Can Prenatal Care Prevent Childhood Obesity?
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Risk factors for obesity include, but are not limited to, low socioeconomic status, minority race/ethnicity status, increased caloric consumption, and sedentary behavior (Robinson, 1999; Speiser, 2005; Zhang & Wang, 2004). Recent research adopting the “fetal origins hypothesis” also suggests that the development of later-life health outcomes such as obesity may be programmed prior to birth (Salsberry & Reagan, 2004). To understand the multidimensional nature of obesity risk among adolescents (age 15-19), we developed an epidemiological study to investigate the unique role that prenatal and maternal characteristics may play in increasing or decreasing a child’s risk for becoming obese.

The Research Questions

1. Do the resources of the mother at the time of the birth (such as her age, marital status, or education level) influence one’s obesity risk?
2. Do features associated with the birth itself (such as whether it was a vaginal or cesarean delivery, whether a child was the mother’s first-born, the child’s APGAR score 1-minute at birth, the child’s birth weight and gestation) increase one’s obesity risk?
3. Do prenatal behaviors adopted by the mother (such as initiation of prenatal health care, smoking during pregnancy, pregnancy related weight gain, and pre-pregnancy body weight) influence a child’s obesity risk?

The motivation of this project comes from a desire to understand which of these characteristics are most associated with the development of obesity, and which are potentially modifiable and thus able to become a specific policy recommendation to help reduce the spread of obesity from generation to generation.

Data & Methods

Our data consists of linked birth certificates and driver license records. The birth records provide information about the birth mother, the prenatal care she received, and the characteristics of the child at the time of delivery. The driver’s license provides a measure of the child’s height and weight at ages 15 to 19. This unique data source yielded a sample of nearly 200,000 Utahans who were born between 1983 and 1990 and reached their late teens in the late 1990s and 2000s.

From the driver’s license records, we calculated a measure of body mass index (BMI) for each child. BMI is calculated as body weight in kilograms divided by height in meters squared. Adolescents who have a BMI-for-Age that is at or above the 95th percentile, according to the CDC height-weight growth charts, are considered overweight.

We then estimated a series of statistical models that predicted which features of the prenatal environment were associated with increased or decreased odds of being overweight during adolescence. We also adjusted our statistical models based on whether the adolescent was male or female, whether s/he was white, black, Hispanic, or other race, and what year s/he was born since the prevalence of obesity varies quite dramatically by these demographic characteristics.

Findings

First, some have contested the validity of measuring BMI from driver’s license records (i.e., people misreport their height and especially weight when getting a license), but the data presented in Figure 1 suggest that the self-reported data from driver’s license records is comparable to other established data sources measuring BMI among adolescents in Utah. It also shows that Utah adolescents are less likely to be overweight than their national counterparts: Utah ranks as the 8th most lean among adults and the leanest among children (Levi, Segal, Gadola, 2007).

Figure Notes:
A. Overweight is defined as having a BMI > 95th percentile.

B. The Youth Risk Behavior Surveillance Survey (YRBSS) is a telephone survey of students in grades 9-12 which is conducted by each state. The National YRBSS estimate is a weighted average of all state surveys.

C. Drivers license data (DLD) provide a measure of self-report height and weight for Utah adolescents age 15-19 (M=16.5)

D. All data were collected in 2005.

As for which characteristics predict a child’s risk of being overweight, our analyses offer the following findings:

- **Demographic Differences**: Female adolescents are less likely to be overweight than males (or perhaps more likely to underreport height/weight on driver license than men). Older adolescents are more likely to be overweight than the younger adolescents. American Indians, Blacks, and Pacific Islanders all have over two times greater the odds of being overweight than whites. Hispanics also have significantly higher odds of being overweight than non-Hispanic adolescents. Finally, we find increased odds of being overweight by birth year: persons born in 1989-1990 have 34% greater odds of being overweight than the persons born in the early 1980s.

- **Maternal Pre-Birth Resources**: A child is less likely to be overweight had the mother been married at the time of the birth. A child born to an older mother is more likely to be overweight during adolescence. As well, children of mothers receiving less than high school had significantly higher odds of being overweight, while children of mothers receiving a college degree or more had significantly lower odds.

- **Birth Experiences**: Birth weight is associated with obesity risk: babies who were greater than 3500 grams (approx. 7.7 pounds) were 50% more likely to be overweight than the babies born in the 2500 to 3500 gram range (5.5-7.5 pound). Children born through a cesarean delivery were 1.4 times more likely to be overweight than children born through a vaginal delivery. The most hearty or robust children at birth (i.e., those with the highest APGAR scores at birth) were less likely to be overweight.

- **Prenatal Behaviors**: Those children whose mothers initiated prenatal health care in the first trimester were significantly less likely to be overweight than those whose mothers began prenatal appointments after their 13th week or never received care. If a mother smoked during pregnancy, the child is almost twice as likely to be overweight. Furthermore, if the mother gained too much weight (as defined by the physician recommended weight categories), the child has 65% higher odds of being overweight during adolescence, compared to a child whose mother gained the recommended weight range or less.

- **Maternal Pre-Pregnancy Weight Status**: The most striking finding of our analysis is the overwhelming effect that mother’s pre-pregnancy weight status has on an adolescent’s risk of being overweight. The child of a mother who was overweight pre-pregnancy is approximately twice as likely to be overweight as the time they reach adolescence, while the child of a mother who was obese pre-pregnancy was five times more likely to be overweight during adolescence, compared to the child of a mother who had a normal pre-pregnancy weight.

**Policy Implications**
We found that prenatal health care is indeed important for the prevention of obesity among children. As such, pregnant women ought to be encouraged to initiate prenatal health care early in the pregnancy, to not gain too much weight during pregnancy, and to not smoke during pregnancy. Our analyses also revealed that the mother’s pre-pregnancy weight status is a strong predictor of a child’s overweight risk. Although it is unclear from this analysis whether this effect indicates a genetic/heritable trait that increases a child’s risk for being overweight or whether it indicates a lifestyle that she exposed the child to throughout his/her childhood, the public health message should focus on how mothers may inadvertently be passing obesity risk...
from generation to generation, setting the child on a trajectory of poor health prior to his or her conception. Thus, couples who are contemplating a family should be encouraged to lose weight prior to conception. Healthy weight and/or healthy lifestyles (rather than unhealthy weight and lifestyles) need to be passed from generation to generation to ensure that we control the spread of the obesity epidemic in America.

References


