Supplemental Information

DATA QUALITY

A comparison of data from Pan et al[13] and data.gov[14] reveals negligible differences: Obesity prevalence differs for Nevada (15.1% at data.gov versus 15.0% in Pan et al[13] for 2010), but estimates for all other states are identical across the 2 data sets for 2010 and 2014. Sample sizes differ slightly for 29 observations, but differences represent <1% of the total sample size for each state-year observation.

We also compare the demographic makeup reported for 2- to 4-year-old participants in the data.gov data with the demographic makeup reported for 1- to 4-year-old enrollees for 3 years for which overlapping data are available[15,22,28]. The former data set is used to assess racial makeup from 2008 to 2014 in our main analyses; the latter is the source of our estimates for 2000 and 2004. Despite the difference in the population covered, we find high correlations (Spearman $\rho \geq 0.9$) for the percentage of all children whose race was reported as Asian American and/or Pacific Islander or African American or who reported ethnicity as Hispanic in all 3 available time points.

Correlations were lower for the percentage of children whose race was reported as white or American Indian. However, this may be due to a change in the way in which race was recorded: for the 2008–2014 data used here, race does not include Hispanic as a possible category; instead, participants were asked to separately report ethnicity as either Hispanic or non-Hispanic. It is likely as a result of this change that we see, for example, 3499 2- to- 4-year-old participants whose race is reported as American Indian but 331 511 1- to 4-year-old enrollees being reported as American Indian in California in 2008. In the same state and the same year, 36 886 2- to- 4-year-old participants have their race listed as white in the primary data set, but 361 589 1- to 4-year-old enrollees have their race reported as white in the secondary data. Other states where there are such extreme differences between the number of white or American Indian children reported across the 2 data sources include Puerto Rico, Texas, and Florida.

We note that the change in race reporting occurred after 2004; thus, this issue should not affect the data we use for demographic makeup in 2000 and 2004.

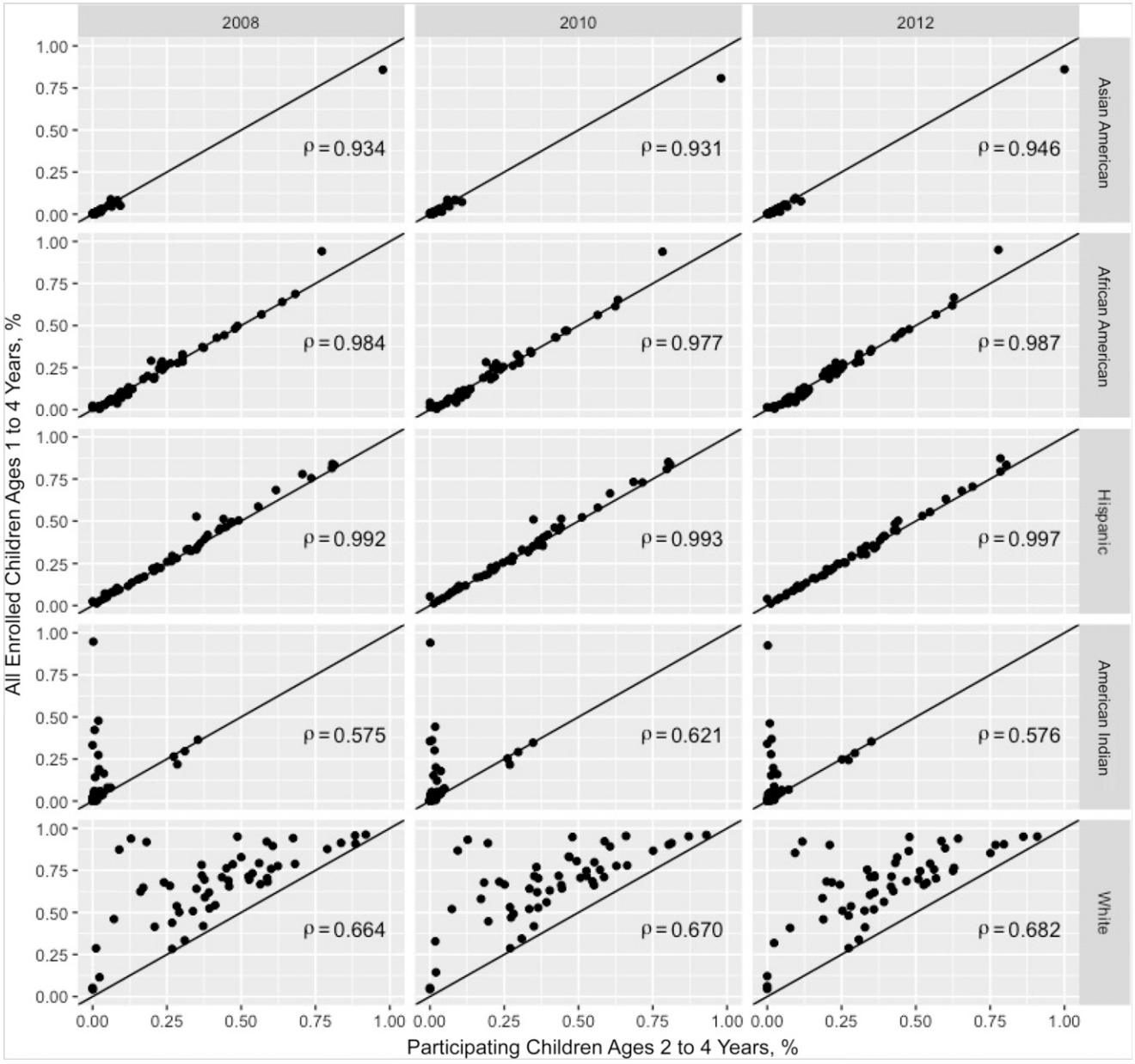
MODEL SPECIFICATION AND SENSITIVITY ANALYSES

Our baseline regression model is specified as follows:

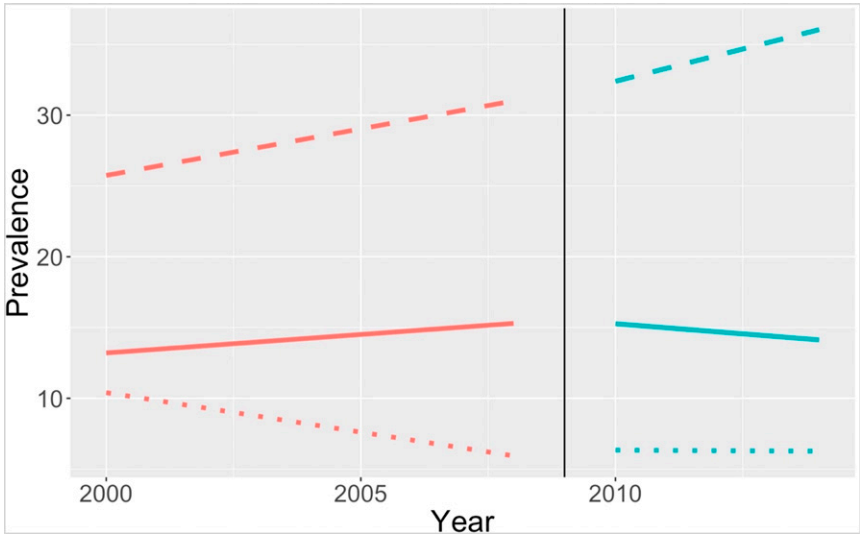
$$\begin{aligned} Y_{it} = a_i &+ b_1(\text{year} - 2009) \\ &+ b_2(\text{post change}) \\ &+ b_3(\text{post change}) \\ &\times (\text{year} - 2009) + e_{it} \end{aligned}$$

where $a_i = a + u_i$.

That is, for state i in time t, the prevalence of obesity among WIC-participating children Y_{it} is modeled as a, the grand mean across all states when year = 2009, plus the time trend before the package change, b_1, the level effect b_2, the trend after the package change $b_1 + b_3$, and a state-level random effect $u_i \sim N(0, \sigma_\mu)$ plus random error $\varepsilon_{it} \sim N(0, \sigma_\varepsilon)$. "Post change" is an indicator variable equal to 1 after the package change and zero otherwise; we omit the level effect $b_2(post\ change)$ from the models presented in Table 2 because it is not statistically significant. In Table 2 model 2 and the models in Supplemental Table 3, we additionally include a vector of control variables.



SUPPLEMENTAL FIGURE 2
Comparison of the demographic composition of the 2- to 4-year-old WIC population and the 1- to 4-year-old WIC population for years in which overlapping data are available.



SUPPLEMENTAL FIGURE 3

Predicted childhood obesity prevalence (solid line), high birth weight (dotted line), and high prepregnancy BMI (dashed line). Lines indicate predicted fit from model 1 in Table 2 and models 1 and 4 in Supplemental Table 4, with red indicating the predicted trend before 2009 and blue indicating the trend after 2009. The predicted trend for high birth weight when using data from the CDC Wonder Database is similar to the trend presented by the dotted line (estimated with data from the WIC-PC reports), albeit with a somewhat less steep decline between 2000 and 2009.

SUPPLEMENTAL TABLE 3 Multivariate Random-Effects Models Predicting the State-Level Obesity Prevalence (Percentage Points) Among 2- to 4-Year-Old WIC Participants (2000–2014) Adjusting for High Prepregnancy BMI and High Birth Weight

	Model 1	Model 2	Model 3	Model 4
Intercept (95% CI)	15.37*** (14.70 to 16.04)	15.72*** (15.12 to 16.31)	13.35*** (11.81 to 14.9)	16.41*** (15.78 to 17.03)
Annual trend[a], yrs (95% CI)	0.17*** (0.07 to 0.27)	0.32*** (0.23 to 0.41)	0.13* (0.03 to 0.24)	0.33*** (0.23 to 0.44)
Change in annual trend after 2009 (95% CI)	−0.50*** (−0.65 to −0.34)	−0.64*** (−0.77 to −0.52)	−0.51*** (−0.67 to −0.34)	−0.68*** (−0.81 to −0.54)
Race and/or ethnicity, %[b] (95% CI)				
American Indian	—	—	0.06 (−0.02 to 0.13)	0.04 (−0.02 to 0.10)
Asian American	—	—	0.20* (0.01 to 0.39)	0.01 (0.16 to 0.19)
African American	—	—	0.02 (−0.01 to 0.06)	0.05** (0.02 to 0.08)
Hispanic	—	—	0.03* (0.002 to 0.06)	0.04*** (0.02 to 0.07)
Children in poverty,[c] % (95% CI)	—	—	−0.01 (−0.33 to 0.322)	0.17 (−0.15 to 0.49)
WIC-participating children with high birth wt, %[d] (95% CI)	−0.11 (−0.47 to 0.25)	1.09** (0.59 to 1.59)	−0.09 (−0.46 to 0.28)	1.47*** (0.93 to 2.00)
WIC-participating women with high prepregnancy BMI, %[e] (95% CI)	0.45* (0.10 to 0.80)	0.51*** (0.18 to 0.84)	0.48*** (0.14 to 0.83)	0.48** (0.15 to 0.80)
ICC	0.79	0.75	0.76	0.67
N	294	294	294	294
N groups	49	49	49	49

Estimates were pooled from models with multiple imputation by chained equations (20 data sets) for WIC-participating children with high birth weight (percentages) and WIC-participating women with high prepregnancy BMI (percentages). Models 1 and 3 use WIC-PC data for birth weight and prepregnancy BMI; data were missing for children with high birth weight (n = 91) state-year observations (31.0%) and for prepregnancy BMI (n = 102) state-year observations (34.7%). Models 2 and 4 used the CDC Wonder Database birth weight data, which did not have missing data. —, not applicable.

[a] The annual trend is calculated with the year centered in 2009.

[b] Demographic makeup is presented as the number of children with race and/or ethnicity reported in each category as a percentage of (for 2000 and 2004) all 1- to 4-y-old children enrolled in the WIC or (for 2008–2014) all 2- to 4-y-old WIC participants as a percentage of all children for whom a race and/or ethnicity in the 5 categories was reported. We further subtract the population-weighted mean demographic makeup from each of these variables so the intercept in model 2 can be interpreted as the mean overall obesity prevalence in 2009 for a state with a demographic makeup comparable to the demographic makeup of our population across all observations (1.14% American Indian, 3.24% Asian American and/or Pacific Islander, 19.95% African American, 44.16% Hispanic, and 31.5% white) and child poverty, birth weight, and prepregnancy BMI variables equal to the average across state-year observations (14.84).

[c] Standardized rate for children ages 0 to 17 y calculated with the anchored SPM available from the Center on Poverty and Social Policy at Columbia University for all US states.[17]

[d] Standardized percentage of WIC-participating 1- to 4-y-olds with birth weights between 4001 and 6000 g.

[e] Standardized percentage of WIC-participating pregnant women with prepregnancy BMI ≥29.1 reported with a 4-y lag.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

SUPPLEMENTAL TABLE 4 Multivariate Random-Effects Models Predicting the State-Level Prevalence (Percentage Points) of Children With High Birth Weights and Women With High Prepregnancy BMI

	Model 1: Birth Wt	Model 2: Birth Wt	Model 3: Birth Wt	Model 4: Prepregnancy BMI	Model 5: Prepregnancy BMI
Intercept[a] (95% CI)	5.38*** (4.60 to 6.16)	6.12*** (4.66 to 7.58)	8.31*** (7.75 to 8.87)	31.67*** (30.66 to 32.68)	32.20*** (30.53 to 33.88)
Yearly trend before 2009 (95% CI)	−0.56*** (−0.63 to −0.49)	−0.47*** (−0.61 to −0.33)	−0.24*** (−0.26 to −0.23)	0.66*** (0.58 to 0.73)	0.72*** (0.64 to 0.81)
Change after 2009 (95% CI)	0.99 (−0.04 to 2.01)	0.52 (−1.60 to 2.63)	−0.34*** (−0.47 to −0.20)	−0.19 (−1.25 to 0.87)	−0.10 (−1.42 to 1.22)
Change in annual trend after 2009 (95% CI)	0.54*** (0.29 to 0.79)	0.42 (−0.12 to 0.97)	0.26*** (0.23, 0.30)	0.25 (−0.01 to 0.52)	−0.03 (−0.37 to 0.31)
ICC	0.42	0.28	0.98	0.58	0.73
N	306	100	392	314	100
N groups	41	10	49	41	10

Models 1, 2, 4, and 5 rely on WIC-PC data for 1996 through 2014; models 2 and 5 are from sensitivity analyses including listwise deletion for missing data, and model 3 is a sensitivity analysis including the CDC Wonder Database data from 2000 until 2014. Results are reported for models with state random effects. Although a Durbin-Wu-Hausman test rejects the null hypothesis of no significant differences in consistency between models with fixed and random effects for birth wt ($P < .001$) for models 1 and 3, it fails to reject the null hypotheses for prepregnancy BMI ($P = .82$) and for model 2. Magnitudes and significance levels are nevertheless similar across models; thus, for comparability with the main analyses, we report random-effects models here.

[a] The annual trend is calculated with the year centered in 2009, so the intercept in model 1 can be interpreted as the mean overall obesity prevalence in 2009. Although there is likely to be a lag between the effects of the 2009 rule change and any change in birth weights, models fitted with the change in trend after 2011 rather than after 2009 return similar results.

*** $P < 0.001$.