BOOMS, BUSTS, AND BABIES' HEALTH*

RAJEEV DEHEJIA AND ADRIANA LLERAS-MUNEY

We study the relationship between the unemployment rate at the time of a baby's conception and parental characteristics, parental behaviors, and babies' health. Babies conceived in times of high unemployment have a reduced incidence of low and very low birth weight, fewer congenital malformations, and lower postneonatal mortality. These health improvements are attributable both to selection (changes in the type of mothers who conceive during recessions) and to improvements in health behavior during recessions. Black mothers tend to be higher socioeconomic status (as measured by education and marital status) in times of high unemployment, whereas White mothers are less educated.

I. INTRODUCTION

In this paper we study the relationship between the unemployment rate at the time of a baby's conception and health outcomes at birth, and we explore whether this relationship is due to the effect of the unemployment rate on fertility decisions or on the health-related behavior of pregnant women. Economic models of fertility suggest that women who choose to have children in recessions may differ from women who choose to postpone fertility. To the extent that these parental characteristics are related to children's health, differential fertility may result in differences in the health of children over the business cycle. At the same time, evidence suggests that individuals' health may improve during recessions, because the overall effect of recessions is to increase health-related activities (and to decrease risky behaviors). Therefore, changes in parental behavior over the business cycle could also affect the health of infants, even in the absence of compositional change.

* We are extremely grateful to Lawrence Katz, Edward Glaeser, and two anonymous referees for detailed comments and to Roland Fryer and Steven Levitt for their generosity in providing us with results from their confidential California birth data. We thank Orley Ashenfelter, Marianne Bertrand, Sherry Glied, Caroline Hoxby, Chang-Tai Hsieh, Alan Krueger, Phillip Levine, Diane Macunovich, Christina Paxson, Jane Waldfogel, and seminar participants at Columbia University, Dartmouth College, Harvard University, Princeton University, University of California, Los Angeles, and the National Bureau of Economic Research Summer Institute for many valuable conversations and suggestions. We also thank Anne Case for allowing us to use her state data, and Phillip Levine for providing us with abortion data from the CDC. We thank Michael Roh for patiently running our specifications on the California data and Alice Roberta Weimers for excellent research assistance. This research was partially funded by the National Institute on Aging, Grant Number K12-AG00983 to the National Bureau of Economic Research.

The Quarterly Journal of Economics, August 2004

Several empirical findings from the existing literature motivate our work. An extensive literature in demographics and economics has documented a procyclical pattern in fertility, i.e., that the number of children born decreases in recessions (Yule [1906], Galbraith and Thomas [1941], Thomas [1941], Becker [1960], Silver [1965], and Ben-Porath [1973], to name but a few), which suggests the possibility of increased selectivity. At the same time, Ruhm [2000, 2003a, 2003b], Ruhm and Black [2002], and Deaton and Paxson [2001] have shown that health-related behaviors and adult mortality are countercyclical. (See also Snyder and Evans [2002].) In this paper we link these two strands of the literature to babies' health outcomes at birth.

We use U. S. birth certificate data from 1975 onward, and match average infant health outcomes and parental characteristics and behaviors with the unemployment rate in the mother's state of residence during the year of conception. We find that babies conceived in times of high unemployment have a reduced incidence of low and very low birth weight, a reduced rate of neonatal and postneonatal mortality, and fewer congenital malformations. Interestingly, these results also appear to hold across countries.

We explore the extent to which health improvements are attributable both to selection (differences in the type of mothers who conceive during recessions) and to changes in behavior by examining average mother characteristics and behaviors as reported in the Natality Files. To confirm our findings, we look at several additional data sets. We use confidential California birth certificate data that link mothers over time and that allow us to estimate mother fixed effects models. We also use data from the Behavioral Risk Factor Surveillance System (BRFSS) to examine the characteristics of women who become pregnant over the business cycle. Using these data, we can also look at how business cycles affect the health behavior of women of fertile ages and of pregnant women. Our evidence suggests that infant health improves because mothers' health-related behaviors (such as smoking and drinking) improve when unemployment is high. But we also find evidence of compositional effects which differ sharply by race: Black mothers tend to be higher socioeconomic status (as measured by education and marital status) in times of high unemployment, whereas White mothers are less educated.

Our results are important for several reasons. We show that temporary changes in labor market conditions affect parental behaviors and child health outcomes at birth; these in turn are known to be correlated with subsequent health and economic outcomes in childhood and adulthood (see the discussion in Almond, Chay, and Lee [2002]). Our results suggest that the opportunity cost of women's time may be an important determinant of health behavior during pregnancy, and consequently suggest a possible mechanism for improving child health outcomes. Our paper also contributes to the large literature on fertility. In particular, our evidence that the fertility response to temporary shocks in income differs substantially by socioeconomic status and by race is consistent with life-cycle models in which imperfect capital markets and skill depreciation during pregnancy play a role in the timing of fertility decisions.

The paper is organized as follows. In Section II we provide a theoretical framework to motivate our empirical work. We pay particular attention to differences in permanent versus temporary changes in wages, and to how these changes may differ across socioeconomic groups depending on their skill level and their access to credit markets. In Section III we describe the empirical approach and the data. Section IV presents the main results from the Natality Files. Section V presents corroborative evidence from other data sources. Section VI concludes.

II. Theoretical Framework

Becker [1960, 1965] provides a framework within which to analyze the relationship between cyclical fluctuations in employment and fertility and health-related behaviors. Within the Becker framework we think of children as normal goods, and think of changes in the unemployment rate as affecting the wages (or employment status) of women and their family members. These effects depend on whether individuals perceive changes in the unemployment rate as permanent or transitory. Women can adjust both the quantity and quality dimensions of fertility. Though our subsequent discussion refers to the former, it is worth noting that in principle these predictions apply to the quality-adjusted demand for children and that predictions regarding

quantity are ambiguous once quality is incorporated into the analysis. We maintain the standard assumption that women are primarily responsible for raising children in the household. The discussion in this section draws substantially on Hotz, Klerman, and Willis [1997].

II.A. The Effect of Changes in the Unemployment Rate on Fertility

We start by reviewing the effects of permanent changes in the unemployment rate on fertility. The effect of a decrease in a woman's wage (holding other household income constant) can be separated into income and substitution effects. Because children are relatively time intensive, a decrease in wages lowers the relative cost of children and therefore increases the demand for children. (See Becker [1965] and also Ben-Porath [1973], Ward and Butz [1980], and Heckman and Walker [1990].) This is the substitution effect. On the other hand, a decline in wages also lowers income, decreasing the demand for children. This is the income effect. The net prediction is ambiguous. Perry [2003] argues that the income effect should be stronger for high wage earners and the substitution effect should be stronger for low wage earners. Therefore, when wages fall, total fertility should decrease for high wage earners and increase for low wage earners. She provides evidence for this pattern in U. S. data.

A decline in the wages of a woman's family members lowers total family income without affecting the value of her time. This will unambiguously reduce the demand for children, although the responsiveness of the demand may differ across groups, in particular across income levels.

The main difference between transitory and permanent changes is that transitory changes in wages have no effect on lifetime income and, hence, total fertility. However, they will affect the timing of fertility.[1] The effect of transitory changes in labor market conditions is complicated by life-cycle fertility considerations. Over the life cycle, couples will time fertility to maximize lifetime income. There are two key factors that affect the

1. However, even if changes in wages are temporary, households might respond as though these changes were permanent (in which case the predictions above apply): wealth could be low relative to income (e.g., Ben-Porath [1973]) or households may also be myopic or uncertain about the permanent or transitory nature of the observed changes in labor market conditions.

timing of births. The first is the extent to which mothers' skills depreciate during temporary absences from the labor force during pregnancy and childbirth [Happel, Hill, and Low 1984] and the second is whether capital markets are perfect or imperfect.

If capital markets are perfect, women's fertility decisions will not depend on the path of wages of other members of the household. Furthermore, if skills do not depreciate, women will substitute fertility into periods in which their own-wage is low. However, if skills deteriorate, then it is no longer clear that low wage periods are optimal, since there is an additional loss of income due to skill depreciation.

If capital markets are imperfect, absent other considerations (in particular, if skills do not depreciate), couples will postpone fertility to periods when the husband's income is high (typically when unemployment is low), since households use the timing of births to smooth consumption; again, if skills deteriorate, it is no longer clear that low unemployment periods are optimal.

We hypothesize that low-skill women are less likely to have human capital that deteriorates rapidly. Therefore, when unemployment rates are high, we expect them to increase fertility if they are not credit constrained, and to postpone fertility if they are.

II.B. The Effect on the Consumption of Health-Related Goods[2]

A decrease in own-wage would again have income and substitution effects with respect to the consumption of health-related goods. Health-related activities are time-intensive, and as such we would expect individuals who face a decline in wages to substitute into these activities. Health-related activities that benefit babies include mothers' own health-related activities, such as exercise (see Ruhm [2000] for evidence on adult health) and prenatal care. Decreases in income (resulting from either lower own-wages or lower wages of family members) would lead to a lower consumption of all (normal) goods, including health-related goods such as health club memberships and nutritious diets, but also could reduce the consumption of health-damaging goods such as cigarettes and alcohol. The work by Ruhm and Black [2002] and Ruhm [2003b] suggests that on average individuals are more

2. The effects of changes in the unemployment rate are qualitatively similar for both temporary and permanent changes so we analyze them jointly here.

likely to cut down on unhealthy behaviors during recessions, generating a countercyclical pattern in health.

II.C. Empirical Predictions and Framework

As we discuss in the next section, our empirical work examines the effect of transitory changes in unemployment. The model makes the following predictions: (a) substitution effects will lead low-skill women who are not credit constrained to increase fertility when unemployment is transitorily high; (b) low-skill women who are credit constrained will tend to postpone fertility when unemployment is high; (c) in terms of behaviors, we expect all mothers to increase time-intensive health behaviors, such as exercise and use of prenatal care, most of which appear to be health-improving.

III. Econometric Specification and Data Description

III.A. Specification

Several issues arise in translating the theoretical framework from Section II into an empirical specification. First, the theory relates to short-term decreases in the wages of individuals and their family members, whereas our empirical work uses aggregate unemployment. This is a consequence of using the Natality Files, and has both advantages and disadvantages. Among the advantages, as a widely publicized measure of the business cycle, the unemployment rate should capture not only individual job loss but also the effect of economic uncertainty more generally. The unemployment rate is also less likely to be endogenous with respect to fertility decisions than individual or family employment. Among the disadvantages, we cannot distinguish between the effects of own employment and spousal (or household) unemployment [Butz and Ward 1979; Heckman and Walker 1990].[3] Furthermore, not all groups are equally affected by changes in the unemployment rate. Hoynes [1999] finds that "lower education levels, nonwhites, and low skill women experience greater cyclical fluctuation than high skill men." Therefore, some caution is needed in interpreting our results.

Second, we do not directly observe skills or credit constraints

3. We also have examined the effect of race- and gender-specific unemployment rates computed from the CPS; results available upon request.

in the data, but we do observe demographic characteristics that are good predictors of these characteristics, namely race, education, and marital status. Low-(high-) education women are likely to correspond to low-(high-) skill women in the discussion above. Blacks are more likely to be credit constrained than Whites [Jappelli 1990].

We consider the following reduced-form specification:

$$(1) \quad Y_{st} = \alpha + \beta*(\text{unemployment rate})_{st} + \rho_s + \theta_t + \gamma_s(\rho_s \cdot t) + \varepsilon_{st},$$

where Y_{st} refers to outcomes (such as mothers' characteristics, babies' health, or use of prenatal care) for children conceived at time t, $(\text{unemployment rate})_{st}$ refers to the state and year-specific rate of unemployment, and ρ_s and θ_t refer to state and year fixed effects. State-specific trends are represented by $\rho_s \cdot t$, where t is a year trend. We match outcomes at time t with unemployment rates at the time of conception. We use the number of births as weights, and present robust standard errors, which correct for heteroskedasticity (including clustering at the state level).[4]

We consider two specifications. In the first, we include state and year fixed effects, but ignore state-specific trends ($\gamma_s = 0$). This specification identifies the effects of changes in the state-level unemployment rate within states over time. It therefore ignores permanent differences between states and national fluctuations (which are absorbed by state and time dummies). In principle, there is no reason to ignore national fluctuations, but these are very likely to be correlated with other national trends, such as female labor force participation. We also present estimates that allow for a state-specific trend. These estimates are more likely to be driven by changes in the unemployment rate rather than other omitted factors, but are also more likely to be sensitive to measurement error.

Can the effect of unemployment in this specification be considered causal? Endogeneity is not the primary concern (in the sense that mothers' fertility decisions do not have an immediate and direct effect on the statewide unemployment rate at the time of conception), but could arise if women leave their jobs in anticipation of future pregnancy. Another concern is that the unem-

4. The rationale for using robust standard errors is serial correlation by state. We weight by population because some states were only reporting 50 percent of births prior to 1985 and because there are very few Black births in some states. Our results are not particularly sensitive to these choices.

ployment rate might capture the effect of a coincident shock or omitted variable. We address both concerns by presenting results using the unemployment rate one year prior to conception as an instrument. We also include additional state-year controls, such as the level of state transfers and Women, Infants, and Children (WIC) supplemental nutrition benefits, etc.[5]

III.B. Data

We exploit variation across states and within states over time in unemployment rates. Our primary measure of unemployment is the state-by-year unemployment rate published by the Bureau of Labor Statistics. Measurement error in the unemployment rate is an important concern. Both the number of individuals unemployed and the labor force are subject to measurement error. Thus, we have also considered an alternative measure of employment, the employment-to-population ratio, and find similar results.

The data on parents and infants come from the Vital Statistics Natality records from 1975 to 1999, covering every birth in the United States. Birth certificates contain information on parents' characteristics including age, marital status, and education; mother's behavior during pregnancy (such as prenatal care information, and information about smoking and drinking); and child health outcomes including birth weight, congenital malformations, and the 5-minute Apgar score.[6] The sample includes all births to mothers ages 18 and older.[7] We aggregate these data into cells defined by state of residence of the mother, year of conception, and race and gender of the baby.

A few data-quality issues are worth mentioning. We use the

5. These controls address concerns of omitted variable bias, but they may be simultaneously determined with our outcomes, such as the average age and education of mothers or the average health of babies. Thus, we do not include them in our main specifications.

6. The Apgar score is a 10-point scale that is used to assess the health of newborns based on five criteria (appearance, pulse, grimace, activity, and respiration) that are rated between 0 and 2. A low Apgar score has been found to be a good predictor of subsequent infant mortality. See Almond, Chay, and Lee [2002].

7. We eliminate teen mothers from our analysis because this group's fertility decisions are potentially complicated by other factors. Parents may be involved in fertility decisions of their teenage children. For example Hao, Hotz, and Jin [2000] suggest that "parents have, under certain conditions, the incentive to penalize teenage (and typically out-of-wedlock) childbearing of older daughters, in order to get the younger daughters to avoid teenage childbearing." Also, the labor market participation of this group is limited, therefore further complicating predictions of the effect of temporary changes in the unemployment rate. There is also a debate about the extent to which teenagers make rational decisions (see Levine [2001]).

date of the last menstrual period to determine the date of conception. Some states did not report this information in the early years of the panel. We therefore drop these observations. Mother's education, congenital malformations, and the 5-minute Apgar score are missing in some states for some years. Some (but not all) states report smoking and drinking after 1989. It is also worth noting that smoking and drinking are known to be underreported by pregnant mothers on the birth certificate.[8] A key variable, marital status, is imputed or missing for some states and years. Marital status was inferred by some states by comparing the last names of the mother, the father, and the infant. We kept data only for those states and years for which marital status was reported directly in the birth certificate. Appendix 1 documents variable availability for each state and year. Our regressions do not hold the sample constant: we use all of the observations available for any given specification.

Descriptive statistics are presented in Table I. In the overall sample, over 50 percent of mothers are between the ages of 25 and 35, and 20 percent are high school dropouts. The prevalence of low birth weight is on the order of 7 percent for the full sample. However, Black infants are on average in worse health compared with White infants: about twice as many Black infants who are born with low birth weight or very low birth weight, and low Apgar scores and infant mortality rates are more than double among Black infants. There are several striking differences between Black and White mothers as well. Only 39 percent of Black mothers are married, compared with 85 percent of White mothers. The distribution of education also differs substantially by race: the proportion of White mothers with college or more education is 21 percent as opposed to 9 percent for Blacks.

We also use restricted-access birth certificate data from California for the years 1990–2000, which contain enough information to identify mothers who have had more than one birth.[9] The California birth certificate data are identical in structure to the national birth certificate data, except for the additional informa-

8. For smoking see Parazzini et al. [1996]. For drinking see results of the 2001 study conducted by the CDC as reported in: http://www.stopgettingsick.com/Conditions/condition_template.cfm/3040/314/46.

9. Because of confidentiality requirements, we do not have direct access to these data. We report the results of specifications that were run for us by Roland Fryer and Steven Levitt, to whom we are very grateful for their assistance. See Fryer and Levitt [2004] for additional details regarding these data.

TABLE I
SUMMARY STATISTICS FOR AGGREGATE NATALITY DATA

Sample	All		White		Black	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Unemployment rate (state and year)	6.61	1.97	6.58	1.97	6.69	1.96
Birthrate	0.063	0.014	0.061	0.013	0.076	0.015
Percent of black babies	0.144	0.153				
White mom = 1	0.84	0.36				
% born below 2500 grams	6.8	3.5	5.8	2.0	13	4.1
% born below 1500 grams	1.3	1.1	1.0	0.6	2.8	1.7
% with Apgar score 5 and below	1.0	1.2	0.8	0.9	1.8	1.7
Infant mortality per 1000 live births	978	423	826	190	1850	955
Neonatal mortality per 1000 live births	639	286	533	146	1150	681
Postneonatal mortality per 1000 live births	340	152	293	81	699	622
Any congenital defects = 1	0.013	0.010	0.012	0.009	0.014	0.015
% mothers who are high school dropouts	19	39	17	38	24	43
% mothers with high school	41	49	40	49	46	50
% mothers with some college	22	41	22	41	21	41
% mothers with college or more	19	39	21	41	8.8	28
% mothers less than age 25	39	49	37	48	52	50
% mothers between age 25 and 35	52	50	54	50	42	49
% mothers greater than 35	8.7	28	9.0	29	6.9	25
Father's education	12.8	1.77	12.9	1.85	12.2	1.18
% moms married	77	42	85	36	39	49
Number of prenatal care visits	10.9	3.79	11.07	3.82	9.88	3.45
% with fewer than 5 prenatal	11	20	10	20	17	15
% had prenatal care in first trimester	80	14	82	6.0	66	9.0
Smoked any time during pregnancy[a]	0.14	0.053	0.148	0.066	0.115	0.070
Drank any time during pregnancy[a]	0.014	0.014	0.013	0.015	0.019	0.017

Data aggregated by state, year of conception, and gender and race of the baby. The numbers of observations in each cell are used as weights. Child mortality data are by state and year for 1979–1998. Infant mortality rates are computed as the number of infants who die within a year of birth as a fraction of live births * 1000, and likewise for neonatal mortality (the number of infants who die within 28 days) and postneonatal mortality (number of infants who die between 28 days and a year of birth).

a. These variables are only calculated from 1989–1999 since the information only started being collected by states in 1989. More generally, not all variables are available for every year and state. Please see Appendix 1 for details.

tion they contain that allows us to convert the data into a panel of mothers. There is some information that the state of California does not collect, such as drinking and smoking, and that is therefore not available in the California panel. (See Appendix 1 for details.)

We use infant mortality data provided by the Centers for Disease Control (CDC). We calculate birthrates using counts from

the Natality Files and population estimates provided by the Bureau of the Census (online). Mortality and birthrates are reported in Table I. They show large differences by race: both neonatal and postneonatal mortality are more than twice as high for Blacks. Blacks' birthrate is also higher than Whites'. Data on state demographics and government transfers are described in Besley and Case [2003]. WIC (Women Infants and Children) benefits were obtained from the U. S. Department of Agriculture. We also use data from the Behavioral Risk Factor Surveillance System and from the World Bank Development Indicators. These data are described in Section V.

IV. Main Results

IV.A. Introductory Results: Birthrates

Table II examines the effect of unemployment on birthrates. Without state-specific trends, the effect of unemployment is positive for the overall sample and for Whites, and negative for Blacks. With state-specific trends, in columns (4) to (6), the effect is negative for all three samples. None of these coefficients is significant, but it is noteworthy that the effect is smaller in magnitude for Whites than for Blacks: a one percentage point change in the unemployment rate results in a 0.8 percent decline in the birthrate for Whites, but a 1.6 percent decline for Blacks. We examine this more directly in columns (7) and (8). We show that the proportion of Black babies born declines as unemployment increases. The magnitude of the effect ranges from 0.4 to 1.3 percent, and both effects are significant at the 1 percent level.

The fact that fertility is more responsive to changes in unemployment for Blacks than for Whites suggests that unemployment leads to greater selectivity in fertility decisions among Blacks. We explore this issue, along with the behavioral effects of unemployment, in the next section.[10]

10. The effect of the unemployment rate on another dimension of selectivity, namely abortion, is inconclusive. Using two data sets, the Alan Guttmacher Institute data and the Centers for Disease Control data (the former is regarded as more accurate, but is not broken down by race), we find some evidence for a positive relationship, but the results are not robust. For example, we find that abortions per live birth increase with unemployment. When we examine abortions per woman, however, we find a negative effect of unemployment using the Guttmacher data and the CDC data for Whites, but find a positive effect for Blacks using the CDC data, significant at the 10 percent level. This issue is unresolved in the literature. These results are presented in Dehejia and Lleras-Muney [2003],

IV.B. Mother Characteristics, Child Health, and Prenatal Care

Tables IIIa through IIIc present our main results. For mother characteristics, childbirth outcomes, prenatal care, and smoking and drinking behavior during pregnancy, we match outcomes to unemployment in the year of conception of the child. Mortality outcomes are matched to unemployment in the year prior to mortality. We present all results with and without state-specific trends.

In Table IIIa we examine the effect of unemployment on the birth outcomes of infants. In the overall sample we find that increased unemployment results in significant decreases in the incidence of low and very low birth weight, and in infant mortality. The effects are significant at the 1 percent level for low birth weight and imply a 0.26 to 0.5 percent reduction in low birth weight for each percentage point increase in unemployment. For very low birth weight the results are smaller in magnitude. For overall infant mortality and postneonatal mortality, the results are significant and negative.

In the lower panels of Table IIIa (and in subsequent tables) we split our results by race. There are two reasons for this. First, it is well-known in the epidemiology literature that there are significant health differences between Blacks and Whites; indeed, this is documented in Table I for infant mortality. Second, our discussion in Section II suggests that credit constraints and the level of human capital (both of which are correlated with race) could effect how women respond to changes in unemployment. When we split by race, we also find reduced low and very low birth weight and infant mortality for both races, but the effects are consistently more significant and larger for Blacks (both in levels and relative to the mean). Furthermore, for Blacks we find a statistically significant and large (3.6 to 4.8 percent) reduction in the incidence of congenital defects. The effect of a one percentage point change in the unemployment rate on other outcomes is small, in general less than 1 percent, except for Black postneonatal mortality (1.2 percent).

In Table IIIb we examine the effect of unemployment on the average characteristics of mothers. In the overall sample (col-

Table 3. See Blank, George, and London [1996] and Levine [2002] for the effects of unemployment on abortion. See Gruber, Staiger, and Levine [1999], Angrist and Evans [1999], Donohue and Levitt [2001], and Pop-Eleches [2002] for the role and implications of abortion in selective fertility decisions.

TABLE II
EFFECT OF UNEMPLOYMENT ON BIRTHRATE AND PERCENT BLACK

Dependent variable	(1) Overall birthrate	(2) White birthrate	(3) Black birthrate	(4) Overall birthrate	(5) White birthrate	(6) Black birthrate	(7) % black babies	(8) % black babies
Unemployment rate	0.000096	0.00019	−0.00047	−0.00022	−0.00019	−0.00047	−0.0018***	−0.00059***
	(0.00034)	(0.00038)	(0.00039)	(0.00023)	(0.00025)	(0.00032)	(0.00038)	(0.00028)
% effect	*0.0015*	*0.013571*	*−0.02474*	*−0.034*	*−0.00792*	*−0.01621*	*−0.0125*	*−0.0041*
State fixed effects	X	x	x	x	x	x	x	x
Year fixed effects	X	x	x	x	x	x	x	x
State-specific trend				x	x	x		x
Observations	2506	1253	1253	2506	1253	1253	1253	1253
R^2	0.51	0.58	0.55	0.74	0.77	0.79	1.00	1.00

Birthrate data are by state, year, and race. Birthrate = number of births divided by population by state and year. Percent Black babies is the ratio of Black births to total births by state and year. Births are matched to unemployment rates by state and year of conception. All regressions are weighted using the number of births in the state, year, and race as weights. Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

TABLE IIIa
EFFECT OF UNEMPLOYMENT ON CHILDREN'S HEALTH OUTCOMES

Dependent variable	(1) % born below 2500 grams	(2) % born below 1500 grams	(3) % with Apgar score 5 and below	(4) Infant mortality rate	(5) Neonatal mortality rate	(6) Postneonatal mortality rate	(7) Congenital defects
All mothers							
Unemployment rate	−0.00034***	−0.00006*	−0.00003	−6.549***	−2.825	−3.726***	0.00009
With state and year fe	(0.000064)	(0.000033)	(0.000045)	(2.336)	(1.829)	(0.933)	(0.00013)
% effect of 1% Δ in u-rate	*−0.50%*	*−0.46%*	*−0.30%*	*−0.67%*	*−0.44%*	*−1.10%*	*0.69%*
Unemployment rate	−0.00018***	−0.00007*	−0.000024	−4.940*	−1.825	−3.117***	0.00011
With state and year fe, and state trends	(0.000063)	(0.00003)	(0.00005)	(2.657)	(2.039)	(1.134)	(0.00015)
% effect of 1% Δ in u-rate	*−0.26%*	*−0.54%*	*−0.24%*	*−0.51%*	*−0.29%*	*−0.92%*	*0.85%*
White mothers							
Unemployment rate	−0.00020***	−0.00004	0.00004	−4.612***	−1.804	−2.810***	0.00015
With state and year fe	(0.00006)	(0.00003)	(0.00003)	(1.588)	(1.199)	(0.827)	(0.00012)
% effect of 1% Δ in u-rate	*−0.34%*	*−0.40%*	*0.50%*	*−0.56%*	*−0.34%*	*−0.96%*	*1.25%*
Unemployment rate	−0.00005	−0.00005	0.00004	−2.546	−0.647	−1.902**	0.00020
With state and year fe, and state trends	(0.00006)	(0.00003)	(0.00003)	(1.678)	(1.246)	(0.962)	(0.00015)
% effect of 1% Δ in u-rate	*−0.09%*	*−0.50%*	*0.50%*	*−0.31%*	*−0.12%*	*−0.65%*	*1.67%*

Black mothers							
Unemployment rate	−0.00089***	−0.00020***	−0.00015	−17.168***	−8.382*	−8.785***	−0.00067***
With state and year fe	(0.00016)	(0.00006)	(0.00019)	(5.073)	(4.390)	(2.301)	(0.00022)
% effect of 1% Δ in u-rate	*−0.68%*	*−0.71%*	*−0.83%*	*−0.93%*	*−0.73%*	*−1.26%*	*−4.79%*
Unemployment rate	−0.00078***	−0.00020***	−0.00016	−15.658**	−7.061	−8.596***	−0.00051**
With state and year fe, and state trends	(0.00016)	(0.00006)	(0.00029)	(6.107)	(5.061)	(2.517)	(0.00025)
% effect of 1% Δ in u-rate	*−0.60%*	*−0.71%*	*−0.89%*	*−0.85%*	*−0.61%*	*−1.23%*	*−3.64%*
P-value on Black-White difference	*0.0000*	*0.0083*	*0.35*	*0.0449*	*0.2448*	*0.0428*	*0.0001*

Data from the Natality Files are aggregated to the state, year, and race level, for states and years as listed in Appendix 1. Child mortality data are by state and year for 1979–1998. Infant mortality rates are computed as the number of infants who die within a year of birth as a fraction of live births * 1000, and likewise for neonatal mortality (the number of infants who die within 28 days) and postneonatal mortality (number of infants who die between 28 days and a year of birth). All regressions include state and year fixed effects. The unemployment rate is calculated at the state-year level and matched to the Natality Files (birth weight, Apgar score) by the year of conception of the baby and to mortality data by the year prior to child mortality. They are weighted by the number of births in the state. Robust standard errors are in parentheses. For the difference between Black and White, the *p*-value tests whether the unemployment-race coefficient is significantly different from zero in a model that is fully interacted with race. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

umns (1) to (4)) there is a significant reduction in high school dropouts and mothers with some college, and an increase in mothers with just a high school education. However, these effects differ by race. Among Whites there is a significant reduction in the proportion of mothers with some college or college plus. Instead, for Blacks we find a significant reduction in high school dropout mothers and a significant increase in more educated mothers. Though the magnitudes of these effects are small, most are statistically significant at the 1 percent level.[11]

In columns (5) to (9) we look at other parental characteristics. The proportion of mothers who are prime-aged with respect to fertility (between 25 and 35) increases for all samples and the proportion of young mothers (less than 25) decreases; however, the proportion of mothers age 35 and older increases for Blacks but decreases for Whites. The average level of education among fathers is also increasing for all samples. There are no significant changes in the proportion of mothers who are married. Overall, these results suggest that the main difference between Blacks and Whites are driven by education, rather than by other factors a priori equally important in fertility decisions, such as marriage. We explore these differences again in the next section.

Table IIIc examines changes in average behavioral outcomes. It is important to note that since these are aggregate results they could be driven either by compositional changes (selection into fertility) or by individual-level behavioral changes. Columns (1) to (3) document significant improvements in prenatal care use among all mothers: the average number of prenatal care visits increases, the proportion of mothers with inadequate prenatal care decreases, and the proportion of mothers who use prenatal care in the first trimester increases. For Blacks the effects are significant at the 1 percent level, and for Whites the effects are significant for the first two outcomes. For both samples the magnitudes of the effects are large: a one percentage point increase in unemployment leads to a 5 percent increase in prenatal care visits among Whites and a 3 percent increase among Blacks. There is also a large decline in the number of mothers with fewer than 5 prenatal care visits (about 30 percent for Whites and 10 percent for Blacks).

Unlike prenatal care, we find a sharp difference between

11. It is interesting to note that Neal [2002] also finds sharp differences in the pattern of fertility and labor participation between White and Black women.

Blacks and Whites in smoking and drinking behavior. The proportion of White mothers who smoke and drink during pregnancy significantly increases for Whites, but decreases for Blacks.

For all outcomes we test whether there are significant differences between Whites and Blacks, in particular whether the unemployment-race interaction is significantly different from zero in a model that is fully interacted with race. The p-values are reported at the bottom of the tables. For all but three outcomes, we find significant differences at the 10 percent level, and for most outcomes the difference is significant at the 1 percent level.[12]

We subject our results to a range of robustness checks (presented in Appendix 3). We add additional state- and time-varying covariates (such as the level of state transfers), and attempt to instrument for the unemployment rate using lagged unemployment. Finally, we try linking births to monthly, rather than yearly, unemployment-rate data. Our results are robust to these alternative specifications.[13]

It is notable that, with the exception of smoking and drinking (for which the sample size is small), the results for both specifications (with and without state-specific trends) are very similar both in terms of magnitude and statistical significance. Given the demands placed on the data by allowing for state-specific trends, particularly for smaller samples, in subsequent specifications we focus on the results with state and year fixed effects. (Results that include state-specific trends are very similar, and are available upon request.)

Overall our results suggest a significant improvement in child health for all subsamples but also suggest that socioeconomic status (SES) of mothers (as measured by education) is worsening among Whites and improving among Blacks. Interestingly, we do not observe any significant differences in selection for other observable demographic characteristics. For behavior, we find that for Blacks all measures of behavior improve, whereas for Whites prenatal care improves, but smoking and drinking during pregnancy increase. To the extent that the SES of Black mothers

12. We also test whether the race interactions are jointly significantly different from zero. For all outcomes the p-value of this test is less than 0.0001.

13. Results are also similar when using the employment to population ratio rather than the unemployment rate. In principle, the employment to population ratio is less subject to measurement error, but in practice when constructed from BLS household data has similar problems to the unemployment rate.

TABLE IIIb
EFFECT OF UNEMPLOYMENT ON MOTHER CHARACTERISTICS AND BEHAVIORS BY RACE, 1976–1998

Dependent variable	(1) % moms less high school	(2) % moms with high school	(3) % moms some college	(4) % moms college or more	(5) Mother's age less than 25	(6) Mother's age between 25 and 35	(7) Mother's age greater than 35	(8) Average father's education	(9) % married
All mothers									
u-rate with state and year fe	−0.00116***	0.00222***	−0.00094***	−0.00011	−0.00097***	0.00115***	−0.00018	0.01535***	0.00008
	(0.00042)	(0.00031)	(0.00030)	(0.00029)	(0.00025)	(0.00020)	(0.00018)	(0.00467)	(0.00030)
	−0.61%	*0.54%*	*−0.43%*	*−0.06%*	*−0.25%*	*0.22%*	*−0.21%*	*0.12%*	*0.01%*
u-rate with state and year fe, and state trends	−0.00091**	0.00080***	0.00020	−0.00009	−0.00220***	0.00187***	−0.00018	0.01172***	−0.00011
	(0.00037)	(0.00019)	(0.00027)	(0.00021)	(0.00017)	(0.00013)	(0.00018)	(0.00380)	(0.00018)
% effect	*−0.48%*	*0.20%*	*0.09%*	*−0.05%*	*−0.56%*	*0.36%*	*−0.21%*	*0.09%*	*−0.01%*
White mothers									
u-rate with state and year fe	−0.00064	0.00235***	−0.00109***	−0.00061**	−0.00032	0.00082***	−0.00049**	0.01383**	0.00032
	(0.00045)	(0.00032)	(0.00039)	(0.00030)	(0.00028)	(0.00024)	(0.00019)	(0.00589)	(0.00028)
	−0.38%	*0.59%*	*−0.50%*	*−0.29%*	*−0.09%*	*0.15%*	*−0.54%*	*0.11%*	*0.04%*
u-rate with state and year fe, and state trends	−0.00058	0.00090***	0.00011	−0.00044**	−0.00197***	0.00175***	−0.00049**	0.01061**	0.00020
	(0.00039)	(0.00018)	(0.00035)	(0.00017)	(0.00018)	(0.00013)	(0.00019)	(0.00465)	(0.00015)
% effect	*−0.34%*	*0.23%*	*0.05%*	*−0.21%*	*−0.53%*	*0.32%*	*−0.54%*	*0.08%*	*0.02%*

Black mothers									
u-rate with state and year fe	−0.00338***	0.00142***	0.00089***	0.00106***	−0.00411***	0.00279***	0.00133***	0.03185***	−0.00012
	(0.00049)	(0.00051)	(0.00034)	(0.00028)	(0.00048)	(0.00035)	(0.00021)	(0.00706)	(0.00080)
	−1.41%	*0.31%*	*0.42%*	*1.20%*	*−1.11%*	*0.52%*	*1.93%*	*0.26%*	*−0.03%*
u-rate with state and year fe, and state trends	−0.00229***	0.00052	0.00107***	0.00070***	−0.00318***	0.00215***	0.00133***	0.02627***	−0.00040
	(0.00038)	(0.00040)	(0.00024)	(0.00015)	(0.00029)	(0.00029)	(0.00021)	(0.00517)	(0.00035)
% effect	*−0.95%*	*0.11%*	*0.51%*	*0.80%*	*−0.86%*	*0.40%*	*1.93%*	*0.22%*	*−0.10%*
P-value on Black-White difference	*0.0000*	*0.1266*	*0.00001*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0501*	*0.6090*

Data from the Natality Files are aggregated to the state, year, and race level, for states and years as listed in Appendix 1. The unemployment rate is calculated at the state-year level and matched to the Natality Files by the year of conception of the baby. Regressions include state and year fixed effects. They are weighted by the number of births in the state. Robust standard errors are in parentheses. For the difference between Black and White, the p-value tests whether the unemployment-race coefficient is significantly different from zero in a model that is fully interacted with race. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

TABLE IIIc
EFFECT OF UNEMPLOYMENT ON BEHAVIORS BY RACE, 1976–1998

Dependent variable	(8) Average no. of prenatal care visits	(9) % < than 5 prenatal care visits	(10) % prenatal care in first trimester	(11) Smoked during pregnancy	Drank during pregnancy
All mothers					
u-rate with state and year fe	0.52965***	−0.02964***	0.00162***	0.00308**	0.00100
	(0.14646)	(0.00545)	(0.00042)	(0.00142)	(0.00124)
	4.86%	*−26.95%*	*0.20%*	*2.20%*	*7.14%*
u-rate with state and year fe, and state trends	0.67067***	−0.02699***	0.00050	0.00002	−0.00022
	(0.24755)	(0.00759)	(0.00041)	(0.00077)	(0.00073)
% effect	*6.15%*	*−24.54%*	*0.06%*	*0.01%*	*−1.57%*
White mothers					
u-rate with state and year fe	0.58250***	−0.02948***	0.00078**	0.00350**	0.00111
	(0.17629)	(0.00555)	(0.00037)	(0.00147)	(0.00129)
	5.26%	*−29.48%*	*0.10%*	*2.36%*	*8.54%*
u-rate with state and year fe, and state trends	0.77210***	−0.03020***	−0.00020	−0.00016	−0.00023
	(0.26660)	(0.00801)	(0.00037)	(0.00080)	(0.00075)
% effect	*6.97%*	*−30.20%*	*−0.02%*	*−0.11%*	*−1.77%*
Black mothers					
u-rate with state and year fe	0.30706***	−0.01848***	0.00529***	−0.00031	−0.00117***
	(0.08887)	(0.00355)	(0.00096)	(0.00094)	(0.00036)
	3.11%	*−10.87%*	*0.80%*	*−0.27%*	*−6.16%*
u-rate with state and year fe, and state trends	0.35638***	−0.01309***	0.00421***	0.00072	−0.00054
	(0.13624)	(0.00409)	(0.00075)	(0.00071)	(0.00039)
% effect	*3.61%*	*−7.70%*	*0.64%*	*0.63%*	*−2.84%*
P-value on Black-White difference	*0.1630*	*0.0952*	*0.0000*	*0.0288*	*0.0894*

Data from the Natality Files are aggregated to the state, year, and race level, for states and years as listed in Appendix 1. The unemployment rate is calculated at the state-year level and matched to the Natality Files by the year of conception of the baby. Regressions include state and year fixed effects. They are weighted by the number of births in the state. Robust standard errors are in parentheses. For the difference between Black and White, the *p*-value tests whether the unemployment-race coefficient is significantly different from zero in a model that is fully interacted with race. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

is improving (in terms of education), we cannot distinguish whether improved health is driven by an improved sample of mothers or improved behavior. Instead, for Whites, to the extent that mothers are less educated, these tables suggest that the improvements in health outcomes are due to changes in individual behavior rather than a change in the sample. We corroborate these speculations in Section V when we examine individual data with mother fixed effects (California birth certificate data) and

examine the choice to become pregnant during recessions using the BRFSS data.

IV.C. Results for Subsamples

In this subsection we present our main results for a range of splits of the sample. This serves as a further robustness check, and provides additional insight into the results from Tables IIIa to IIIc.

In Table IV we split the sample by race and education.[14] To the extent that mothers' education is the main source of selectivity in birth decisions, we expect to see (and find) a more homogeneous set of results between Blacks and Whites within education categories. In particular, we find that Black and White low-education mothers drive increases in birth weight and also show a uniform increase in the use of prenatal care. Instead, among college-plus mothers there is an increase in the incidence of low birth weight, congenital defects, and the proportion of babies with a low Apgar score, and a mixed set of results for prenatal care improvements.

It is noteworthy that the share of married women increases significantly among Black high school dropouts and graduates. This suggests that single women selecting out of fertility may drive the health improvements for these groups. When the results are further split by marital status (results not presented), we do find that the most significant health and prenatal-care improvements among Black high school dropouts and high school graduates are among single women.

IV.D. Discussion

Taken together, the results from Tables III and IV provide evidence of improvements in babies' health as unemployment increases. The tables also suggest that changes in the composition of mothers giving birth play a significant role in this pattern. Among Blacks there is a significant reduction in the proportion of low-education mothers, and this group drives some of the health improvements we observe for Blacks. These mothers—who are more likely to have unhealthy babies—opt out of fertility, leading to improvements in the average health of babies for this group. For Whites we instead find an increase in the proportion of

14. We drop individuals below age 25, who may not yet have completed college. Our results are not particularly sensitive to this sample restriction.

TABLE IV
EFFECT OF UNEMPLOYMENT BY RACE AND EDUCATION, 1976–1998

Dependent variable	(1) % born below 2500 grams	(2) % born below 1500 grams	(3) % with Apgar score 5 and below	(4) % married	(5) Average no. of prenatal care visits	(6) % < than 5 prenatal care visits	(7) % prenatal care in first trimester	(8) Congenital defects
High school dropout								
White								
Unemployment rate	−0.00061***	−0.00011	0.00008	−0.00059	0.07580	−0.00447***	0.00819***	−0.00021
	(0.00020)	(0.00007)	(0.00010)	(0.00071)	(0.05644)	(0.00068)	(0.00092)	(0.00021)
% effect	*−0.81%*	*−0.89%*	*0.76%*	*−0.08%*	*0.75%*	*−3.52%*	*1.22%*	*−1.53%*
Black								
Unemployment rate	−0.00054	−0.00034*	−0.00059	0.00491***	0.12856**	−0.00834***	0.00959***	−0.00092**
	(0.00056)	(0.00018)	(0.00077)	(0.00131)	(0.05071)	(0.00148)	(0.00169)	(0.00046)
% effect	*−0.33%*	*−1.03%*	*−2.67%*	*1.29%*	*1.46%*	*−3.68%*	*1.68%*	*−5.28%*
P-value on difference	*0.7699*	*0.1424*	*0.4811*	*0.3511*	*0.6524*	*0.1212*	*0.4048*	*0.1717*
High school graduate								
White								
Unemployment rate	−0.00014	−0.00004	−0.00001	−0.00013	−0.00914	0.00039	0.00262***	0.00001
	(0.00010)	(0.00006)	(0.00005)	(0.00024)	(0.05066)	(0.00041)	(0.00041)	(0.00015)
% effect	*−0.23%*	*−0.39%*	*−0.12%*	*−0.01%*	*−0.08%*	*0.87%*	*0.31%*	*0.07%*
Black								
Unemployment rate	−0.00112***	−0.00016	−0.00009	0.00281***	0.01321	−0.00333***	0.00523***	−0.00021
	(0.00031)	(0.00013)	(0.00025)	(0.00077)	(0.05742)	(0.00105)	(0.00110)	(0.00026)
% effect	*−0.84%*	*−0.53%*	*−0.47%*	*0.56%*	*0.13%*	*−2.42%*	*0.75%*	*−1.47%*
P-value on difference	*0.0005*	*0.2267*	*0.7265*	*0.2613*	*0.7350*	*0.0126*	*0.0123*	*0.1120*

Some College								
White								
	−0.00004	0.00003	0.00008*	−0.00027	−0.00077	0.00072**	0.00198***	0.00029**
Unemployment rate	(0.00010)	(0.00006)	(0.00004)	(0.00019)	(0.02861)	(0.00030)	(0.00030)	(0.00014)
% effect	*−0.08%*	*0.33%*	*1.16%*	*−0.03%*	*−0.01%*	*2.40%*	*0.22%*	*2.24%*
Black								
	−0.00085***	−0.00024	−0.00008	0.00044	0.03464	−0.00176**	0.00407***	−0.00002
Unemployment rate	(0.00031)	(0.00016)	(0.00015)	(0.00081)	(0.03324)	(0.00089)	(0.00086)	(0.00024)
% effect	*−0.73%*	*−0.84%*	*−0.48%*	*0.07%*	*0.31%*	*−1.98%*	*0.51%*	*−0.15%*
P-value on difference	*0.0249*	*0.0724*	*0.1165*	*0.0469*	*0.4567*	*0.0194*	*0.1659*	*0.1776*
College or more								
White								
	0.00011	0.00004	0.00005	0.00006	−0.00905	0.00084***	0.00137***	0.00046***
Unemployment rate	(0.00009)	(0.00004)	(0.00004)	(0.00008)	(0.02658)	(0.00030)	(0.00025)	(0.00015)
% effect	*0.24%*	*0.47%*	*0.83%*	*0.01%*	*−0.07%*	*3.65%*	*0.15%*	*3.84%*
Black								
	0.00068**	0.00012	0.00042**	0.00074	0.00816	0.00075	0.00137**	0.00024
Unemployment rate	(0.00032)	(0.00018)	(0.00018)	(0.00061)	(0.03183)	(0.00082)	(0.00067)	(0.00023)
% effect	*0.68%*	*0.47%*	*2.87%*	*0.09%*	*0.07%*	*1.30%*	*0.16%*	*1.94%*
P-value on difference	*0.3981*	*0.4348*	*0.0199*	*0.1374*	*0.5295*	*0.6171*	*0.8687*	*0.3473*

Data from the Natality Files are aggregated to the state, year, and race level, for states and years as listed in Appendix 1. Regressions exclude individuals below age 25. The unemployment rate is calculated at the state-year level and matched to the Natality Files by the year of conception of the baby. Regressions include state and year fixed effects. They are weighted by the number of births in the state. Robust standard errors are in parentheses. For the difference between Black and White, the *p*-value is for the unemployment-race interaction.

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

low-education mothers. This suggests that the substitution effect is stronger among low-education mothers than among high-education mothers, leading to a reduction in the average level of education among Whites.

Once we break the sample by education groups, we find that results are much more homogeneous across the races (with the exception of smoking and drinking). They suggest that less-educated women see large improvements in health and behavior, whereas health and behavior appear, if anything, to worsen as education increases for both races. These results also suggest that not all improvements in health for Blacks are driven by selection since we see improvements among low-skill Blacks in both behavior and health—although of course there may still be selection based on unobservables. We attempt to find further evidence for these patterns in the next section using additional data.

In terms of the theoretical framework outlined in Section II, the fact that there is an increase in the proportion of low-education White mothers in times of high unemployment is consistent with the view that these are women whose skills do not depreciate during time away from the labor market and who consequently substitute into fertility when unemployment is high. This interpretation, however, requires either that these women are not credit constrained or that the substitution effect dominates any credit constraints. The decrease in the proportion of low-education Black mothers, and more generally the sharply different pattern compared with Whites, is consistent with the view that Blacks, and in particular low-education Blacks, are more likely to be credit constrained than Whites or more educated Blacks.

V. Extensions

V.A. Evidence from California's Linked Birth Certificate Records: Behavior versus Selection

In this section we examine whether the countercyclical health improvements that we note in Section IV are due to behavioral changes or purely to selection. We use a panel of mothers from restricted-access data from California's Birth Certificate records from 1990 to 2000, and link county of residence with county-level unemployment rates in the year of conception. We compare cross-sectional estimates of the effect of unemployment—which in principle include both selection and behavioral

effects—with estimates that include mother fixed effects, which measure the effect of changes in the unemployment rate within mothers over time (i.e., behavioral effects). If we find a significant effect of unemployment on children's health in the latter specification, it will suggest that part of the health benefits associated with recessions are due to changes in individual behavior.

Table V, Panel A, presents cross-sectional estimates in which the sample is restricted to mothers who are observed at least twice in the California birth certificate data.[15] For Whites we find an increase in the incidence of low birth weight, and a significant increase in the number of prenatal care visits. For Blacks we find (insignificant) reductions in low birth weight, and a significant increase in the use of prenatal care. For both groups the results are smaller in magnitude than the national sample, and are generally not highly significant.[16] Thus, any conclusions drawn from these results must be taken with caution.

In Panel B we control for selection by adding mother fixed effects to the specification. Comparing results from Panels A and B, we find that for Whites the negative effect of unemployment on birth outcomes becomes much smaller in magnitude, and improvements in prenatal care use become larger. Instead, among Blacks we find that the magnitude of the effect of unemployment on health outcomes and prenatal care use decrease in the fixed-effects specification relative to the cross-sectional estimates. These results are consistent with the view that among White mothers negative selection offsets some of the behavioral improvements in times of high unemployment. Instead, for Blacks, selection is positive in times of high unemployment, and when this is accounted for, the pure behavioral improvements in health are smaller. However, we must be cautious not to overinterpret these results. Because all coefficients are insignificant when fixed effects are included, we cannot rule out that behavioral improvements could also play a role in the health improvements of Black babies.

15. Results comparing the full sample of mothers with mothers who have had two or more births are very similar.

16. There are several possible reasons for this difference. The effects of unemployment could be smaller for California mothers relative to the national average. For example, there could be fewer credit constraints in California relative to other states. The effects of changes in county-level unemployment could be different from the effects of changes in state-level unemployment. For example, changes at the state level could be better predictors of changes in permanent income. There is possibly more measurement error in these local unemployment rates. Finally, the California data cover a later period; indeed, the magnitudes are comparable to the national results if we restrict the sample to 1990 and later.

TABLE V
EFFECT OF UNEMPLOYMENT IN CALIFORNIA, 1990–2000
MOTHERS WITH AT LEAST TWO BIRTHS

Dependent variable	(1) Born below 2500 grams	(2) Born below 1500 grams	(3) Average no. of prenatal care visits	(4) < than 5 prenatal care visits	(5) Prenatal care in first trimester
Panel A: cross section					
White mothers (N = 840,656)					
Unemployment rate	0.0011*	−5.33e-07	0.0286***	0.00022	0.0013
	(0.00058)	(0.00024)	(0.0096)	(0.00039)	(0.00084)
Add county-specific trend					
Unemployment rate	0.002***	1.6e-04	0.034***	−7.7e-04	0.001
	(7.2e-04)	(2.9e-04)	(0.012)	(5.1e-04)	(0.001)
Black mothers (N = 155,207)					
Unemployment rate	−0.0034	−0.0015	0.0532*	−0.0016	0.0036
	(0.0022)	(0.0011)	(0.0296)	(0.0017)	(0.0028)
Add county-specific trend					
Unemployment rate	−0.004	−0.002**	0.033	−0.005***	0.006
	(0.003)	(0.001)	(0.038)	(0.002)	(0.004)
Panel B: mother fixed effects					
White mothers					
Unemployment rate	0.00054	−0.00033	0.0328***	−0.00016	0.0016
	(0.00063)	(0.00027)	(0.0114)	(0.00051)	(0.0010)
Add county-specific trend[a]					
Unemployment rate	0.001	−1.9e-04	0.022	−0.002***	0.002**
	(8.3e-04)	(3.5e-04)	(0.015)	(6.7e-04)	(0.001)
Black mothers					
Unemployment rate	−0.00022	0.00047	0.0112	−5.64e-06	0.0024
	(0.0025)	(0.0013)	(0.0355)	(0.0022)	(0.0035)
Add county-specific trend					
Unemployment rate	4.5e-04	8.1e-04	−0.009	−0.003	0.003
	(0.003)	(0.002)	(0.043)	(0.003)	(0.004)

Robust standard errors are in parentheses. Individual level data are from the California Birth Certificate Files from 1990 to 2000. The unemployment rate is calculated at the county-year level and matched by year of conception of the baby. Regressions include county and year fixed effects, and state-specific trends where specified.

a. These results with both mother fixed effects and county-specific trends are based on a 80 percent random sample of mothers with multiple births because of computational constraints. This is true only for the sample of white moms.

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

V.B. Evidence from Individual Behavioral Data

To provide further evidence on the type of women who are pregnant when unemployment is high, and to further explore their health behavior during recessions, we use individual data from the Behavioral Risk Factor Surveillance System (BRFSS)

from 1985 to 2002. The BRFSS is a series of cross sections, each of which is a representative sample of the noninstitutionalized population of the United States. It contains information about pregnancy status at the time of the survey as well as other demographic characteristics including state of residence and race. We restrict our sample to Black and White, pregnant and nonpregnant, women ages 18 to 45. Individuals are asked questions both about their health and their health-related behavior. Not all health-related questions were asked every year in every state; therefore, the number of observations varies with the outcome of interest. Summary statistics for these data are in Appendix 2. About 4 percent of women ages 18 to 45 report being pregnant at the time of the interview. About 25 percent smoked in the last month, an average of about 16 cigarettes per day. More than half of the sample reported drinking in the last month, an average of 11 drinks per month.

In Table VI we examine the effect of unemployment and its interactions with education, marital status, and age on the probability of pregnancy at the time of the interview. The regressions also include state and year dummies, as well as state-specific trends, and we use the survey weights. The results are surprisingly consistent with our findings from the Natality Files. We find a positive and significant relationship between the unemployment rate and the probability of pregnancy for Whites, whereas the effect is negative (and insignificant) for Blacks. But more importantly, the effect of the unemployment rate differs significantly by education group across the races: more-educated Whites are less likely to be pregnant when the unemployment rate increases, whereas the opposite is true for Blacks (although the interactions are only significant for Whites). On the other hand, although married women and young women are less likely to become pregnant in recessions, the response is qualitatively similar for both races. So the main characteristic that affects selection into fertility differentially across the races appears to be education.

In Table VII we examine how unemployment affects a range of health-related behaviors for all fertile-aged women and for pregnant women. These results therefore can shed light on both the cyclical behavior of pregnant women and on selection. In columns (1) and (2) we look at the effect of unemployment on smoking. Although not significant, there is an increase in the prevalence of smoking among most fertile-aged and pregnant women when the unemployment rate increases, with the excep-

TABLE VI
SELECTION IN PREGNANCY, BRFSS DATA

Dependent variable: Pregnant at time of interview	White	White	Black	Black
Unemployment rate	0.00350**	0.01148***	−0.00088	−0.00256
	(0.00169)	(0.00374)	(0.00550)	(0.00979)
Unemployment rate * high school		−0.00383		0.00189
		(0.00314)		(0.00668)
Unemployment rate * some college		−0.00571*		0.00053
		(0.00315)		(0.00642)
Unemployment rate * college or more		−0.00743**		0.00328
		(0.00315)		(0.00693)
Unemployment rate * married		−0.01201***		−0.00363
		(0.00131)		(0.00419)
Unemployment rate * (age 25 to 35)		0.00535***		0.00326
		(0.00193)		(0.00557)
Unemployment rate * (ages > 35)		0.00552***		0.00140
		(0.00175)		(0.00546)
Married = 1		0.10613***		0.04232
		(0.00804)		(0.02630)
Age between 25 and 35		−0.04266***		−0.06422*
		(0.01183)		(0.03590)
Age 35 and above		−0.09693***		−0.09031**
		(0.01091)		(0.03542)
High school graduate = 1		0.05869***		0.00861
		(0.01920)		(0.03032)
Some college = 1		0.06726***		0.00312
		(0.01926)		(0.02777)
College or more = 1		0.09038***		0.00000
		(0.01935)		(0.00000)
Constant		−0.09952***		0.09429
		(0.02806)		(0.06374)
State, year dummies	yes	yes	yes	yes
State-specific trend	yes	yes	yes	yes
Observations	448876	448073	61753	61539
R^2	0.00	0.02	0.01	0.03

The excluded education category is high school dropout, the excluded age category is 18–25. Regressions use survey weights, and include state and year fixed effects, and state-specific trends. Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

tion of pregnant Black mothers among whom smoking decreases. Similarly, the number of cigarettes smoked among pregnant women increases in the full sample of women and among Whites, but decreases among Blacks (in column (4)). Columns (5) through (8) present results for drinking: even though drinking increases with the unemployment rate for most groups (Ruhm [2000] also finds this result), the effect is negative among pregnant Black mothers. The number of drinks decreases for all pregnant women.

TABLE VII

SMOKING AND DRINKING BEHAVIOR BY RACE AND EDUCATION, BRFSS DATA

Dependent variable	(1) Smokes currently Women age 15 to 45	(2) Smokes currently Pregnant women	(3) Average number of cigarettes per day Women age 15 to 45	(4) Average number of cigarettes per day Pregnant women	(5) = 1 if drank in last month Women age 15 to 45	(6) = 1 if drank in last month Pregnant women	(7) Number of drinks in last month Women age 15 to 45	(8) Number of drinks in last month Pregnant women
Full sample:								
Unemployment rate	0.00345	0.00235	−0.01667	0.28278	0.00579	0.00050	0.93713	−2.19055**
	(0.00320)	(0.01325)	(0.15944)	(0.79820)	(0.00422)	(0.01450)	(0.67284)	(1.01183)
White sample:								
Unemployment rate	0.00401	0.00509	−0.01405	0.04191	0.00584	0.01596	1.05925	−2.35448**
	(0.00343)	(0.01411)	(0.17098)	(0.89723)	(0.00450)	(0.01491)	(0.72662)	(1.16862)
Black sample:								
Unemployment rate	0.00096	−0.03964	0.11121	−0.54311	0.00408	−0.07921*	−0.52888	−2.75099*
	(0.00846)	(0.02993)	(0.39180)	(1.28825)	(0.01164)	(0.04090)	(1.06893)	(1.61830)
State, year dummies	yes	yes	yes	yes	yes	yes	yes	yes
State-specific trend	yes	yes	yes	yes	yes	yes	yes	yes
Observations	510503	21535	78080	1903	356836	15175	262534	6437
R^2	0.01	0.02	0.04	0.20	0.05	0.05	0.01	0.15

Regressions use survey weights, and include state and year fixed effects and state-specific trends. Robust standard errors are in parentheses.
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Overall, these results, though not highly statistically significant, mirror our findings from the Natality Files for pregnant women, and they also support selection in the hypothesized direction: reduced smoking and drinking among Blacks is congruent with low-SES black women postponing fertility when unemployment is high; increased smoking and drinking among Whites is congruent with an increase in fertility for low-SES mothers.

V.C. Results Using Cross-Country Data

We conclude by examining whether similar results exist across countries. We use country-level panel data from the World Bank World Development Indicators (available online). This data set contains information on infant mortality rates, birthrates, and unemployment rates from 1980 to 1999. We keep countries with at least two years of data, which leaves us with 96 countries. The number of years for which data are available varies substantially by country; on average we have about fourteen years per country, although developed countries have a much more complete series than developing countries.[17] As expected, infant mortality and birthrates are much higher in developing countries (means presented in Table VIIIb). In particular, infant mortality is about 4 times higher (28 per 1000 compared with 8 per 1000).

In Table VIIIa we examine the relationship between unemployment and the birthrates and infant mortality rates across all countries, including country and year dummies. In columns (1) and (2) we find a negative and statistically significant relationship between lagged unemployment—which corresponds most closely to unemployment at the time of conception—and the birth and mortality rates. In column (3) we show that even controlling for birthrates, which might capture country-specific, time-varying improvements in health and living standards, the unemployment effect remains significant. Interestingly, note that the coefficient on birthrates is positive and significant. Taken at face value, this correlation is consistent with the evidence presented for Blacks in the United States, namely that when more babies are born, they tend to be less healthy on average. Finally, in column (4) we show that the adult death rate is not significantly associated with unemployment, thereby plausibly ruling out gen-

17. Developed countries are defined as Western European countries, Iceland, Canada, the United States, Japan, Australia, and New Zealand. All other countries were categorized as developing. The full list of countries can be found in the notes to Table VIIIb.

TABLE VIIIa
THE EFFECT OF UNEMPLOYMENT ON INFANT HEALTH OUTCOMES
COUNTRY LEVEL PANEL 1980–1999, INCLUDING ALL COUNTRIES

Dependent variable	(1) Birthrate (per 1000 people)	(2) Infant mortality rate (per 1000 live births)	(3) Infant mortality rate (per 1000 live births)	(4) Death rate (per 1000 people)
A-No weights				
Lagged unemployment (*Mean* 8.41, *s.d.* *5.78*)	−0.070***	−0.160***	−0.097***	−0.009
	(0.018)	(0.040)	(0.037)	(0.007)
Birthrate, crude (per 1000 people)			0.892***	
			(0.072)	
Observations	875	875	875	875
R^2	0.97	0.97	0.98	0.97
B-Population used as weights				
Lagged unemployment	−0.074***	−0.233***	−0.131**	−0.018
	(0.023)	(0.060)	(0.051)	(0.011)
Birthrate, crude (per 1000 people)			1.380***	
			(0.080)	
Observations	875	875	875	875
R^2	0.98	0.98	0.99	0.95
Means (s.d.) of dependent variables	17.44	18.01	18.01	8.51
	(7.86)	(19.17)	(19.17)	(2.62)

Robust standard errors are in parentheses. Regressions include country and year fixed effects.
Data: World Development Indicators (WDI) collected by the World Bank, available online at: http://www.worldbank.org.
* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

eral improvements in healthcare as a confounding factor in the previous columns. In Table VIIIb we split the sample into developed and developing countries; the results are qualitatively similar across both samples and remain significant.[18]

There are several important limitations of these cross-country results, and addressing these concerns, we feel, is beyond the scope of the present paper. Nonetheless, we note that the results are consistent with our findings from the United States.

18. There are several reasons for proceeding this way. The theory and empirical evidence presented so far have suggested that the effect of unemployment is likely to differ by income level. The quality of the data differs sharply between rich and poor countries. Finally, in developing countries the unemployment rate may not be well measured.

TABLE VIIIb
THE EFFECT OF UNEMPLOYMENT ON INFANT HEALTH OUTCOMES
COUNTRY LEVEL PANEL 1980–1999, BY LEVEL OF DEVELOPMENT

Dependent variable	(1) Birthrate (per 1000 people)	(2) Infant mortality rate (per 1000 live births)	(3) Infant mortality rate (per 1000 live births)	(4) Death rate (per 1000 people)
Developed countries[a]				
Lagged unemployment	−0.130***	−0.098***	−0.087***	−0.003
	(0.021)	(0.024)	(0.025)	(0.012)
Birthrate, crude (per 1000 people)			0.085	
			(0.059)	
Mean (s.d.) of dependent variables	12.84	7.69	7.69	9.31
	(2.19)	(2.93)	(2.93)	(1.50)
Observations	401	401	401	401
R^2	0.94	0.93	0.93	0.94
Developing countries[b]				
Lagged unemployment	−0.058*	−0.331***	−0.211**	−0.013
	(0.033)	(0.112)	(0.090)	(0.019)
Birthrate, crude (per 1000 people)			2.070***	
			(0.141)	
Mean (s.d.) of dependent variables	21.00	26.01	26.01	7.90
	(8.77)	(22.34)	(22.34)	(3.09)
Observations	474	474	474	474
R^2	0.98	0.97	0.98	0.95

a. Developed countries include Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States; b. Developing countries include Albania, Algeria, Argentina, Azerbaijan, Bahamas, Bangladesh, Barbados, Belarus, Belize, Bolivia, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Estonia, Fiji, Guam, Honduras, Hong Kong, Hungary, Israel, Jamaica, Kazakhstan, Korea, Rep. Latvia, Lithuania, Macao, Macedonia, Malaysia, Malta, Mexico, Moldova, Morocco, Nicaragua, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Puerto Rico, Romania, Russian Federation, Seychelles, Singapore, Slovak Republic, Slovenia, South Africa, Sri Lanka, St. Lucia, Suriname, Tajikistan, Thailand, Trinidad and Tobago, Turkey, Uganda, Ukraine, Uruguay, Uzbekistan, Venezuela, Virgin Islands, West Bank and Gaza, Zambia, and Zimbabwe. Robust standard errors are in parentheses. Regressions include country and year fixed effects and are weighted using population as weights.

Data: World Development Indicators (WDI) collected by the World Bank, available online at: http://www.worldbank.org.

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

VI. CONCLUSION

In this paper we have examined whether the business cycle induces a cycle in the health of children and the characteristics of their mothers. Using the Natality files, we find evidence for these

effects. We find that when unemployment is high, neonatal and postneonatal mortality decline, and all mothers tend to increase their use of prenatal care. Along the dimension of selection we find that less-educated single Black mothers are less likely to have babies during recessions, raising the average health of Black babies, and that less-educated White mothers are more likely to have babies during recessions, leading to reduced average health among Whites.

We also find evidence of decreases in risky behavior, such as drinking and smoking, among Blacks, but increases in these activities among Whites. Because of the aggregate nature of these results, our effects on behavioral outcomes capture both selection and individual-level behavioral changes. In particular, among Blacks, since the average mothers' education increases, both selection and behavior lead to improved behavior-related outcomes. In contrast, among Whites negative selection would offset behavioral improvements. Our fixed-effects results from a panel of California mothers suggest for Blacks that selection drives our results (and that behavioral effects are relatively small) and for Whites since there is negative selection that behavioral effects are larger than the joint behavior-plus-selection effect. We also show that our results are robust to a wide range of specifications and controls, and finally we provide evidence suggesting that these relationships seem to hold for cross-country data.

What are the implications of our findings? First, our results provide evidence consistent with the intertemporal fertility models discussed in Section II. In particular, the pattern of substitution into fertility by low-skill women suggests that skill depreciation plays an important role in fertility decisions, and the pattern of Black-White differences is consistent with the view that Blacks, particularly low-skill Blacks, are likely to be credit constrained. Second, our findings with respect to behavioral changes induced by unemployment also raise interesting issues. Given that women's health behavior improves with higher unemployment rates and that incomes are lower, it would seem that the opportunity cost of time is an important consideration in these behavioral changes. If, as many have suggested, improving birth outcomes should be a policy objective, then our results suggest that policies attenuating the effect of taking time off from work to attend prenatal care, and to attend to health more generally, are particularly important.

APPENDIX 1

State	Year started 100% reporting	Educational attainment of parents	Date last normal menstrual period began	Prenatal care information	Legitimacy status—Marital status	5-minute Apgar score	Drinking while pregnant	Smoking while pregnant
Alabama	1976	1976–	1976–	1976–	1975–	1978–	1989–	1989–
Alaska	1977	1975–	1975–	1978–	1975–	1978–	1989–	1989–
Arizona	1985	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Arkansas	1980	1978–	1978–	1978–	1975–	1978–	1989–	1989–
California	1985	1978, 1989–	1975–	1975–	1989–	only 1978	Never	Never
Colorado	1973	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Connecticut	1979	1975–	1982–	1975–	1989–	1982–	1989–	1989–
Delaware	1985	1975–	1975–	1975–	1975–	1989–	1989–	1989–
DC	1985	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Florida	1972	1975–	1975–	1975–	1975–	1979–	1989–	1989–
Georgia	1985	1975–	1975–	1975–	1980–	1980–	1989–	1989–
Hawaii	1979	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Idaho	1977	1978–	1978–	1978–	1978–	1978–	1989–	1989–
Illinois	1974	1975–	1975–	1975–	1975–	1979–	1989–	1989–
Indiana	1978	1975–	1975–	1975–	1975–	1978–	1989–	1999–
Iowa	1974	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Kansas	1974	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Kentucky	1976	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Louisiana	1975	1975–	1975–	1975–	1975–	1982–	1990–	1990–
Maine	1972	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Maryland	1975	1975–	1975–	1975–	1989–	1979–	1989–	1989–
Massachusetts	1977	1975–	1976–	1976–	1978–	1978–	1989–	1989–
Michigan	1973	1975–	1975–	1975–	1975–1977, 1989–	1978–	1989–	1989–
Minnesota	1976	1975–	1975–	1975–	1975–	1982–	1989–	1989–
Mississippi	1979	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Missouri	1972	1975–	1975–	1975–	1975–	1978–	1989–	1989–

Montana	1974	1975–	1975–	1975–	1988–	1978–	1989–	1989–
Nebraska	1974	1975–	1975–	1975–	1975–	1978–	1990–	1990–
Nevada	1976	1975–	1975–	1975–	1989–	1978–	1989–	1989–
New Hampshire	1972	1975–	1975–	1975–	1975–	1978–	1989–	1989–
New Jersey	1979	1975–	1975–	1975–	1975–	1978–	1989–	1989–
New Mexico	1985	1980–	1985–	1980–	1980–	1980–	1989–	1989–
New York	1973	1975–	1975–	1975–	1989–	1978–	1995–	1995–
North Carolina	1975	1975–	1975–	1975–	1975–	1978–	1989–	1989–
North Dakota	1985	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Ohio	1977	1975–	1975–	1975–	1989–	1978–	1989–	1989–
Oklahoma	1975	1975–	1975–	1975–	1975–	1991–	1991–	1991–
Oregon	1974	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Pennsylvania	1979	1976–	1978–	1978–	1975–	1978–	1989–	1989–
Rhode Island	1972	1975–	1975–	1975–	1975–	1978–	1989–	1989–
South Carolina	1974	1975–	1975–	1975–	1975–	1978–	1989–	1989–
South Dakota	1980	1975–	1975–	1975–	1975–	1978–	Never	Never
Tennessee	1975	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Texas	1976	1989–	1980–	1975–	1975–1976,1989–	Never	1989–	1989–
Utah	1978	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Vermont	1972	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Virginia	1975	1975–	1978–	1978–	1975–	1978–	1989–	1989–
Washington	1978	1992–	1975–	1975–	1975–	1980–	1989–	1989–
West Virginia	1976	1975–	1975–	1975–	1975–	1978–	1989–	1989–
Wisconsin	1975	1975–	1978–	1975–	1975–	1978–	1989–	1989–
Wyoming	1979	1975–	1975–	1975–	1975–	1978–	1989–	1989–

Marital Status

By 1979, 39 states were reporting marital status. From 1975 to 1977, states asked whether birth was legitimate. Starting in 1978, marital status was asked directly on the birth certificate in most states, except for twelve states. Georgia, Idaho, Massachusetts, Maryland, Montana, New Mexico, and Ohio started asking marital status in later years (see table above). There are five states that report marital status but did not ask the question on the birth certificate directly. Rather they infer it using different procedures. California started inferring marital status in 1989 by comparing parents' and children's surnames. Direct marital status question was asked only starting in 1997. Connecticut has inferred marital status since 1989. Michigan reported illegitimacy from 1975–1977, did not report marital status until 1989, and starting inferring, marital status in 1989. It is known that the number of births to unmarried women was underreported by as much as 25 percent from 1989–1993. In Nevada, marital status is asked only through electronic registration but not on paper copies. In 1995 and 1996 data were misreported due to computer processing errors. New York started inferring marital status in 1989 and still does, although method of inference changed in 1997. Texas reported illegitimacy in 1975–1976, started inferring marital status in 1989, and started asking marital status directly starting in 1994. Births to unmarried women are known to have been underreported in the 1989–1993 period.

Parental Education

Mothers' and fathers' education was reported only by some states in some years as reported in the table above. Also, starting in 1991, fathers' education was reported only in categories rather than in single years as was the case prior to 1991.

Congenital Malformations

Were reported in the Natality Files from 1981 through 1989, and then again from 1994 through 1999. New Mexico never reported this item. We coded only whether there were any congenital malformations. In later years only, there is more information on the type of congenital malformation.

Appendix 2: Summary Statistics for BRFSS Data

Sample	All		White		Black	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
All women ages 18–45						
Pregnant	0.042	0.20	0.042	0.20	0.040	0.20
Smokes currently	0.26	0.44	0.27	0.44	0.21	0.41
Number of cigarettes	16.6	9.34	17.1	9.36	12.3	8.02
Drink in the last month	0.60	0.49	0.62	0.49	0.50	0.50
Number of drinks	10.6	53.5	10.9	53.7	8.52	51.6
Number of servings of fruits and vegetables per day	3.83	2.16	3.85	2.13	3.65	2.33
Had regular doctor checkup less than one year ago	0.58	0.49	0.57	0.50	0.67	0.47
Number of days physical health was not good in the last month	2.47	5.93	2.48	5.93	2.38	5.93
Number of days mental health was not good in the last month	4.09	7.71	4.10	7.68	4.02	7.94
N	516,903		453,283		63,620	
Pregnant women only						
Smokes currently	0.14	0.35	0.14	0.35	0.12	0.33
Number of cigarettes	13.9	8.65	14.2	8.62	10.9	8.34
Drink in the last month	0.28	0.45	0.28	0.45	0.30	0.46
Number of drinks	3.30	11.4	3.23	11.3	3.85	11.5
Number of servings of fruits and vegetables per day	4.38	2.34	4.41	2.27	4.19	2.80
Had regular doctor checkup less than one year ago	0.68	0.46	0.68	0.47	0.74	0.44
Number of days physical health was not good in the last month	2.54	6.17	2.53	6.11	2.68	6.62
Number of days mental health was not good in the last month	2.88	6.50	2.78	6.30	3.70	7.80
N	21,818		19,257		2,561	

Appendix 3: Specification Checks

	(1) % born below 2500 grams	(2) % born below 1500 grams	(3) Average no. of prenatal care visits	(4) % < than 5 prenatal care visits	(5) % prenatal care in first trimester	(6) Smoked during pregnancy	(7) Drank during pregnancy	(8) Congenital defects
Effect of unemployment: IV Results, using lagged unemployment								
Whites								
	−0.00026**	−0.00012***	0.36051***	−0.02558***	0.00249*	−0.00119*	−0.00350***	0.00028***
	(0.00013)	(0.00003)	(0.04074)	(0.00270)	(0.00132)	(0.00070)	(0.00052)	(0.00006)
Black								
	−0.00103***	−0.00033***	0.26256***	−0.01659***	0.00636***	−0.00156***	−0.00187***	−0.00047***
	(0.00029)	(0.00008)	(0.03113)	(0.00157)	(0.00136)	(0.00045)	(0.00019)	(0.00010)
Effect of unemployment with time-varying controls[a]								
Whites								
	−0.00012	0.00001	0.39727***	−0.0236***	−0.00028	0.00263***	0.00054	0.00037***
	(0.00011)	(0.00003)	(0.05981)	(0.00230)	(0.00110)	(0.00041)	(0.00038)	(0.00006)
Black								
	−0.00054**	−0.00007	0.30126***	−0.0140***	0.00347***	−0.00031	−0.00089***	0.00014
	(0.00024)	(0.00007)	(0.04227)	(0.00136)	(0.00112)	(0.00027)	(0.00010)	(0.00011)
Effect of monthly unemployment rate								
Whites								
	−0.00010***	−0.00004***	0.26613***	−0.02143***	0.00070**	−0.00194	0.00069	0.00014***
	(0.00004)	(0.00001)	(0.01661)	(0.00091)	(0.00032)	(0.0021)	(0.00097)	(0.00004)
Black								
	−0.00067***	−0.00017***	0.20366***	−0.01381***	0.00454***	−0.00140	−0.00087	−0.00035***
	(0.00010)	(0.00004)	(0.01324)	(0.00058)	(0.00038)	(0.00140)	(0.00056)	(0.00007)

Data from the Natality Files are aggregated to the state, year, and race level, for states and years as listed in Appendix 1. The unemployment rate is calculated at the state-year level and matched to the Natality Files by the year of conception of the baby. Regressions include state and year fixed effects and state-specific trends. They are weighted by the number of births in the state. Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

a. Time-varying controls include percent of population greater than age 65, percent of population between ages 5 and 17, average WIC benefits, percent of population on Medicaid, the abortion rate, and real government transfers per capita.

COLUMBIA UNIVERSITY AND NBER
PRINCETON UNIVERSITY AND NBER

REFERENCES

Almond, Douglas, Kenneth Chay, and David Lee, "Does Low Birth Weight Matter? Evidence from the U. S. Population of Twins Births," University of California, Berkeley, Center for Labor Economics, Working Paper No. 53, 2002.

Angrist, Joshua, and William Evans, "Schooling and Labor-Market Consequences of the 1970 State Abortion Reforms," in *Research in Labor Economics (Vol. 18),* Solomon Polachek and John Robst, eds. (New York: Elsevier Science, 1999), pp. 75–114.

Becker, Gary, "An Economic Analysis of Fertility," in *Demographic and Economic Change in Developed Countries,* National Bureau of Economic Research Series, Number 11 (Princeton, NJ: Princeton University Press, 1960), pp. 209–231.

——, "A Theory of the Allocation of Time," *Economic Journal,* LXXV (1965), 493–517.

Ben-Porath, Yoram, "Short-Term Fluctuations in Fertility and Economic Activity in Israel," *Demography,* X (1973), 185–204.

Besley, Timothy, and Anne Case, "Political Institutions and Policy Choices: Evidence from the United States," *Journal of Economic Literature,* XLI (2003), 7–73.

Blank, Rebecca, Christine George, and Rebecca London, "State Abortion Rates: The Impact of Policies, Providers, Politics, Demographics and Economic Environment," *Journal of Health Economics,* XV (1996), 513–553.

Butz, William, and Michael Ward, "The Emergence of Countercyclical U. S. Fertility," *American Economic Review,* LXIX (1979), 318–328.

Deaton, Angus, and Christina Paxson, "Mortality, Income, and Income Inequality over Time in Britain and the U. S.," National Bureau of Economic Research Working Paper No. 8523, 2001.

Dehejia, Rajeev, and Adriana Lleras-Muney, "The Timing of Births: Is the Quality of Children Counter-Cyclical?" National Bureau of Economic Research Working Paper No. 10122, 2003.

Donohue, John, and Steven Levitt, "The Impact of Legalized Abortion on Crime," *Quarterly Journal of Economics,* CXVI (2001), 379–420.

Fryer, Jr., Roland, and Steven Levitt, "The Causes and Consequences of Distinctively Black Names," *Quarterly Journal of Economics,* CXIX (2004), 767–805.

Galbraith, Virginia L., and Dorothy S. Thomas, "Birth Rates and the Interwar Business Cycles," *Journal of the American Statistical Association,* XXXVI (1941), 465–476.

Gruber, Jonathan, Douglas Staiger, and Phillip Levine, "Abortion Legalization and Child Living Circumstances: Who is the 'Marginal Child'?" *Quarterly Journal of Economics,* CXIV (1999), 263–291.

Hao, Lingxin, V. Joseph Hotz, and Ginger Zhe Jin, "Games Daughters and Parents Play: Teenage Childbearing, Parental Reputation, and Strategic Transfers," National Bureau of Economic Research Working Paper No. 7670, 2000.

Happel, Stephen K., J. K. Hill, and S. A. Low, "An Economic Analysis of the Timing of Childbirth," *Population Studies,* XXXVIII (1984), 299–311.

Heckman, James, and James Walker, "The Relationship between Wages and Income and the Timing and Spacing of Births: Evidence from Swedish Longitudinal Data," *Econometrica,* LVIII (1990), 1411–1441.

Hotz, Joseph V., Jacob A. Klerman, and Robert J. Willis, "The Economics of Fertility in Developed Countries," in *Handbook of Population and Family Economics,* Mark R. Rosenzweig and Oded Stark, eds. (Amsterdam: North-Holland, 1997), pp. 275–348.

Hoynes, Hilary, "The Employment, Earnings, and Income of Less Skilled Workers over the Business Cycle," National Bureau of Economic Research Working Paper No. 7188, 1999.

Jappelli, Tullio, "Who Is Credit Constrained in the U. S. Economy?" *Quarterly Journal of Economics,* CV (1990), 219–234.
Levine, Phillip B., "The Sexual Activity and Birth Control Use of American Teenagers," in *An Economic Analysis of Risky Behavior Among Youths,* Jonathan Gruber, ed. (Chicago, IL: University of Chicago Press, 2001), pp. 167–218.
——, "The Impact of Social Policy and Economic Activity throughout the Fertility Decision Tree," National Bureau of Economic Research Working Paper No. 9021, 2002.
Neal, Derek, "The Measured Black-White Wage Gap among Women Is Too Small," National Bureau of Economics Research Working Paper No. 9133, 2002.
Perry, Cynthia, "How Do Female Earnings Affect Fertility Decisions?" Working paper, Massachusetts Institute of Technology, 2003.
Parazzini, Fabio, E. Davoli, M. Rabaiotti, S. Restelli, L. Stramare, M. Dindelli, C. La Vecchia, and R. Fanelli, "Validity of Self-Reported Smoking Habits in Pregnancy: A Saliva Cotinine Analysi," *Acta Obstetricia et Gynecologica Scandinavica,* LXXV (1996), 352–354.
Pop-Eleches, Cristian, "The Impact of a Change in Abortion Regime on Socio-Economic Outcomes of Children: Evidence from Romania," Working paper, Columbia University, 2002.
Ruhm, Christopher, "Are Recessions Good for Your Health?" *Quarterly Journal of Economics,* CXV (2000), 617–650.
——, "Good Times Make You Sick," *Journal of Health Economics,* XXIV (2003a), 637–658.
——, "Healthy Living in Hard Times," National Bureau of Economic Research Working Paper No. 9468, 2003b.
Ruhm, Christopher, and William E. Black, "Does Drinking Really Decrease in Bad Times?" *Journal of Health Economics,* XXI (2002), 659–678.
Silver, Morris, "Births, Marriages, and the Business Cycles in the United States," *Journal of Political Economy,* LXXIII (1965), 237–255.
Snyder, Stephen, and William Evans, "The Impact of Income on Mortality: Evidence from the Social Security Notch," National Bureau of Economic Research Working Paper No. 9197, 2002.
Thomas, Dorothy S., *Social and Economic Aspects of Swedish Population Movements, 1750–1933* (New York, NY: Macmillan Co., 1941).
Ward, Michael, and William Butz, "Completed Fertility and Its Timing," *Journal of Political Economy,* LXXXVIII (1980), 917–940.
Yule, G. Udny, "On the Changes of Marriage and Birth Rates in England and Wales During the Past Half Century: With an Inquiry as to Their Probable Causes," *Journal of the Royal Statistical Society,* LXIX (1906), 88–147.