



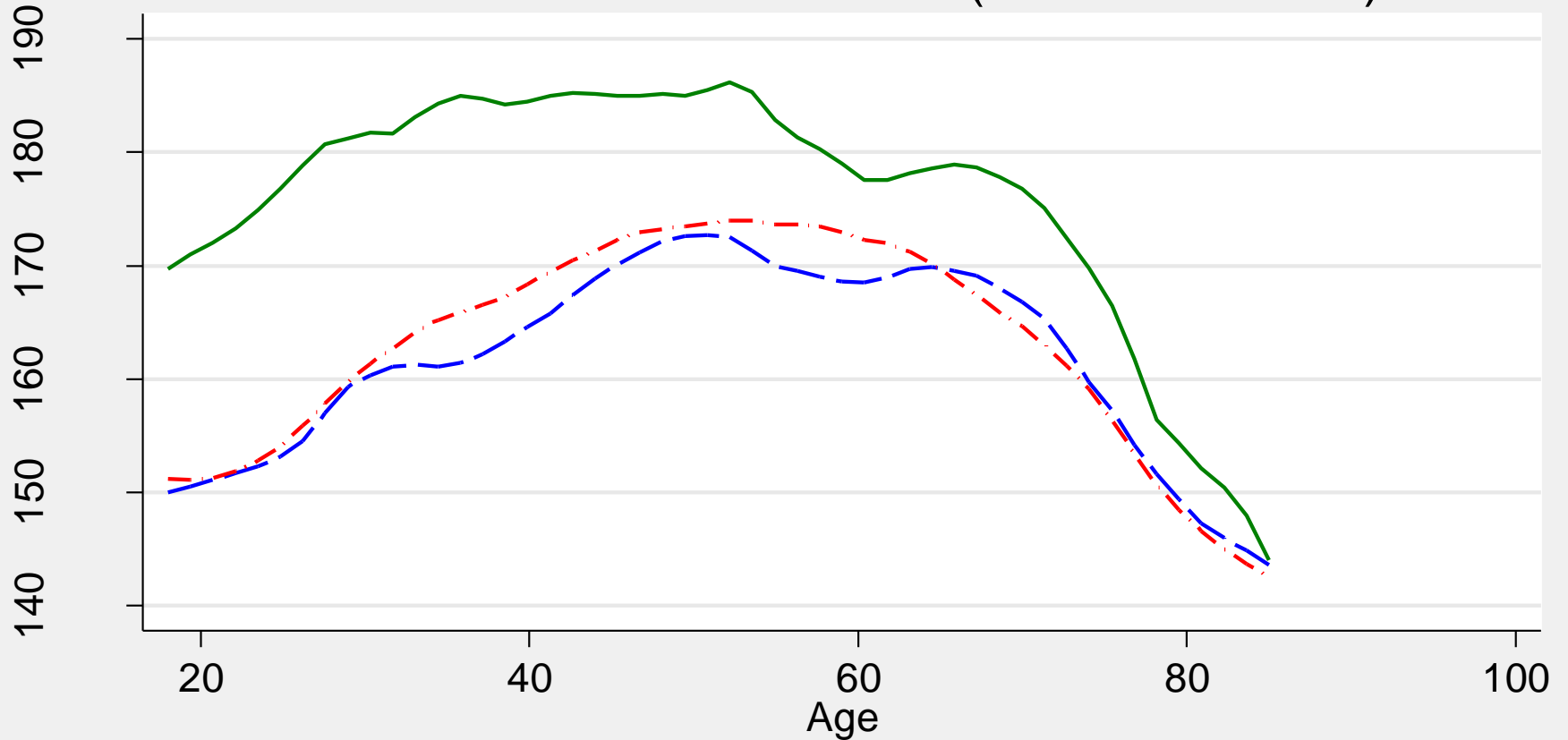
# The Effects of the Food Stamp Program on Energy Balance & Obesity

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# Weight and Age by FSP Status for all Women (NHANES03-06)



Local Polynomial Smooth Line:  
— FSP Participants    - - - Non-Participants  
- . - . - Non-Eligible

# BACKGROUND

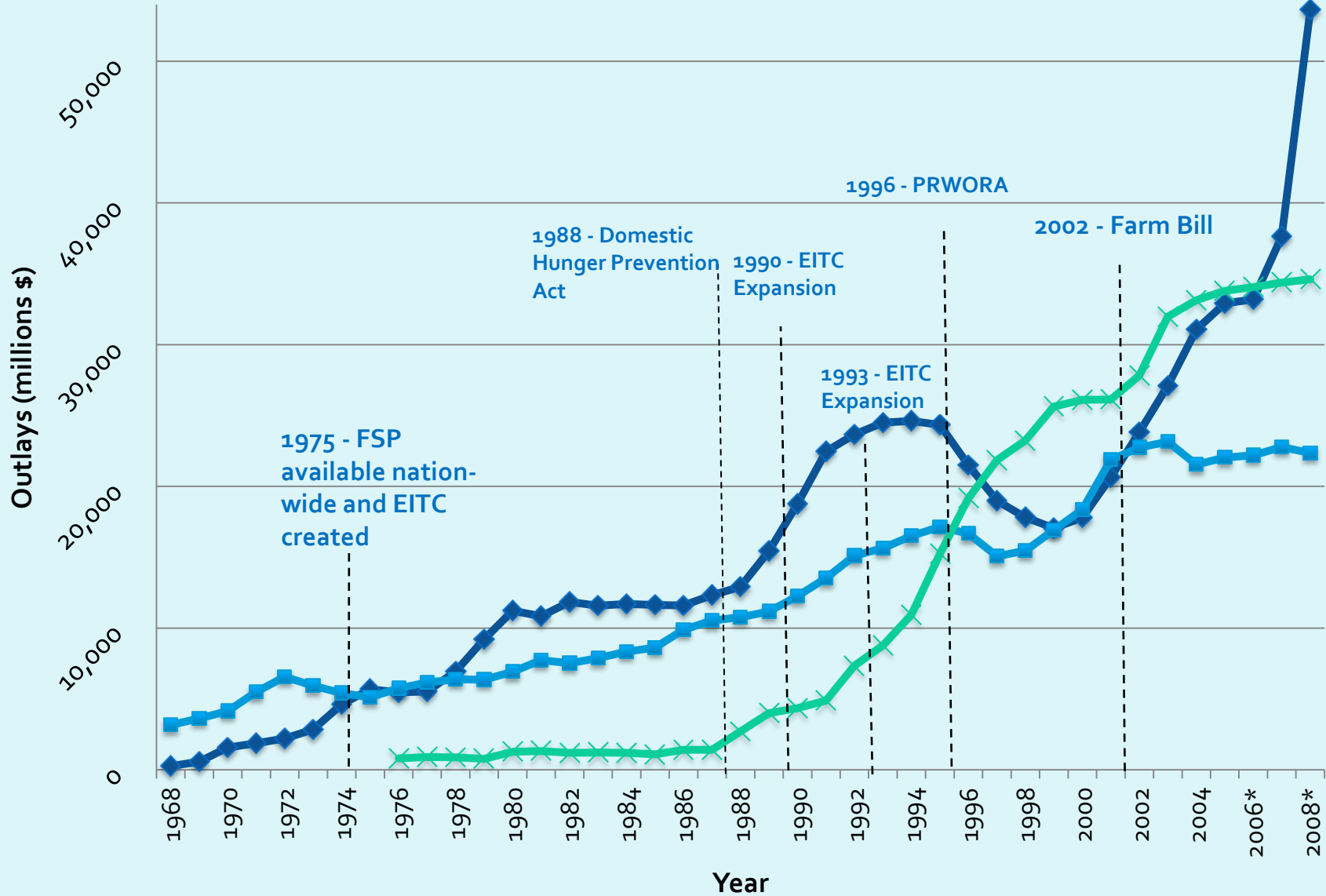
- Food Stamp Program (now SNAP) is an important safety net for low-income Americans.
  - In-kind transfer, \$ only for food.
  - Entitlement program.
  - 2010 monthly average participation = 13% of US population.
  - \$68.2 of \$92.7 billion spent on food assistance in 2010 distributed in FSP benefits.

SNAP = Supplemental Nutrition Assistance Program

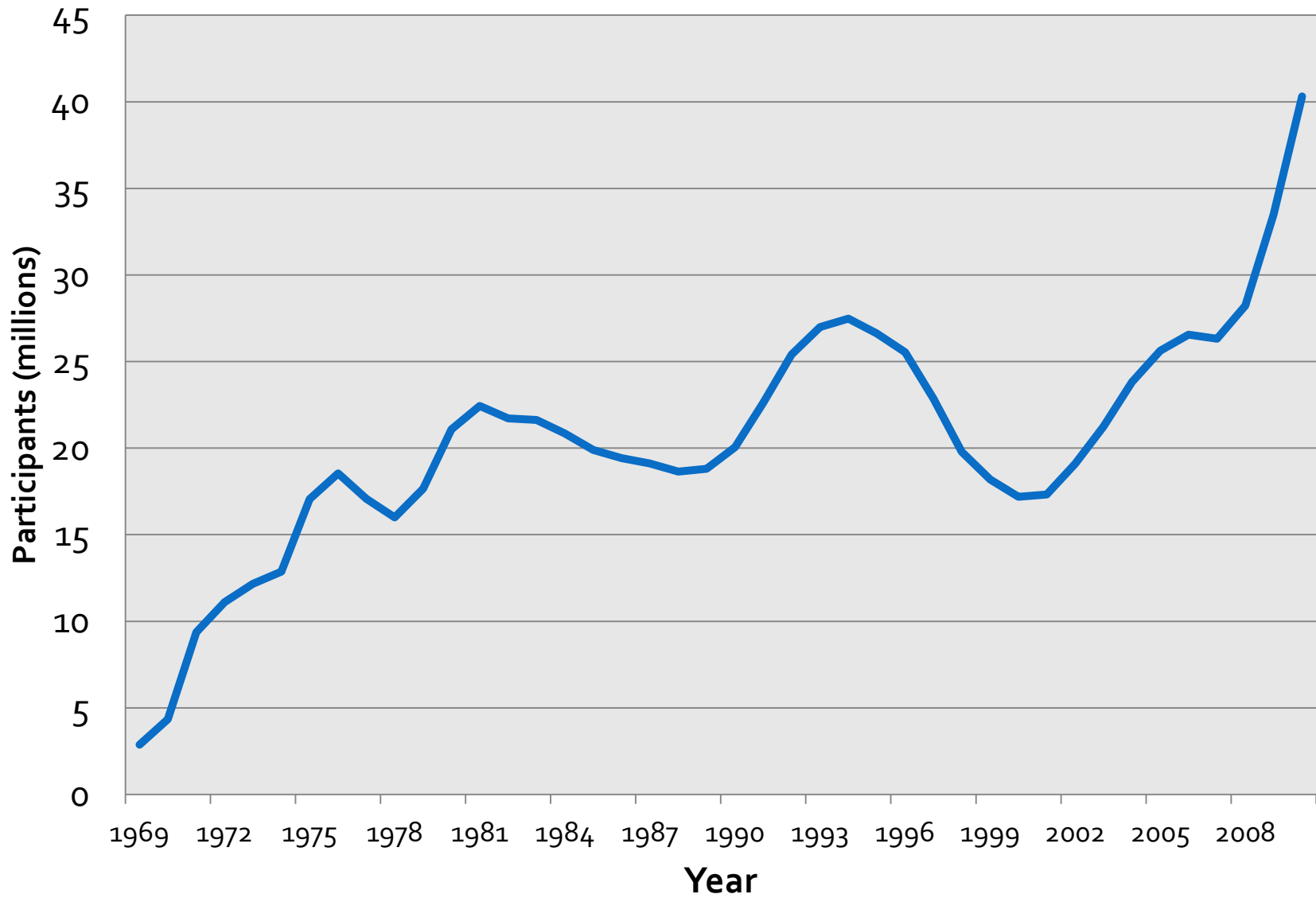
Source: <http://www.fns.usda.gov/pd/annual.htm>

# US Assistance Outlays by Type (1969-2009)

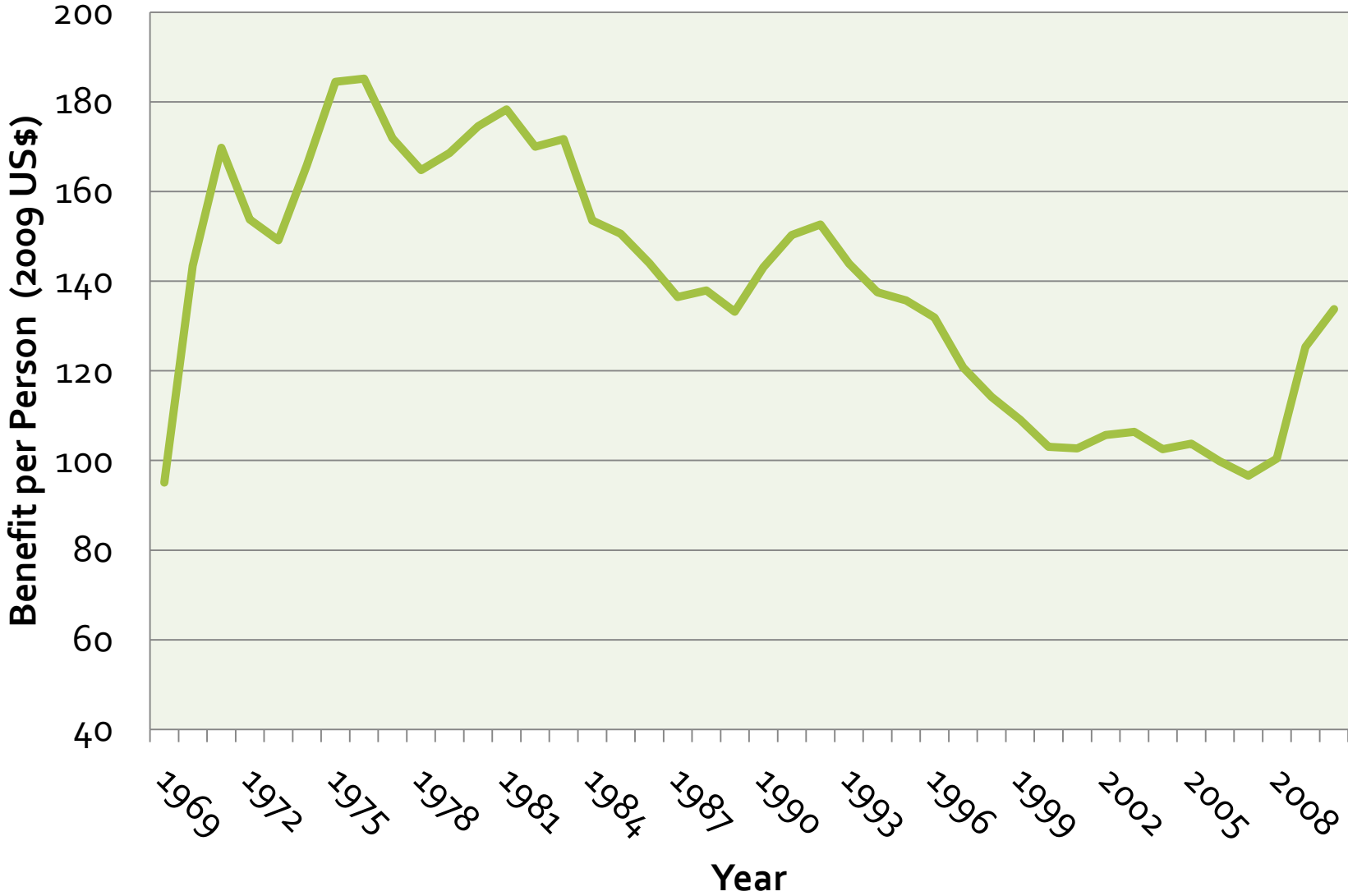
◆ Food Stamp Program    ■ Family Support and TANF    × Earned Income Tax Credit



# Food Stamp Program Average Monthly Participation



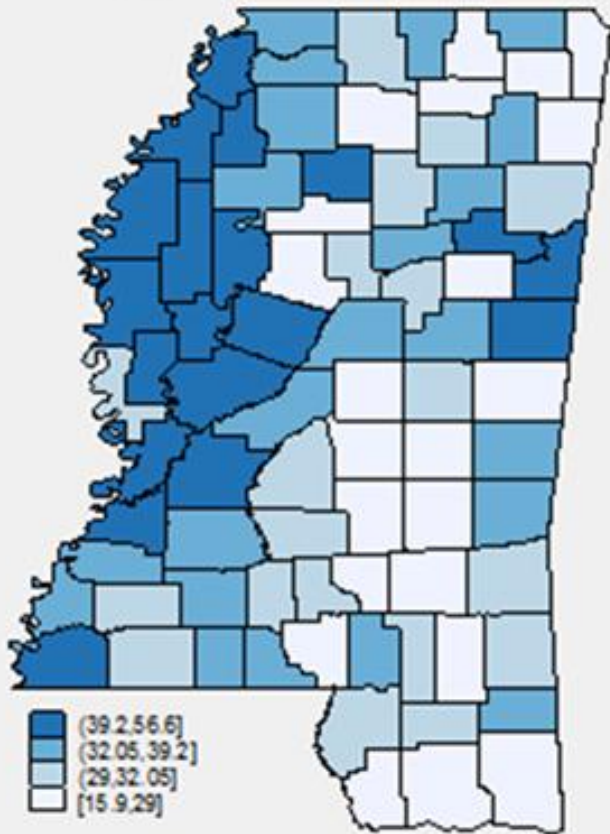
# Deflated Average Monthly Benefits per Person



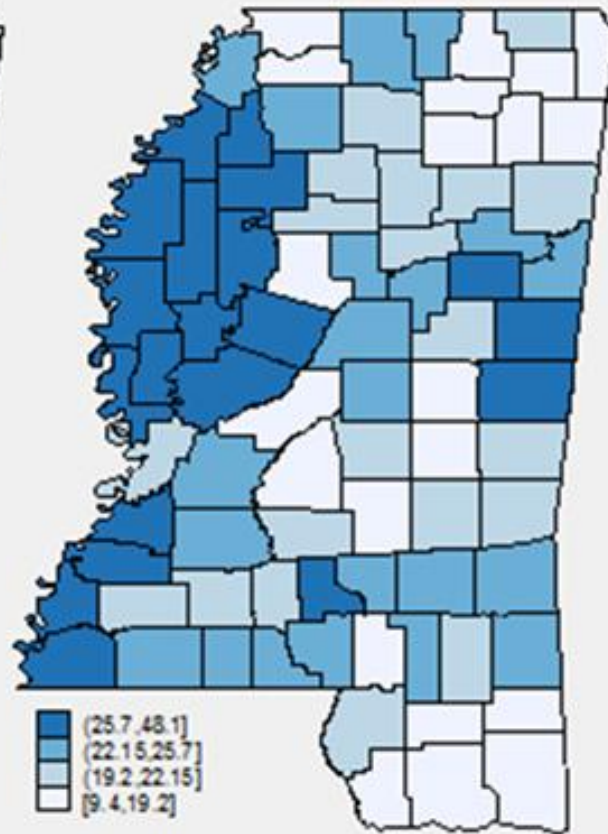
# MOTIVATION

- Obesity is a precursor to many health conditions and premature mortality.
  - Curbing obesity epidemic has become a national priority under the Obama administration.
- Policy analysis & program evaluation
  - Do food & nutrition programs improve health & nutrition?
  - Through which pathways?
- “Health-wealth gradient” & links between SES & health

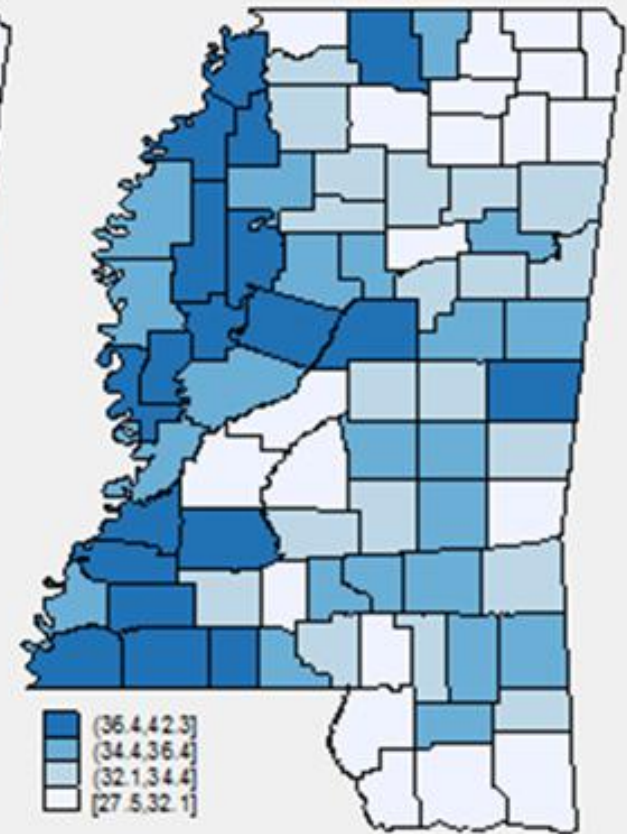
FSP Participation



Poverty



Obesity



Source: USDA Economic Research Service Food Environment Atlas

# PREVIOUS LITERATURE

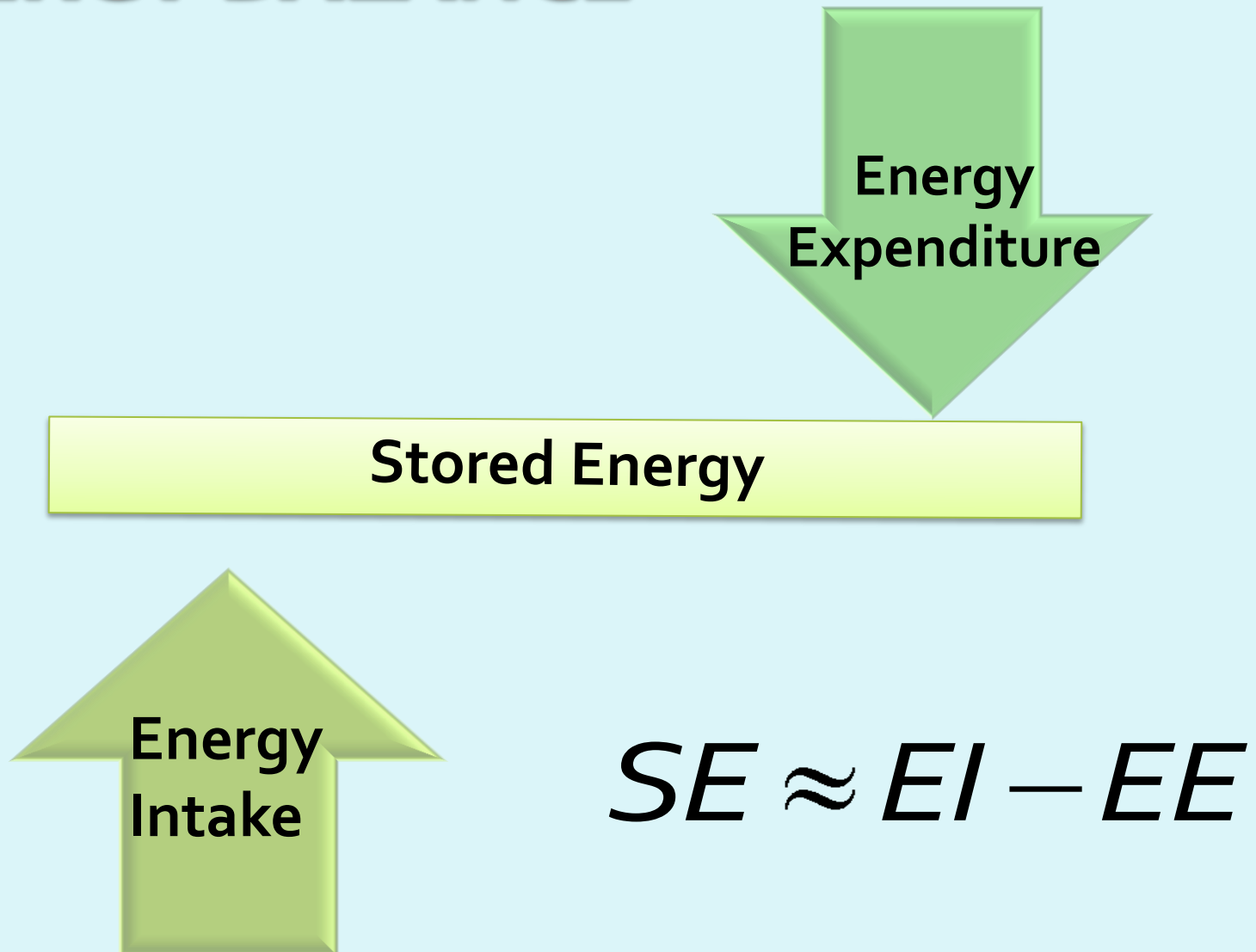
<i>Study:</i>	<i>Data</i>	<i>Weight &amp; Height</i>	<i>Results</i>
1. Gibson (2003)	NLSY79 1985-1996 waves	Self report	9.1% ↑ in Pr(BM $\geq$ 30) for women only
2. Chen, Yen & Eastwood (2005)	CSFII 1994-1996	Self report	3.6 unit ↑ in BMI for women
3. Meyerhoefer & Pylypchuk (2008)	MEPS 2000-2003	Self report	5.9% ↑ in Pr(BM $\geq$ 25) for women
4. Fan (2010)	NLSY79 1985-1994 waves	Self report	No effect on Pr(BM $\geq$ 30), Pr(BM $\geq$ 25), or BMI

Also: Baum (2007), Ver Ploeg et al. (2007), Ver Ploeg and Ralston(2008), and Alston et al. (2009).

# CONTRIBUTIONS

- New conceptual framework, model potential causal pathway and the relevant outcome.
- In model of weight change, control for health variables omitted from previous work.
- New data set with measured weight.

# ENERGY BALANCE



# RESEARCH QUESTIONS

1. Have FSP participants gained more weight than non-participants?

$$ES = \alpha_0 + \alpha_1 PA + \alpha_2 CS + \alpha_3 FSP + \alpha_4 Z + \varepsilon_{ES}$$

- ES = change in “energy stores”
- PA = vigorous physical activity
- CS = calorie surplus
- FSP = Food Stamp Program participation indicator or spell length
- Z = individual characteristics

# RESEARCH QUESTIONS

2. Do FSP participants consume more calories (energy) than non-participants?

$$CS = \delta_0 + \delta_1 BW^t + \delta_2 FSP + \delta_3 Z + \varepsilon_{EC}$$

- ES = change in “energy stores”
- PA = vigorous physical activity
- CS = calorie surplus
- FSP = Food Stamp Program participation indicator or spell length
- Z = individual characteristics

# RESEARCH QUESTIONS

3. Do FSP participants exercise less than non-participants?

$$PA = \beta_0 + \beta_1 BW^t + \beta_2 FSP + \beta_3 Z + \varepsilon_{EE}$$

- ES = change in “energy stores”
- PA = vigorous physical activity
- CS = calorie surplus
- FSP = Food Stamp Program participation indicator or spell length
- Z = individual characteristics

# RESEARCH QUESTIONS

4. What factors influence the decision to participate in the FSP?

$$FSP = \phi_0 + \phi_1 BW^t + \phi_2 Z + \varepsilon_{FSP}$$

- ES = change in “energy stores”
- PA = vigorous physical activity
- CS = calorie surplus
- FSP = Food Stamp Program participation indicator or spell length
- Z = individual characteristics

# DATA

- National Health and Nutrition Examination Survey (NHANES) 2003-2004 & 2005-2006
  - 19,593 individuals completed physical exam and questionnaire.
  - Restrict analysis to adult women  $\leq$  185 % poverty.
  - Detailed information on:
    - Personal and household characteristics
    - Anthropometric measurements
    - Weight history
    - Current health status
    - Lab results

# CONTROL VARIABLES

- Race, education, marital status (SES)
- Reproductive history
- Employment characteristics
- Health behaviors
- TV and computer time
- Social support & mental health

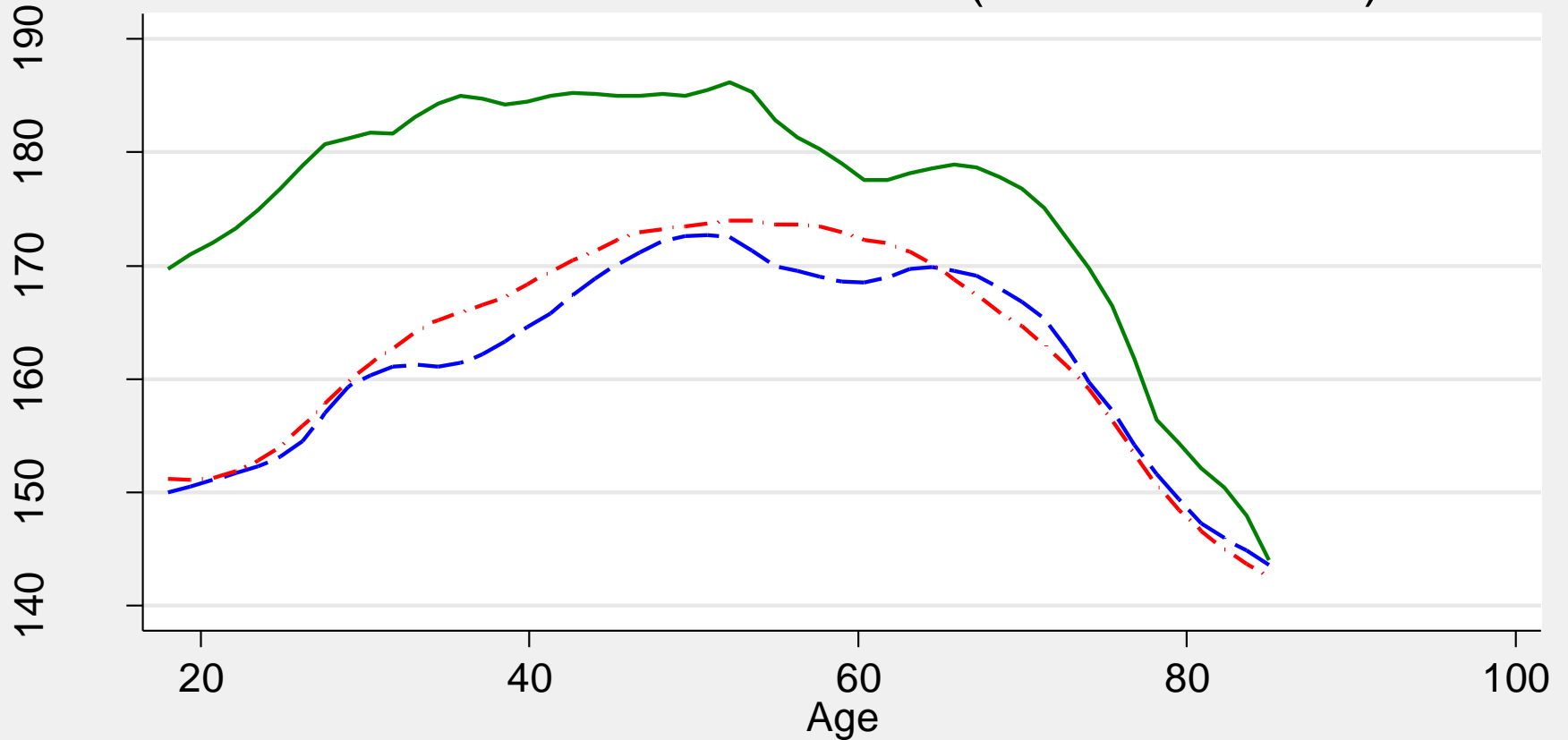
## Determinants of Weight Gain in 18-70 Year Old Women

	<i>Weight (lbs)</i>		<i>Change in Weight in Past Year (lbs)</i>		
	(1)	(2)	(3)	(4)	(5)
FSP Last Year	18.77** (2.972)	3.033 (1.749)	2.221 (1.670)	1.751 (1.784)	1.499 (1.796)
Physical activity			-2.418 (1.345)	-1.904 (1.325)	-1.586 (1.323)
Calorie surplus			0.00295* (0.00113)	0.00331* (0.00123)	0.00379** (0.00126)
Age			-0.125** (0.0455)	-0.111* (0.0536)	-0.130* (0.0540)
[Age - mean(Age)] <sup>2</sup>			0.00197 (0.00260)	0.00195 (0.00285)	0.00270 (0.00267)
Race & Births			X	X	X
SES characteristics				X	X
Health Behaviors & Conditions				X	X
Psychosocial characteristics				X	X
Constant	162.5** (2.042)	4.041** (0.656)	9.138** (2.256)	10.54** (3.506)	9.813** (3.492)
Observations	1368	1,368	1,368	1,368	1,368
R-squared	0.032	0.004	0.030	0.043	0.058

Standard errors in parentheses, \*\* p<0.01, \* p<0.05.

$$ES = \alpha_0 + \alpha_1 PA + \alpha_2 CS + \alpha_3 FSP + \alpha_4 Z + \varepsilon_{ES}$$

# Weight and Age by FSP Status for all Women (NHANES03-06)



Local Polynomial Smooth Line:  
— FSP Participants    - - - Non-Participants  
- . - . - Non-Eligible

## Determinants of Weight Gain in 25-40 Year Old Low-Income Women

	<i>Weight (lbs)</i>		<i>Change in Weight in Past Year (lbs)</i>		
	(1)	(2)	(3)	(4)	(5)
FSP Last Year	18.85** (5.627)	4.135 (2.668)	3.850 (2.896)	2.797 (3.265)	2.077 (3.520)
Physical Activity			-0.617 (3.217)	-1.115 (3.141)	-0.623 (3.162)
Calorie Surplus			0.00341 (0.00173)	0.00321 (0.00187)	0.00419* (0.00175)
Age			0.0155 (1.269)	0.191 (1.182)	-0.115 (0.922)
[Age - mean(Age)] <sup>2</sup>			0.0129 (0.0913)	0.0383 (0.0823)	0.0131 (0.0655)
Race & Births			X	X	X
SES characteristics				X	X
Health Behaviors & Conditions				X	X
Employment Characteristics				X	X
Psychosocial Characteristics					X
Constant	162.5** (3.755)	3.681** (1.170)	-0.0531 (47.16)	-2.617 (43.78)	5.976 (34.58)
Observations	332	332	332	332	332
R-squared	0.035	0.009	0.035	0.079	0.126

$$ES = \alpha_0 + \alpha_1 PA + \alpha_2 CS + \alpha_3 FSP + \alpha_4 Z + \varepsilon_{ES}$$

## Determinants of Weight Gain in 25-40 Year Old Women

	<i>Weight (lbs)</i>		<i>Change in Weight in Past Year (lbs)</i>		
	(1)	(2)	(3)	(4)	(5)
FSP spell length	1.134 (0.577)	0.406 (0.277)	0.369 (0.318)	0.248 (0.389)	0.171 (0.412)
Physical activity			-0.506 (3.261)	-0.977 (3.168)	-0.522 (3.185)
Calorie surplus			0.00328 (0.00173)	0.00312 (0.00185)	0.00413* (0.00174)
Age			-0.0691 (1.261)	0.114 (1.171)	-0.180 (0.913)
[Age - mean(Age)] <sup>2</sup>			0.00748 (0.0897)	0.0338 (0.0810)	0.00922 (0.0646)
Race & Births			X	X	X
SES characteristics				X	X
Health Behaviors and Conditions				X	X
Employment Characteristics				X	X
Psychosocial Characteristics					X
Constant	166.1** (3.471)	4.013** (1.226)	3.261 (46.59)	0.213 (42.54)	8.469 (33.71)
Observations	332	332	332	332	332
R-squared	0.012	0.008	0.035	0.078	0.126

$$ES = \alpha_0 + \alpha_1 PA + \alpha_2 CS + \alpha_3 FSP + \alpha_4 Z + \varepsilon_{ES}$$

## Physical Activity, Calorie Surplus, and FSP Participation

	<i>Vigorous Physical Activity</i>			<i>Calorie Surplus</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
FSP Last Year	-0.05 (0.061)	-0.05 (0.071)	0.02 (0.072)	-49.16 (99.60)	69.32 (94.89)	32.64 (100.8)
Weight		0.00 (0.001)	0.00 (0.001)		-7.713** (0.962)	-7.591** (1.025)
Race & Age		X	X		X	X
Other controls			X			X
Constant	0.276** (0.0401)	-0.999 (1.011)	-1.135 (0.921)	307.6** (65.75)	960.5 (1,352)	304.7 (1,305)
Observations	332	332	332	332	332	332
R-squared	0.003	0.029	0.169	0.001	0.207	0.277

$$PA = \beta_0 + \beta_1 BW^t + \beta_2 FSP + \beta_3 Z + \varepsilon_{EE}$$

$$CS = \delta_0 + \delta_1 BW^t + \delta_2 FSP + \delta_3 Z + \varepsilon_{EC}$$

# FSP Participation Determinants

	(1)	(2)	(3)	(4)	(5)
Weight (lbs)	0.00385** (0.000953)	0.00297** (0.000976)	0.00425* (0.00156)	0.00700** (0.00204)	0.00776** (0.00179)
Weight 1 year ago			-0.00252 (0.00202)	-0.00294 (0.00198)	-0.00222 (0.00208)
Income to Poverty Ratio*Weight				-0.00267 (0.00191)	-0.00387* (0.00166)
Race & Age		X	X	X	X
Births			X	X	X
SES characteristics			X	X	X
Health Behaviors & Conditions			X	X	X
Employment Characteristics			X	X	X
Psychosocial Characteristics				X	X
Non-homeowner					X
Constant	-0.239 (0.185)	-1.460 (2.630)	-2.320 (2.704)	-3.472 (2.764)	-2.072 (2.950)
Observations	129	129	129	129	129
R-squared	0.120	0.199	0.512	0.544	0.589

Standard errors in parentheses, \*\* p<0.01, \* p<0.05.

$$FSP = \phi_0 + \phi_1 BW^t + \phi_2 Z + \varepsilon_{FSP}$$

# CONCLUSION

- Positive association between FSP & weight exists, but we cannot infer a causal relationship from participation to weight gain.
- Magnitude of weight gain implied by change in calorie surplus and physical activity does not match observed weight gain.
- Possibly omitted variables correlated with both weight and FSP participation.

# EXTENSIONS

- Restricted-use NHANES variables:
  - State and county of residence
- State and county level measures of:
  - Social rank or identity
  - FSP Program generosity
- Control for omitted variables linked to obesity and program participation.
- Simultaneous equations framework.

# THANK YOU

*"My doctor told me to stop having intimate dinners for four. Unless there are three other people."*

-Orson Welles

*"Be careful about reading health books. You may die of a misprint."*

- Mark Twain