Geographic Variation in Childhood Obesity

The effect of a healthier school environment

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Introduction

US Obesity Epidemics

- Obesity in the US has increased dramatically in the last decades
  - ◇ In late 1970s, 12.7% of men and 17% of women were obese
  - ◇ During 2015-2016, 26.9% of men and 27.6% percent of women were obese
- Important health implications
  - ◇ Obesity increases inpatient and outpatient spending by 36% (Sturm, 2002)
  - ◇ Estimated annual medical cost of obesity is $147 billion in 2008 US dollars (CDC)
  - ◇ Negative health outcomes related to obesity include heart disease, stroke, type 2 diabetes and certain type of cancer
- Childhood obesity is also a pervasive phenomenon
  - ◇ Obesity rates are 8.9% among 2- to 5-year-olds, 17.5% for 6- to 11-year-olds and 20.5% of 12- to 19-year-olds

Definition of Obesity

- Based on Body Mass Index (BMI)
  - ◇ Normal weight is a BMI between 18.5 and 24.9
  - ◇ Overweight is a BMI between 25.0 and 29.9
  - ◇ Obesity is a BMI over 30
- BMI measured as body mass (kg) divided by square of body height (m^2)
- Different use of BMI for children aged 2 to 20
  - ◇ Comparison against percentile for children of same sex and age
  - ◇ BMI above the 95th percentile is considered obese

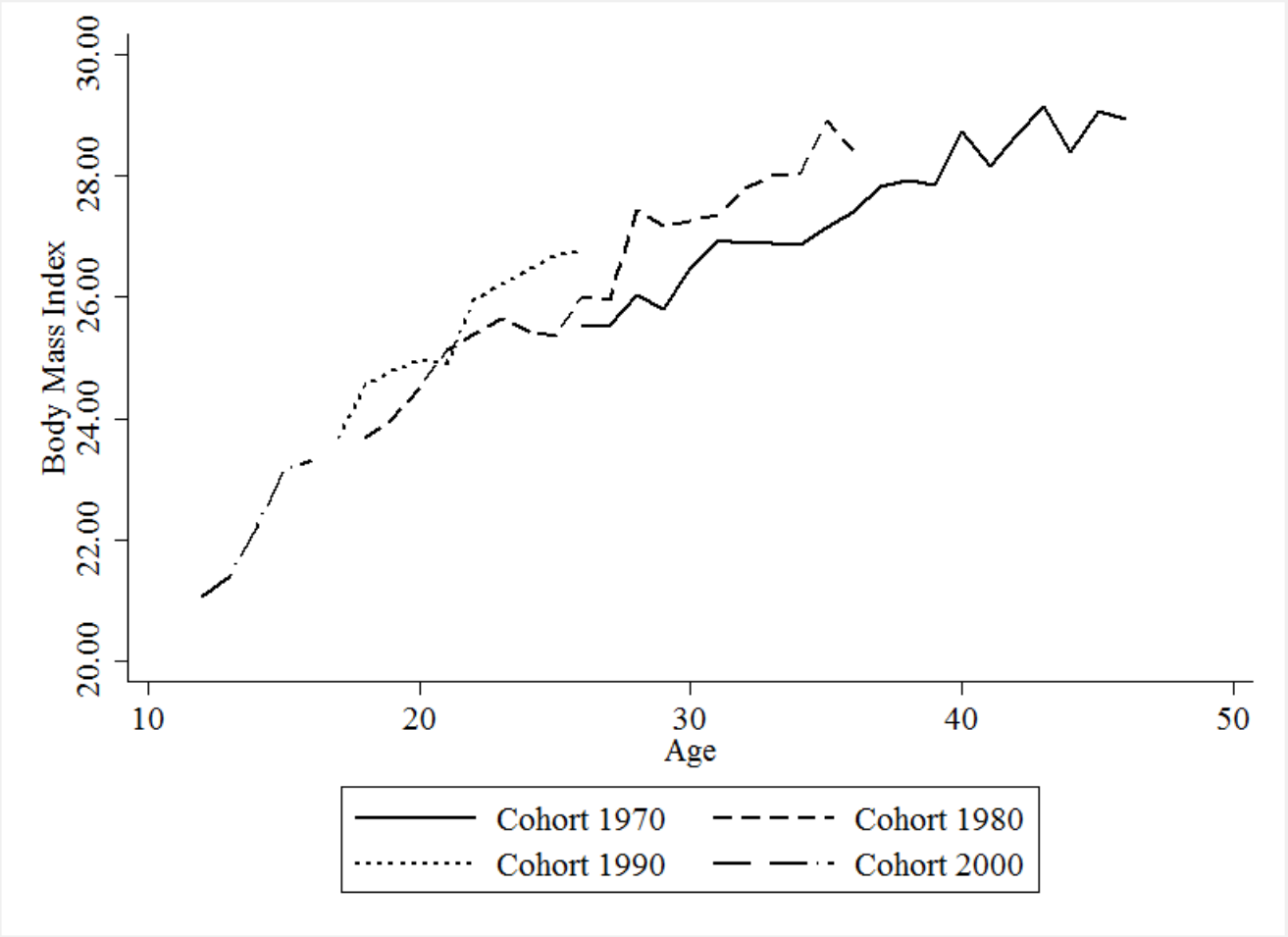
School Nutrition Policies

- National School Lunch Act of 1946
  - ◇ Created the National School Lunch Program (NSLP)
  - ◇ Grown from 3,368 million lunches served in 1969 to 5,052 million in 2016
- Child Nutrition and WIC Reauthorization Act of 2004
  - ◇ Requires that school districts design and implement wellness policies from the 2006/2007 school year
- Healthy Hunger-Free Kids Act of 2010
  - ◇ Gives USDA the authority to set new standards for food sold in lunches (e.g. reduced portion sizes, minimum on fruit and vegetables per serving)
  - ◇ Increases access to NSLP
  - ◇ School districts audited every 3 years to see if they meet nutrition standards

Literature

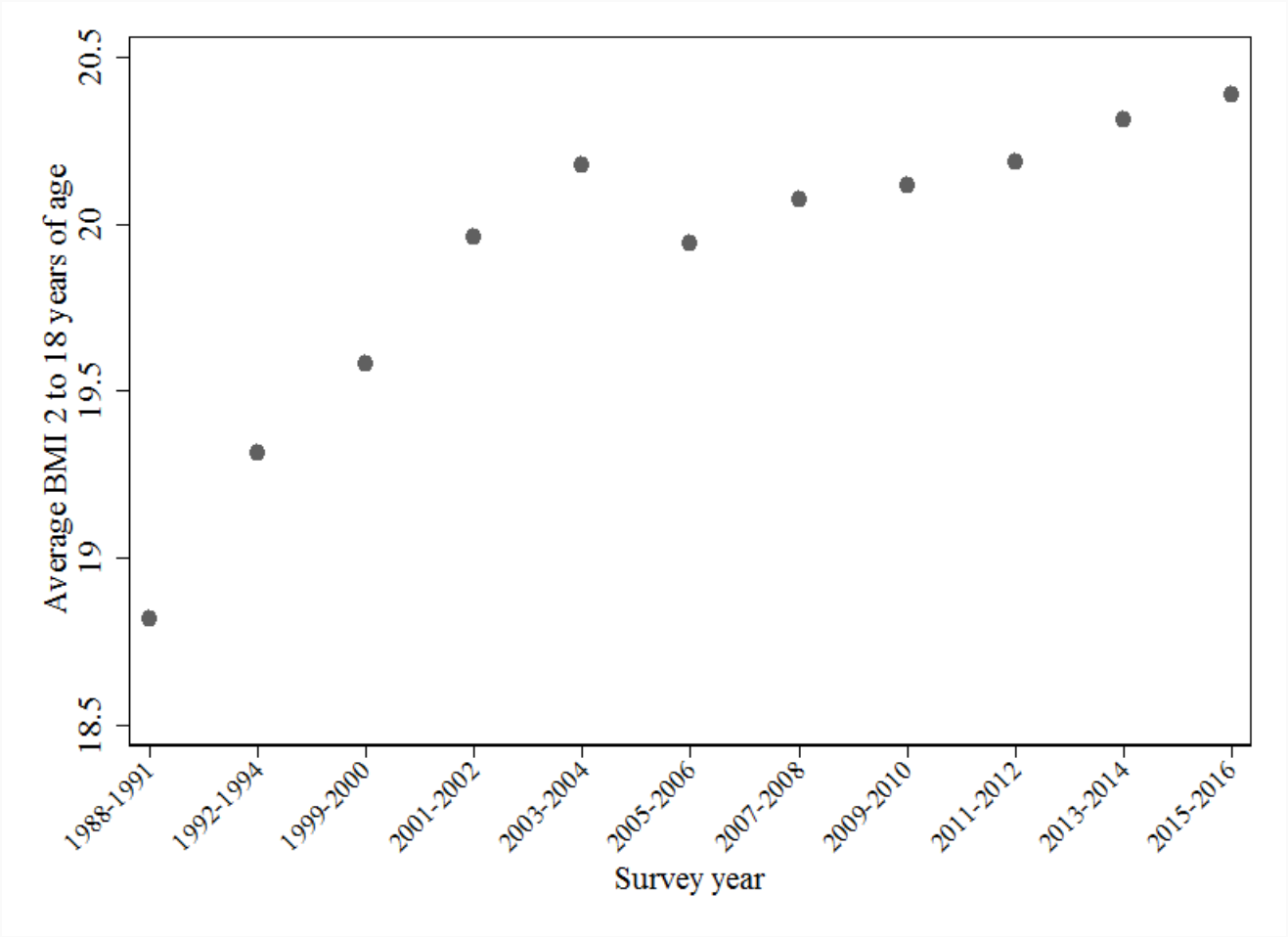
- Cutler, Glaeser and Shapiro (2003)
  - ◇ Increase in obesity since 1980 mostly driven by increase in calories consumed instead of decrease in calories expended
  - ◇ Propose a theory based on technical change in food preparation
- Eid, Overman, Puga and Turner (2008)
  - ◇ Relationship between urban sprawl and obesity
  - ◇ Use NLSY79 data to track change in BMI for young adults moving into more sprawling neighborhoods
- Large descriptive literature on adult and childhood obesity
  - ◇ Li et al. (2015), Ng et al. (2014), Ogden et al. (2016)
- Impact of school nutrition environment
  - ◇ Anderson et al. (2017), Bauhoff (2014), Campbell et al. (2011), Schanzenbach (2009)

BMI Over Lifetime



- Source: National Health Interview Survey (NHIS)
- Data on adults age 18+ from 1976 through 2016, young adults age 12-17 from 2008

Secular Trend in Teen BMI



- Source: National Health and Nutrition Examination Survey (NHANES III and NHANES 1999-2016)

Research Questions

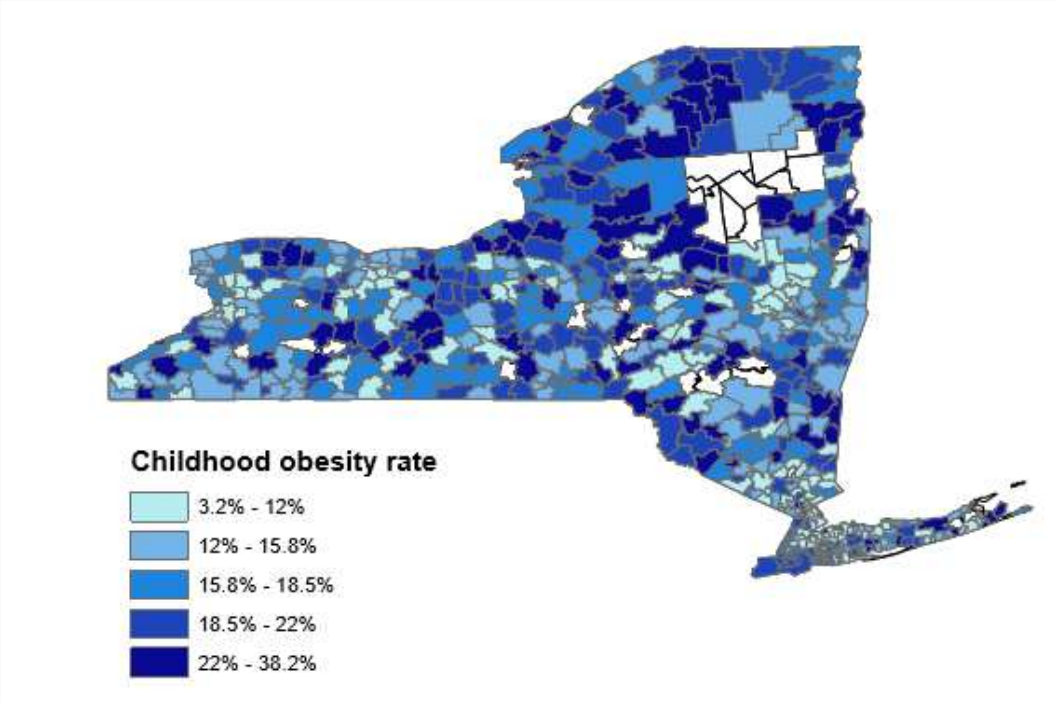
How effective are school wellness policies in addressing childhood obesity?

Are students affected by the health status of their peers?

Potential Identification Strategies

Movers

- Non-trivial fraction of students change school
  - ◇ Bradbury et al. (2013) measure that 10.6% of non-high-school Boston Public School students have "nonstructural" school changes
- Different childhood obesity rates at the school district level (likely at the school level as well)



- Source: New York State Department of Health

Movers: Data

- Early Childhood Longitudinal Study
  - ◇ ECLS-K follows kindergarten class of 1988-99 through 8th grade
    - → 22,700 children sampled from 1,300 schools
    - → 2,542 movers from spring of 1st grade and spring of 3rd grade
    - → Geolocation of the students' school and home in restricted use data
  - ◇ ECLS-K:2011 tracks cohort of 2010-2011 through 5th grade (Spring 3rd grade will be released in Jan 2018)
- National Longitudinal Survey of Youth 1979 (NLSY79)
  - ◇ 12.7k individuals age 14 to 22 in 1979 followed biennially until 2012
  - ◇ Can be linked to NLSY Children and Young Adults to study 11.5k children born to female NLSY respondents
  - ◇ Access to Zip code and census tract from BLS data enclave in Washington

Movers: Data

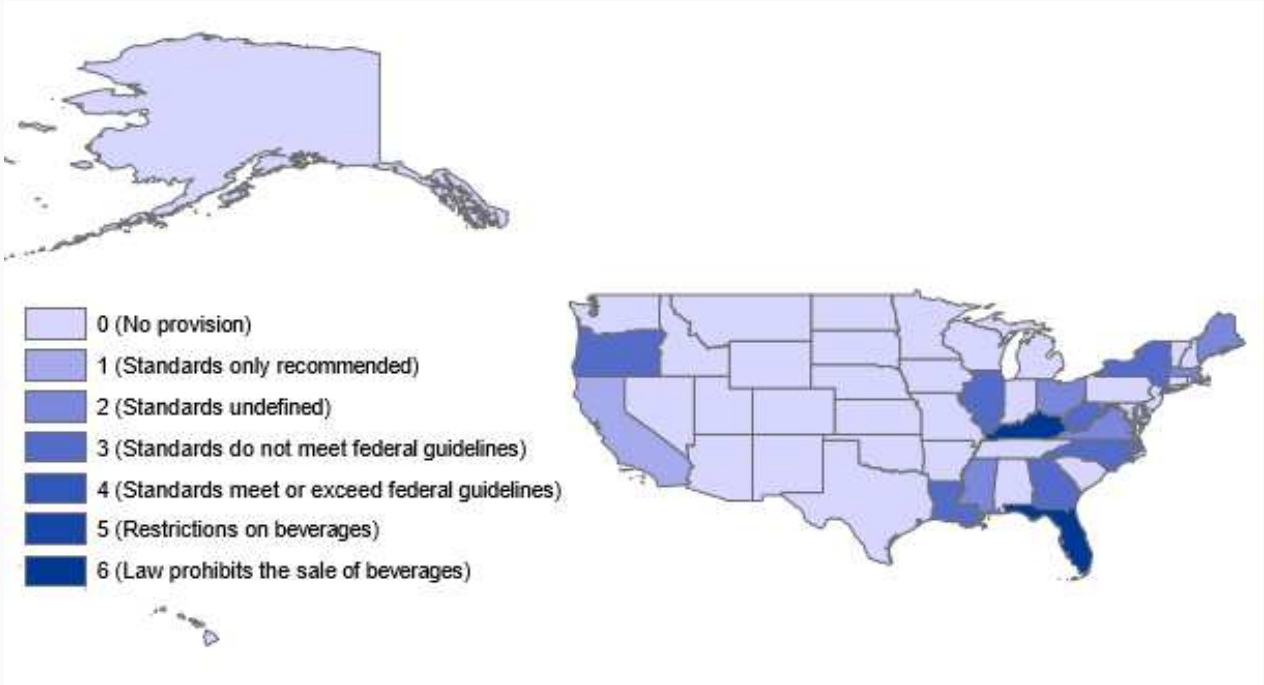
- Alternative: various states require BMI screening in different grades
  - ◇ Administrative data on students moving within one of these states would be ideal

13 States Requiring BMI Screening			
State	**Tools Used to Assess BMI or Body Composition**	**Grade Levels**	**Parent Notification Required?**
Arkansas	None required or recommended	K, 2, 4, 6, 8, and 10	Yes
Connecticut[a]	None required or recommended	K, 6 or 7, and 9 or 10	No
Florida	None required or recommended	1, 3, 6, and optionally 9	No
Illinois[b]	None required or recommended	Before entering school and in grades K or 1, 6, and 9	Yes
Maine	None required or recommended	Rules have not yet been promulgated	
Massachusetts	None required or recommended	1, 4, 7, and 10	Yes
Nebraska[c]	None required or recommended	Preschool, K-4, 7, and 10	No
Nevada	None required or recommended	4, 7, and 10	No
New Jersey[a]	None required or recommended	1-12	No
New York[b,d]	None required or recommended	Upon school entry and in grades pre-K or K, 2, 4, 7, and 10	Yes
Ohio	Fitnessgram[e] recommended	K, 3, 5, and 9	Yes
Pennsylvania	None required or recommended	1-12	Yes
Tennessee[d]	Fitnessgram[e] recommended	K, 2, 4, 6, 8, and 1 year of high school	Yes

- Source: Linchey & Madsen (2011), table 1

School Eating Environment

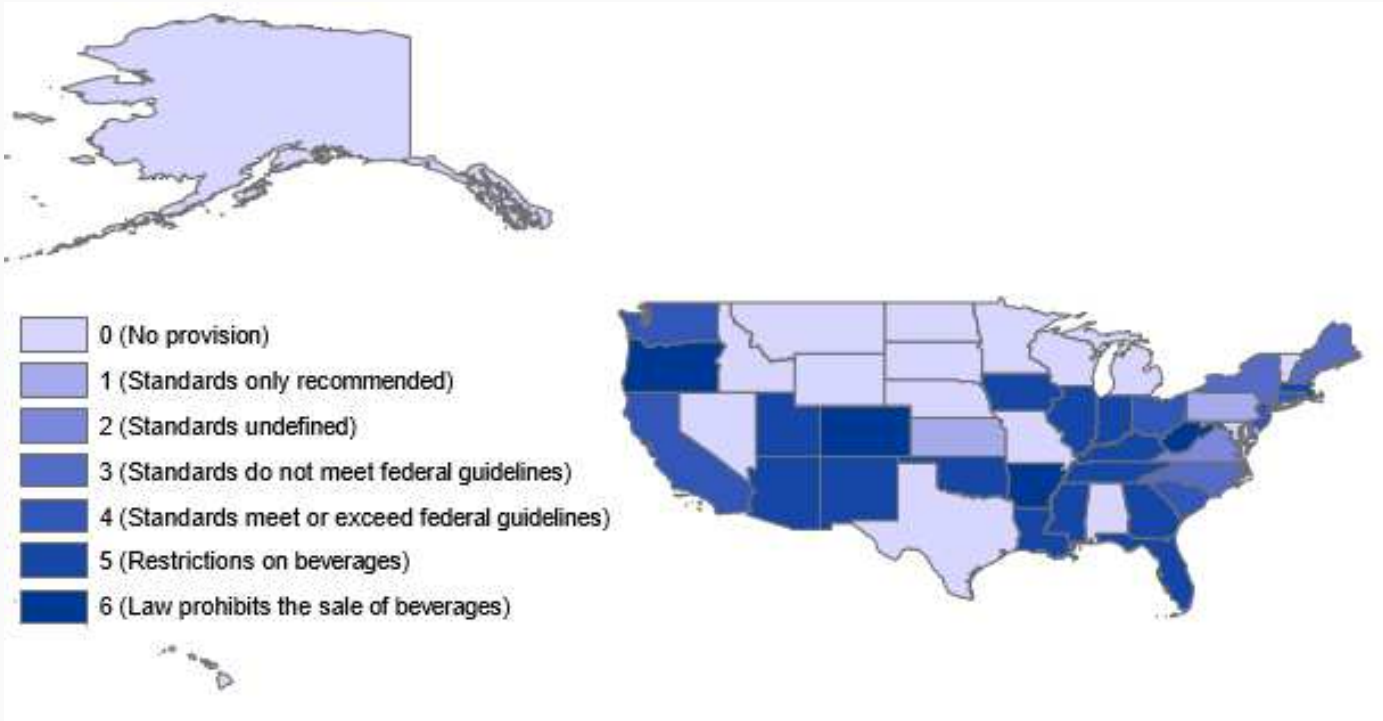
- Large time and geographic variation in school eating environment
- Example: strength of policies regulating standard for a la carte beverages in elementary schools as of 2003



Source: CLASS, 2003

School Eating Environment

- Policies regulating standard for a la carte beverages in elementary schools as of 2015



Source: CLASS, 2015

School Eating Environment: Data

- Classification of Laws Associated with School Students (CLASS)
  - ◇ Scoring system used to evaluate state-level school physical education and nutrition policies from 2003 through 2015
  - ◇ Developed by the National Cancer Institute
  - ◇ High correlation with other state law evaluation data (e.g. Bridging the Gap)
- National Health and Nutrition Examination Survey (NHANES)
  - ◇ Cross sectional surveys conducted biennially from 1999
  - ◇ 24-hour dietary recalls and physical examinations
  - ◇ Geocode variables are restricted use and require on-site access
- National Survey of Children's Health (NSCH)
  - ◇ State-level BMI data for kids 10-17 years
  - ◇ Interviews conducted in 2004, 2007, 2011 and 2016

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