

Explaining the rise in Obesity

ECON 40565
Fall 2007

Introduction

- Rapid increase in obesity since 1970
 - In 1970, 14% of the population was obese
 - Today, rates are around 30%
- Up through 1970s, long terms trend are such that improvements in body size have been health iproving (Fogel)
- Now the average BMI is in dangerous range

Figure 1: Historical trends in BMI

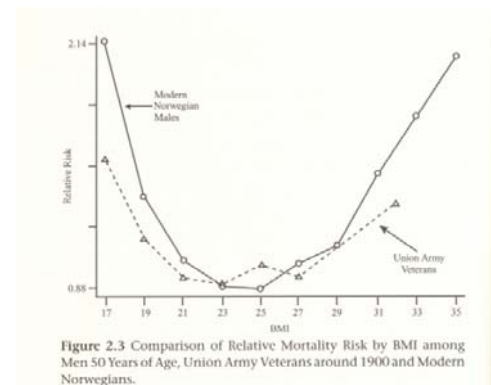
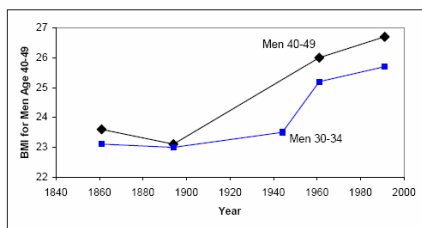
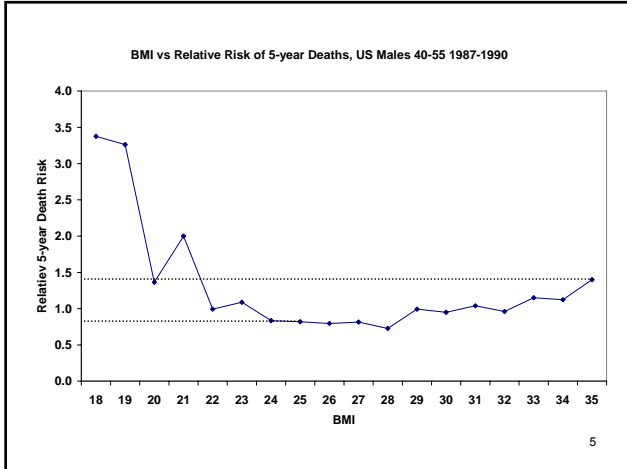


Figure 2.3 Comparison of Relative Mortality Risk by BMI among Men 50 Years of Age, Union Army Veterans around 1900 and Modern Norwegians.



Definitions

- Obesity based on Body Mass Index
- BMI = weight (kg)/(height in cm)²
- = 703 x weight (pounds)/(height in inches)²
- BMI < 20 Underweight
- 20 ≤ BMI < 25 Ideal
- 25 ≤ BMI < 30 overweight
- 30 ≤ BMI obese

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Two primary sources of BMI data

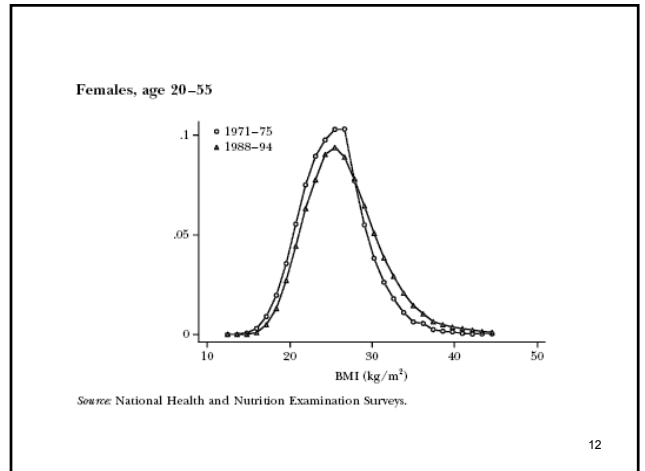
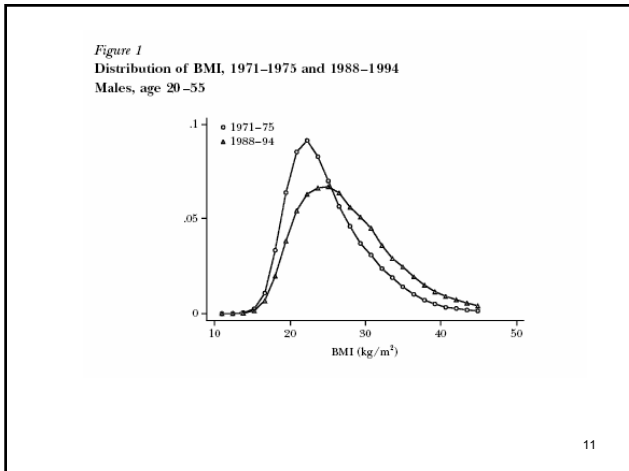
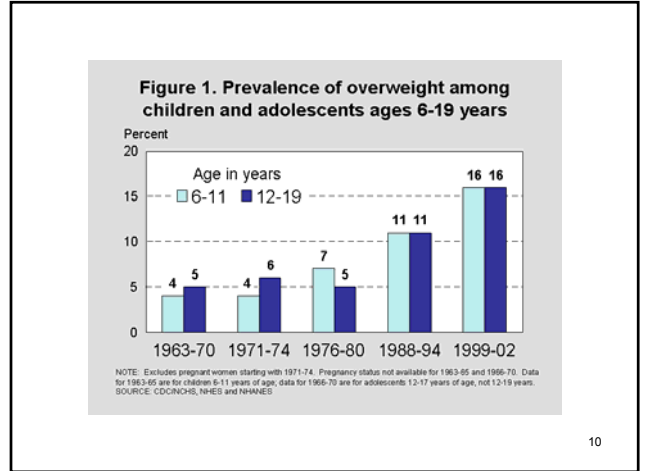
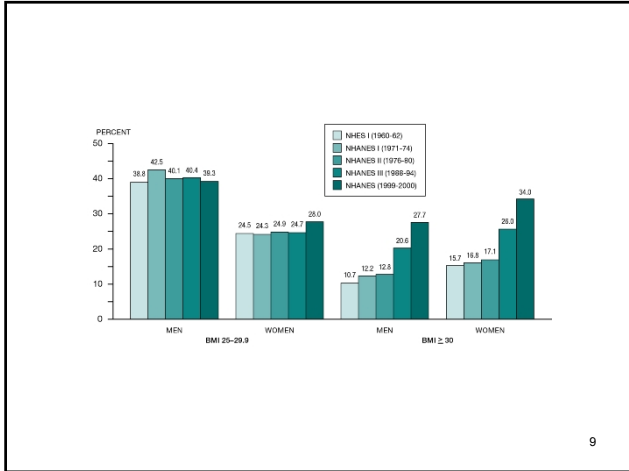
- National Health Interview Survey
 - Annual survey of 160K people
 - Self reported health conditions (including height and weight)
 - Tend to overstate height, understate weight
- National Health Examination and Nutrition
 - Twice a decade surveys of 12K people
 - Give detailed physical exams (including blood tests)
 - Detailed source for many health conditions

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Obesity Rates Over Time

Group	Obesity		Overweight	
	1971/74	1999/00	1971/74	1999/00
All	14.6	30.9	47.7	64.5
Males	12.2	27.7	54.7	67.0
Females	16.8	34.0	41.1	62.0
Black F.	29.7	50.8	60.5	78.0

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Change in obesity rates

Country	Years	Change obesity rate (% point changes)	
		Males	Females
US	76-94	12-20%	17-25%
Canada	78-88	7-9%	10-9%
Sweden	80-89	5-5%	9-9%
UK	80-91	6-13%	8-15%
Japan	76-93	1-2%	3-3%

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Change in obesity rates

Country	Years	Change obesity rate (% point changes)	
		Males	Females
US	76-94	66%	47%
Canada	78-88	29%	-10%
Sweden	80-89	0%	0%
UK	80-91	117%	88%
Japan	76-93	100%	0%

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% Obese for Different Groups

Group	71-75	89-94	Δ(% change)
Single male	8	19	8 (138%)
Mar. male, non working spouse	13	26	13 (100%)
Mar. male, Working spouse	11	24	13 (18%)
S. female	18	32	14 (78%)
Mar. female, not working	16	36	19 (125%)
Mar. female, working	13	33	21 (175%)

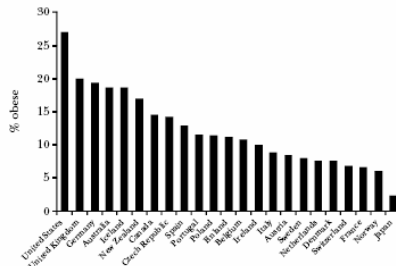
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% Obese for Different Groups

Group	71-75	89-94	Change
Elderly	19	32	12 (63%)
Male, <HS	15	23	8 (53%)
Male, HS	13	24	11 (84%)
Male, College	8	21	13 (163%)

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Figure 2
Obesity in International Perspective



Source: OECD Health Statistics (2000).

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Facts to explain

- Increase is recent (started in 1970s)
 - Comes at a time when almost all other health measures are improving
- Increase in all segments in the population
- Increase has not been as great in other developed countries

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Usual suspects

- TV
- Lack of exercise
- Super-sized fast food meals
- Working moms
- Decline in smoking
- Can dispose of some of these right away

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- Why is this a difficult problem to disentangle?
- An increase in 100-150 calories/day would explain 10-12 pound increase in weight over past 20 years.
 - Equal to 3 Oreos
 - One can of Pepsi

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Basics of the problem

- Cutler et al. show that the problem is a rise in calories consumed, not a fall in calories burned
- Data from a variety of sources
 - Food diaries
 - Time diaries
 - Physiological studies, calories burned by an activity

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Table 2
Changes in Food Consumption, 1977–1978 to 1994–1996

Meal	Calories*			Change	Percentage of Total Change
	1977–1978	1994–1996			
Male	TOTAL	2080	2347	268	100%
	Breakfast	384	420	36	13
	Lunch	517	567	50	19
	Dinner	918	859	-59	-22
	Snacks	261	501	241	90
	Calories per meal	573	566	-7	
	Meals per day	3.92	4.53	.61	
Female	TOTAL	1515	1658	143	100%
	Breakfast	286	312	26	18
	Lunch	368	398	31	22
	Dinner	676	602	-74	-52
	Snacks	186	346	160	112
	Calories per meal	422	408	-14	
	Meals per day	3.86	4.44	.58	

Note

- Meals have increased
- Calories per meal has stayed the same
- Big increase in snacks and calories from snacks
- How does these results eliminate the hypothesis that “Super sized” meals are the cause of the problem?

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Table 3
Time Use, 1965–1995
(Minutes per day, age 18–64)

Activity	1965	1975	1985	1995
Paid work	290	258	259	266
Eating on the job	11	8	8	—
Breaks	8	4	5	1
Household work	146	128	124	102
Food preparation	44	41	39	27
Meal cleanup	21	12	10	4
Child care	37	51	31	18
Obtaining goods and services	51	45	55	49
Personal needs and care	622	644	634	632
Meals at home	58	54	50	65
Meals out	11	19	19	(meals at home & out)
Sleeping/napping	473	496	479	455
Education and training	12	16	18	23
Organizational activities	20	24	18	17
Entertainment/social	78	65	65	72
Recreation	27	37	43	47
Active sports	5	4	10	13
Outdoor	1	7	5	6
Walking/hiking/exercise	1	2	4	5
Communication	158	191	195	212
TOTAL	1440	1440	1440	1440
Kcal per minute per kilogram	1.69	1.57	1.62	1.53
E for 70 kilogram man	16.4	15.5	14.7	12.6
E for 60 kilogram woman	15.1	12.3	15.5	11.3

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Time use in minutes/day

	1965	1975	1985	1995
Paid wk	290	258	259	266
House wk	146	128	124	102
food prep	44	41	39	27
WatchTV	89	129	129	151
Exercise	27	37	43	47

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Energy

- Big drop in housework
- Slight drop in work
- Increase in exercise
- Increase in sedentary activity (TV)
- Convert into energy index
- Therefore
 - Problem is one of increased calories
 - Not a reduction in calories consumed

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Energy used (Kcal per day)

	1965	1975	1985	1995
Males	16.4	13.5	14.7	12.6
Females	15.1	12.3	13.5	11.3

I am pretty sure the text in the Cutler et al. paper is in error about the units of Measure on this variable. The key is that since 1975, the measure of energy Has not fallen sharply. Since 1975m, calories burned have fallen by $(11.3-12.3)/12.3 = -0.081$ for females and $(12.6-13.5)/13.5 = -0.067$

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Cutler et al. theory Technological change in food production

- Major advances in food preparation such vacuum packing, microwaves, freezing, preservatives, etc.
- Technology has reduced the time and direct cost of food preparation
- Evidence: time spent on food preparation among non-working mothers has fallen 50% in past 25 years
- Greatly reduced the costs of certain types of higher calorie food

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Example – French fry

- Americans have always consumed lots of potatoes
- Until recently (post WWII), French fry consumption was limited
- High cost of preparation (peeling, cutting, frying)
- Innovations
 - allowed the fry to be cut, peeled fried and frozen at central relocation
 - Reheated in oil or in oven
- From 1977-1995, potato use increased by 30% -
- all of it an increase in fries and chips

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Implications

- Greater variety of foods. Therefore, more meals and less food per meal.
- Evidence
 - Increase in snack food
 - Increase in meals
 - Fall in the price of prepared food

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Relative Price Changes for Certain Foods, 1/1980 – 11/2003

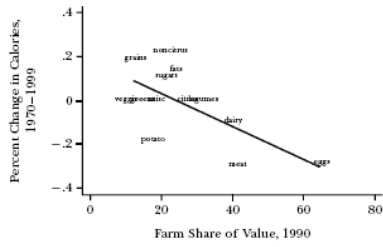
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|-----------------------|------|
| • All consumer prices | 137% |
| • Fresh fruit | 276% |
| • Fresh vegetables | 252% |
| • Dairy products | 96% |
| • Frozen food | 83% |
| • Frozen potatoes | 93% |
| • Potato chips | 77% |
| • Ground beef | 90% |
| • Soda | 53% |

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Implications

- Increase in food consumption should be greatest in foods with greater processing
- Evidence
 - Look at change in calories based on farm share of cost. Smaller farm share, less processing. We see the biggest increase in calories in those sectors with small farm share
 - Look at change in calories based on brand names. Brand names have more processing³²

Figure 3
Food Preparation and Changes in Intake



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Implications

- Individuals that take advantage of technology should have biggest increase in obesity
- Evidence
 - Increase in single males compared to non-working married females
 - Some contrary evidence, big increase for highest educated

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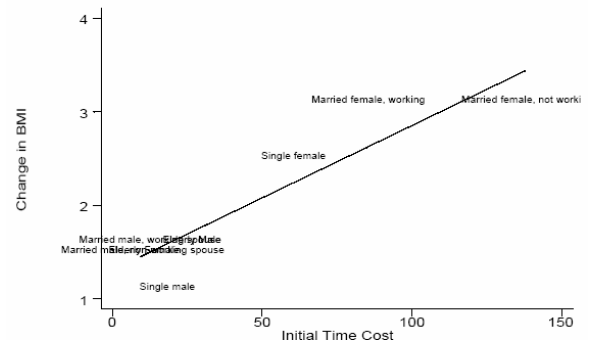
Table 4
Time Costs by Demographic Group
(minutes)

	1965		1995	
	Meal Prep.	Meal Prep. + Cleanup	Meal Prep.	Meal Prep. + Cleanup
Adults				
Single male	15.6	18.1	15.5	17.3
Married male, nonworking spouse	6.5	9.4	13.2	14.4
Married male, working spouse	8.1	11.9	13.2	14.4
Single female	38.1	60.1	28.0	33.1
Married female, working	58.3	84.8	35.7	41.4
Married female, not working	94.2	137.7	57.7	68.8
Elderly				
Male	16.6	26.3	18.5	20.2
Female	65.9	10.4	50.1	60.3

Source: Authors' calculations from Americans' Use of Time Survey Archives, 1965 and 1995.

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Figure 9: Time Costs and Changes in BMI Using Sex-Specific Time



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Schanzenbach

- National school lunch program
 - Serves lunch to 30 million
 - 60% of kids in schools
 - 49% free
 - 9% reduced price
 - Served 187 billion lunches
- Costs
 - Feds pay \$6 billion

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Why worry about school lunches

- Broad based, impact lots of kids
- Growth follows time series in obesity
 - 7.1 million kids in 1946
 - ~ 30 million in 2003
- High in calories – maybe wrong calories
 - High in fat and saturated fat
- 1995 federal reform to increase RDA of vitamins/minerals, reduce fat, reduce soda (pop for people from the midwest)

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Table 7: Calories Consumed in NHANES

	Kids < Age 12				All Kids 5-16			
	Lunch Calories (1)	Non-lunch calories (2)	Lunch Calories (3)	Non-lunch calories (4)	Lunch Calories (5)	Non-lunch calories (6)	Lunch Calories (7)	Non-lunch calories (8)
School lunch every day	51.9 (22.8)	-1.9 (37.5)	46.0 (23.4)	-7.9 (38.2)	61.3 (26.1)	38.2 (42.2)	40.7 (26.9)	-5.9 (42.6)
Constant	601.9 (21.1)	1257.0 (34.7)	380.6 (74.8)	1266.2 (122.3)	593.9 (24.2)	1222.9 (39.2)	497.3 (69.0)	1588.7 (109.6)
Covariates	No	No	Yes	Yes	No	No	Yes	Yes
N	2318	2318	2318	2318	3430	3430	3430	3430

Notes: Source: NHANES III. All columns include age/gender fixed effects. Covariates include race, day of reporting, parents' BMI, family size, and reports of whether consumption is "typical".

Kids who eat school lunches consume 40-46 more calories/day

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My favorite dishes

- Fizzle burger w/ tater tots
- Pork pinwheel (followed by beef pinwheel, chicken pinwheel and turkey pinwheel)
- Gondola pizza boat
- Turkey imperial
- Anything with stuffing
- Ice cream sandwiches (Bill Werbaneth used to let melt throughout lunch because he liked soft ice cream)

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Dishes I did not like

- Johnny Marzetti
- Spaghetti and meatballs
- What ever was the no-meat Friday meal
 - e.g., Fish sticks
- Chuckwagon steak sandwiches (when soy is considered steak)

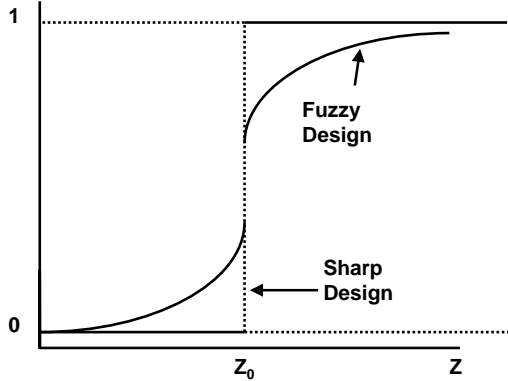
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RD Design

- School lunches subsidized by feds
 - Free is <130% of FPL
 - Reduced cost of 130-185% of FPL
 - Pay 40 cents/mean
 - > 185%, pay full price of \$1.75
- Those just above and below 185% of FPL are functionally identical
- However, there is a sharp break in lunch use
- If impact of school lunch on obesity, should see change at 185% of FPL

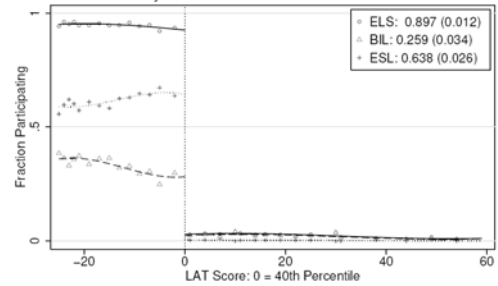
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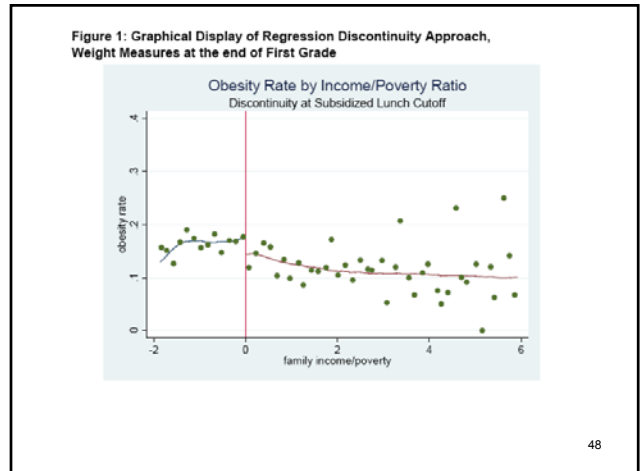
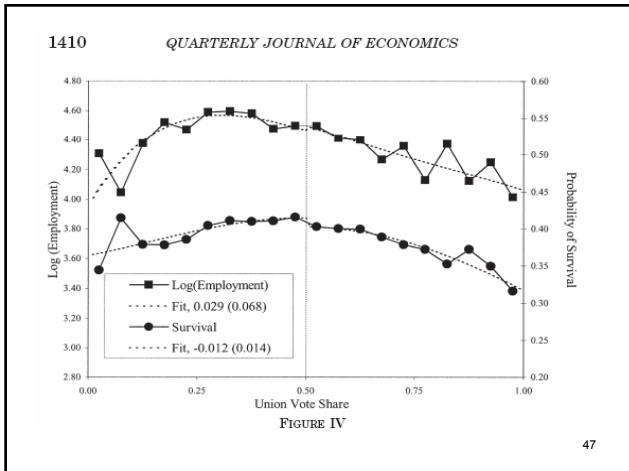
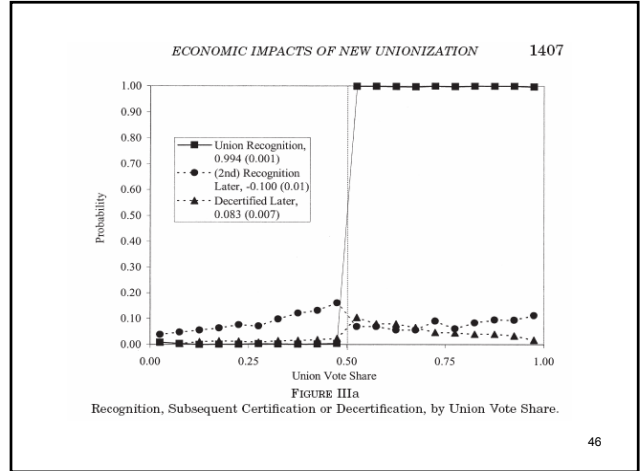
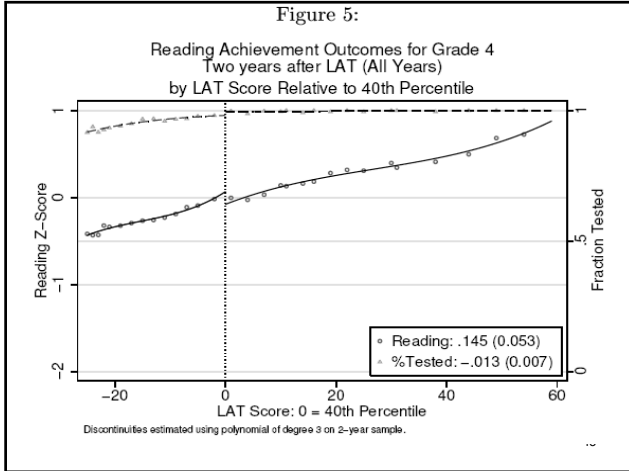
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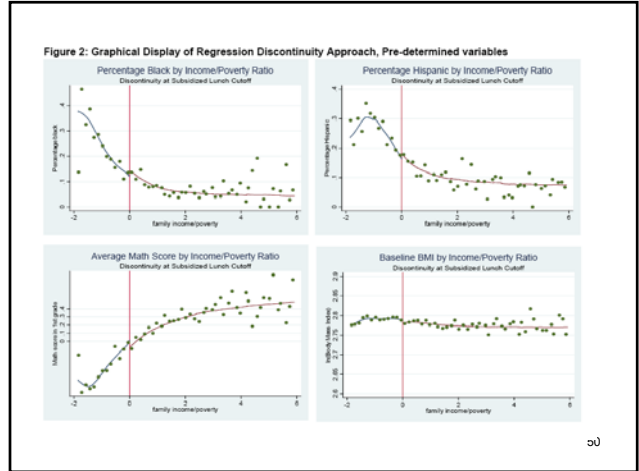
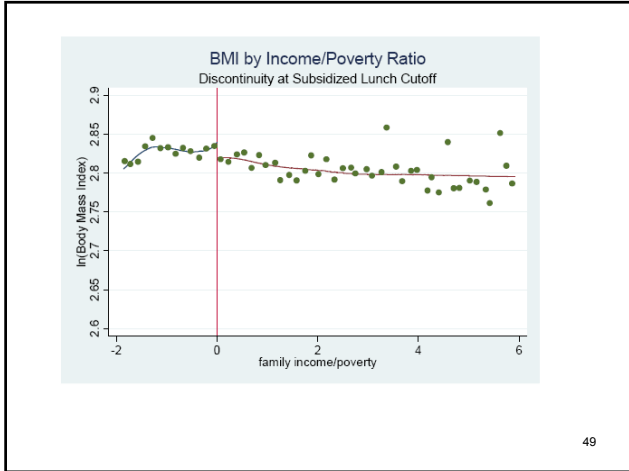
Assignment to ELS, Bilingual and ESL for Grade 4
One year after LAT (All Years)
by LAT Score Relative to 40th Percentile



Note: Discontinuities estimated using polynomial of degree 3 on 1 year sample.

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Change in obesity right at discontinuity

Table 6: Regression Discontinuity Results at Reduced-Price Cutoff

	Coefficient (Standard error)	P-value	Mean DepVar, 185-205% FPL	Falsification Cutoff=200% FPL
	(1)	(2)	(3)	(4)
<i>Panel A: Weight outcomes, end of first grade</i>				
Obesity indicator	0.040 (0.025)	0.099	0.125	-0.009 (0.029)
ln(BMI)	0.022 (0.011)	0.046	2.82	0.010 (0.013)
<i>Panel B: Lunch participation</i>				
Receive free or reduced price lunch	0.258 (0.017)	0.000	0.418	0.115 (0.039)
Eat school lunch	0.044 (0.013)	0.001	0.815	-0.020 (0.031)

Change in use of school lunches right discontinuity

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Do the results make sense?

- E =eat lunch at school
- P=poverty status
- O=obesity
- $\Delta E/\Delta P = 0.044$
- $\Delta O/\Delta P = 0.04$
- $[\Delta O/\Delta P]/[\Delta E/\Delta P] = \Delta O/\Delta E = 0.04/0.044=0.909$
- Eating school lunch increases chance of obesity by 91 percentage points. Too large to make sense – but, a great idea

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