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Early Adult Obesity and U.S. Women's Lifetime Childbearing Experiences

Michelle L. Frisco and

The Pennsylvania State University, 211 Oswald Tower, University Park, PA 16803

Margaret Weden

The RAND Corporation, 1776 Main St., P.O. Box 2138, Santa Monica, CA 90407

Abstract

Literature from multiple disciplines suggests that women who are obese during early adulthood may accumulate social and physiological impediments to childbearing across their reproductive lives. This led the authors to investigate whether obese young women have different lifetime childbearing experiences than leaner peers by analyzing data from 1,658 female participants in the 1979 National Longitudinal Survey of Youth. Study sample members were nulliparous women ages 20 – 25 in 1982. The authors examined their childbearing experiences between 1982 and 2006 and found that young women who were obese at baseline had higher odds of remaining childless and increased odds of underachieving fertility intentions than young women who were normal weight at baseline. These results suggest that obesity has long-term ramifications for women's childbearing experiences, with respect to whether and how many children women have in general and relative to the number of children they want.

Keywords

childlessness; fertility/family planning/infertility; life course; obesity; transition to parenthood

Currently, more than one third of all men and women in the United States are obese according to their body mass index (BMI) classification (BMI ≥ 30), and another one third of adults are overweight (25 ≤ BMI < 30; Flegal, Carroll, Kit, & Ogden, 2012). In other words, less than half of the U.S. population's weight falls in a range that is considered normal for height.

U.S. obesity rates have recently begun to stabilize (Flegal et al., 2012), but the increased obesity prevalence over the last three decades and current high rates still lead to its classification as one of the most serious public health problems of the 21st century. This is due to the fact that obesity places individuals at risk of a wide array of health problems, including diabetes, cancer, and heart disease (U.S. Surgeon General, 2007). In addition, obesity leads to an accumulation of risk factors that alter the adult life course and aging process in enduring ways (Ferraro & Kelley-Moore, 2003; Schafer & Ferraro, 2007). Although controversial, some experts have even suggested that the increase in obesity and obesity-related health conditions could decrease U.S. life expectancy for current and future generations of Americans (Olshansky et al., 2005). In sum, obese adults are clearly in disadvantaged positions for lifetime health and longevity.

This study asked whether obesity's consequences also accumulate in ways that influence the lifetime childbearing experiences of U.S. women. Our inquiry was motivated by previous research conducted by scholars from several academic disciplines, which can be woven together using key ideas from theory aimed at understanding women's lifetime childbearing experiences. This scholarship led us to posit that being obese during early adulthood may increase women's likelihood of childlessness and their odds of underachieving their childbearing intentions. We tested this premise by analyzing 24 years of data from female participants in the National Longitudinal Study of Youth 1979 cohort (NLSY79).

A Life Course Perspective on Early Adult Obesity and Childbearing

The long-term and cumulative impact that health conditions have on the life course trajectories of individuals has been well established. Infant and child health influences key aspects of adult socioeconomic status (Conley & Bennett, 2000; Haas, 2006; Palloni, 2006) and health across the adult life course (Blackwell, Hayward, & Crimmins, 2001; Haas, 2007). Earlier adult health also shapes long-term adult health trajectories (Ferraro, Farmer, & Wybraniec, 1997).

Obesity has specifically been shown to have accumulating and enduring consequences for health (Ferraro & Kelley-Moore, 2003; Schafer & Ferraro, 2007) and socioeconomic well-being (Glass, Haas, & Reither, 2010). Furthermore, these studies suggest that losing weight does not always ameliorate the problems caused by obesity earlier in adulthood. For example, obese women's lower occupational attainment stems from reduced postsecondary schooling (Glass et al., 2010), which women have higher odds of completing if they are enrolled by age 25 due to the competing demands women have for their time as they age (Jacobs & King, 2002). Thus, weight loss after age 25 likely does little to change women's occupational attainment. Physiologically, obesity earlier in adulthood influences later life lower body disability even if individuals lose weight, a finding that led researchers to conclude that obesity can alter the adult life course in enduring ways (Ferraro & Kelley-Moore, 2003).

We argue that a life course perspective acknowledging the long-term and cumulative influence of obesity is quite applicable for understanding how women's body weight during the early adult years may influence lifetime childbearing experiences. Body weight is a physiological and social status, and its social ramifications are more consequential for women than men across a wide range of outcomes (e.g., Carmalt, Cawley, Joyner, & Sobal, 2008; Crosnoe, 2007; Dor, Fergusson, Langworth, & Tan, 2010; Rolls, Fedoroff, & Guthrie, 1991). Literature from across academic disciplines has also suggested that a woman's body weight influences key social and physiological determinants of lifetime childbearing, including her ability to find a suitable partner and her ability to physiologically bear children.

The inability to find a suitable partner has been identified as a key factor that leads to involuntary childlessness and underachieved childbearing intentions among women (Bongaarts, 2001; Morgan & Rackin, 2010), and obese women are at a clear disadvantage for both short- and longer term romantic and sexual partnerships (see Sobal, 2006, for a full review). Obese young women date less frequently and at later ages than normal-weight young women (Cawley, Joyner, & Sobal, 2006; Pearce, Boergers, & Prinstein, 2002), and they experience sexual initiation later (Cawley et al., 2006). Obese young women are also less likely to enter into both cohabiting and marital unions, unlike obese men who are less likely cohabit but suffer no disadvantage relative to normal-weight men with respect to entry into marital relationships (Mukhopadhyay, 2008).

More than half (59%) of U.S. births still occur to married women (Hamilton, Martin, & Ventura, 2012), and 58% of births to unmarried women now occur within cohabiting unions (Martinez, Daniels, & Chandra, 2012). Furthermore, use of assisted reproductive technology to bear children, a potential means for all women to bypass the need for sexual partnership for childbearing, is still rare. The most recent estimates indicate that just over 1% of all 2010 births were the result of assisted reproductive technology (Centers for Disease Control and Prevention, 2012). Therefore, reduced and delayed partnership among obese young women likely delays attempts at childbearing, a factor that reduces women's lifetime number of births (Morgan & Rackin, 2010). Thus, women who are obese in early adulthood should be at greater risk of having fewer children and underachieved fertility intentions than nonobese peers due not only to delayed and reduced prospects for partnership but also to greater risks of physiological fertility impediments that stem from attempting conception at later ages.

Obesity may also physiologically impede childbearing in another way: It may lead to disease-induced sterility. Bongaarts's (2001) discussion of disease-induced sterility focused on the negative impact that communicable, sexually transmitted diseases have on childbearing. A deep clinical body of research has also suggested that obesity is a chronic health problem that may lead to disease-induced sterility (see Metwally, Li, & Ledger, 2007, for a detailed review). For example, obese women are at risk of ovulation failure and infertility stemming from medical conditions such as polycystic ovary syndrome (e.g., Pasquali, Patton, & Gambineri, 2008; Zain & Norman, 2008). Miscarriage is also more common among obese versus normal-weight women who conceive naturally in the bulk of studies on this topic (Bussen, Sutterlin, & Steck, 1999; Hamilton-Fairley, Kiddy, Watson, Paterson, & Franks, 1992; Lashen, Fear, & Sturdee, 2004). Furthermore, the findings are somewhat mixed, but a recent review concluded that obese women also have poorer responses to assisted reproductive treatment than nonobese peers (Metwally et al., 2007).

When the physiological impediments that obesity poses for childbearing are considered in tandem with obese women's delayed and lower chances of partnership, the notion that early adult obesity's consequences may accumulate across women's adult reproductive life span crystallizes. Because obesity has been tied to both social and physiological determinants of childbearing, it is unlikely that any one determinant drives an association between early adult body weight and lifetime childbearing. Instead, early adult obesity likely leads to an accumulation of disadvantages for childbearing, which led us to conduct the current study.

We analyzed 24 years of data from the NLSY79 to examine whether obese young women ages 20 through 25 in 1982 had a higher likelihood of childlessness and an increased risk of underachieving their fertility intentions between 1982 and 2006 than women ages 20 through 25 in 1982 who were normal weight. This 24-year period approximates the adult childbearing years for the most recent U.S. cohort of women to have completed their childbearing years. We present results from descriptive and multivariate analyses estimating the association between early adult obesity and women's childbearing experiences. Our multivariate models include variables identified by previous research as factors associated with body weight, childbearing outcomes, or both (e.g., women's sociodemographic background, age at first menarche, and variables capturing partnership experiences).

Bearing and raising children is still a greatly valued aspect of U.S. family life. The average ideal family size in the United States remains slightly above 2. On average, Americans also still expect to have two children (Hagewen & Morgan, 2005), even if childbearing intentions and completed childbearing are not always concordant (Bongaarts, 2001). Furthermore, few American women are voluntarily childless despite the rise in this status (Amba & Martinez, 2006), and cohorts of women born after 1968 are having more children than their immediate predecessors — even more educated women, who generally have lower fertility rates (Vere,

2007). Thus, it is important to consider whether young women grappling with a prominent public health problem may be at a disadvantage for childbearing in general and for bearing as many children as they want.

Method

Data and Sample

The NLSY79 is a longitudinal, nationally representative study of 12,686 American youth ages 14 through 22 who were first interviewed in 1979 (<http://www.bls.gov/nls/nlsy79.htm>). The original sample includes three subsamples: (a) a nationally representative cross-sectional sample ($n = 6,111$), (b) a racially and/or economically disadvantaged oversample ($n = 5,295$), and (c) a military sample ($n = 1,280$). All but 186 members of the military sample were dropped from follow-up in 1985, and economically disadvantaged non-Black/non-Hispanic respondents were dropped from follow-up in 1991 ($N = 1,643$ in 1979). Of the remaining sample members followed up annually until 1994 and then biannually after 1996, response rates are high (ranging between 80% and 90%; Center for Human Resource Research, 2008).

The NLSY79 is arguably the best source of U.S. data for studying adult women's lifetime childbearing experiences (Morgan & Rackin, 2010; Quesnel-Vallee & Morgan, 2003). Women in the current study ranged in age from 20 to 25 in 1982 and 44 to 49 in 2006. This period of 24 years entails essentially the entire adult reproductive life span of the most recent cohort of U.S. women to have completed childbearing. The rich childbearing histories, along with women's reports of height and weight so early in adulthood, make the NLSY79 the best U.S. data set for considering the relationship between early adult obesity and women's lifetime childbearing experiences.

Our final analytic sample was limited to female respondents who participated in the 1982 NLSY79 survey ($N = 5,982$). This is the first wave when the NLSY79 collected data on women's height, weight, and childbearing expectations at the same time. From this sample, we include women who were age 20 or older in 1982 ($N = 4,038$). This constraint reflects the fact that teenage childbearing involves distinct social and physiological processes compared to adult childbearing. The Centers for Disease Control and Prevention (CDC) also has different guidelines for classifying weight categories of children and teenagers versus adults. We also constrained the sample to women who were systematically followed by the NLSY79 from 1982 through 2006 as part of the original cross-sectional or Black and Hispanic economically disadvantaged supplementary samples ($N = 3,024$). We dropped women from the supplementary military sample ($N = 412$) and the economically disadvantaged supplemental sample ($N = 602$) because they were not followed after 1994 and 1990, respectively, and thus offer limited data points from which to construct reliable childbearing histories. Finally, we limited our analyses to women who did not have a birth prior to the 1982 interview and women who were not pregnant during their 1982 interview, when weight and fertility expectations were collected ($N = 1,658$). This reduced possible confounding of weight by previous births or current pregnancies. In our final analytical sample, roughly one third of women had missing data on one or more analytical variable. We employed multiple-imputation techniques described in Acok (2005) and Allison (2001) to address missing data using the SAS procedure PROC MI. Use of complete-case analysis to address missing data produced results similar to those presented here.

Measures

Childbearing variables are based on data abstracted from the childbearing and relationship history file compiled by the Ohio State University Center for Human Resource Research

(CHRR; for a detailed description see Center for Human Resource Research, 2008). These data include variables that were cleaned, edited, and evaluated for data quality by the CHRR.

Childlessness was a dichotomous variable indicating whether a woman experienced no live births as of 2006 (1 = *no births*). Among sample members, 27% were childless in 2006. Recall that this number is derived from a sample that excluded women who had teenage births. Thus, the proportion of childless women in our sample is higher than the national estimate of 15% that has been reported for the most equivalent birth cohort by the U.S. Division of Vital Statistics (Chandra, Martinez, Mosher, Amba, & Jones, 2005).

We ensured that associations between early adult obesity and childbearing did not reflect women's ability to carry a pregnancy to term by estimating supplementary models predicting no pregnancies (results available on request). We do not include these analyses in this article because they are substantively and statistically similar to estimates from models predicting childbearing.

Underachieved childbearing intentions was a dichotomous variable based on young women's 1982 reports of how many children they expected to have and 2006 data on women's total number of births. If total births between 1982 and 2006 were the same or higher as women's 1982 report of expected number of births, women were classified as achieving (and possibly exceeding) their childbearing intentions (0 = *yes*). A "1" indicates that women had fewer children than they expected in 1982, or that they underachieved their childbearing intentions. Roughly half of the study sample underachieved their childbearing intentions (51%). Previous research has also investigated factors that lead to overachieving versus achieving childbearing intentions (Morgan & Rackin, 2010). We collapsed these categories because we did not have sufficient sample power to estimate the association between obesity and overachieving childbearing intentions (because so few obese women do so). There is also no substantive reason to expect obese women to overachieve their fertility intentions.

Early adult weight categories are based on women's BMI, computed from self-reported weight and height in 1982. Ideally, weight and height would be measured rather than self-reported. Unfortunately, the NLSY79 never measured height and weight in any survey round. We used CDC guidelines to calculate BMI ($BMI = \text{weight (lbs)} / [\text{height (in.)}]^2 \times 703$) and then used BMI to classify respondents into CDC weight categories indicating underweight ($BMI < 18.5$), normal weight ($18.5 \leq BMI < 25$), overweight ($25 \leq BMI < 30$), and obesity ($BMI \geq 30$).

The proportions of women in each weight category during early adulthood are displayed in Table 1. Three quarters of the women were classified as normal weight. The proportion overweight was 8%, the proportion obese was 6%, and 10% of the women were underweight. Estimates of the overweight and obesity prevalence for the sample are slightly lower than nationally representative estimates obtained from the National Health and Nutrition Examination Survey II women ages 20 through 39 for the period ranging from 1976 to 1980 (Ogden, Flegal, Carroll, & Johnson, 2002). The disparity reflects the fact that our baseline sample was younger and excluded women who had children as teenagers.

We used 1982 weight categories for several reasons. Theoretically, we were interested in the way that early adult weight shapes lifetime childbearing. We hypothesized that women who are heavy during this life course stage are especially disadvantaged for childbearing because their weight poses social and physiological problems across their reproductive lives. This is especially likely when one considers that women's weight trajectories tend to increase with age until midlife (Baltrus, Lynch, Everson-Rose, Raghunathan, & Kaplan, 2005). Thus,

women who are obese in early adulthood are unlikely to move out of this risk category by the end of their reproductive years. In fact, supplementary analyses indicated that, among 1982 overweight and obese sample members, only 3.5% of women lost enough weight to be classified as normal weight in their mid-40s. Some of our sample members not classified as obese in 1982 may move into this risk category over time, and possibly after the birth of a child. Thus, focusing on early adult weight also strengthened our ability to ensure the correct causal order between weight and childbearing outcomes.

Note that height and weight data were first collected by NLSY79 in the previous survey wave (1981). We used 1982 rather than 1981 data for two reasons. First, using 1982 data allowed us to measure height, weight, and childbearing intentions at the same baseline. In addition, because the analyses were focused on women age 20 or older, we retained 440 NLSY79 female respondents who were not yet 20 in 1981. Supplementary analyses using 1981 height and weight data and the smaller sample (excluding the 440 respondents just described) produced results that were statistically and substantively similar to results presented here.

Other Analytic Variables

Analyses adjusted for control variables that are associated with obesity, childbearing, or the relationship between the two. Data from 1982 were used to construct control variables unless a variable of interest could be constructed only by using data from other survey waves. These exceptions are noted. Indicators of women's sociodemographic background included *age*, measured in years; *race/ethnicity*, which was categorized as non-Hispanic White (reference), Non-Hispanic Black, or Hispanic; *poverty status*, which indicated whether the family income was below the poverty level for the respondent's reported size of family for the year preceding 1982 (1 = *below poverty level*); and the *years of schooling* of both *respondents* and their *mothers*. *Rural residence*, a CHRR variable based on the proportions of urban and rural populations in the county of the respondent's 1982 residence, and *region*, a CHRR-coded variable based on respondents' states of residence (i.e., Northeast, North Central, South, or West) also were controlled, as were women's *1981 Armed Forces Qualifications Test scores* and their *1981 standardized self-esteem scores*. Our final control variables accounted for other factors that influence childbearing. Women's *childbearing intentions* indicate the total number of children a woman expected to have in 1982, *early age of menarche* (1 = *yes*) indicated that menarche occurred before a woman's 13th birthday, *age of sexual initiation* indicates that first intercourse was relatively early (*before age 16*) or late (*20 years or older*) versus average (*between ages 16 and 19*), and baseline *marital status* categorized women as being either never married, currently married, or previously married in 1982.

Analytical Strategy

All descriptive and multivariate analyses were conducted using Stata version 11.0. We used the *micombine* procedure to produce estimates and standard errors computed by employing Rubin's rules because we imputed missing data on analytic variables (Acock, 2005; Royston, 2005; Rubin, 1987). We also used the Stata *svy* procedures to appropriately adjust all estimates using NLSY79 sample weights.

We first estimated descriptive statistics for the total sample and for women in each early adult weight category. We also report whether there were statistically significant differences in the distribution of all analytic variables by women's early adult weight. These tests of statistical significance were estimated using bivariate regression models and survey-adjusted Wald tests. The Wald test is analogous to a likelihood-ratio test but for data with survey

weights, and it allowed us to conduct a simultaneous test of the statistical significance of all of the weight category variables relative to the analytical variable of interest.

Next, we used logistic regression models to evaluate the relationship between women's early adult weight and our two lifetime childbearing outcomes. For each outcome, we estimated two models. Model 1 evaluated the unadjusted relationship between early adult weight and the two childbearing outcomes, with the model estimating underachieved childbearing intentions also including a control for women's 1982 childbearing intentions. The second model evaluated the relationship between early adult weight and the childbearing outcomes after adjusting models for confounders.

Results

Weighted summary statistics in Table 1 suggest that the total sample's sociodemographic profile was typical of what would be expected for a female sample that includes only women who did not have a teenage birth. The sample was slightly more advantaged than a national sample including teen mothers. The majority of the sample was White (85%); on average, women completed 13.24 years of schooling; their mothers completed 12.12 years of schooling; and only 11% of women reported a family income that placed them below the poverty level. In addition, three quarters of women in the study were never married at baseline, and only 6% experienced sexual initiation before their 16th birthdays.

Estimates in Table 1 also indicate that there were statistically significant differences in characteristics of young women classified in different early adult weight categories. The percentage of obese women who had no children by 2006 was more than double the proportion of normal-weight women (60% vs. 25%, respectively). In addition, only 24% of obese women had two or more children, but 54% of normal-weight women had two or more children. These estimates could in part be driven by the fact that obese women expected to have fewer children than their normal-weight peers at baseline. Only 8% of normal-weight women expected to have no children, versus 19% of obese women. Even with lower childbearing intentions, though, more obese young women than women in any other weight category did not meet their childbearing intentions over the 24 year span of the study. Roughly two thirds of obese women underachieved their fertility intentions.

Data in Table 1 also show that there was significant variation in the sociodemographic characteristics of young women in different weight categories. Compared to overweight and obese women, a greater proportion of normal and underweight women were non-Hispanic White. Conversely, the proportion of obese and overweight women who were non-Hispanic Black was roughly two to three times higher than the proportion of normal- and underweight women who were non-Hispanic Black. Women's educational attainment and their mother's educational attainment were related to early adult weight in expected ways. Obese young women completed about 1.26 fewer years of schooling than normal-weight peers, and their mothers completed 1.63 fewer years of schooling. A greater proportion of obese and overweight young women (vs. normal- and underweight young women) had incomes below the poverty line in 1982, but this observed difference was not statistically significant.

Estimates in Table 1 also indicate other differences in the characteristics of women by their early adult weight. Obese young women had lower self-esteem and lower Armed Forces Qualification Test scores than nonobese peers. Obese and overweight young women were also more likely than normal- and underweight peers to experience menarche prior to age 13. In addition, 58% of obese young women had not experienced sexual initiation prior to their 20th birthday versus 41%, 43%, and 30% of normal, overweight, and underweight young women, respectively. Note that at baseline there were no significant differences in the

marital status of young women by early adult weight categories. This reflects the fact that few young women in general had married by 1982, which is not unexpected; our sample was more advantaged than one that does not exclude teenage mothers from analysis. Supplementary analyses (not shown) indicated that by 1986, young women who were obese in 1982 were significantly less likely to marry than peers in other early adult weight categories.

The significant differences in women's individual and background characteristics by their early adult weight classifications signify the importance of estimating multivariate models that accounted for these potential confounders of the association between early adult obesity and lifetime childbearing. These models are presented in Tables 2 and 3.

Estimated associations between early adult weight and women's lifetime risk of remaining childless are shown in Table 2. Findings from Model 1 echoed descriptive findings in Table 1. The odds of remaining childless were almost four and half times higher for women who were obese during early adulthood than for their peers who were normal weight during this life course stage (odds ratio [OR] = $\exp[1.49] = 4.42$). Women who were overweight in early adulthood also had odds of childlessness that were 65% (OR = $\exp[0.50]$) higher than normal weight peers, but this estimated effect was at the border of statistical significance ($p = .04$). A supplementary analysis also revealed that the difference in the odds of childlessness between overweight and obese women was statistically significant.

When we introduced control variables to Model 2, the estimated odds of childlessness remained statistically significant and almost four times higher for the women who were obese in early adulthood (OR = $\exp[1.33] = 3.80$). The estimated effect of being overweight in early adulthood was marginally reduced in magnitude and was just below statistical significance ($p = .08$).

We used findings from Model 2 to calculate the predicted likelihood of lifetime childlessness among women in each of the four early adult weight categories when all other covariates in Model 2 were set to their mean or modal values. Among women who were underweight and normal weight in early adulthood, the predicted probability of remaining childless was similar (0.27 and 0.28, respectively). By contrast, the probability of lifetime childlessness was 0.37 among overweight young women and 0.59 among obese young women. Put more succinctly, obese young women were more likely to win a coin toss than have a baby before the end of their reproductive lives.

The results from our next set of analyses, which are shown in Table 3, estimated whether the findings just discussed reflected lower childbearing intentions or women's inability to have as many children as intended. The results in Model 1 indicated that, net of baseline intentions, obese young women were about three times more likely than their normal-weight peers to underachieve their childbearing intentions (OR = $\exp[1.10] = 3.00$). When we controlled for women's background characteristics in Model 2, obese women's increased risk of underachieved childbearing intentions was reduced (OR = $\exp[0.82] = 2.30$) but remained statistically significant.

Discussion

We developed a framework based on research from multiple disciplines to explain why early adult obesity may influence women's lifetime childbearing experiences. This framework led us to posit that early adult obesity has social and physiological consequences that accumulate over the adult life course in ways that negatively influence women's ability to have children and achieve their childbearing intentions. Our study's findings support this supposition and highlight the formative role that early adult weight has in stratifying women

into different lifetime childbearing experiences. The results indicated that women who were underweight or normal weight in early adulthood had similar childbearing experiences with respect to their risk of lifetime childlessness and their ability to achieve their childbearing intentions. Overweight women's lifetime childbearing experiences also more closely resembled the experiences of normal- and underweight women, especially once confounders were included in statistical models.

Women who were obese during early adulthood had different experiences. Their odds of lifetime childlessness were higher than their nonobese peers. In fact, their adjusted probability of ever having a child was slightly lower than their likelihood of winning a coin toss.

Given that obese women expected to have a lower number of children than their normal-weight peers and were twice as likely to expect to have no children or one child, it is possible that the increased risk of childlessness that we observed is a reflection of obese women's lower baseline childbearing preferences. Our analyses suggest that this was not the case. Not only was the high risk of lifetime childlessness among young obese women robust to controlling for their lower fertility intentions, but young obese women in the study sample were more likely than their normal-weight peers to underachieve their fertility intentions. They had fewer children over the course of their lives than they would have liked to have. Thus, our study found that obesity's consequences for family formation are more far reaching than obesity's impact on union formation (Fu & Goldman, 1996; Mukhopadhyay, 2008) or single pregnancy events (Metwally et al., 2007) alone. To our knowledge, this is the first study to demonstrate the long-term ramifications of obesity for lifetime childbearing experiences, including the achievement of one's childbearing intentions. The study's findings are especially notable given American's preference to have two children (Hagewen & Morgan, 2005), the continued low U.S. rates of voluntary childlessness (Amba & Martinez, 2006), and the psychosocial distress associated with infertility and involuntary childlessness (McQuillan, Greil, White, & Jacob, 2003).

No single social or physiological childbearing determinant likely explains why early adult obesity influences lifetime childbearing and women's ability to meet their childbearing intentions. Early adult obesity may also operate through different determinants for individual women. For example, some obese young women may face delayed partnership, attempt conception later and find that either age, weight, or the combination of the two delays or prevents pregnancy or birth. Other obese young women may never bear children because they never find a suitable partner. Others may delay or never experience childbearing solely because their fertility is physiologically impaired. A priority of future research should be to test the relative importance of different determinants (or combinations of determinants) for explaining why early adult obesity is associated with lifetime childbearing. Such an analysis was not possible with the NLSY79 because it does not include good measures of the physiological determinants of fertility.

Study findings must be considered within the proper context. They represent the childbearing experiences of women who were in their early 20s in 1982, when obesity was relatively rare compared to its current prevalence. The most recent estimates indicate that one third of young women are now obese (Flegal et al., 2012). Thus, the impact that early adult obesity has on lifetime childbearing today could be more far reaching. Early adult obesity could also be less consequential now if obesity operates solely through social pathways and obese women today face less weight stigma, but this seems unlikely given the wealth of clinical research linking obesity and infertility (see Metwally et al., 2007, for a review) and evidence suggesting that weight discrimination is still a major issue that obese Americans, women and younger adults in particular, face (Puhl, Andreyeva, & Brownell,

2008). Recent research also suggests that social context may shape how obesity and childbearing are related among contemporary cohorts of women. Consistent with our findings, Kane and Frisco (2013) found that obese female high school students had a lower risk of adolescent childbearing than nonobese young women in general, but their risk of childbearing increased (and eventually surpassed nonobese young women's risk of adolescent childbearing) as the proportion of obese students within the school increased.

Future research should continue to examine how early adult weight influences childbearing among more recent cohorts of women as their reproductive lives unfold. Another line of investigation that future research should pursue is the role that weight change plays in lifetime childbearing. Given that weight gain is more common than weight loss, it may be particularly fruitful to address its role in childbearing. The current study and its findings can serve as a springboard for both of these research strands along with the examination of processes linking early adult weight to childbearing that is proposed above.

The study findings should be considered in light of several limitations. Women's BMI scores were based on self-reported height and weight data. Thus, early adult BMI estimates may be biased downward slightly because adults underreport weight and overreport height (Gorber, Tremblay, Mohr, & Gorber, 2007). This bias should not markedly influence our findings, because small differences in BMI scores based on actual versus self-reported height and weight will not affect most women's weight classification. Sample selection resulting from attrition and purposeful non-follow-up by NLSY79 administrators could also make our findings less generalizable than we would like. The NLSY79 weights help to eliminate such bias but may not fully do so. The exclusion of women who gave birth prior to 1982 also means that our findings are not generalizable to women who experience a teen birth. They are more applicable to young women who are slightly more privileged than a national sample that includes teenage childbearers. Understanding the relationship between adolescent obesity and teenage births requires a different conceptual model given that most teen births are unintended (Finer & Henshaw, 2006). Our final limitation was an inability to adequately assess whether associations between early adult weight and lifetime childbearing varied by women's racial/ethnic background due to the small number of obese Hispanic and Black women in the sample.

Despite these limitations, this study makes an important contribution to knowledge about women's weight and childbearing experiences. We showed that early adult obesity poses a significant impediment to childbearing and women's ability to achieve their fertility intentions in the United States. Most American women still place great importance on childbearing, and there is a general belief that women today have tremendous control over whether, when, and how many children to bear in light of social and political advancements in women's rights and technological advances in contraception. Our findings suggest that a generation of obese young women whose reproductive years recently ended did not have this type of control over childbearing. The fact that the U.S. obesity crisis has reached epidemic levels suggests that an even larger proportion of women today may face barriers to childbearing. If so, the result may be disappointment for a growing segment of U.S. women and possibly even compositional shifts in the U.S. population more generally.

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Table 1

Characteristics of All Women and Women in Different Early Adult Weight Categories

Lifetime childbearing experiences	Total sample (N = 1,658)	Underweight women (n = 147)	Normal weight women (n = 1241)	Overweight women (n = 174)	Obese women (n = 96)
Total births ^a					
0	0.27	0.26	0.25	0.35	0.60
1	0.21	0.25	0.21	0.27	0.16
2	0.34	0.28	0.34	0.26	0.19
3 or more	0.18	0.21	0.20	0.12	0.05
Intended births ^b					
0	0.10	0.13	0.08	0.16	0.19
1	0.09	0.11	0.08	0.09	0.16
2	0.53	0.52	0.53	0.43	0.35
3 or more	0.28	0.24	0.29	0.32	0.30
Underachieved childbearing intentions ^c	0.51	0.45	0.51	0.55	0.65
Early adult weight					
Underweight	0.10	1.00			
Normal weight (reference)	0.76		1.00		
Overweight	0.08			1.00	
Obese	0.06				1.00
Other early adult characteristics of women					
Age ^c	21.88	21.90	21.87	21.64	22.46
Race/ethnicity ^a					
Non-Hispanic White (reference)	0.85	0.90	0.86	0.74	0.70
Non-Hispanic Black	0.10	0.06	0.09	0.20	0.22
Hispanic	0.05	0.04	0.05	0.06	0.08
Below poverty level	0.11	0.12	0.11	0.13	0.14

Lifetime childbearing experiences	Total sample (N = 1,658)	Underweight women (n = 147)	Normal weight women (n = 1241)	Overweight women (n = 174)	Obese women (n = 96)
Years of schooling ^a	13.24	13.06	13.36	13.05	12.10
Mother's years of schooling ^a	12.12	12.43	12.22	11.80	10.59
Rural residence	0.18	0.18	0.17	0.22	0.26
Region					
Northeast (reference)	0.24	0.24	0.25	0.18	0.16
North Central	0.29	0.32	0.28	0.37	0.17
South	0.32	0.27	0.32	0.32	0.49
West	0.15	0.17	0.15	0.13	0.18
1981 AFQT score ^a	56.61	56.14	58.37	51.22	40.38
1981 Self-esteem score ^c	23.24	23.29	23.39	22.94	21.38
Menarche before age 13 ^a	0.41	0.25	0.41	0.54	0.52
Age of sexual initiation ^b					
Younger than age 16	0.06	0.05	0.06	0.08	0.09
Age 16 – 19 (reference)	0.53	0.65	0.53	0.49	0.33
At or above age 20	0.41	0.30	0.41	0.43	0.58
Marital status					
Never married	0.75	0.73	0.73	0.85	0.76
Currently married (reference)	0.21	0.22	0.23	0.13	0.17
Previously married	0.04	0.05	0.04	0.02	0.07

Note: Data are from female participants in the National Longitudinal Survey of Youth 1979 who were observed during early adulthood in 1982. Sample members were ages 20 through 25, nulliparous, and not pregnant in 1982. Total births and underachieved childbearing intentions are based on data describing women's childbearing experiences between 1982 and 2006, when women were ages 44 through 49. All other analytic variables are based on 1982 data unless otherwise specified in the table. Analyses employed sampling weights and combined estimates across multiply imputed data sets using Rubin's (1987) rule to produce the mean values and proportions reported in the table. AFQT = Armed Forces Qualification Test.

^aDifferences across weight categories are statistically significant at the p .001 level.

^bDifferences across weight categories are statistically significant at the p .05 level.

^cDifferences across weight categories are statistically significant at the p .01 level.

Table 2

Weighted Estimates (Logits) From Logistic Regression Models Predicting Lifetime Childlessness among Women ($N = 1,658$)

Variable	Model 1		Model 2	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Early adult weight (ref.: normal)				
Underweight	0.07	0.24	−0.04	0.26
Overweight	0.50 [*]	0.24	0.46	0.26
Obese	1.49 ^{***}	0.30	1.33 ^{***}	0.31
Intended number of children			−0.38 ^{***}	0.08
Age			0.10	0.06
Race/ethnicity (ref.: non-Hispanic White)				
Non-Hispanic Black			0.30	0.28
Hispanic			−0.21	0.45
Below poverty level			−0.10	0.26
Years of schooling			−0.04	0.07
Mother's years of schooling			0.03	0.03
Rural residence			−0.14	0.20
Region (ref.: Northeast)				
North Central			−0.16	0.22
South			0.28	0.23
West			0.02	0.26
1981 AFQT score			0.00	0.00
1981 Self-esteem score			0.00	0.02
Early age of menarche (before age 13)			0.04	0.17
Age of sexual initiation (ref.: age 16 – 19)				
Younger than age 16			−0.01	0.35
At or above age 20			−0.03	0.16
Marital status (ref.: currently married)				
Never married			0.73 ^{***}	0.21
Previously married			0.49	0.44
Constant	−1.10 ^{***}	0.082	−3.04 [*]	1.40

Note: Data are from female participants in the National Longitudinal Survey of Youth 1979 who were observed during early adulthood in 1982. Sample members were ages 20 through 25, nulliparous, and not pregnant in 1982. Childlessness is based on data describing women's childbearing experiences between 1982 and 2006, when women were ages 44 through 49. All other analytic variables are based on 1982 data unless otherwise specified in the table. Analyses employed sampling weights and combined estimates across multiply imputed data sets using Rubin's (1987) rules. ref. = reference; AFQT = Armed Forces Qualification Test.

^{*}
p .05.

^{***}
p .001.

Table 3

Weighted Estimates (Logits) From Logistic Regression Models Predicting Whether Women Underachieved Their Childbearing Intentions (N = 1,658)

Variable	Model 1		Model 2	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Early adult weight (ref.: normal)				
Underweight	0.01	0.25	−0.02	0.26
Overweight	0.32	0.28	0.28	0.28
Obese	1.10 **	0.34	0.82 *	0.35
Intended number of children	1.21 ***	0.10	1.34 ***	0.11
Age			0.18 **	0.06
Race/ethnicity (ref.: non-Hispanic White)				
Non-Hispanic Black			0.71 *	0.31
Hispanic			−0.24	0.42
Below poverty level			−0.10	0.26
Years of schooling			−0.12	0.06
Mother's years of schooling			0.01	0.03
Rural residence			−0.01	0.20
Region (ref.: Northeast)				
North Central			−0.22	0.21
South			0.11	0.21
West			0.04	0.25
1981 AFQT score			−0.00	0.00
1981 Self-esteem score			0.02	0.02
Early age of menarche (before age 13)			−0.05	0.16
Age of sexual initiation (ref.: age 16 – 19)				
Younger than age 16			−0.24	0.36
At or above age 20			−0.13	0.16
Marital status (ref.: currently married)				
Never married			0.63 **	0.21
Previously married			0.56	0.45
Constant	−2.58 ***	0.21	−5.92 ***	1.39

Note: Data are from female participants in the National Longitudinal Survey of Youth 1979 who were observed during early adulthood in 1982. Sample members were ages 20 through 25, nulliparous, and not pregnant in 1982. Underachieved childbearing intentions are based on women's reports of childbearing intentions in 1982 and their actual childbearing experiences between 1982 and 2006, when women were ages 44 through 49. All other analytic variables are based on 1982 data unless otherwise specified in the table. Analyses employed sampling weights and combined estimates across multiply imputed data sets using Rubin's (1987) rules. ref. = reference; AFQT = Armed Forces Qualification Test.

* $p < .05$.

** $p < .01$.

*** $p < .001$.