

Female Labor Force Participation and Diet Quality

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Motivation: Why Is Diet Quality Important?

Poor diet is a strong predictor of obesity (Bray & Popkin, 1998; Chen *et al.*, 2016).

- Rates of Obesity. In 2011-2014, obesity rates in the U.S. were 36% in adults and 17% in youth.
- The Cost of Obesity.
 - The medical cost: \$147 billion to \$210 billion per year (Finkelstein *et al.*, 2009; Cawley & Meyerhoefer, 2012)
 - The labor cost: \$506 per person per year (Cawley *et al.*, 2007)

Diet is important in determining other health outcomes, such as cardiovascular disease, diabetes, and certain types of cancer (World Health Organization, 2002).

Food Choices in the United States: What Data Tell Us

Table: Food expenditure on healthful and unhealthful food categories, 2005-2013

Healthful	Share(%)	Recommended share(%)	Unhealthful	Share(%)	Recommended share(%)
Whole grain products	10.57	10.09	Non-whole grain products	11.63	6.10
Potato products	1.96	1.77	Whole milk products	1.44	0.86
Dark green vegetables	0.48	5.59	Cheese	5.25	0.60
Orange vegetables	0.55	2.61	Beef,pork,veal,lamb,and game	6.28	5.31
Canned and fry beans,lentils, and peas	0.35	8.32	Bacon,sausage, and luncheon meats	1.39	0.91
Other vegetables	2.81	8.66	Fats and condiments	2.41	1.79
Whole fruits	4.14	16.49	Soft drinks,sodas,fruit drinks, and ades	8.29	1.33
Fruit juices	2.42	1.86	Sugars,sweets,and candies	15.15	0.41
Reduced fat,skim milk,and low-fat yogurt	5.40	8.77	Soups	3.53	0.51
Chicken, turkey, and game birds	0.10	2.69	Frozen or refrigerated entrees	10.06	0.18
Fish and fish products	1.80	11.92	Total	65.42	18.00
Nuts,nut butters, and seeds	2.64	3.16			
Eggs and egg mixtures	1.37	0.12			
Total	34.58	82.00			

Note: The USDA recommended shares are based on the recommended dollar costs of feeding a representative family consisting of 1 male and 1 female aged 19 to 50 years, 1 child aged 9 to 11 years, and 1 child aged 6 to 8 years, according to the Liberal Food Plan.

Determinants of Poor Diet Quality in the Literature

- Food Access. The market does not provide enough healthful food, especially in poor areas with less population.
- Budget Constraint. Healthful food is more expensive than unhealthy food that people can not afford healthful food.
- Preference. Unhealthy food tastes better than healthful food.

Different from the above literature. We focus on female time allocation for working and food preparation.

Female labor force participation, time, and diet quality

Labor force participation can affect diet quality in two ways

- Working hours, income improves, afford healthful food
- Working hours, less time for food shopping, preparation, and cooking

Empirical results are mixed

- In developing countries, female labor force participation improves the diet as income improved (Sangwan and Kumar, (2021))
- Retirement improves the diet quality for the family in the US (Hinnosaar, 2018)

Our study is aiming to

- **Quantify the causal relationship between the working hours and diet quality**

- The family diet quality would decrease by 2.4%-4.5% for a 10 hours increase in female head's working hours.
- Female working hours have negative effects on shopping frequency, negative effects on vegetable and fruit expenditure share, and positive effects on frozen and prepared food expenditure share.

Our study contributes to

- Literature on female labor force participation, time allocation, and diet quality.
- Literature on the determinants of diet quality.
- Literature on the relationship between time and health.

Data and Measures on Diet Quality

- Nielsen Homescan data: panel data with rich purchases records and demographic characteristics
- Diet quality measures: three expenditure-based measures on diet quality
 - expenditure share of fruits and vegetables
 - expenditure share of healthful food
 - USDA Score

Fixed Effect Model

$$Y_{ht} = \beta_0 + \beta_1 work_{ht} + X_{ht}\delta + \lambda_h + \mu_t + \epsilon_{ht}, \quad (1)$$

- Y_{ht} represents our outcome variable of interest for household h , in year t
- $work_{ht}$ is the working hours for the female heads in the family t
- X_{hy} is a vector of control variables
- X_{ict} is the vector of demographics
- λ_h are a set of household fixed effects and μ_t are household fixed effect and year fixed effect

Table: Results for the Fixed Effect Model

	Ln(Expenditure share of fruits and vegetables) (1)	Ln(Expenditure Share of healthful food) (2)	Ln(USDA Score) (3)	Ln(Expenditure share of fruits and vegetables) (4)	Ln(Expenditure Share of healthful food) (5)	Ln(USDA Score) (6)
head working hours (10 hours)	-0.005*** (0.001)	-0.004*** (0.000)	-0.005*** (0.000)			
Female head working hours (10 hours)				0.009*** (0.001)	0.015*** (0.002)	0.013*** (0.001)
Household controls	Y	Y	Y	Y	Y	Y
Household fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
Observations	422,342	422,342	422,342	422,342	422,342	422,342
R-squared	0.016	0.008	0.030	0.008	0.016	0.030

Fixed Effect Instrument Variable Method

The first stage of our IV model is specified as follows:

$$work_{ht} = \alpha_0 + \alpha_1 eligible_ind_{ht} + X_{ht}\sigma + \lambda_h + \mu_t + e_{ht}, \quad (2)$$

- Where $eligible_ind_{ht}$ represents a categorical variable representing the social security indicator (the value is 1 if the age is 65 or above, the value is 0.5 if the age is between 62 and 65, and the value is 0 if the age is below 62).

The second stage is:

$$y_{ht} = \beta_0 + \beta_1 \widehat{work_{ht}} + X_{ht}\delta + \lambda_h + \mu_t + \epsilon_{ht}, \quad (3)$$

	Ln(Expenditure share of fruites and vegetabls food) FE (1)	Ln(Expenditure share of healthful food) FE-IV (2)	Ln(Expenditure share of healthful food) FE (3)	Ln(Expenditure share of healthful food) FE-IV (4)
Panel A				
Female head working hours (10 hours)	-0.007*** (0.001)	-0.027** (0.014)		
Female head not working			0.023*** (0.004)	0.112** (0.057)
Observations	176,014	176,014	176,014	176,014
	Ln(Expenditure share of healthful food) FE (1)	Ln(Expenditure share of healthful food) FE-IV (2)	Ln(Expenditure share of healthful food) FE (3)	Ln(Expenditure share of healthful food) FE-IV (4)
Panel B				
Female head working hours (10 hours)	-0.005*** (0.001)	-0.023*** (0.007)		
Female head not working			0.013*** (0.002)	0.098*** (0.029)
Observations	176,014	176,014	176,014	176,014
	Ln(USDAScore) FE (1)	Ln(USDAScore) FE-IV (2)	Ln(USDAScore) FE (3)	Ln(USDAScore) FE-IV (4)
Panel C				
Female head working hours (10 hours)	-0.007*** (0.001)	-0.045*** (0.008)		
Female head not working			0.020*** (0.002)	0.187*** (0.036)
Observations	176,014	176,014	176,014	176,014

Results

Table: Results for Labor Force Participation of Female Head on the Count of Grocery Trips

	Ln(Count of grocery trips)	Ln(Count of of grocery trips)	Ln(Count of of grocery trips)	Ln(Count of grocery trips)	Ln(Count of grocery trips)	Ln(Count of grocery trips)
	FE Full sample (1)	FE age55-74 (2)	FE-IV age55-74 (3)	FE Full sample (4)	FE age55-74 (5)	FE-IV age55-74 (6)
Female head working hours (10 hours)	-0.019*** (0.001)	-0.016*** (0.001)	-0.066*** (0.010)			
Female head not working				0.053*** (0.002)	0.039*** (0.003)	0.276*** (0.042)
Observations	422,342	176,014	176,014	422,342	176,014	176,014

Table: Results for Female Labor Force Participation on the Number of Days for Grocery Shopping

	Ln(Number of days for grocery shopping)	Ln(Number of days for grocery shopping)	Ln(Number of days for grocery shopping)	Ln(Number of days for grocery shopping)	Ln(Number of days for grocery shopping)	Ln(Number of days for grocery shopping)
	FE Full sample (1)	FE age55-74 (2)	FE-IV age55-74 (3)	FE Full sample (4)	FE age55-74 (5)	FE-IV age55-74 (6)
Female head working hours (10 hours)	-0.017*** (0.001)	-0.013*** (0.001)	-0.052*** (0.009)			
Female head not working				0.047*** (0.002)	0.031*** (0.002)	0.214*** (0.039)
Observations	422,342	176,014	176,014	422,342	176,014	176,014

Table: Results for Labor Force Participation of Female Head on the Frozen Food

	Ln(Expenditure share of frozen food)	Ln(Expenditure share of frozen food)	Ln(Expenditure share of frozen food)	Ln(Expenditure share of frozen food)	Ln(Expenditure share of frozen food)	Ln(Expenditure share of frozen food)
	FE Full sample (1)	FEIV age55-74 (2)	FE age55-74 (3)	FE Full sample (4)	FEIV age55-74 (5)	age55-74 (6)
Female head working hours (10 hours)	0.012*** (0.001)	0.013*** (0.001)	0.041** (0.018)			
Female head not working				-0.031*** (0.003)	-0.028*** (0.005)	-0.167** (0.074)
Observations	422,342	176,014	176,014	422,342	176,014	176,014

Results and Discussion

Results

- In the FE model, We find a 1%-1.3% improvement in the diet quality with a 10 hours reduction in female heads' working hours, while the improvement in diet quality is 2.3%-4.5% for the same working hours change in the FE-IV model.
- We find that the family with females working more hours significantly reduce their trips to grocery shopping and switch their purchases from fruits and vegetables to frozen and prepared food.

Future direction

- food at home and away from home
- good measures on diet quality and good empirical design

Table: First-Stage Results from FE-IV

	Female head working hours (10 hours) (1)	Female head not working (2)
eligibility of social security benefits indicator	-0.385*** (0.015)	0.0926*** (0.004)
Household controls	Y	Y
Household fixed effects	Y	Y
Year fixed effects	Y	Y
F Statistic	654.88	423.09
Observations	176,014	176,014
R_Square	0.11	0.09