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The Impact of Changing Economic Conditions on Overweight Risk Among Children in California from 2008–2012

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Abstract

Background—The recent economic recession represents an opportunity to test whether decreases in economic resources may have deleterious consequences on childhood overweight/obesity risk.

Methods—We investigated the association between indicators of changing macroeconomic conditions from 2008–2012 and overweight/obesity risk among school-aged children in California (n=1,741,712) using longitudinal anthropometric measurements. Multivariate regression, with individual and county fixed-effects, was used to examine the effects of annual county-level unemployment and foreclosure rates on risk of child overweight/obesity, overall and among subgroups (race/ethnicity, sex, county-level median household income, county-level urban/rural status).

Results—From 2008 to 2012, approximately 38% of children were overweight/obese and unemployment and foreclosure rates averaged 11% and 6.9%, respectively. A 1-percentage point (pp) increase in unemployment was associated with a 1.4 pp (95% Confidence Interval [CI]: 1.3, 1.5) increase in overweight/obesity risk. Therefore, a child of average weight could expect a 14% increase in BMI z-score in association with a 1 pp increase in unemployment during the study period. We found some differences in the magnitude of the effects for unemployment among demographic subgroups, with the largest effects observed for unemployment among American Indians and Pacific Islanders.

Conclusion—Comparing children to themselves over time, we provide evidence that increases in county-level unemployment are associated with increased overweight/obesity risk. Given that overweight among children with lower economic resources remains a challenge for public health,

these findings highlight the importance of policy-level approaches which aim to mitigate the impact of decreased resources as economic conditions change.

Keywords

child overweight/obesity; economic conditions; foreclosure; unemployment; economic recession

INTRODUCTION

Persistent disparities in overweight among children with lower economic resources compared to those with higher economic resources represents a critical challenge for public health in the U.S. [1–3]. Therefore, it is important to understand the impact of significant decreases in economic resources at the broader community-level (e.g., business closings, changing economic security) on childhood overweight/obesity outcomes. The recent economic recession represents an opportunity to test whether changing economic conditions have consequences on childhood overweight/obesity risk.

Research on the effects of recessions on weight status is mixed, with some studies in the U.S. suggesting that recessions are associated with increased overweight/obesity [4–6] (or correspondingly, that improving economic conditions are associated with decreased overweight/obesity), [7] while others suggest that recessions are associated with decrease overweight/obesity [8, 9]. Most of these studies rely on repeated cross-sectional data, self-reported anthropometric measurements, or a single measure of economic hardship (e.g., unemployment). Prior research utilizes individual-level employment status, which can be correlated with unobserved traits that also influence health, thus producing misleading associations and fails to capture changes in spending that occur among families who perceive greater economic uncertainty, but do not actually become unemployed, and among those who have experienced economic hardships, due to potential losses in investments or a reduction in work hours [10, 11]. Prior literature is also limited to adults and few studies have leveraged longitudinal data to compare the same individual to him- or herself over time.

We improve upon previous studies by using measured longitudinal anthropometric measurements to examine the impact of macroeconomic indicators on children's overweight/obesity risk. We investigate the association between two indicators of economic conditions (county-level unemployment and foreclosure) and overweight/obesity among children in California between 2008 to 2012. The overlap between this study period and the Recession (December 2007 to June 2009) [12], as well as our ability to overcome major sources of confounding by comparing children to themselves over time, provides a unique opportunity to better identify changes in children's weight as a result of changing economic conditions.

Economic theory suggests that changing macroeconomic conditions, like those experienced during a recession, could impact health through several pathways, including reductions in income and changes in time allocation [13]. Lakdawalla and Philipson propose an upside down u-shaped relationship between income and BMI and suggest different predicted changes in BMI depending on the degree to which income increases or decreases and on

baseline income [14]. Changing economic conditions may increase weight gain if families opt to save money by decreasing their purchase of healthful foods in favor of increasing consumption of cheaper, energy-dense foods [15–17], as was recently demonstrated in a comparison of the same households pre- and post-recession [18]. However, changing economic conditions may decrease children's risk for weight gain if parental engagement in health-promoting activities, such as preparing healthy meals, increases when working hours decrease [19] or if households face extreme hardship that leads to a further economizing of food purchases, resulting in a decrease in total caloric intake [20].

The primary aim of this paper is to test these competing hypotheses. Based on research suggesting that the impact of recessions varies by sociodemographic characteristics [5, 9, 21–23], the secondary aim of this paper is to assess heterogeneity by race/ethnicity, urban/rural status, median household income, or child sex.

METHODS

Data Sources

Individual-level measured weight and height, collected by the Department of Education, were obtained for children in fifth, seventh, and ninth grade, enrolled in public schools in all of California's 58 counties [24]. We limited our eligible sample to children who had at least 2 anthropometric measurements, since we were interested in within-child estimates ($n=1,901,689$). Children were excluded for missing height or weight ($n=222,775$), implausible BMI z-score ($n=14,324$), or race/ethnicity ($n=122,878$). Our final analytic sample included 1,741,712 children aged 7–18 years who were followed between 2008 and 2012. Over the study period, 83% ($n=1,438,992$), 17% ($n=302,164$), and <1.0% ($n=556$) of children had 2, 3, and 4 or 5 measurements, respectively.

County-level annual unemployment estimates (2008–2012) were obtained from the Bureau of Labor Statistics. County-level annual foreclosure rates (2008–2012) were obtained from RealtyTrac LLC whose data covers more than 90 percent of the U.S. [25]. Three-year estimates (2005–2007) of county-level median household income were obtained from the American Community Survey (ACS), which were used as an indicator of baseline income.¹ The Johns Hopkins Institutional Review Board deemed that this analysis of de-identified secondary data was non-human subjects research.

Dependent Variables

The primary dependent variable was overweight/obesity defined as BMI ≥85th percentile compared to the age- and sex-specific Centers for Disease Control and Prevention (CDC)/National Center for Health Statistics (NCHS) 2000 growth charts.

¹Five year estimates (2005–2009) were used for the following counties because of missing data on the variable of interest due to size: Alpine, Inyo, Mariposa, Modoc, Mono, Sierra, and Trinity. Five year estimates are available for all areas where as three year estimates are available for areas with populations >20,000.

Independent Variables

We examine aggregate, county-level indicators because they capture broad changes in the macroeconomy which affect everyone and not just individuals who became unemployed or were foreclosed upon [4, 10, 13, 25, 26]. It is also plausible that becoming unemployed is confounded with individual-level characteristics that may also affect health [9, 13]. For example, poor work performance may also impact parenting style (e.g. lack of supervision of childhood meals) which in turn, affects children weight. Therefore, the main independent variables included annual county-level unemployment and foreclosure rates (2008–2012), which have previously been associated with adult weight status [5–9]. Unemployment is the most widely used indicator of macroeconomic conditions [5–9, 13, 27], however, during the recession, foreclosures also represented a significant shock to household's and community's financial well-being [25]. The recession, indicated by a decline in several metrics of economic activity (e.g. real income, employment, retail sales), ended in June 2009 when macroeconomic indicators *began* to increase (i.e., not when economic activity returned to pre-recession levels) [12]. However, high unemployment and foreclosure persisted and data indicate that median household income fell significantly more from June 2009 to June 2011 (6.7%) than during the official recession period (3.2%) [28]. Therefore, this study explores the impact of changing economic conditions over a five-year period that overlaps with the recession, because the recession had longer-term economic impacts beyond its official end date [28, 29].

Annual unemployment rate (a percent) was defined as the number of persons unemployed divided by the civilian labor force. Annual foreclosure rate (a percent) represented total foreclosures divided by the total number of mortgages.

Effect Measure Modifiers and Confounding Factors

Child age was calculated using birth date and the anthropometric measurement date. Race/ethnicity was self-reported as one of the following categories: American Indian/Alaska Native (henceforth, American Indian), Asian, Pacific Islander or Native Hawaiian, Filipino, Hispanic or Latino, African American or Black, white and, beginning in 2011, two or more races. Counties were classified as urban or rural using the 2013 Economic Research Service Rural-Urban Continuum Codes (RUCC)[30]. Urban was defined as RUCC = 3 and rural was defined as RUCC >3 to 9. Using three-year ACS estimates, counties above the statewide median household income (\$58,316) were defined as high-income, while counties at or below the median were categorized as low-income. We used county-level income as an effect measure modifier because individual income was not available.

Statistical Analysis

We used fixed-effect linear probability models, with individual- and county-level fixed-effects, and county-level clustered standard errors [29], to test the relationship between overweight/obesity and changing economic conditions (2008–2012) using measures of county-level unemployment and foreclosure. This approach allowed us to compare each child to him- or herself over time and, in doing so, control for all baseline time-invariant measured (e.g., race/ethnicity) and unmeasured (e.g., SES) individual-level factors that may influence the selection into the neighborhood where a child resides [31, 32]. For example,

parental race/ethnicity may influence which county one lives in and child BMI. Fixed-effects models also control for unmeasured time-invariant factors, (e.g. food preferences). Our ability to eliminate potential sources of confounding, a key limitation in prior analyses, allows us to better identify the causal impact of changing economic conditions on children's overweight risk.

Based on prior literature, we hypothesized that macroeconomic conditions might have a more pronounced effect for Blacks, Latinos, males, and low-income households [4, 5, 10, 21–23, 25]. We stratified by race/ethnicity, sex, median household income and urban/rural status and assessed heterogeneity in the effects of economic conditions on overweight/obesity using a post-hoc Wald test of differences. Models included a county indicator to account for time-invariant county characteristics related to child weight and macroeconomic conditions (which are possible while also including individual fixed-effects because some children moved during the study period) and an age by race/ethnicity interaction to control for race/ethnicity-specific time trends in overweight/obesity. Linear probability models (i.e., ordinary least squares with dichotomous outcomes) are a recommended alternative to logistic models when outcomes are common, as well as when risk differences rather than ratios are the desired measure of effect [33]. The coefficients from these models are probabilities and were multiplied by 100 so that they can be interpreted as the percentage point (pp) change. Alpha was set to 0.05 and all analyses were performed using Stata 13.1 (StataCorp LP, College Station, TX).

Sensitivity Analyses

We assessed whether our results would have changed given the following alternative specifications: 1) when BMI z-score, underweight and obesity were modeled as the outcomes and 2) when unemployment and foreclosure were log-transformed. Since approximately 25% of the population of California resides in Los Angeles (L.A.) county, we assessed our results when excluding individuals residing in this area. Additional robustness checks included excluding children who moved counties (n for non-movers= 1,670,397), excluding years after the peak in unemployment (2011–2012), excluding children with extreme changes in their BMI z-score (change in BMI z-score > 5) (n =1,128), and estimating the association using mixed- and between-effects models.

RESULTS

Table 1 displays demographic and economic characteristics of the sample from 2008 to 2012. The mean age of the study children (n=1,741,712) was 13 (standard deviation: 1.6). Half of the sample was Latino (53%) or male (51%). Approximately 38% of children were overweight/obese.

Statewide, unemployment and foreclosure peaked in 2010 at ~14% and ~8% respectively (Figure 1). County-level trends in unemployment demonstrate a qualitatively consistent pattern across counties, while there was more variation in county-level foreclosure patterns (Figure 2). Variation in unemployment and foreclosure rates by county is described in Supplemental Table 1.

A 1 pp increase in unemployment was associated with a 1.4 pp (95% Confidence Interval [CI]: 1.3, 1.5) increase in overweight risk (Table 2). The direction of the relationship was opposite for foreclosure and the magnitude of the association was considerably lower (Table 2). A 1 pp increase in foreclosure was associated with a 0.29 pp (95% CI: -0.48, -0.10) decrease in overweight/obesity risk.

Heterogeneity

The magnitude of the effects for unemployment was somewhat greater in high-income (1.5 pp; 95% CI: 1.4, 1.7) and rural counties (1.8 pp; 95% CI: 1.4, 2.2) and among females (1.5 pp; 95% CI: 1.4, 1.6) (Table 3). The magnitude of the association was highest for American Indians (1.8 pp; 95% CI: 1.5, 2.0) and Pacific Islanders (1.8 pp; 95% CI: 1.5, 2.3). The estimate for American Indians was significantly greater than those for whites (1.5 pp; 95% CI: 1.4, 1.6), Latinos (1.4 pp; 95% CI: 1.3, 1.5), Blacks (1.6 pp; 95% CI: 1.5, 1.7), Asians (1.2 pp; 95% CI: 1.1, 1.3), and Filipinos (1.1 pp; 95% CI: 0.80, 1.3). The magnitude of association among Latinos, Asians, and Filipinos was significantly smaller as compared to Pacific Islanders.

The magnitude of association of foreclosure on overweight was smaller for males (-0.23 pp; 95% CI: -0.41, -0.062) compared to females (-0.34 pp; 95% CI: -0.55, -0.14) (Table 3). The foreclosure-overweight relationship was largest among Pacific Islanders (-0.69 pp; 95% CI: -1.2, -0.20) and this was greater than whites (-0.19 pp; 95% CI: -0.37, -0.0064), American Indians (0.0016 pp; 95% CI: -0.34, 0.34) and Asians (-0.23 pp; 95% CI: -0.52, 0.0068).

Sensitivity Analyses

The direction and statistical significance of the association between unemployment and overweight/obesity remained unchanged in the sensitivity analyses (Supplemental Tables 2–8). Foreclosure was not significantly associated with BMI z-score or underweight (Supplemental Table 2) and the foreclosure-overweight/obesity relationship was no longer statistically significant when excluding years after the peak in unemployment (Supplemental Table 6). We found that increased unemployment was associated with a significant decrease in underweight risk (-1.3 pp; 95% CI: -1.4, -1.1), which is consistent with the primary results for overweight (Supplemental Table 2). Results were unchanged in magnitude, precision or significance when excluding children with extreme changes in BMI z-score (Supplemental Table 7).

DISCUSSION

This study leveraged longitudinal data in order to identify the impact of changing economic conditions during the recession on childhood overweight/obesity risk. We found that increased unemployment was associated with increased risk of overweight/obesity. Increased foreclosure was associated with decreased risk of overweight/obesity, however, the magnitude of the unemployment-overweight/obesity association was 5 times larger than the magnitude of the association for foreclosure-overweight/obesity and was more robust to sensitivity checks. In this sample, a child of average weight (BMI z-score of 0.54 [Table 1])

could expect a 14% increase in BMI z-score (i.e. a BMI z-score of 0.62 based on $\beta=0.08$ [Supplemental Table 1]) in association with a 1pp increase in unemployment during the period of observation. These observed changes in overweight/obesity risk may have important implications at the population level given that small changes in weight (5–10%) have been shown to change chronic disease risk [34–36]. This study overcomes many of the potential sources of confounding by comparing children to themselves over time as the economic environment changed around them.

Our analysis of subgroups revealed some differences in the magnitude of the effects for both unemployment and foreclosure. However, the estimates were largely in the same direction as our primary results and while significant, the differences were small. The largest magnitudes of effect were observed for unemployment among American Indians and Pacific Islanders. Prior research also suggests recessions disproportionately impact racial/ethnic minorities, however, differences have largely been reported among Blacks and Latinos [5, 9, 25]. The small differences by household income are consistent with evidence suggesting that higher income households reduced the price they paid per calorie during the recession, whereas lower income households cut the total number of calories purchased [37]. Small sub-group differences between males and females is consistent with literature which finds differences in the economic resources-BMI relationship by sex among children and adolescents [1, 2].

Our results are consistent with research that reports aggregate-level unemployment is associated with increased overweight/obesity risk [4, 5, 7]. The effects are a combination of the effects for children whose families actually experienced unemployment, as well as the changes in social norms and the widespread ‘recession mentality’ that occurred due to economic uncertainty (i.e. feared loss of income), even among those who did not become unemployed [13]. The literature suggests several possible mechanisms through which changes in aggregate-level economic conditions could increase overweight/obesity risk. Constricting economic resources can render healthful foods unaffordable, leading to increased household consumption of cheaper, energy-dense foods [13, 15–18] and decreased consumption of fruits and vegetables [17] leading to an overconsumption of energy [38]. In times of economic crisis, consumers tend to trade down to lower priced foods, which for many households includes fast or take-away foods as demonstrated by stable share prices of fast food during the recession [39]. It is plausible that increased unemployment could result in local-area budget cuts to after-school programs and sports leagues. Evidence suggests that community-level deprivation has been associated with decreased access to places for recreation and physical activity [40]. We speculate that the decrease in underweight risk would be operating through similar mechanisms as the increase in overweight risk.

We speculate that losing or changing residence as a result of foreclosure may be a more extreme form of hardship and may require an even greater economizing that would lead families to cut down on their food purchases and reduce food-away-from-home spending [20]. Very constrained budgets could lead to decreased overweight, because meager finances lead people to consume lower quantities or cook meals at home, which tend to be lower in total energy [13, 20]. Foreclosure effects and economizing may persist beyond families foreclosed upon as increasing neighborhood blight would result in decreased property value and wealth neighborhood-wide [41]. For example, Joshi [26] found that individuals were

likely to experience worse mental health when local housing prices declined (2005–2011), and this association was most pronounced among individuals who were not homeowners. Currie and Tekin also find that increased community-level foreclosure was associated with higher emergency room visits for mental health, heart attack, stroke, and hypertension, in high foreclosure states, including California [25]. The authors hypothesize that these associations may be the result of stress resulting from the lengthy foreclosure process (~90 and 117 days in California) and it is plausible that prolonged stress could result in a greater depletion of resources forcing even greater economizing and thus, decreased overweight among children.

Consistent with our results, Currie and Tekin [25] employ mutually adjusted models to demonstrate that the effects of foreclosure cannot be explained by unemployment (or vis versa). Furthermore, those foreclosed upon may be different than those who become unemployed and changing economic conditions may differentially impact these populations. During the recession, middle-income households faced the highest unemployment rates [42] and those foreclosed upon were more likely to be households with children and low-income, first-time buyers, many of whom were in minority neighborhoods and may not have qualified for loans during other times [23, 43, 44]. A study of subprime borrowers in California found that Blacks were significantly more likely than whites to report being targeted by unscrupulous mortgage brokers and that lender marketing efforts were the impetus for taking out a home equity loan [45]. Subsequently, the economic fallout was greatest in Black and Latino neighborhoods [25, 46–49]. If foreclosure is a more extreme economic hardship and those who were foreclosed upon or living in high-foreclosure communities had lower net resources at baseline, then the opposing direction of effects for unemployment and foreclosure could be consistent with an upside down u-shaped relationship between income and BMI [13]. But the estimates for foreclosure were much smaller in magnitude and more sensitive to model specifications, so should be interpreted cautiously.

Our data analysis and approach have several strengths including the use of longitudinal data and individual and county fixed-effects, which has previously been described as the ideal study design for identifying the effects of economic recessions [9]. This approach allows us to control for individual- and county-level measured and unmeasured time-invariant confounding. Limitations of this study should also be noted. First, we are not able to control for potential unmeasured time-varying confounding; but biased coefficients would only result if a factor co-varied with county-level unemployment and foreclosure and affected BMI. Although data collectors did receive training on collection of height and weight measurements, the anthropometrics were collected during routine physical fitness testing, rather than according to a research protocol. Approximately 12% of the children are not measured at any time point. We assume that those children measured represent those not measured, but if those unmeasured children are systematically different (e.g. systematically from less-stable households) than it is possible that the association would have been different had they been included in the sample. Using a smaller geographical unit for unemployment and foreclosure (e.g. zipcode-level) may have been preferred due to variation within counties; however, a data-use agreement prevented us from presenting less aggregate estimates for overweight/obesity. Our findings may be less generalizable to non-judicial

states where the foreclosure process is longer or to states that experienced a less severe recession, as unemployment and foreclosure rates in California were higher than the national averages [27].

This study enhances our understanding of the impact of changes in economic conditions on overweight/obesity risk among children. We improve upon prior studies by comparing children to themselves over time and provide evidence that increases in unemployment are associated with increased overweight/obesity risk. A better understanding in this area is critical given the potential deleterious effects of decreased economic resources resulting from unemployment. Future studies should explore the pathways by which different economic shocks affect weight status among children in order to inform future policy and intervention strategies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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What is already known on this subject

- Research on the effects of economic recessions on weight status among adults is mixed.
- Prior studies are limited to adults and rely on repeated cross-sectional data, self-reported anthropometric measurements, a single measure of economic hardship (e.g., unemployment), or individual-level employment status, which can be correlated with unobserved traits that also influence health, thus producing misleading associations.

What this study adds

- The overlap between the study period (2008 to 2012) and the Great Recession, as well as our ability to overcome major sources of confounding by comparing children to themselves over time, enhances our understanding of the extent to which changing economic conditions impact overweight/obesity risk among children.
- Results suggest that increased unemployment is associated with a significant increase in overweight risk among children. Overweight among children remains a challenge for public health. Therefore, it is critical to develop policy and intervention strategies which aim to mitigate the impact of decreased resources as economic conditions change.

Figure 1.
Mean Unemployment and Foreclosure Rates, 2008–2012

Figure 2.
County-level Unemployment and Foreclosure Rates, 2008–2012

Table 1

Demographic Characteristics of Children Attending Public Schools in California, 2008–2012

	N = 1,741,712
	Mean (Standard Deviation) or N (%)^a
Mean age (years)	13 (1.6)
Sex	
Males	1,932,016 (51%)
Females	1,854,692 (49%)
Mean BMI z-score	0.54 (1.2)
Underweight ^b	102,148 (2.7%)
Overweight/obesity ^b	1,456,320 (38%)
2008	267,243 (40%)
2009	273,069 (40%)
2010	397,838 (39%)
2011	247,744 (37%)
2012	270,426 (37%)
Obesity ^b	713,332 (19%)
Mean Unemployment Rate	11 (3.1)
Mean Foreclosure Rate	6.9 (3.0)
Mean Median Household Income (dollars)	58,296 (10,445)
Race/Ethnicity ^c	
American Indian/Alaska Native	22,282 (0.59%)
Asian	334,912 (8.9%)
Pacific Islander or Native Hawaiian	20,441 (0.54%)
Filipino	105,948 (2.8%)
Hispanic or Latino	2,005,930 (53%)
African American or Black	245,479 (6.5%)
White	1,015,377 (27%)
Two or More	9,075 (0.24%)

^aDescriptive statistics (N, mean, standard deviation) reflect the total observations (3,786,708) over the time period (2008–2012).

^bUnderweight is defined as BMI < 5th percentile; overweight/obesity is defined as BMI ≥ 85th percentile; and obesity is defined as BMI ≥ 95th percentile of age- and sex-specific reference values using the 2000 CDC/NCHS growth charts.

^cRace/ethnicity was self-reported as one of the following categories: American Indian/Alaska Native, Asian, Pacific Islander or Native Hawaiian, Filipino, Hispanic or Latino, African American or Black, white, and beginning in 2011, two or more races.

Table 2

Individual Fixed-Effects Regression for the Relationship Between Unemployment Rate, Foreclosure Rate, and Overweight/Obesity^{a,b}

	N = 1,741,712
	Percentage Point (95% Confidence Interval)
Unemployment Rate ^c	1.4 (1.3, 1.5) ***
Foreclosure Rate ^c	-0.29 (-0.48, -0.10) **

^a Estimated for children followed between 2008–2012 using ordinary least squares regression, with individual and county fixed-effects. Models include both county-level unemployment and foreclosure and an age by race/ethnicity interaction to control for race/ethnicity-specific time trends. Beta coefficients were multiplied by 100 and can be interpreted as a percentage point change.

^b Overweight/obesity is defined as BMI ≥ 85th percentile using the 2000 CDC/NCHS growth charts.

^c p-value for age by race/ethnicity = < 0.001.

*
p < 0.05

**
p < 0.01

p < 0.001

Table 3

Assessment of Heterogeneous Effects by County-Level Income, Urban/rural Status, Sex, and Race/ethnicity for the Relationship Between Unemployment Rate, Foreclosure Rate, and Overweight/Obesity^{a,b,c}

	Percentage Point (95% Confidence Interval)		
	N ^d	Unemployment Rate	Foreclosure Rate
County-Level Income ^e			
Low-Income Counties ^f	1,113,832	1.3 (1.3, 1.4) *** ₁	-0.33 (-0.53, -0.12) *** ₁
High-Income Counties ^f	608,057	1.5 (1.4, 1.7) **	-0.82 (-1.2, -0.35) *** ₁
Urban/Rural Status ^g			
Rural Counties ^f	25,942	1.8 (1.4, 2.3) *** ₁	0.10 (-0.24, 0.44) ¹
Urban Counties ^f	1,713,409	1.4 (1.3, 1.5) ***	-0.34 (-0.54, -0.13) ***
Sex			
Males ^f	888,397	1.3 (1.2, 1.4) *** ₁	-0.23 (-0.41, -0.062) ₁
Females ^f	853,315	1.5 (1.4, 1.6) ***	-0.34 (-0.55, -0.14) ***
Race/Ethnicity			
White	471,297	1.5 (1.4, 1.6) *** ₁	-0.19 (-0.37, -0.0064) ₁
Asian	157,710	1.2 (1.1, 1.3) *** ₂	-0.23 (-0.52, 0.068) ^{1,2}
Hispanic or Latino	925,734	1.4 (1.3, 1.5) ***	-0.32 (-0.51, -0.14) *** _{2,3}
African American or Black	114,690	1.6 (1.5, 1.7) *** ₁	-0.59 (-0.84, -0.34) *** ₄
Pacific Islander	9,562	1.8 (1.5, 2.2) *** _{1,3}	-0.69 (-1.2, -0.20) *** _{3,4}
Filipino	49,363	1.1 (0.80, 1.3) *** ₂	-0.34 (-0.70, 0.013) ^{1,2,4}
American Indian/Alaska Natives	10,002	1.8 (1.6, 2.0) *** ₃	0.0016 (-0.34, 0.34) ¹

^aEstimated for children followed between 2008–2012 using ordinary least squares regression, with individual and county fixed-effects. Models include both county-level unemployment and foreclosure and an age by race/ethnicity interaction to control for race/ethnicity-specific time trends. Coefficients were multiplied by 100 and can be interpreted as a percentage point change.

^bSimilar numbers denote that the post hoc test of differences between groups (e.g. sex) is *not* significantly different ($p > 0.05$).

^cOverweight/obesity is defined as BMI z-score ≥ 85th percentile using the 2000 CDC/NCHS growth charts.

^dChildren can be included in *both* 1) urban and rural models and/or 2) low- and high-income models if they moved counties during the study period.

^eLow-income counties were defined as < \$58,361, the statewide median household income (using ACS estimates [2005–2007]). High-income counties were defined as ≥ \$58,361.

^fp-value for age by race/ethnicity = < 0.001.

^gUrban is defined as RUCC ≤ 3 and rural is defined as RUCC > 3 to 9.

*
p < 0.05

**
p < 0.01

p < 0.001