Data Analysis Plan – Capstone Project

Hypothesis: Adults with self-reported food insecurity are at a higher risk for metabolic syndrome.
Secondary Hypothesis: Adults with self-reported food insecurity are more likely to have a normal BMI in conjunction with metabolic syndrome and less likely to be overweight/obese without metabolic syndrome.

Exposure:
Food Insecurity as measured by the Adult Food Security Category on a scale 1-4.

Outcomes:
Primary: Metabolic Syndrome – meets 3 or more criteria
Waist Circumference: ≥ 102 cm for men and ≥ 88 cm for women
or ≥ 94 cm in men and ≥ 80 cm in women with increased insulin resistance (HOMA-IR ≥ need cutoff)
Blood Pressure: Elevated ≥130/85 mm Hg or drug treatment
Triglycerides: ≥ 150 mg/dL or drug treatment
HDL-C: <40 mg/dL men and <50 mg/dL women or drug treatment
Fasting Glucose: ≥ 100mg/dL or drug treatment
Secondary: BMI, HOMA-IR

Possible Covariates:
Gender (male, female), Ethnicity (Non-Hispanic Black, Hispanic, Non-Hispanic Other, Non-Hispanic White), age, education, income, alcohol use, smoking status, physical activity.

Inclusion Criteria:
18-65 years olds. Serum triglyceride levels and serum fasting glucose levels were measured on NHANES examinees who were examined in the morning session only. Eligible NHANES examinees were randomly assigned to the morning fasting sample. Only individuals in the morning session will therefore be included.

Exclusion Criteria:
Pregnant Women.

Data and Variables:
All datasets contain the SEQN variable which will be used to link individuals between datasets.
Food Insecurity: Adult Food Security Category from Food Security Questionnaire. Variable: 1999-2002: ADfdsec, 2003-2014: FSDAD.
Waist Circumference: BMIWAIST from Body Measures Data Set
Blood Pressure: 1999-2002: BPXDAR from Blood Pressure Dataset 2003-2014 Systolic Average: BPXSY1, BPXSY2, BPXSY3, PBXSY4 Diastolic Average: BPXDI1, PBXDI2, BPXDI3, BPXDI4
Hypertension medication: BPQ050A from Blood Pressure & Cholesterol
Triglycerides: LBXTR from Cholesterol- LDL & Triglycerides
HDL-C: Variable: 1999- 2004: LBDHDL from Cholesterol Total & HDL dataset 2005-2014: LBDHDD from Cholesterol-HDL dataset.
Cholesterol Medication: Answers yes to BPQ090D and BPQ100D from Blood Pressure and Cholesterol Questionairre
Fasting Glucose: Variable: LBXGLU from Plasma Fasting Glucose, Serum C-peptide & Insulin Dataset (1999-2004), Plasma Fasting Glucose & Insulin Dataset (2005-2012) and Plasma Fasting Glucose Dataset (2013-2014).
Medication to lower blood sugar: DIQ070 Now taking pills to lower blood sugar from Diabetes questionnaire.

BMI: BMXBMI from Body Measures Dataset

Insulin: Variable: 1999-2010 LBXIN from Plasma Fasting Glucose, Serum C-peptide & Insulin Dataset (1999-2004), Plasma Fasting Glucose & Insulin Dataset (2005-2010) 2011-2012: LBXIN from Plasma Fasting Glucose & Insulin Dataset transformed as recommended by CDC (Insulin (Mercodia-equivalent) = 0.6295 + [1.0770*Insulin (Roche)] – [0.0008566*Insulin(Roche)**2]) to match previous cycles. 2013-2014: LBXIN from Insulin dataset transformed according to recommendation by CDC to match previous cycles.

Gender: RIAGENDR from the Demographics and Sample Weights Data Set

Ethnicity: 1999-2010: RIDRETH1 from the Demographics and Sample Weights Data Set 2011-2014: RIDRETH3.

Age: RIDAGEYR from the Demographics and Sample Weight Data Set

Alcohol Use: Never – will be defined as answering no to ALQ 110 - Had at least 12 alcohol drinks/lifetime Variable: ALQ110.

Occasional – Reports drinking 2 or less drinks less than 3 days a week and 0 for # days have 5 or more drinks/past 12 mos. Variables: ALQ120, ALQ130 and ALQ140

Moderate – Reports drinking 2 or less drinks per day and 0 for # days have 5 or more drinks/past 12 mos. Variables: ALQ120, ALQ130 and ALQ140

Heavy – Reports drinking more than 2 drinks per day or greater than 0 for # days have 5 or more drinks/past 12 mos. Variables: ALQ120, ALQ130 and ALQ140

Smoking status: Never – answered no to SMQ020 smoked at least 100 cigarettes in life.

Former- answered yes to SMQ020 SMQ020 smoked at least 100 cigarettes in life and Not at all to SMQ040 Do you now smoke cigarettes.

Current – answered yes to SMQ020 smoked at least 100 cigarettes in life and Every Day or Some Days to SMQ040 Do you now smoke cigarettes

Physical Activity: NEED HELP using Physical Activity Questionnaire

Income: Variable: INDHHINC (household income), if missing values are of concern, INDFMINC (family income) will be considered from Demographics and Sample Weight Data Set

Pregnancy: Variable: RIDEXPRG from Demographics and Sample Weight Data Set

Education: DMDEDUC3 from 18-19 years olds, DMDEDUC2 for ≥20 year olds.

Analysis:

Primary analysis will be performed using logistic regression. A likelihood ratio test will be used to test the significance of the food insecurity exposure variable with full food security used as the reference category. Odds ratios for abnormal cardiometabolic health in the marginal, low, and very low food security categories compared to the reference full food security category will be calculated. All analysis will be performed using R and version controlled using Git. All files except data will be stored in a repository on github.

All potential covariates will be evaluated for confounding and effect modification. Covariates that are not confounders or effect modifiers will be considered as precision variables or for face validity.

Samples from each NHANES cycle will be weighted appropriately using the guidelines published by the CDC.

Tables and Graphs:

Table 1. Characteristics of Study Participants by Food Security Category

	Full Food Securtity	Marginal Food Security	Low Food Security	Very Low Food Security	p-value
	N(%)	N(%)	N(%)	N(%)	
Gender					
Male					
Ethnicity					
Asian					
Black					
Hispanic					
Other					
Non-Hispanic White					
Education					
Less than 9th Grade					
Some High School					
High School Grad					
Some College or AA degree					
College Graduate or above					
Smoking Status					
Never					
Former					
Current					
Alcohol					
Never					
Occasional					
Moderate					
Heavy					
Physical Activity					
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	
Age					
Income					

Table 2. Crude and adjusted odds ratios for metabolic syndrome vs Full Food Security (reference)

	Crude OR (95% CI)	Adjusted OR (95% CI)
Marginal Food Security		
Low Food Security		
Very Low Food Security		