3138 0.1467524

lost weight: intentional.fsWithHunger1:factor(Race)2 -0.1555282 0.3519278 -0.4419 0.7017310

lost weight: unintented.fsWithHunger1:factor(Race)2 -0.4734430 0.3043937 -1.5554 0.2601183

tried to lose weight (but didnt).fsWithHunger1:factor(Race)2 0.1693774 0.2494535 0.6790 0.5671802

tried to not gain.fsWithHunger1:factor(Race)2 0.2522497 0.4309071 0.5854 0.6175364

lost weight: intentional.fsWithHunger2:factor(Race)2 0.0987121 0.2117525 0.4662 0.6869395

lost weight: unintented.fsWithHunger2:factor(Race)2 -0.6806744 0.2124178 -3.2044 0.0851351 .

tried to lose weight (but didnt).fsWithHunger2:factor(Race)2 0.2425712 0.1302129 1.8629 0.2035133

tried to not gain.fsWithHunger2:factor(Race)2 -0.1136332 0.2265466 -0.5016 0.6657257

lost weight: intentional.fsWithHunger1:factor(Race)3 -0.7855255 0.5804706 -1.3533 0.3086359

lost weight: unintented.fsWithHunger1:factor(Race)3 -0.5911579 0.6475534 -0.9129 0.4576575

tried to lose weight (but didnt).fsWithHunger1:factor(Race)3 -0.2062758 0.4901993 -0.4208 0.7148068

tried to not gain.fsWithHunger1:factor(Race)3 0.1485038 0.9048610 0.1641 0.8847248

lost weight: intentional.fsWithHunger2:factor(Race)3 0.0329078 0.3493940 0.0942 0.9335481

lost weight: unintented.fsWithHunger2:factor(Race)3 -0.8451661 0.4996211 -1.6916 0.2327912

tried to lose weight (but didnt).fsWithHunger2:factor(Race)3 0.2426452 0.2229304 1.0884 0.3900857

tried to not gain.fsWithHunger2:factor(Race)3 0.2716379 0.3371426 0.8057 0.5049804

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Coefficient SE t value Pr(>|t|)

lost weight: intentional.(Intercept) -0.818643 0.057139 -14.3273 7.504e-14 \*\*\*

lost weight: unintented.(Intercept) -2.427487 0.102530 -23.6758 < 2.2e-16 \*\*\*

tried to lose weight (but didnt).(Intercept) 0.228166 0.042157 5.4123 1.136e-05 \*\*\*

tried to not gain.(Intercept) -1.149610 0.067884 -16.9350 1.459e-15 \*\*\*

lost weight: intentional.fsWithHunger1 0.229797 0.148108 1.5516 0.132858

lost weight: unintented.fsWithHunger1 1.008470 0.189812 5.3130 1.474e-05 \*\*\*

tried to lose weight (but didnt).fsWithHunger1 -0.284381 0.187068 -1.5202 0.140530

tried to not gain.fsWithHunger1 -0.444406 0.230096 -1.9314 0.064404 .

lost weight: intentional.fsWithHunger2 0.061888 0.106693 0.5801 0.566870

lost weight: unintented.fsWithHunger2 0.930588 0.184990 5.0305 3.101e-05 \*\*\*

tried to lose weight (but didnt).fsWithHunger2 -0.158157 0.086311 -1.8324 0.078367 .

tried to not gain.fsWithHunger2 -0.346768 0.101941 -3.4017 0.002176 \*\*

lost weight: intentional.factor(Male)1 -0.423791 0.057491 -7.3714 7.920e-08 \*\*\*

lost weight: unintented.factor(Male)1 -0.145359 0.145773 -0.9972 0.327880

tried to lose weight (but didnt).factor(Male)1 -0.818723 0.074071 -11.0533 2.532e-11 \*\*\*

tried to not gain.factor(Male)1 -0.293614 0.085093 -3.4505 0.001923 \*\*

lost weight: intentional.fsWithHunger1:factor(Male)1 -0.383815 0.229493 -1.6724 0.106430

lost weight: unintented.fsWithHunger1:factor(Male)1 -0.210862 0.231913 -0.9092 0.371581

tried to lose weight (but didnt).fsWithHunger1:factor(Male)1 -0.292410 0.310236 -0.9425 0.354592

tried to not gain.fsWithHunger1:factor(Male)1 -0.131047 0.340763 -0.3846 0.703685

lost weight: intentional.fsWithHunger2:factor(Male)1 -0.220605 0.167495 -1.3171 0.199301

lost weight: unintented.fsWithHunger2:factor(Male)1 -0.318104 0.247151 -1.2871 0.209406

tried to lose weight (but didnt).fsWithHunger2:factor(Male)1 -0.151168 0.141508 -1.0683 0.295218

tried to not gain.fsWithHunger2:factor(Male)1 -0.073738 0.169697 -0.4345 0.667488

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Coefficient SE t value Pr(>|t|)

like to weigh less.(Intercept) 1.057556 0.061122 17.3024 8.724e-16 \*\*\*

like to weigh more.(Intercept) -1.680101 0.073815 -22.7610 < 2.2e-16 \*\*\*

like to weigh less.fsWithHunger1 -0.145677 0.170346 -0.8552 0.4002621

like to weigh more.fsWithHunger1 1.303577 0.236080 5.5218 8.527e-06 \*\*\*

like to weigh less.fsWithHunger2 -0.062517 0.125797 -0.4970 0.6233874

like to weigh more.fsWithHunger2 0.680432 0.151536 4.4902 0.0001291 \*\*\*

like to weigh less.factor(Race)1 -0.294537 0.070578 -4.1732 0.0002972 \*\*\*

like to weigh more.factor(Race)1 0.713892 0.118828 6.0078 2.413e-06 \*\*\*

like to weigh less.factor(Race)2 -0.402993 0.074094 -5.4390 1.059e-05 \*\*\*

like to weigh more.factor(Race)2 -0.114049 0.165183 -0.6904 0.4960327

like to weigh less.factor(Race)3 -0.618009 0.101155 -6.1095 1.857e-06 \*\*\*

like to weigh more.factor(Race)3 0.140183 0.192847 0.7269 0.4737735

like to weigh less.fsWithHunger1:factor(Race)1 -0.059079 0.211867 -0.2789 0.7825658

like to weigh more.fsWithHunger1:factor(Race)1 -0.821109 0.349325 -2.3506 0.0266085 \*

like to weigh less.fsWithHunger2:factor(Race)1 0.039032 0.128059 0.3048 0.7629486

like to weigh more.fsWithHunger2:factor(Race)1 -0.468736 0.212305 -2.2078 0.0362803 \*

like to weigh less.fsWithHunger1:factor(Race)2 0.076587 0.223872 0.3421 0.7350227

like to weigh more.fsWithHunger1:factor(Race)2 -0.529564 0.329663 -1.6064 0.1202687

like to weigh less.fsWithHunger2:factor(Race)2 0.124345 0.152928 0.8131 0.4235453

like to weigh more.fsWithHunger2:factor(Race)2 -0.429985 0.249077 -1.7263 0.0961578 .

like to weigh less.fsWithHunger1:factor(Race)3 0.182348 0.456188 0.3997 0.6926276

like to weigh more.fsWithHunger1:factor(Race)3 -1.091732 0.660057 -1.6540 0.1101528

like to weigh less.fsWithHunger2:factor(Race)3 -0.018407 0.217884 -0.0845 0.9333227

like to weigh more.fsWithHunger2:factor(Race)3 -0.085281 0.295987 -0.2881 0.7755366

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Coefficient SE t value Pr(>|t|)

like to weigh less.(Intercept) 1.289362 0.069170 18.6405 < 2.2e-16 \*\*\*

like to weigh more.(Intercept) -2.204063 0.116060 -18.9907 < 2.2e-16 \*\*\*

like to weigh less.fsWithHunger1 -0.028367 0.202070 -0.1404 0.88910

like to weigh more.fsWithHunger1 1.406116 0.309210 4.5475 5.398e-05 \*\*\*

like to weigh less.fsWithHunger2 -0.026283 0.113580 -0.2314 0.81824

like to weigh more.fsWithHunger2 0.820190 0.171899 4.7714 2.705e-05 \*\*\*

like to weigh less.factor(Male)1 -0.684037 0.052785 -12.9588 1.608e-15 \*\*\*

like to weigh more.factor(Male)1 0.893250 0.140028 6.3791 1.722e-07 \*\*\*

like to weigh less.fsWithHunger1:factor(Male)1 -0.341640 0.245836 -1.3897 0.17271

like to weigh more.fsWithHunger1:factor(Male)1 -0.587356 0.375672 -1.5635 0.12623

like to weigh less.fsWithHunger2:factor(Male)1 -0.239188 0.150269 -1.5917 0.11973

like to weigh more.fsWithHunger2:factor(Male)1 -0.425459 0.205162 -2.0738 0.04493 \*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Coefficient SE t value Pr(>|t|)

too thin.(Intercept) -2.477554 0.103136 -24.0223 < 2.2e-16 \*\*\*

too big.(Intercept) 0.393257 0.059481 6.6115 5.182e-07 \*\*\*

too thin.fsWithHunger1 1.386677 0.215793 6.4260 8.281e-07 \*\*\*

too big.fsWithHunger1 0.092336 0.199362 0.4632 0.647106

too thin.fsWithHunger2 0.659893 0.199296 3.3111 0.002732 \*\*

too big.fsWithHunger2 0.092935 0.097249 0.9556 0.348058

too thin.factor(Race)1 0.473395 0.142710 3.3172 0.002690 \*\*

too big.factor(Race)1 -0.081299 0.068998 -1.1783 0.249351

too thin.factor(Race)2 0.093763 0.196976 0.4760 0.638042

too big.factor(Race)2 -0.102405 0.068005 -1.5059 0.144159

too thin.factor(Race)3 0.275603 0.229957 1.1985 0.241533

too big.factor(Race)3 -0.589975 0.083508 -7.0649 1.675e-07 \*\*\*

too thin.fsWithHunger1:factor(Race)1 -0.691504 0.475897 -1.4531 0.158173

too big.fsWithHunger1:factor(Race)1 -0.481248 0.240902 -1.9977 0.056312 .

too thin.fsWithHunger2:factor(Race)1 -0.333759 0.221306 -1.5081 0.143578

too big.fsWithHunger2:factor(Race)1 -0.140096 0.121594 -1.1522 0.259738

too thin.fsWithHunger1:factor(Race)2 -0.610439 0.352500 -1.7317 0.095171 .

too big.fsWithHunger1:factor(Race)2 -0.219752 0.234891 -0.9356 0.358113

too thin.fsWithHunger2:factor(Race)2 -0.601819 0.317361 -1.8963 0.069082 .

too big.fsWithHunger2:factor(Race)2 -0.062737 0.115937 -0.5411 0.593023

too thin.fsWithHunger1:factor(Race)3 -0.990922 0.678717 -1.4600 0.156271

too big.fsWithHunger1:factor(Race)3 0.050942 0.491940 0.1036 0.918319

too thin.fsWithHunger2:factor(Race)3 0.081198 0.448536 0.1810 0.857748

too big.fsWithHunger2:factor(Race)3 0.116017 0.227332 0.5103 0.614118

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Coefficient SE t value Pr(>|t|)

too thin.(Intercept) -2.628548 0.152742 -17.2090 < 2.2e-16 \*\*\*

too big.(Intercept) 0.567307 0.065571 8.6518 1.626e-10 \*\*\*

too thin.fsWithHunger1 1.507050 0.231053 6.5225 1.096e-07 \*\*\*

too big.fsWithHunger1 0.283344 0.169014 1.6765 0.101859

too thin.fsWithHunger2 0.528786 0.209156 2.5282 0.015741 \*

too big.fsWithHunger2 0.141794 0.093281 1.5201 0.136771

too thin.factor(Male)1 0.402264 0.168286 2.3904 0.021894 \*

too big.factor(Male)1 -0.472475 0.058155 -8.1244 7.827e-10 \*\*\*

too thin.fsWithHunger1:factor(Male)1 -0.678666 0.320680 -2.1163 0.040924 \*

too big.fsWithHunger1:factor(Male)1 -0.668309 0.236005 -2.8318 0.007364 \*\*

too thin.fsWithHunger2:factor(Male)1 -0.033828 0.247095 -0.1369 0.891831

too big.fsWithHunger2:factor(Male)1 -0.265625 0.128621 -2.0652 0.045778 \*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Coefficient SE t value Pr(>|t|)

too thin.(Intercept) -2.787369 0.223258 -12.4850 0.006354 \*\*

too big.(Intercept) 0.602789 0.081977 7.3532 0.017997 \*

too thin.fsWithHunger1 1.571743 0.470222 3.3426 0.079038 .

too big.fsWithHunger1 0.509832 0.279065 1.8269 0.209238

too thin.fsWithHunger2 0.617888 0.324975 1.9013 0.197618

too big.fsWithHunger2 0.148177 0.135426 1.0942 0.388078

too thin.factor(Male)1 0.503719 0.251348 2.0041 0.182951

too big.factor(Male)1 -0.416890 0.071608 -5.8219 0.028259 \*

too thin.factor(Race)1 0.739197 0.247491 2.9868 0.096195 .

too big.factor(Race)1 0.159161 0.097887 1.6260 0.245470

too thin.factor(Race)2 0.056888 0.352443 0.1614 0.886602

too big.factor(Race)2 0.017310 0.084088 0.2059 0.855957

too thin.factor(Race)3 0.516605 0.362886 1.4236 0.290558

too big.factor(Race)3 -0.657660 0.107395 -6.1238 0.025645 \*

too thin.fsWithHunger1:factor(Male)1 -0.323819 0.532617 -0.6080 0.605046

too big.fsWithHunger1:factor(Male)1 -0.759586 0.435000 -1.7462 0.222895

too thin.fsWithHunger2:factor(Male)1 0.076122 0.396544 0.1920 0.865495

too big.fsWithHunger2:factor(Male)1 -0.151410 0.173663 -0.8719 0.475217

too thin.fsWithHunger1:factor(Race)1 -0.708253 0.686484 -1.0317 0.410636

too big.fsWithHunger1:factor(Race)1 -0.678501 0.359824 -1.8856 0.199995

too thin.fsWithHunger2:factor(Race)1 -0.581748 0.342000 -1.7010 0.231045

too big.fsWithHunger2:factor(Race)1 -0.197736 0.171763 -1.1512 0.368692

too thin.fsWithHunger1:factor(Race)2 0.586052 0.532716 1.1001 0.385998

too big.fsWithHunger1:factor(Race)2 -0.156981 0.346168 -0.4535 0.694654

too thin.fsWithHunger2:factor(Race)2 -0.095211 0.521543 -0.1826 0.871975

too big.fsWithHunger2:factor(Race)2 -0.043951 0.180646 -0.2433 0.830452

too thin.fsWithHunger1:factor(Race)3 -1.068735 2.211968 -0.4832 0.676702

too big.fsWithHunger1:factor(Race)3 -0.517542 0.497121 -1.0411 0.407160

too thin.fsWithHunger2:factor(Race)3 -0.031818 0.741083 -0.0429 0.969655

too big.fsWithHunger2:factor(Race)3 0.230309 0.341164 0.6751 0.569217

too thin.factor(Male)1:factor(Race)1 -0.431116 0.310950 -1.3864 0.299938

too big.factor(Male)1:factor(Race)1 -0.515793 0.113407 -4.5482 0.045097 \*

too thin.factor(Male)1:factor(Race)2 0.018728 0.429340 0.0436 0.969170

too big.factor(Male)1:factor(Race)2 -0.207554 0.128851 -1.6108 0.248523

too thin.factor(Male)1:factor(Race)3 -0.373424 0.411011 -0.9086 0.459489

too big.factor(Male)1:factor(Race)3 0.118440 0.161676 0.7326 0.540040

too thin.fsWithHunger1:factor(Male)1:factor(Race)1 0.038892 0.742037 0.0524 0.962964

too big.fsWithHunger1:factor(Male)1:factor(Race)1 0.083713 0.585852 0.1429 0.899472

too thin.fsWithHunger2:factor(Male)1:factor(Race)1 0.405815 0.450316 0.9012 0.462605

too big.fsWithHunger2:factor(Male)1:factor(Race)1 -0.037566 0.258325 -0.1454 0.897711

too thin.fsWithHunger1:factor(Male)1:factor(Race)2 -2.112677 0.669397 -3.1561 0.087428 .

too big.fsWithHunger1:factor(Male)1:factor(Race)2 0.060664 0.507092 0.1196 0.915708

too thin.fsWithHunger2:factor(Male)1:factor(Race)2 -0.802285 0.694038 -1.1560 0.367128

too big.fsWithHunger2:factor(Male)1:factor(Race)2 -0.023123 0.256837 -0.0900 0.936467

too thin.fsWithHunger1:factor(Male)1:factor(Race)3 0.077248 3.938808 0.0196 0.986134

too big.fsWithHunger1:factor(Male)1:factor(Race)3 1.084736 0.874270 1.2407 0.340503

too thin.fsWithHunger2:factor(Male)1:factor(Race)3 0.150426 0.990618 0.1519 0.893239

too big.fsWithHunger2:factor(Male)1:factor(Race)3 -0.161112 0.383494 -0.4201 0.715232

Coefficient SE t value Pr(>|t|)

like to weigh less.(Intercept) 1.398841 0.081824 17.0958 0.003404 \*\*

like to weigh more.(Intercept) -2.638540 0.230532 -11.4454 0.007547 \*\*

like to weigh less.fsWithHunger1 0.170104 0.346569 0.4908 0.672122

like to weigh more.fsWithHunger1 1.952506 0.510337 3.8259 0.062028 .

like to weigh less.fsWithHunger2 -0.088246 0.183254 -0.4816 0.677667

like to weigh more.fsWithHunger2 0.932935 0.340463 2.7402 0.111369

like to weigh less.factor(Male)1 -0.654804 0.062939 -10.4039 0.009113 \*\*

like to weigh more.factor(Male)1 1.300688 0.273345 4.7584 0.041439 \*

like to weigh less.factor(Race)1 -0.121749 0.117185 -1.0389 0.407950

like to weigh more.factor(Race)1 1.400225 0.304280 4.6018 0.044121 \*

like to weigh less.factor(Race)2 -0.304215 0.105140 -2.8934 0.101572

like to weigh more.factor(Race)2 0.565642 0.337207 1.6774 0.235457

like to weigh less.factor(Race)3 -0.747003 0.133889 -5.5793 0.030656 \*

like to weigh more.factor(Race)3 0.857810 0.325264 2.6373 0.118713

like to weigh less.fsWithHunger1:factor(Male)1 -0.564489 0.448575 -1.2584 0.335244

like to weigh more.fsWithHunger1:factor(Male)1 -0.875009 0.541222 -1.6167 0.247326

like to weigh less.fsWithHunger2:factor(Male)1 -0.017715 0.215787 -0.0821 0.942049

like to weigh more.fsWithHunger2:factor(Male)1 -0.251344 0.387562 -0.6485 0.583162

like to weigh less.fsWithHunger1:factor(Race)1 -0.336459 0.409745 -0.8211 0.497871

like to weigh more.fsWithHunger1:factor(Race)1 -1.421378 0.666740 -2.1318 0.166688

like to weigh less.fsWithHunger2:factor(Race)1 0.110093 0.228546 0.4817 0.677570

like to weigh more.fsWithHunger2:factor(Race)1 -0.603548 0.426696 -1.4145 0.292830

like to weigh less.fsWithHunger1:factor(Race)2 -0.038242 0.380862 -0.1004 0.929178

like to weigh more.fsWithHunger1:factor(Race)2 -0.502458 0.520576 -0.9652 0.436281

like to weigh less.fsWithHunger2:factor(Race)2 0.208731 0.223050 0.9358 0.448163

like to weigh more.fsWithHunger2:factor(Race)2 -0.470816 0.505879 -0.9307 0.450266

like to weigh less.fsWithHunger1:factor(Race)3 -0.493824 0.522141 -0.9458 0.444096

like to weigh more.fsWithHunger1:factor(Race)3 -2.004086 3.706963 -0.5406 0.642921

like to weigh less.fsWithHunger2:factor(Race)3 0.448858 0.347828 1.2905 0.325953

like to weigh more.fsWithHunger2:factor(Race)3 0.074303 0.594209 0.1250 0.911923

like to weigh less.factor(Male)1:factor(Race)1 -0.392204 0.134179 -2.9230 0.099825 .

like to weigh more.factor(Male)1:factor(Race)1 -0.891940 0.367314 -2.4283 0.135868

like to weigh less.factor(Male)1:factor(Race)2 -0.152784 0.140664 -1.0862 0.390886

like to weigh more.factor(Male)1:factor(Race)2 -0.894888 0.428429 -2.0888 0.171942

like to weigh less.factor(Male)1:factor(Race)3 0.214931 0.161757 1.3287 0.315263

like to weigh more.factor(Male)1:factor(Race)3 -0.890934 0.421556 -2.1134 0.168904

like to weigh less.fsWithHunger1:factor(Male)1:factor(Race)1 0.339247 0.579833 0.5851 0.617712

like to weigh more.fsWithHunger1:factor(Male)1:factor(Race)1 0.819728 0.689073 1.1896 0.356278

like to weigh less.fsWithHunger2:factor(Male)1:factor(Race)1 -0.263744 0.314300 -0.8391 0.489705

like to weigh more.fsWithHunger2:factor(Male)1:factor(Race)1 0.094664 0.456523 0.2074 0.854926

like to weigh less.fsWithHunger1:factor(Male)1:factor(Race)2 0.315788 0.513545 0.6149 0.601250

like to weigh more.fsWithHunger1:factor(Male)1:factor(Race)2 -0.132270 0.598222 -0.2211 0.845532

like to weigh less.fsWithHunger2:factor(Male)1:factor(Race)2 -0.132358 0.281744 -0.4698 0.684752

like to weigh more.fsWithHunger2:factor(Male)1:factor(Race)2 -0.051159 0.657784 -0.0778 0.945088

like to weigh less.fsWithHunger1:factor(Male)1:factor(Race)3 1.486583 1.040241 1.4291 0.289207

like to weigh more.fsWithHunger1:factor(Male)1:factor(Race)3 1.730878 4.752993 0.3642 0.750631

like to weigh less.fsWithHunger2:factor(Male)1:factor(Race)3 -0.757526 0.498425 -1.5198 0.267912

like to weigh more.fsWithHunger2:factor(Male)1:factor(Race)3 -0.420993 0.787631 -0.5345 0.646457

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1