

The Impact of Long Term Participation in the Supplemental Nutrition Assistance Program on Family Obesity

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Motivation

- Rapid increase in obesity over past 30 years
- Obesity is most prevalent among low-income individuals
- One suggested cause is participation in the Supplemental Nutrition Assistance Program (SNAP; formerly the Food Stamps Program)
- SNAP participation has increased substantially due to recession, and benefits were increased as part of stimulus package with potential implications for obesity rates

Research Question

- Does participation in the SNAP program increase obesity?
- Examine effect on both children ages 5 to 18 and adults
- Focus on participation in SNAP over past 5 years since obesity is a stock measure which takes time to adjust to changes in behavior
- Use a 2SLS strategy based on expansion of EITC to identify causal effect of SNAP participation on child obesity

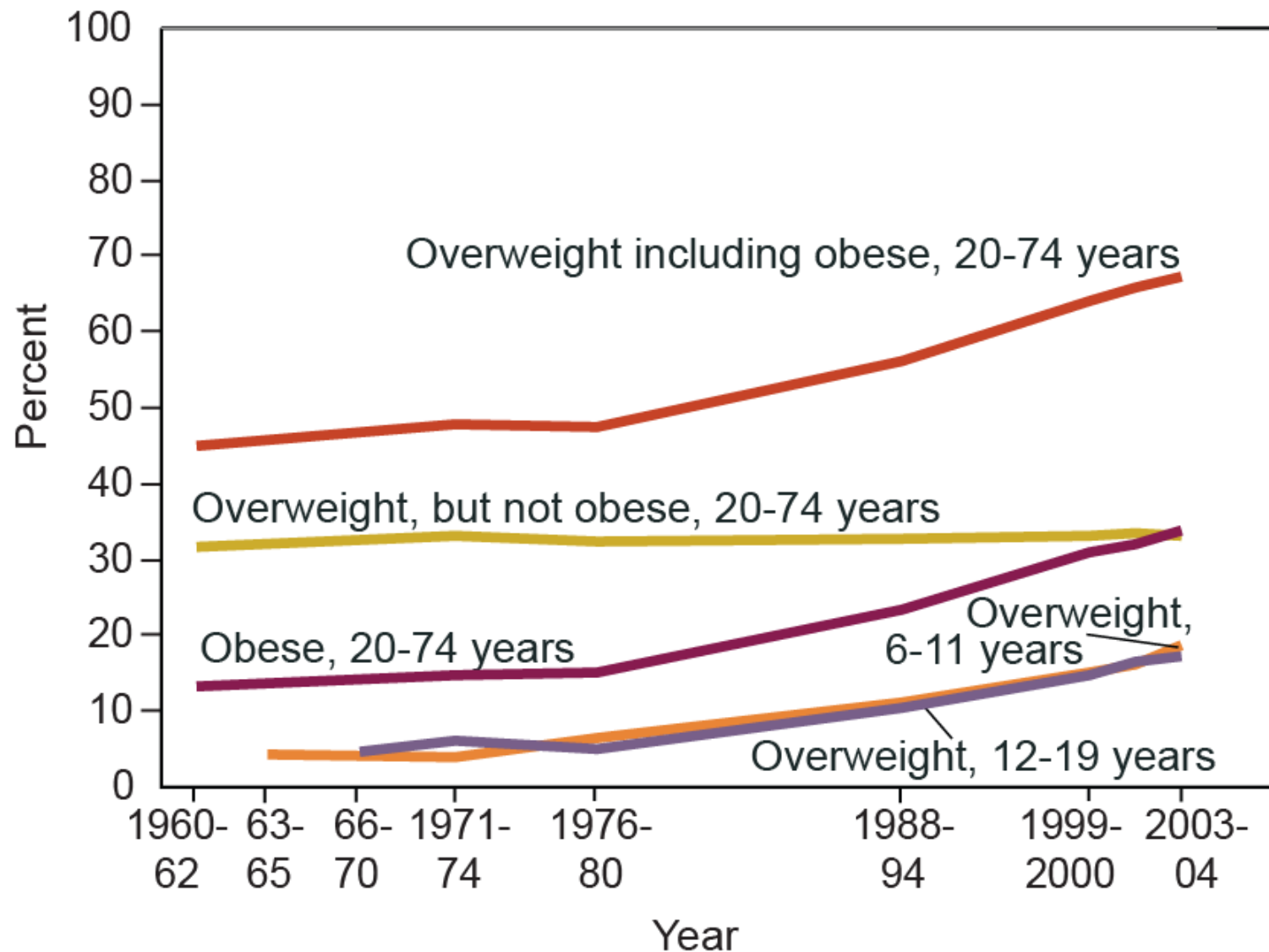
Obesity Definitions

- BMI: Body Mass Index
 - Formula: $\text{weight (kg)} / [\text{height (m)}]^2$
 - Formula: $\text{weight (lb)} / [\text{height (in)}]^2 \times 703$
- Clinical Weight Classifications for adults
 - Obese: $\text{BMI} \geq 30$
 - Overweight: $\text{BMI} \geq 25$
 - Healthy Weight: $18.5 \leq \text{BMI} < 25$
 - Underweight: $\text{BMI} < 18.5$

Obesity Definitions

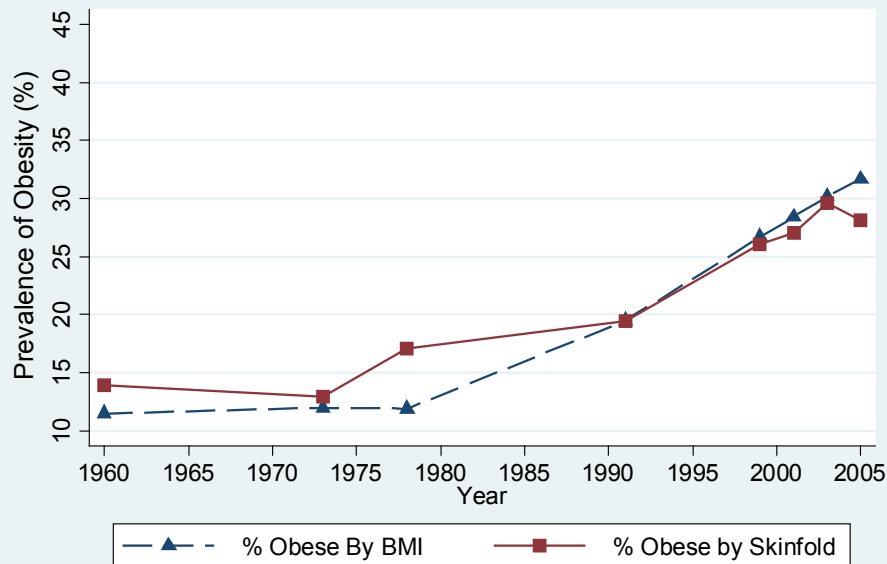
- Clinical Weight Classifications for children (ages 2-19)
 - Obese: BMI \geq 95th percentile of 2000 CDC growth chart for age and sex
 - Overweight: BMI \geq 85th percentile
 - Healthy Weight: 5th \leq BMI $<$ 85th percentile
 - Underweight: BMI $<$ 5th percentile

Overweight and obesity

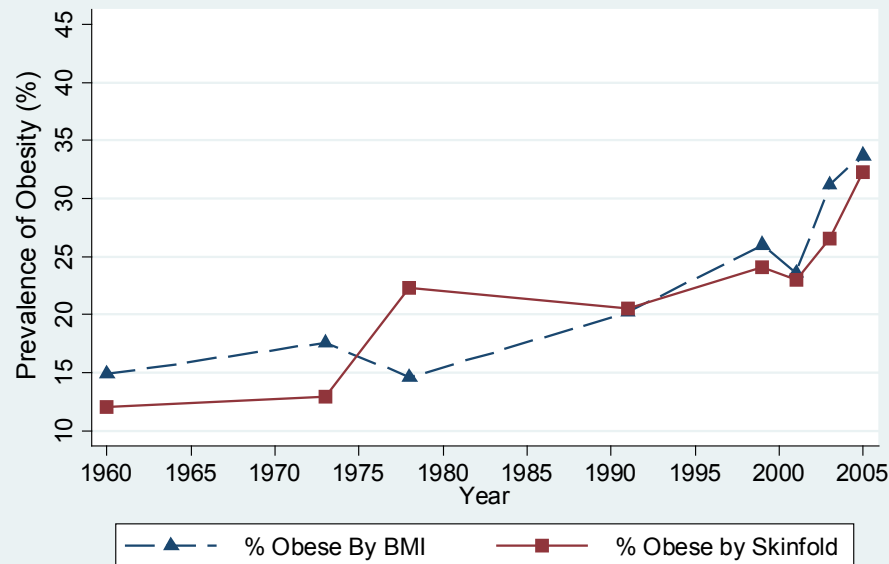


SOURCES: Centers for Disease Control and Prevention, National Center for Health Statistics, *Health, United States, 2006*, Figure 13. Data from the National Health and Nutrition Examination Survey.

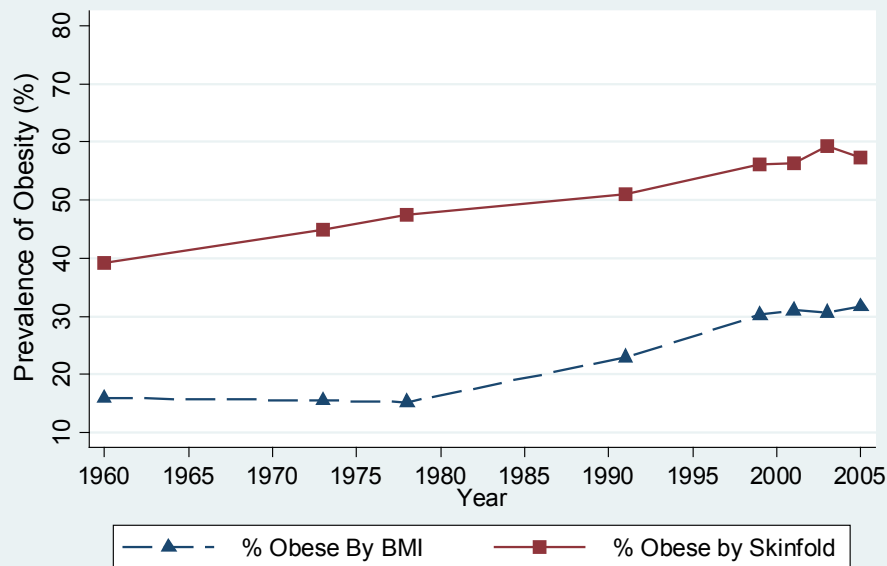
White Males



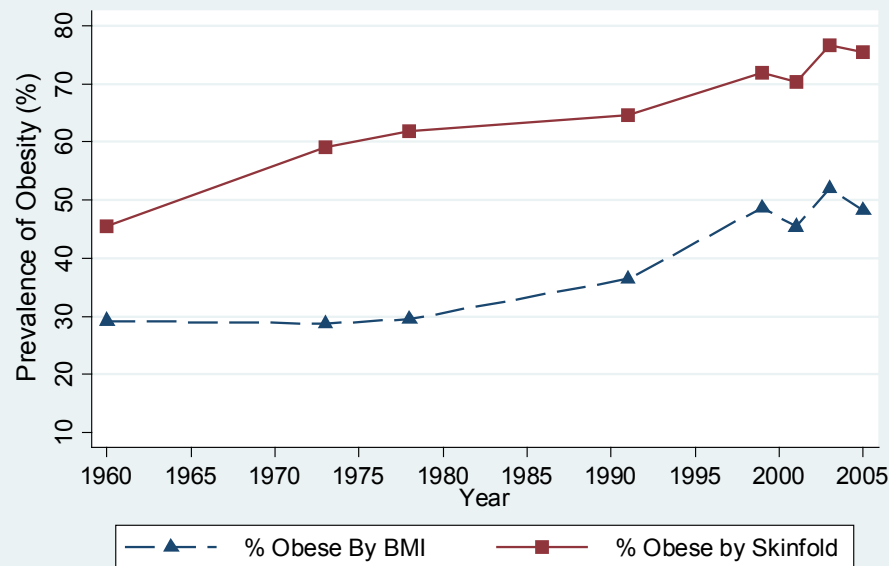
Black Males



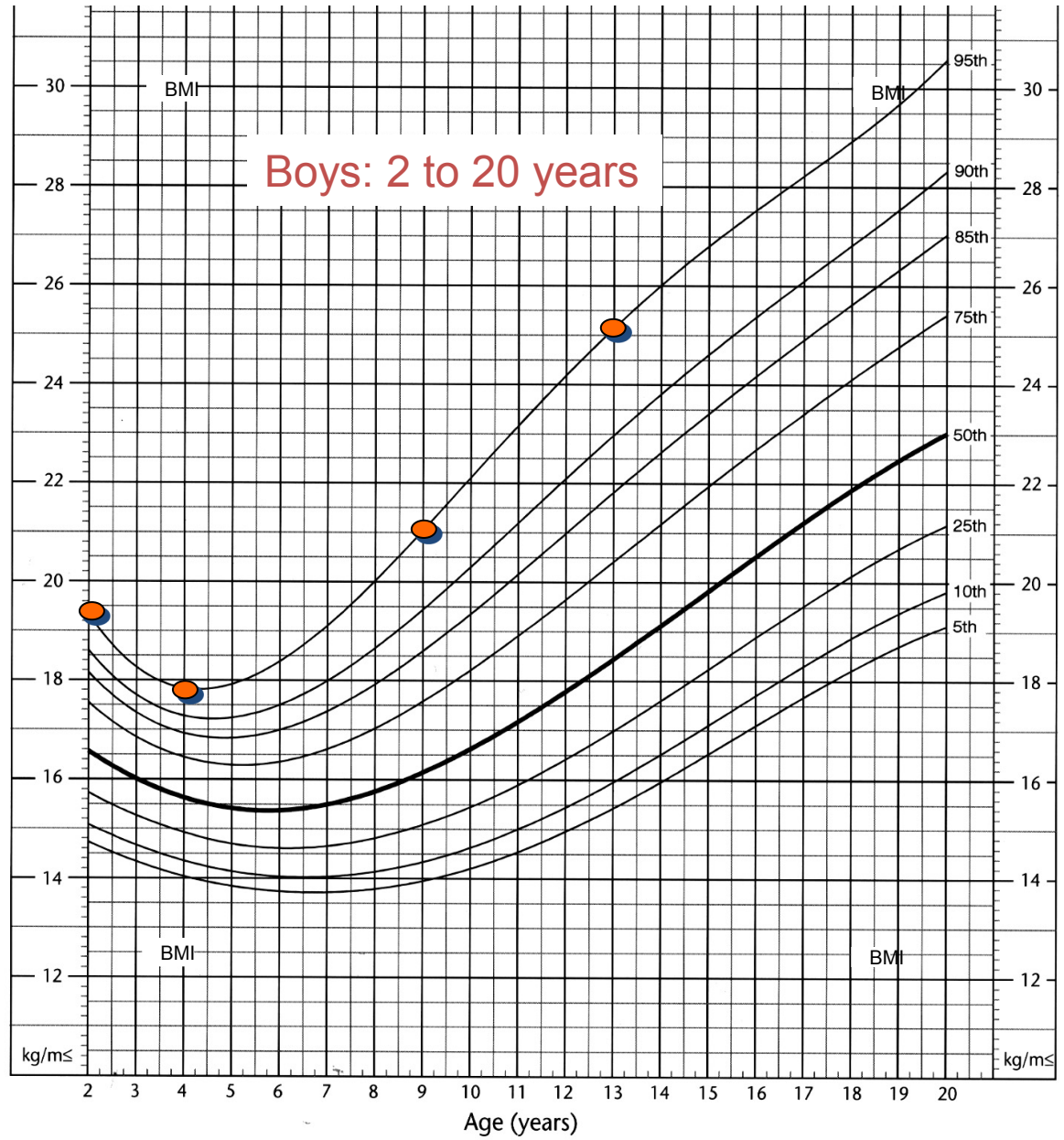
White Females



Black Females

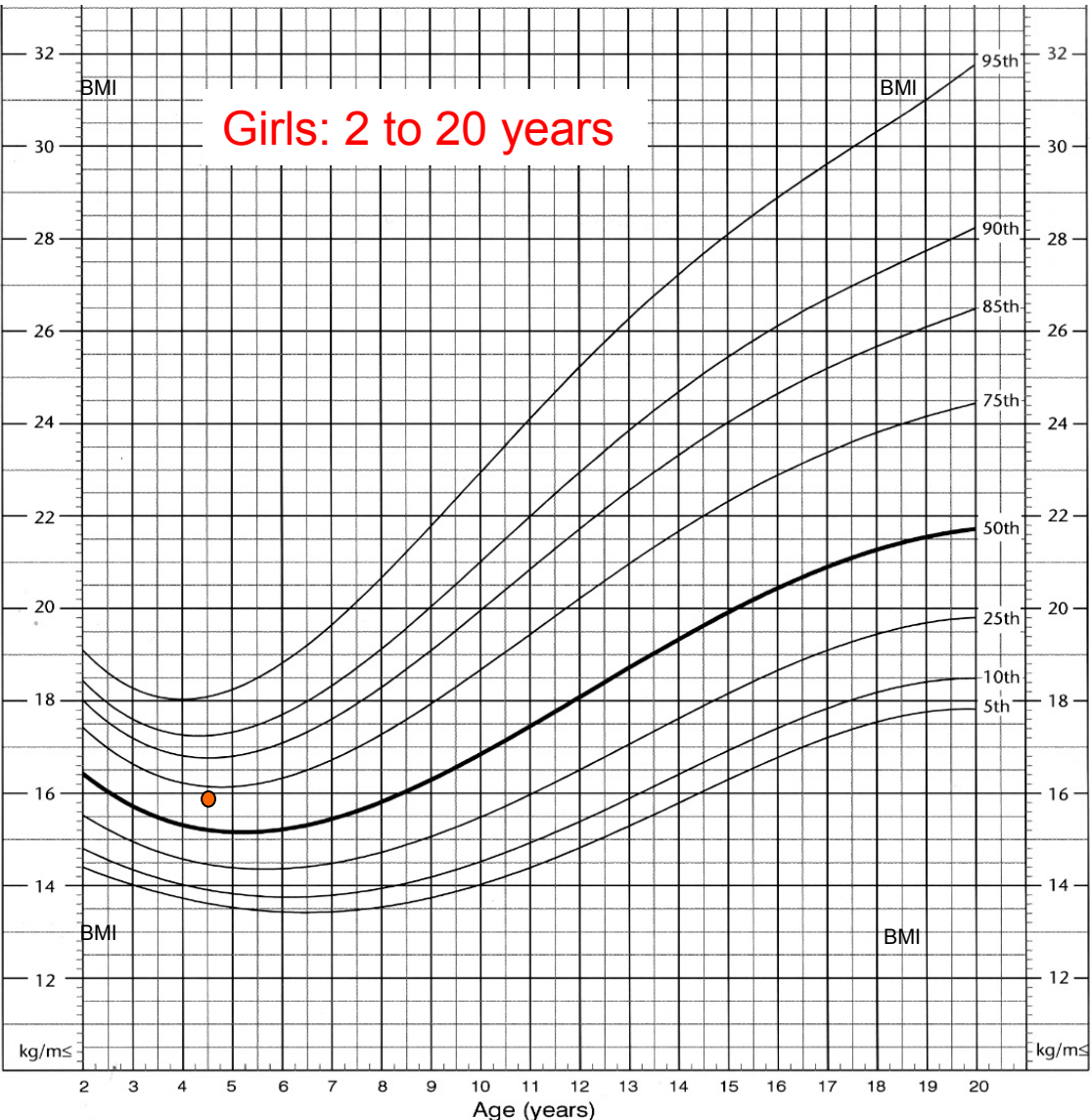


For Children, Obesity Cut-off Changes with Age



Age	BMI
2 yrs	19.3
4 yrs	17.8
9 yrs	21.0
13 yrs	25.1

For Children, Obesity Cut-off Changes with Age



Why Worry About Obesity?

- In adults, obesity has been linked to an increased risk of morbidity and mortality
 - Obesity associated with high blood pressure, high blood cholesterol, type II diabetes mellitus, coronary heart disease, osteoarthritis, etc. (Must et al., 1999; Mokdad et al., 2003)
 - Significantly increases risk of mortality (Calle et al., 1999) and is a leading cause of preventable death (Mokdad et al., 2005)

Why Worry About Obesity?

- For children, obesity has been associated with type II diabetes mellitus, hyperlipidemia, atherosclerosis, hypertension, depression, nonalcoholic fatty liver disease, and obstructive sleep apnea (Daniels, 2006; Dietz, 1998; Krebs and Jacobson, 2003)
- Obesity has negative effects on child development and educational attainment (Cawley, 2004; Cawley and Spiess, 2008)
- Negative effects persist into adulthood

Fatness and Public Policy

- Obese persons have higher annual medical expenditures than healthy weight persons (Finkelstein et al., 2009; Finkelstein et al., 2003; Sturm, 2002)
 - ~42% or \$1,429/year (2006)
- Treating obesity attributable illnesses costs \$147 billion (2008 \$) per year in the U.S., or 9.1% of total health expenditures (Finkelstein et al., 2009)
 - Half paid by Medicaid/Medicare
- The increased prevalence of obesity is responsible for more than 25% of the excess growth in health care costs over inflation (Finkelstein et al., 2009; Thorpe et al., 2004)

Background on SNAP

- In June 2009, the SNAP program served 35.1 million low-income persons, providing total benefits worth \$4.675 billion
 - Increase in participation of 22% in past year
- Provides average benefits of \$133/person or \$295/family for the purchase of unprepared food to individuals with gross monthly income below 130 percent of the poverty line
 - Stimulus Package increased the maximum monthly food-stamp benefit by 13.6%

SNAP and Obesity

- Food Stamps Program renamed Supplemental Nutrition Assistance Program on Oct 1, 2008
 - Name change is meant to “focus on nutrition and putting healthy food within reach for low income households”
 - “SNAP helps low-income people and families buy the food they need for good health”
- Previous research has suggested that SNAP participation increases obesity (Baum, 2007; Gibson, 2003, 2006; Meyerhoefer and Pylypchuk, 2008; Zagorsky and Smith, 2009)
- Public perception that SNAP causes obesity (Besharov, 2002; 2003)

SNAP and Obesity

- If SNAP participation increases obesity then program expansions could have serious negative health consequences
 - Since SNAP participants are disproportionately on Medicaid/SCHIP this could result in additional costs to the government beyond the cost of SNAP benefits
- Alternatively, if SNAP participation decreased obesity program expansion could be an effective public health intervention
 - Costs may be offset by reduction in Medicaid/SCHIP spending

SNAP and Obesity

- How can SNAP affect obesity?
- Increase Obesity:
- A dollar of SNAP benefits increases the consumption of food by more than does a dollar of unrestricted cash benefits (Fox et al., 2004)
- Approximately a quarter of SNAP recipients would spend less than their SNAP allocation on food were the benefits provided as cash (Whitmore, 2002)
- The monthly lump sum distribution of SNAP could also contribute to obesity if it results in binge eating (Townsend et al., 2001; Shapiro, 2003)

SNAP and Obesity

- Decrease Obesity:
- Improve nutrition by increasing family's food budget allowing the purchase of more expensive fruits and vegetables and less processed food
- Encourage eating food at home rather than food at restaurants or fast food outlets
- Reduce food insecurity, which has been associated with obesity (Casey et al., 2006)

SNAP and Obesity

- Previous research has consistently found SNAP participation to be associated with an increase in obesity for adult women (Townsend et al., 2001; Gibson, 2003, 2006; Chen et al., 2005; Baum, 2007) and female children (Gibson, 2004, 2006), but a decrease in obesity for male children (Gibson, 2004)

SNAP and Obesity

- Previous estimates suggest that a year of SNAP participation increases probability of obesity for:
 - Single women by between 5 and 10 percent
 - Girls ages 5 to 11 by 1.2 percentage points (8.3%)
- Decreases probability of obesity for boys ages 5 to 11 by 1 percentage point (5.7%)
- However, no previous study has effectively addressed the endogeneity between SNAP participation and obesity

Endogeneity of SNAP Participation

- Since participation in SNAP is optional it is possible that differences in BMI/obesity rates between participants and non-participants are driven by unobserved differences rather than SNAP participation itself (i.e. enjoy food)
- Even examining the same participants over time, participation in the program may be driven by changes that also affect weight (i.e. food insecurity)
- Therefore need exogenous source of variation in participation to identify true effect

Data

- National Longitudinal Survey of Youth 1979 cohort (NLSY79) and Children and Young Adults of NLSY79
 - NLSY79 Nationally representative sample of individuals who were between the ages of 14 and 21 on December 31, 1978
 - CYA of NLSY79 are data on all children born to women of the NLSY79 collected biannually since 1986
 - Contains detailed demographic and economic data
 - Use 1986 through 2006 waves

Data

- Restrict to Earned Income Tax Credit eligible families
- Drop pregnant women/girls
- Estimate models separately for women and men/girls and boys due to different physiology
- Estimate models separately for children ages 5 to 11 and 12 to 18 due to impact of puberty on weight and relative own dietary control of older children vs younger children

Summary Stats for Children

Table 1. Descriptive Statistics

Variable	Ages 5 to 11		Ages 12 to 18	
	Boys	Girls	Boys	Girls
Obese	0.1627 (0.3692)	0.1716 (0.3771)	0.1685 (0.3744)	0.1713 (0.3769)
Overweight	0.2984 (0.4576)	0.3235 (0.4679)	0.3224 (0.4675)	0.3733 (0.4838)
Body Mass Index (BMI)	17.5713 (4.1380)	17.871 (4.3532)	21.2273 (4.8774)	22.2255 (5.1586)
5 Year Food Stamps Exposure (Years)	1.874 (2.0327)	1.8616 (2.0164)	1.7548 (1.9955)	1.7322 (2.0170)
Indicator for Self-Reported Weight and/or Height	0.2519 (0.4342)	0.2588 (0.4380)	0.4224 (0.4940)	0.459 (0.4984)
Observations	5113	4832	4931	4670

Weighted means with standard deviations in parentheses.

Summary Stats for Adults

Table 1. Descriptive Statistics

Variable	Males	Females
Obese	0.1815 (0.3854)	0.2237 (0.4167)
Overweight	0.5696 (0.4951)	0.4622 (0.4986)
Body Mass Index (BMI)	26.3768 (4.6213)	25.9943 (6.1229)
5 Year Food Stamps Exposure (Years)	0.3572 (0.9554)	0.6928 (1.3900)
Observations	15907	16777

Weighted means with standard deviations in parentheses.

Identification

- As discussed above, SNAP participation is potentially endogenous to BMI and obesity status, which would make simple estimates of its effect on obesity biased
- However, if we can find a source of variation in SNAP participation unrelated to weight we could obtain unbiased estimates
- Since SNAP eligibility is determined by income, the changes in income caused by the labor supply response to changes in the parameters of state and federal Earned Income Tax Credit programs may be one such source of variation

Identification

- The EITC has previously been used as an instrument to examine the effect of income on obesity (Schmeiser, 2009) and the effect of family income on child development (Dahl and Lochner, 2008)
- 2SLS has been used to estimate the effect of SNAP participation on obesity for immigrants using changes in immigrant eligibility rules (Kaushal, 2007)

Background on EITC

- EITC is the largest anti-poverty program in the U.S. for the non-elderly
 - Federal expenditures in excess of \$48.5 billion and over 24.5 million recipients in tax year 2007 (CBPP, 2009)
- Administered through the tax system (IRS)
- EITC is refundable: even those without tax owing can receive the credit
- Can elect to receive the credit on each paycheck or at tax time (most chose tax time)

Background on EITC

- EITC Functions as a wage supplement for those who have labor earnings income
- Large body of research showing changes in EITC benefits affect labor supply and therefore income (Eissa & Hoynes, 2004; Eissa & Liebman, 1996; Keane & Moffitt, 1998; Meyer & Rosenbaum, 2001)

Maximum Value of Federal EITC Benefit

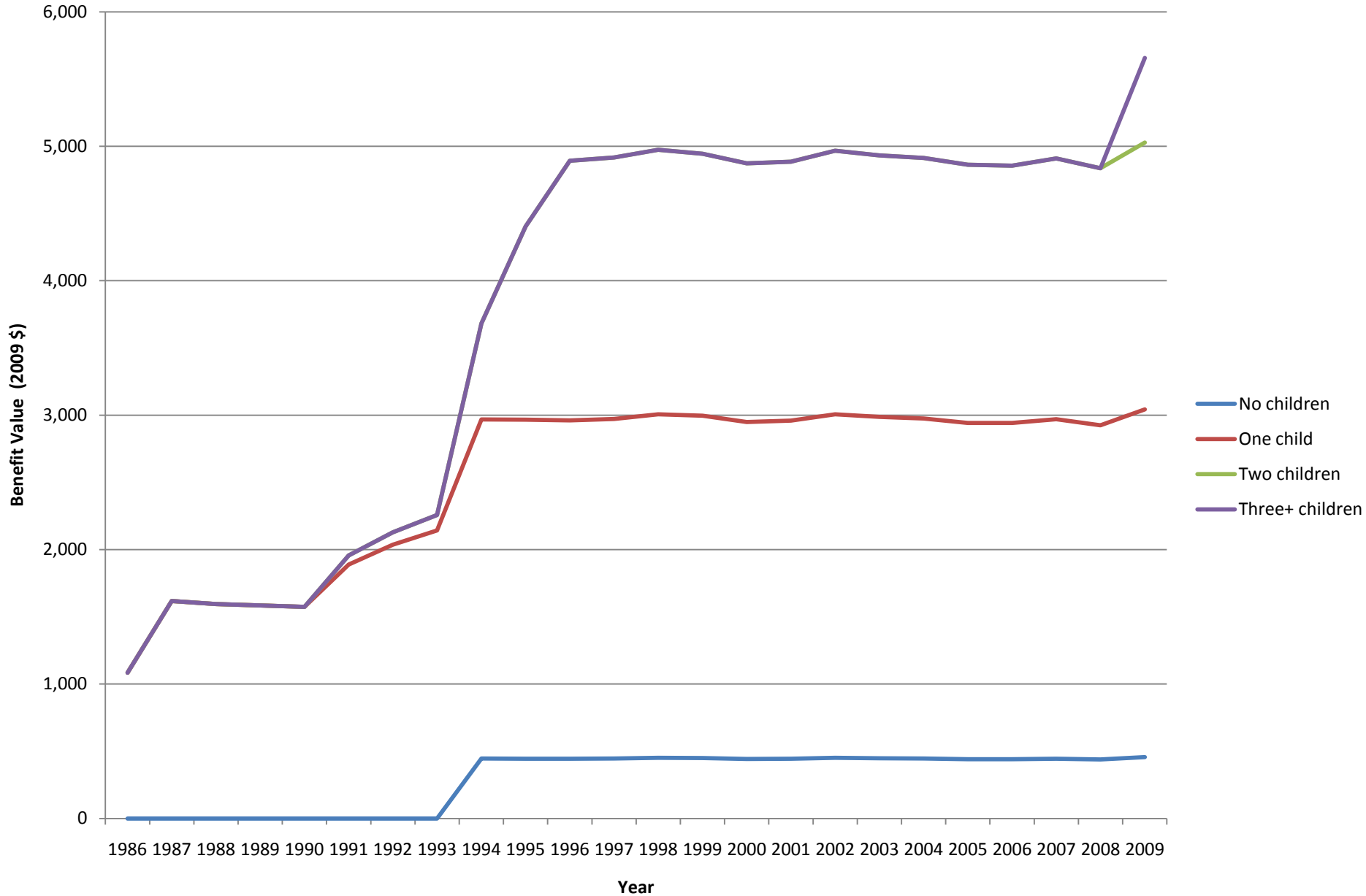


Table 2: State EITC supplements 1984-2002 (%)

State:	CO	DC	IL	IA	KS	ME	MD	MA	MN	MN	NJ	NY	OK	OR	RI	VT	WI	WI	WI
# of children:							1+		0	1+		1+					1	2	3+
1984																	30	30	30
1985																	30	30	30
1986															22.21				
1987															23.46				
1988															22.96	23			
1989															22.96	25	5	25	75
1990				5											22.96	28	5	25	75
1991				6.5					10	10					27.5	28	5	25	75
1992				6.5					10	10					27.5	28	5	25	75
1993				6.5					15	15					27.5	28	5	25	75
1994				6.5					15	15	7.5				27.5	25	4.4	20.8	62.5
1995				6.5					15	15	10				27.5	25	4	16	50
1996				6.5					15	15	20				27.5	25	4	14	43
1997				6.5				10	15	15	20		5	27.5	25	4	14	43	
1998				6.5	10		10	10	15	25	20		5	27	25	4	14	43	
1999	8.5			6.5	10		10	10	25	25	20		5	26.5	25	4	14	43	
2000	10	10	5	6.5	10	5	15	10	25	25	10	22.5		5	26	32	4	14	43
2001	10	25	5	6.5	10	5	16	15	33	33	15	25		5	25.5	32	4	14	43
2002	0	25	5	6.5	15	5	16	15	33	33	17.5	27.5	5	5	25	32	4	14	43
Refundable?	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y

State EITCs

- Function as a supplement to federal EITC
- For example:
 - Federal benefit of \$4000
 - In WI if you have 2 children your supplement rate is 14%
 - WI EITC is then $\$4000 * .14 = \560

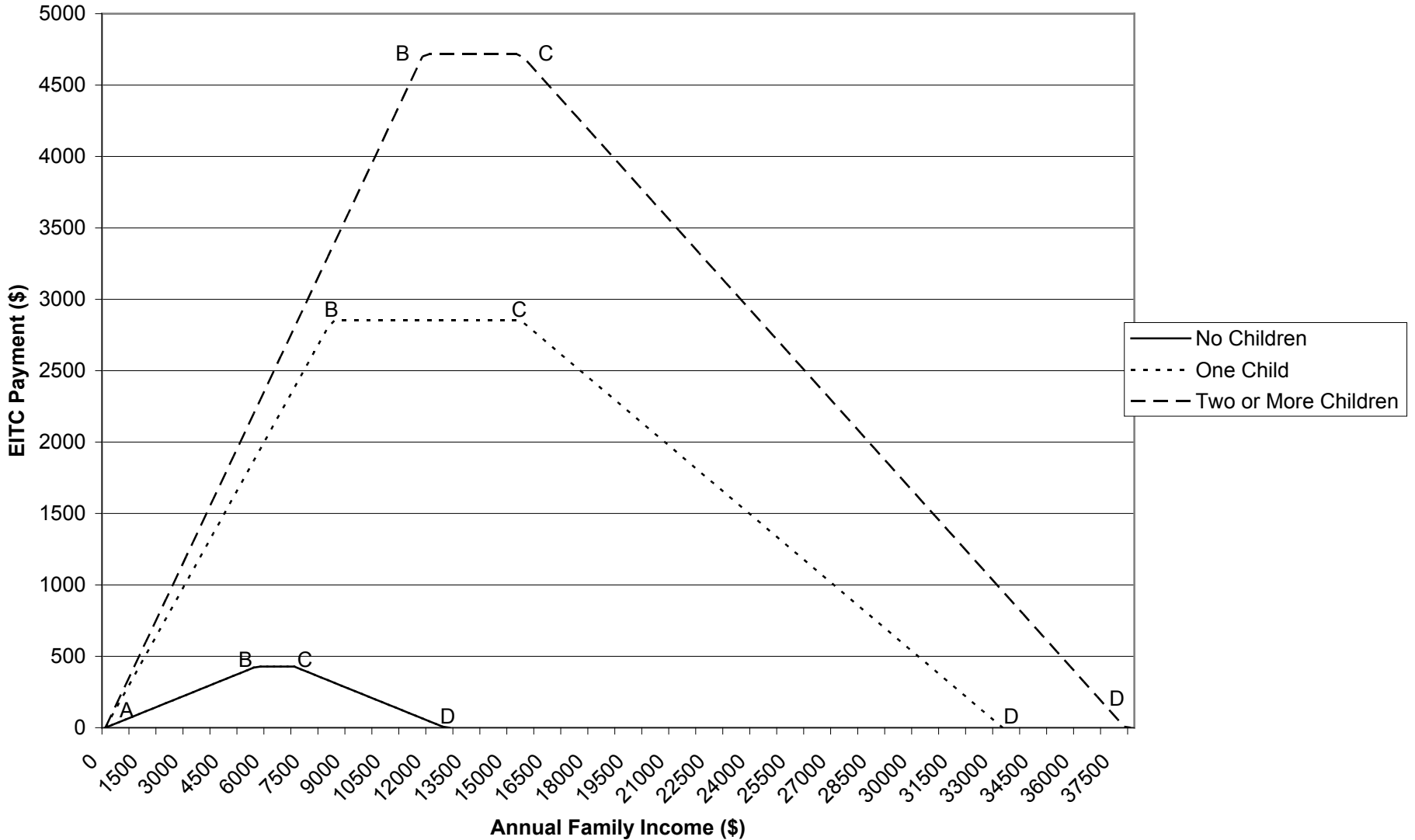
Background on EITC

Earned Income Tax Credit Parameters, 2009

Number of Children	Credit rate (percent)	Minimum income for maximum credit	Maximum credit	Phaseout rate (percent)	Phaseout range [1]	
					Beginning income	Ending income
No children	7.65	5,970	457	7.65	7,470	13,440
One child	34	8,950	3,043	15.98	16,420	35,463
Two children	40	12,570	5,028	21.06	16,420	40,295
Three children	45	12,570	5,657	21.06	16,420	43,279

[1] In 2009, the values of the beginning and ending points of the phase-out range were increased for married taxpayers filing jointly. The values for these taxpayers were \$5,000 higher.

Credit Regions of the Federal EITC



Identification

- In order to capture both the state and federal changes in the EITC create the average value of combined EITC benefits for each state and year
- Generate EITC benefit values by running entire NLSY sample through the NBER TAXSIM program for every state by year combination
 - Independent of state demographics

Identification

- Then calculate state/year average EITC value for EITC eligible individuals and assign to all people who live in that state/year
 - Use one year lag of state by year average value of EITC as instrument for SNAP participation to capture delay between when EITC change occurs and when people respond to the change
 - Also include value of EITC squared to capture the non-linear response to the program
 - These state by year changes in EITC benefits should be unrelated to individual weight

Empirical Methods Children

- LPM Model:

$$F_{ist} = \alpha + \beta_1 SNAP_{it} + \beta_2 X_{it} + \beta_3 P_{st} + \varepsilon_{ist}$$

- i =individuals, t =time, s =state
- F : Obese/Overweight
- $SNAP$: Number of past 5 years spent on SNAP
- X : Vector of demographics (age indicators, race/ethnicity, average family income over life, birth order, birth weight, whether breast-fed, mother's age at birth of the child, number of children in the family, mother's highest grade completed, mother's Armed Forces Qualifying Test (AFQT) percentile score, mother's marital status, mother's employment status, region of residence and residence in an MSA, an indicator for mother-reported weight and/or height, and year dummies)
- P : State level food price index
- Use individual, sibling, and state fixed-effects
- Family invariant demographics dropped when sibling FEs estimated
- Time invariant demographics dropped when individual FEs estimated

Empirical Methods Adults

- LPM Model:

$$F_{ist} = \alpha + \beta_1 SNAP_{it} + \beta_2 X_{it} + \beta_3 P_{st} + \varepsilon_{ist}$$

- i =individuals, t =time, s =state
- F : BMI/Obese/Overweight
- $SNAP$: Number of past 5 years spent on SNAP
- X : Vector of demographics (age indicators, race/ethnicity, family income, TANF participation, occupational strenuousness, number of own children in the family, mother's highest grade completed, Armed Forces Qualifying Test (AFQT) percentile score, marital status, hours worked, region of residence and residence in an MSA)
- P : State level food price index, State level cigarette price index
- Time invariant demographics dropped when individual FEs estimated

Empirical Methods

- IV (2SLS) Model:

- First Stage:

$$SNAP_{ist} = \delta + \gamma EITC_{it} + \lambda EITCsq_{it} + \phi X_{it} + \varphi P_{st} + \nu_{ist}$$

- Second Stage:

$$F_{ist} = \alpha + \beta_1 SNAP_{it} + \beta_2 X_{it} + \beta_3 P_{st} + \varepsilon_{ist}$$

- *Instruments*

- *EITC*: One year lag of state by year average value of the combined federal and state EITC benefit for EITC eligible NLSY79 sample
 - *EITCsq*: Square of EITC

Results for Children

Table 2. Linear Probability Estimates of the Effect of SNAP Participation on obesity status for boys ages 5 through 11

	Obese			
	Model 1	Model 2	Model 3	Model 4
Number of Past 5 Years Participating in SNAP	0.0061** (0.0030)	-0.0081 (0.0063)	-0.0102* (0.0054)	0.0060* (0.0031)
Number of Past 5 Years Participating in SNAP (IV)	-0.0725** (0.0351)	-0.0393 (0.0501)	-0.1140*** (0.0400)	-0.0669** (0.0318)
Individual Fixed-Effects		X		
Sibling Fixed-Effects			X	
State Fixed-Effects				X
First Stage F-Statistic	25.71	25.71	25.71	25.71
Observations	5113	5113	5113	5113

Robust Standard Errors in Parentheses Clustered at the State Level. *** p<0.01, ** p<0.05, * p<0.1

Boys Ages 5 to 11

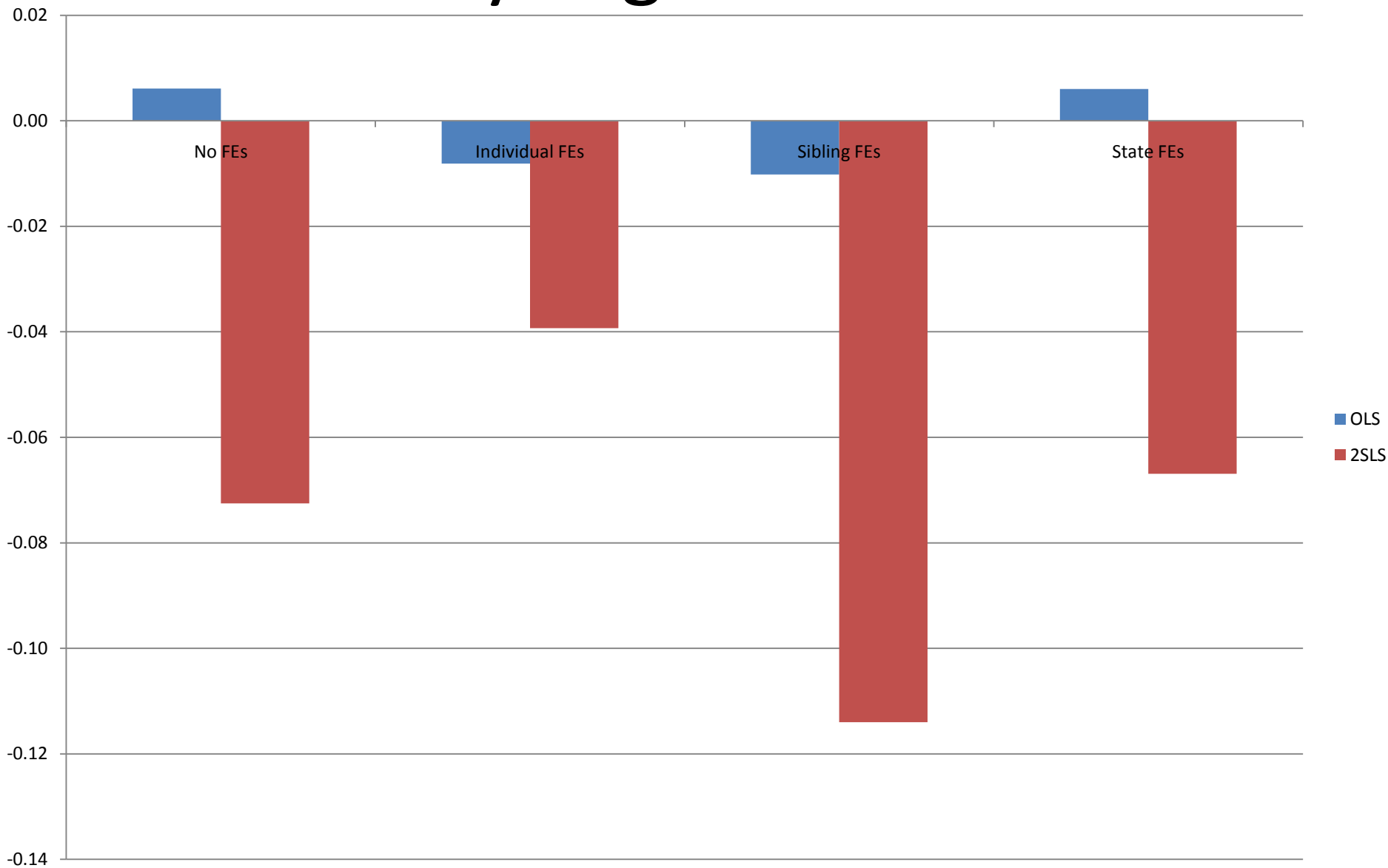


Table 3. Linear Probability Estimates of the Effect of SNAP Participation on obesity status for girls ages 5 through 11

	Obese			
	Model 1	Model 2	Model 3	Model 4
Number of Past 5 Years Participating in SNAP	0.0005 (0.0033)	0.0042 (0.0067)	0.0072 (0.0058)	0.0021 (0.0034)
Number of Past 5 Years Participating in SNAP (IV)	-0.0570 (0.0409)	0.0055 (0.0489)	0.0026 (0.0364)	-0.0754* (0.0397)
Individual Fixed-Effects		X		
Sibling Fixed-Effects			X	
State Fixed-Effects				X
First Stage F-Statistic	19.26	19.26	19.26	19.26
Observations	4832	4832	4832	4832

Robust Standard Errors in Parentheses Clustered at the State Level. *** p<0.01, ** p<0.05, * p<0.1

Girls Ages 5 to 11

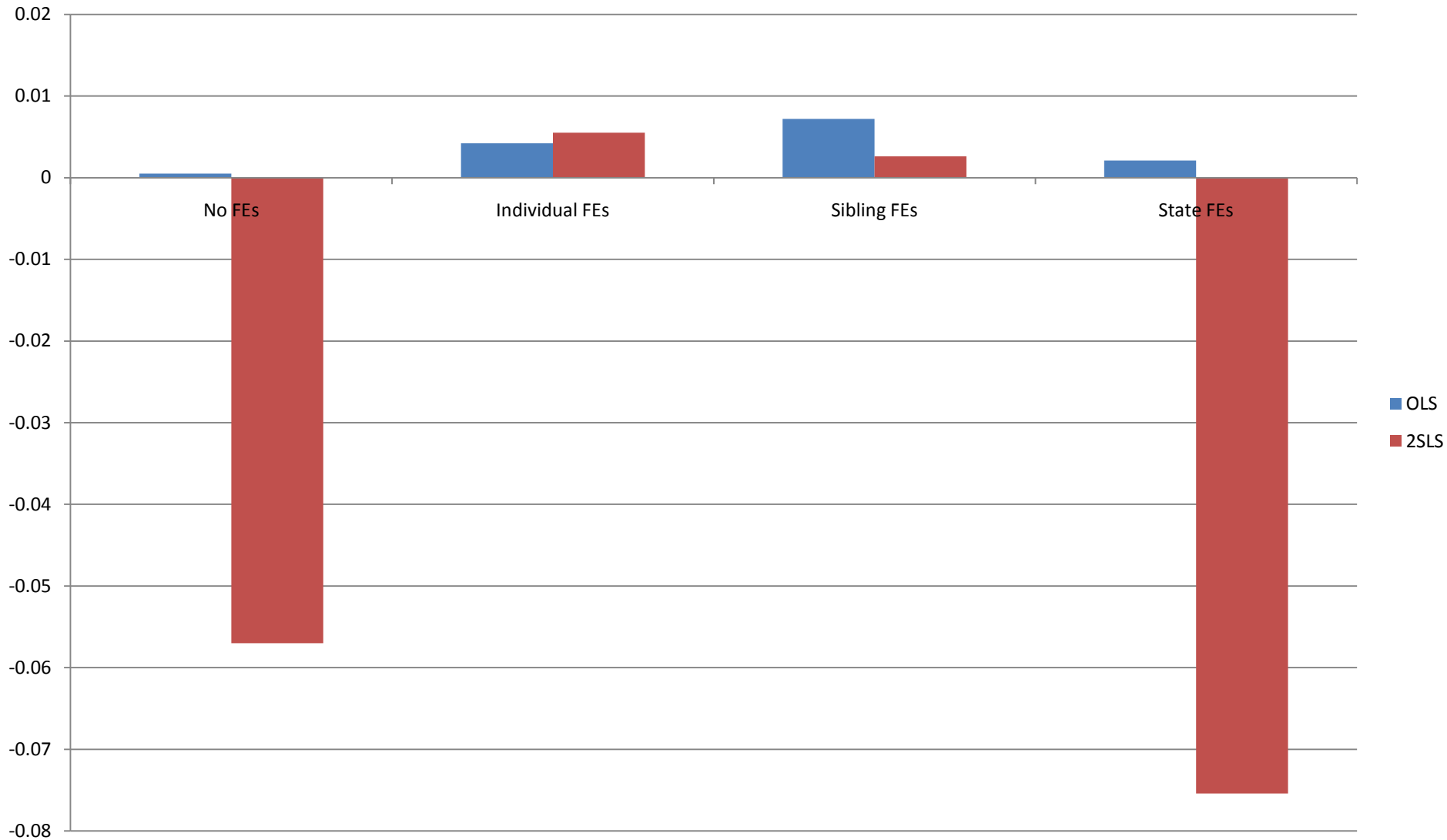


Table 4. Linear Probability Estimates of the Effect of SNAP Participation on obesity status for boys ages 12 through 18

	Obese			
	Model 1	Model 2	Model 3	Model 4
Number of Past 5 Years Participating in SNAP	0.0060*	-0.0038	-0.0050	0.0056*
	(0.0032)	(0.0052)	(0.0051)	(0.0032)
Number of Past 5 Years Participating in SNAP (IV)	-0.0507	-0.0072	-0.0168	-0.0739*
	(0.0395)	(0.0526)	(0.0519)	(0.0386)
Individual Fixed-Effects		X		
Sibling Fixed-Effects			X	
State Fixed-Effects				X
First Stage F-Statistic	19.24	19.24	19.24	19.24
Observations	4931	4931	4931	4931

Robust Standard Errors in Parentheses Clustered at the State Level. *** p<0.01, ** p<0.05, * p<0.1

Boys Ages 12 to 18

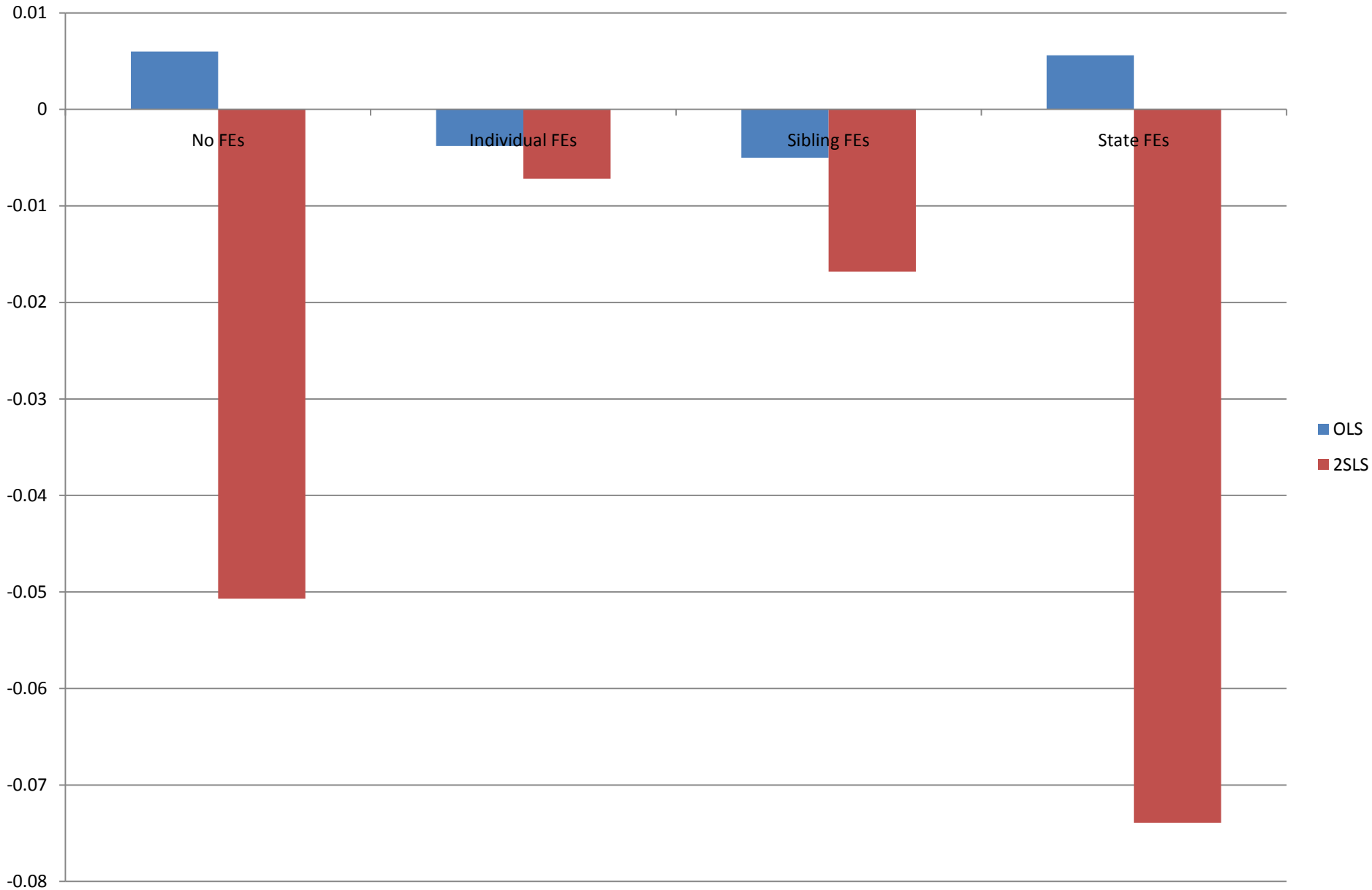
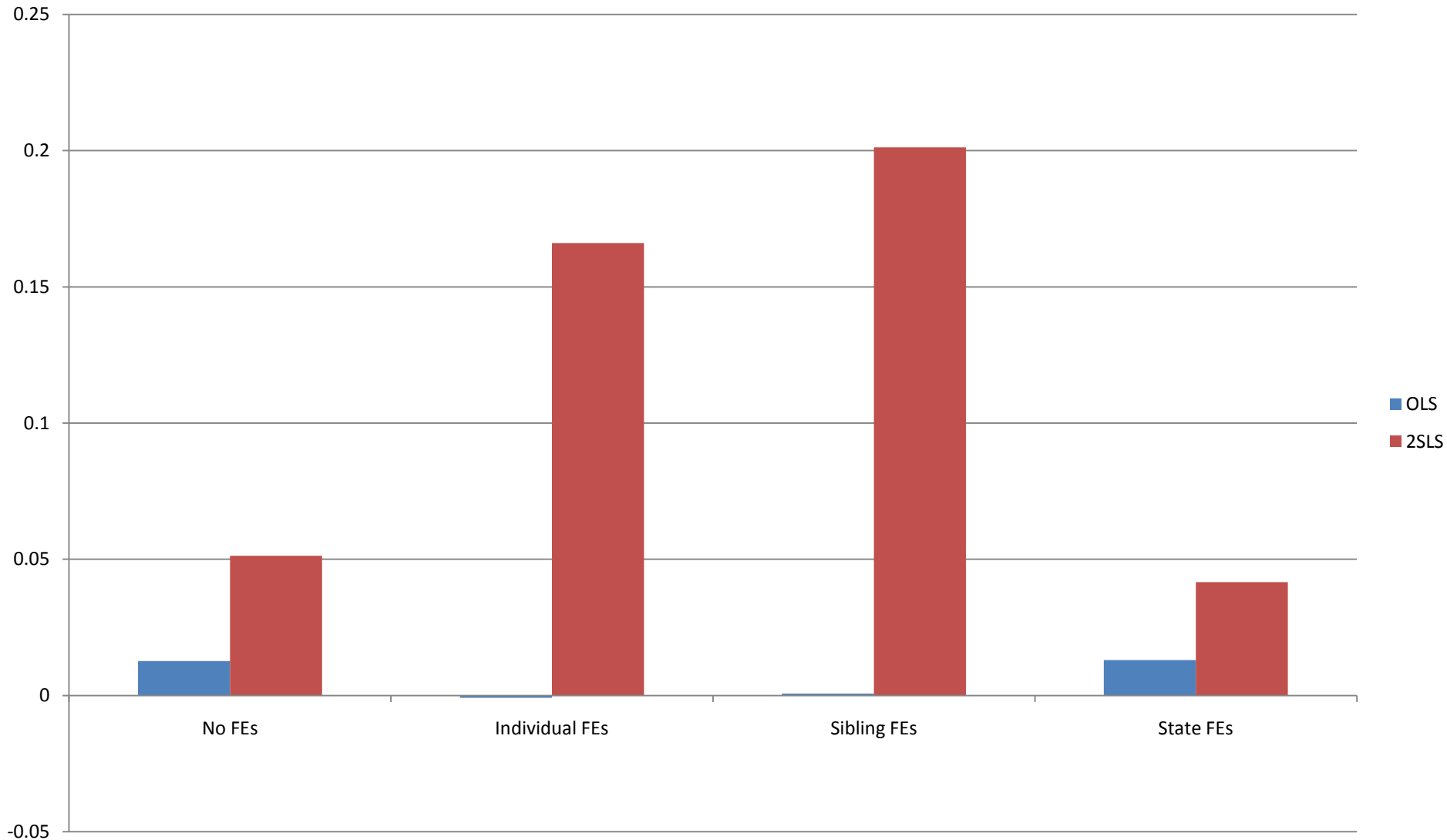


Table 5. Linear Probability Estimates of the Effect of SNAP Participation on obesity status for girls ages 12 through 18

	Obese			
	Model 1	Model 2	Model 3	Model 4
Number of Past 5 Years Participating in SNAP	0.0127*** (0.0034)	-0.0008 (0.0055)	0.0007 (0.0056)	0.0130*** (0.0035)
Number of Past 5 Years Participating in SNAP (IV)	0.0513 (0.0415)	0.1661*** (0.0621)	0.2012** (0.0797)	0.0416 (0.0372)
Individual Fixed-Effects		X		
Sibling Fixed-Effects			X	
State Fixed-Effects				X
First Stage F-Statistic	20.62	20.62	20.62	20.62
Observations	4670	4670	4670	4670

Robust Standard Errors in Parentheses Clustered at the State Level. *** p<0.01, ** p<0.05, * p<0.1

Girls Ages 12 to 18



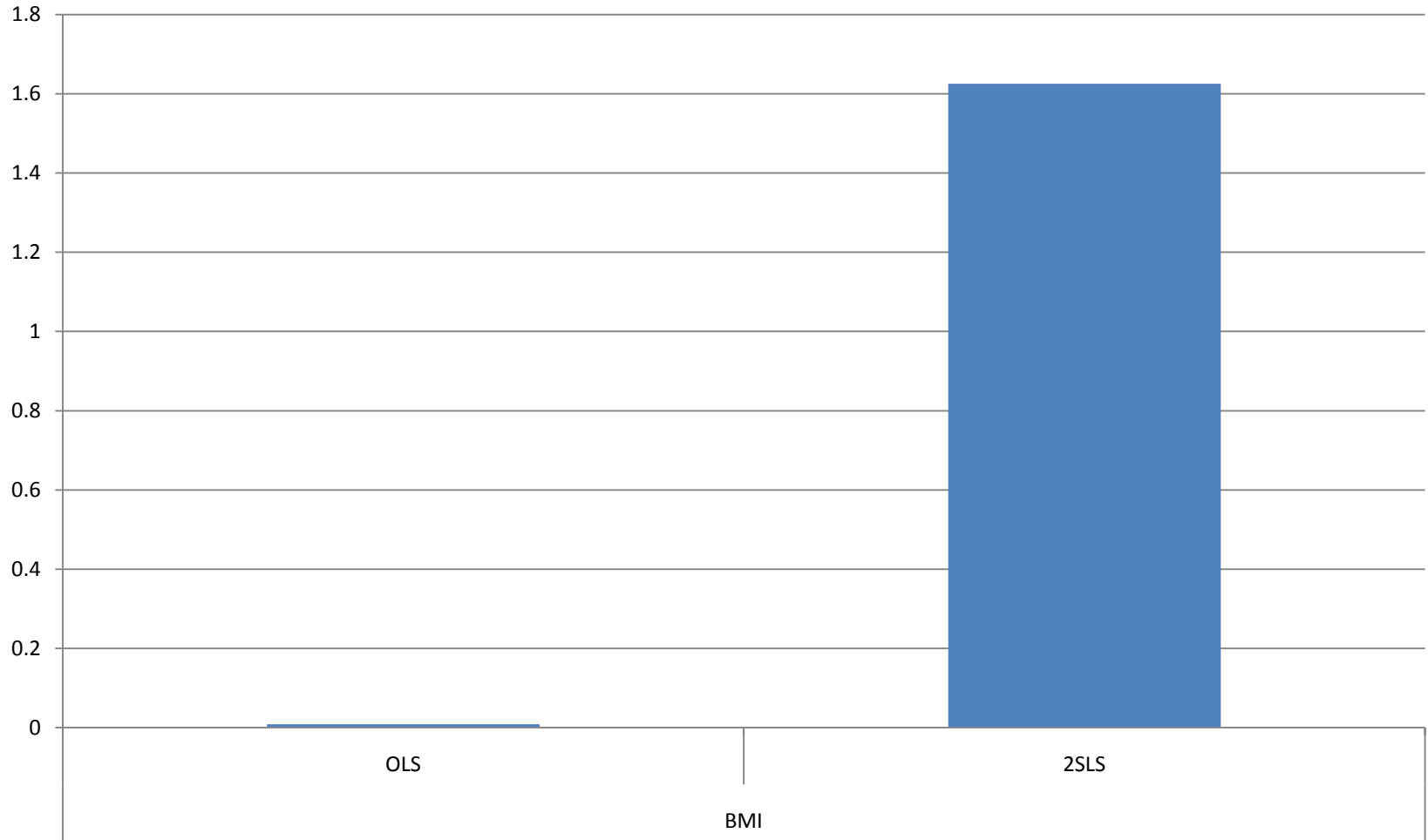
Results for Adults

Table 2. Linear Probability Estimates of the Effect of SNAP Participation on the BMI and Obesity Status of Women

	BMI			Obese		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Number of Past 5 Years Participating in SNAP	0.3459*** (0.0363)	0.0088 (0.0216)	1.6249*** (0.5620)	0.0256*** (0.0026)	0.0038* (0.0023)	0.1262** (0.0559)
Individual Fixed-Effects		X	X		X	X
IV			X			X
First Stage F-Statistic			28.59			28.59
Observations	16777	16777	16777	16777	16777	16777

Standard Errors Clustered at the State Level. *** p<0.01, ** p<0.05, * p<0.1

Women BMI



Women Obesity

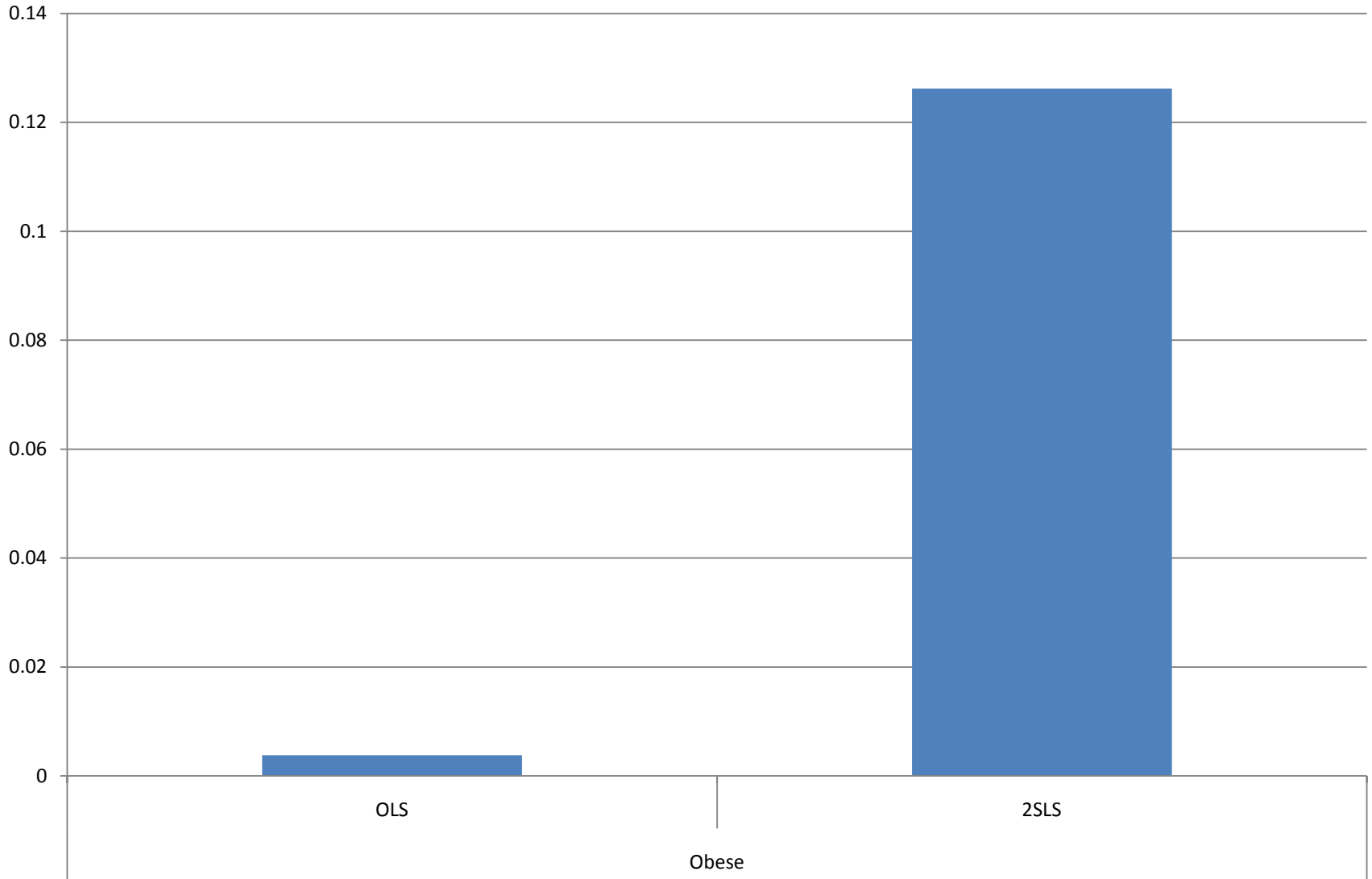
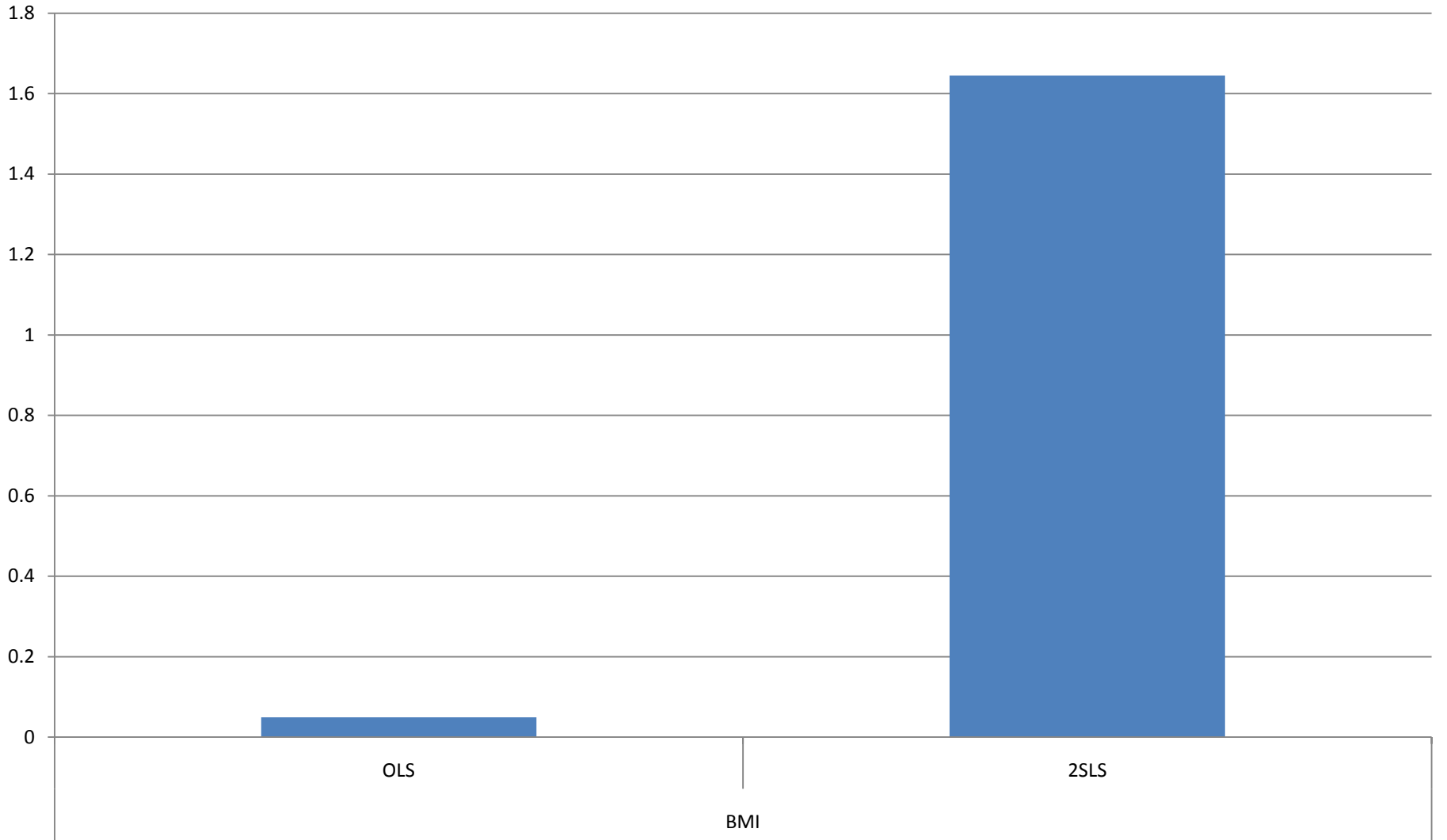


Table 3. Linear Probability Estimates of the Effect of SNAP Participation on the BMI and Obesity Status of Men

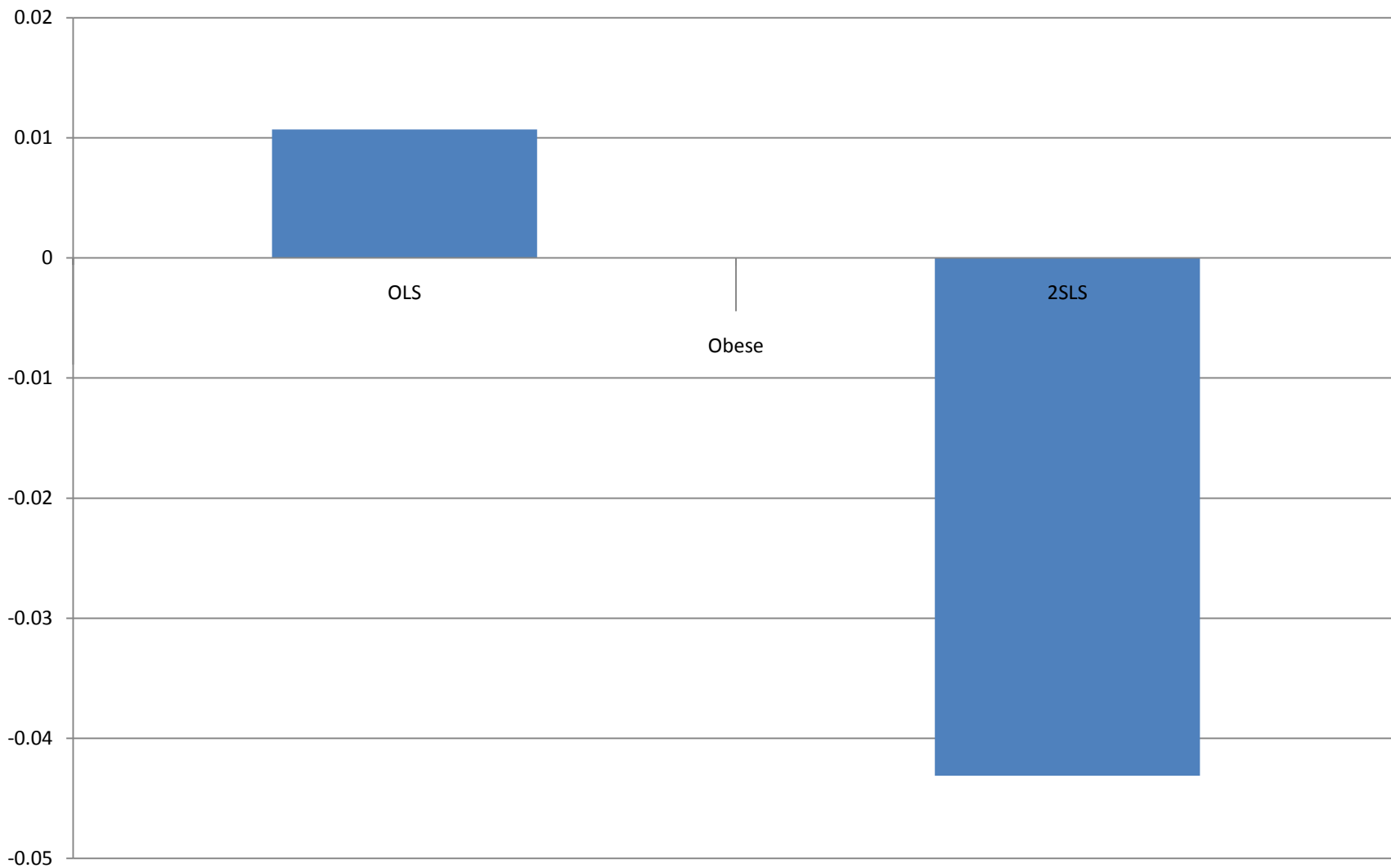
	BMI			Obese		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Number of Past 5 Years Participating in SNAP	0.1552*** (0.0397)	0.0491** (0.0227)	1.6449* (0.9308)	0.0194*** (0.0034)	0.0107*** (0.0031)	-0.0431 (0.1083)
Individual Fixed-Effects		X	X		X	X
IV			X			X
First Stage F-Statistic			10.72			10.72
Observations	15907	15907	15907	15907	15907	15907

Standard Errors Clustered at the State Level. *** p<0.01, ** p<0.05, * p<0.1

Men BMI



Men Obesity



Summary for Children

- Additional year of SNAP participation reduces the probability of being obese for boys ages 5 to 11 by 7 percentage points
- Boys 12 to 18: 7.8 percentage point decrease
- Girls 5 to 11: 7.8 percentage point decrease
- Girls 12 to 18: 2.5 percentage point increase

Conclusion

- Unlike previous research I find that SNAP participation reduces obesity for both boys and girls ages 5 to 11
 - Magnitude of the effect is the same for boys and girls
 - Negative effect of SNAP participation on obesity for boys ages 12 to 18
 - Positive but insignificant effect for girls ages 12 to 18
 - Magnitude of the effect is much larger once the IV is used

Summary for Adults

- Additional year of SNAP participation increases the BMI of both Women and men by 1.6 BMI points
- Increase probability of obesity for women by 12.6 percentage points
- Decreases the probability of obesity for men by 4.3 percentage points (not significant)

Conclusion

- For adults, results are consistent with previous research, though magnitude of the effect is slightly larger than previous estimates

Policy Implications

- Recent expansion of SNAP benefits may reduce child obesity rate
- Permanent expansion of benefits may be an effective public health intervention for reducing child obesity
- However, it may increase adult obesity rates (primarily for women)

Thank You