



## Original article

# Economic contraction and maternal health behaviors during pregnancy in a national sample of U.S. women

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## ARTICLE INFO

## Article history:

Received 5 September 2013

Accepted 14 February 2014

Available online 12 March 2014

## Keywords:

Economic conditions

Pregnancy

Smoking

Alcohol consumption

Weight gain

## ABSTRACT

**Purpose:** The purpose of this study was to examine associations between maternal exposure to unexpected economic contraction and health behaviors during pregnancy using methods to account for impacts of economic contraction on selection into pregnancy.

**Methods:** Data on health behaviors among 7074 pregnancies in the National Longitudinal Survey of Youth 1979 were linked to monthly unemployment rates in maternal state of residence. The study examined associations between exposure to unexpected economic contraction (higher than expected state-level unemployment) during each trimester of pregnancy and maternal smoking, alcohol use, and gestational weight gain using generalized linear models.

**Results:** Economic contraction was not associated with maternal smoking or gestational weight gain. Associations between economic contraction and maternal alcohol use differed by maternal race–ethnicity and education. Among black–non-Hispanic women, exposures to economic contraction during the first and second trimester of pregnancy were associated with a 42% (95% confidence interval, 1.08, 1.85) and 33% (95% confidence interval, 1.01, 1.74) increased risk of alcohol use, respectively.

**Conclusions:** Findings suggest that exposure to extreme economic contraction during pregnancy may be associated with increased use of alcohol with differences by maternal race–ethnicity and educational attainment. Economic contraction was not associated with other maternal pregnancy behaviors.

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## Introduction

Although a growing literature suggests that economic downturns are associated with increased incidence of adverse perinatal health outcomes, including fetal death [1,2], low and very low birth weight [3–6], small for gestational age [7], and neonatal mortality [8,9]; little work has examined the relations between economic contraction and maternal health behaviors during pregnancy. Because smoking, alcohol use, diet, and physical activity are important determinants of both short- and long-term maternal and child health [10–13], it is critical to understand whether and how these behaviors are influenced by economic downturns. Moreover, these behaviors represent a potential mechanism through which economic conditions could influence fetal and infant health.

The economy may influence health behavior in several ways. Work hours may either decrease or increase during recessions, impacting leisure time for health-seeking behaviors [14]. Economic contraction may also alter spending on tobacco, alcohol, food, physical activity, or preventative care because of real or anticipated loss of income or changes in access to goods and services [15]. Contracting economies are also associated with increased psychosocial stress, which is associated with higher levels of smoking and decreased smoking cessation, alcohol use, and higher fat diets [16].

Importantly, influences of the macroeconomy on maternal pregnancy behaviors may differ by race–ethnicity or socioeconomic status (SES). Individuals of minority race–ethnicity and those with low education bear a disproportionate burden of job loss during recessions [17], suggesting that any impacts of economic downturn on maternal pregnancy behaviors may be stronger among these groups. Because women of non-Hispanic black race–ethnicity and low SES are also at increased risk of adverse perinatal health outcomes compared with white women and those of higher SES, it is important to understand how the macroeconomy may influence pregnancy behaviors among these potentially vulnerable populations.

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Prior work has demonstrated that recessions are associated with reduced smoking, alcohol consumption, excess body weight, and physical inactivity in the general (nonpregnant) population [14,18,19], but little research has examined whether or how economic contraction influences health behavior during pregnancy. In their seminal study of U.S. births between 1975 and 1999, Dehejia and Lleras-Muney [20] found that increases in the unemployment rate in the year of conception were associated with improvements in maternal health behavior (e.g., smoking and drinking) during pregnancy, with behaviors improving primarily among black mothers and worsening among white mothers. These findings were attributed to impacts of economic change on both selection into pregnancy (i.e., who becomes pregnant during economic downturns) and health behavior during pregnancy.

The present study builds on this existing work by examining associations between maternal exposure to economic contraction (at several levels of severity) and maternal smoking, alcohol use, and gestational weight gain (GWG). In contrast to previous work, we focus on examining the relations between economic contraction during pregnancy and behavior change, using several methods to control for impacts on selection into pregnancy. Moreover, we examine whether these associations differ by maternal race–ethnicity, educational attainment, poverty, or employment status. In light of the recent deep recession in the US, it is critical that we develop a comprehensive understanding of whether and how economic contraction affects perinatal health.

## Methods

### Data

Data came from the National Longitudinal Survey of Youth (NLSY79), a prospective cohort study enrolling youth aged 14–22 years in 1979. The NLSY79 data are well suited to these research questions because it includes data on maternal smoking, alcohol use, and GWG as well as household income and maternal employment status over a period of 20 years and across all 50 states.

The study included 8282 singleton births to 4233 women in 50 states, Washington DC, and Puerto Rico from 1982 to 2002. Births missing variables needed to calculate economic events during pregnancy—that is, date of birth ( $n = 1$ ), maternal state of residence during pregnancy ( $n = 222$ ), and length of gestation ( $n = 985$ )—were excluded, for a study sample of 7074 births to 3975 women. Mothers of included births ( $n = 7074$ ) were more likely to be aged greater than 35 years, unmarried, poor, and nulliparous compared with mothers of excluded births ( $n = 1208$ ; Appendix A), reflecting loss to follow-up among the NLSY79 cohort as mothers aged. Births to Hispanic mothers and those out of the labor force were also slightly more likely to be excluded.

### Variables

#### Economic contraction during pregnancy

Following previous work [7,8,21], this study defined unexpected economic contractions as months in which the state unemployment rate was higher than its statistically expected value, using flexible autoregressive, integrative, and moving average modeling. These models produce residual values representing the difference between the observed and expected unemployment rates. We then created binary variables, defining months with observed values significantly greater than the 99% confidence interval (CI) of expected values as unexpected economic contractions. If one of these months fell during a trimester of pregnancy, that trimester was categorized as exposed to an economic contraction (details available in Appendix B). We also examined several less extreme

measures of economic contraction: (1) the trimester-specific averages of the positive residuals from the autoregressive, integrative, and moving average models (a continuous variable representing all deviations of the observed unemployment rate from its expected value) and (2) residuals above the 90th and 95th percentiles (binary variables measuring less extreme economic contractions). We focus our analyses on the extreme unexpected economic contractions above the 99% CI (referred to as economic contractions for brevity), hypothesizing that these most severe economic contractions would elicit the largest population-level response.

#### Maternal pregnancy behaviors

Smoking and alcohol use were dichotomized as yes or no, with yes indicating any use. These data did not enable us to assess binge drinking during pregnancy, which is linked to adverse birth outcomes. GWG—although influenced by nonbehavioral factors—may be considered an indicator of diet and physical activity behaviors [11] and is considered a “behavior” in this study. GWG was categorized according to the prepregnancy body mass index specific ranges of gain recommended by the Institute of Medicine [11]: gains below the range were labeled “inadequate,” gains above the range were labeled “excessive,” and gains within the recommended range (“adequate”) were the reference group.

#### Maternal prepregnancy characteristics

Race–ethnicity was classified by NLSY79 as black–non-Hispanic, Hispanic, and nonblack–non-Hispanic. In the original NLSY79 sample, those classified as nonblack–non-Hispanic self-identified as being of European descent (68%), Asian–Pacific Islander (1%), American Indian (8%), “American” (9%), or other (14%). Maternal educational attainment, poverty status, marital status, employment status, and body mass index were taken from the survey closest to, but before, each woman's estimated date of conception. Educational attainment was categorized as less than high school (<12), high school (12), and greater than high school (>12). Employment status was categorized as employed, unemployed, keeping house, and out of the labor force.

#### Statistical analysis

Associations between economic contraction in the first, second, and third trimester of pregnancy and risk of each outcome (i.e., smoking, alcohol use, inadequate vs. adequate weight gain, and excessive vs. adequate weight gain) were estimated using generalized linear models with a binomial distribution to obtain risk ratios (RRs). Model 1 was adjusted for state and year fixed effects, which control for any state- or year-specific factors that may be correlated with both economic contraction and pregnancy behaviors. To identify potential confounders, we assessed whether prepregnancy characteristics thought to be associated with health behaviors during pregnancy were also associated with exposure to economic contraction (Appendix C), after adjusting for year of birth to account for the fact that economic contraction was more common earlier in the study period when the cohort was younger (Appendix Figure B2). Model 2 was then adjusted for the characteristics found to be associated with exposure: maternal race–ethnicity and educational attainment. NLSY79 used stratified- and over-sampling methods, but recommends against using sampling weights in regression analyses (Bureau of Labor Statistics 2008; per NLSY79 User's Guide, “regression analysis: a common question is whether one should use the provided weights to perform weighted least squares when doing regression analysis. Such a course of action may not lead to correct estimates. If particular groups follow significantly different regression specifications, the preferred method of analysis is to estimate a separate

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