

# Periconceptional Risk Factors for Birth Defects among Younger and Older Teen Mothers



Amy P. Case PhD<sup>1,\*</sup>, Adrienne T. Hoyt MPH<sup>1</sup>, Mark A. Canfield PhD<sup>1</sup>, Anna V. Wilkinson PhD<sup>2</sup>

<sup>1</sup> Texas Department of State Health Services, Austin, TX

<sup>2</sup> The University of Texas School of Public Health, Austin Regional Campus & Michael and Susan Dell Center for Healthy Living, Austin, TX

## ABSTRACT

**Study Objectives:** We sought to determine whether selected periconceptional health behaviors that influence risk for birth defects differ between older and younger adolescents and whether pregnancy intention predicts more positive preconception health behaviors among teens.

**Design and Participants:** We analyzed interview responses from 954 adolescent control group participants from the National Birth Defects Prevention Study who delivered live infants during 1997-2007.

**Main Outcome Measures:** Adjusted odds ratios (aORs) and 95% confidence intervals (CIs) were calculated for factors of interest by age categories (13-15, 16-17, and 18 years, relative to 19 years). To construct a composite periconceptional behavior index, we summed the following healthy behaviors: nonsmoker, nondrinker, folic acid supplementation, and eating 5 or more servings of fruits and vegetables per day.

**Results:** Analyses indicated that women in the youngest group (13-15 years of age) were more likely to be Hispanic (aOR 2.83, 95% CI 1.40-5.70) and less likely to engage in some unhealthy pregnancy-related behaviors compared with 19-year-olds, such as smoking (aOR 0.45, 95% CI 0.20-0.99) and being overweight or obese (aOR 0.32, 95% CI 0.16-0.61). However, they were also less likely to have taken periconceptional folic acid (aOR 0.44, 95% CI 0.21-0.90). About one-third of teen mothers indicated that their pregnancies had been intended. Among 18- and 19-year-olds, this predicted a higher mean value for the composite periconceptional behavior index (2.30 versus 1.94,  $P \leq .01$ ).

**Conclusions:** Teen mothers are not a homogeneous group. Each age subgroup presents varied demographic and behavioral factors that put them at varying levels of risk for birth defects. Furthermore, caregivers should not assume that teens do not plan pregnancies or that they need not be informed of the importance of periconceptional health.

**Key Words:** Adolescent, Preconception care, Health behavior, Tobacco use, Adolescent behavior, Drinking behavior, Fruit, Vegetables, Folic acid, Congenital anomalies, Health surveys

## Introduction

Although birth rates for US teens continue to fall, about 400,000 babies are delivered each year to mothers aged 20 years or younger; about 14% of those are born to mothers younger than 17 years.<sup>1</sup> Several types of birth defects, including gastroschisis and renal agenesis, disproportionately affect the offspring of younger mothers,<sup>2-5</sup> and there is some evidence to suggest that births to very young teens disproportionately contribute to this burden,<sup>6,7</sup> underscoring the possibility that they may have different risk factors compared with older adolescents. Findings on the contribution of physiological immaturity to poorer birth outcomes among offspring born to adolescents have been inconsistent,<sup>8,9</sup> suggesting that differing periconceptional health and behaviors play a part.<sup>10</sup> However, while it is clear from studies of within-group differences of nonpregnant

teens that each age group presents a different behavioral and physiological profile, most etiological birth defect studies treat teen mothers as homogeneous regardless of their age. Therefore, it is important for future studies of birth defects risk factors to better understand whether and how relevant periconceptional health and behaviors vary within this age group.

Several patterns about the health behaviors of interest have been observed in the literature that inform the basis for this study: First, these behaviors tend to differ between nonpregnant older and younger teens<sup>11,12</sup>; second, younger and older teen mothers and their adult counterparts exhibit different behaviors during pregnancy<sup>13</sup>; and, third, in general, mothers report several different periconceptional behaviors depending on whether the pregnancy was planned.<sup>14,15</sup> However, virtually all studies of preconception health treat teens as a single stratum, and only occasionally are younger teens represented in these studies.<sup>16-18</sup> Although there are notable exceptions,<sup>12,19</sup> scant attention has been directed to preconception behaviors and exposures among the youngest mothers and whether they differ from older teens. Finally, the extent to which pregnancy intention exerts a similar influence among teens has not been explored.

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\* Address correspondence to: Amy P. Case, PhD, Birth Defects Epidemiology & Surveillance Branch, Texas Department of State Health Services, P.O. Box 149347, Austin, TX 78714-9347, USA; Phone: (512) 565-1687; fax: (512) 458-7330

E-mail address: [acase@research-commons.com](mailto:acase@research-commons.com) (A.P. Case).

Although it is often assumed that pregnancies among teen mothers are universally unintended, research indicates that between 7% and 35% of these conceptions were planned or wanted.<sup>20–22</sup> Although the proportion varies by age group, even among the youngest teens, planned pregnancy is not unknown.<sup>20</sup> Pregnancy intention is a particularly important characteristic when considering preconception behaviors,<sup>15,23,24</sup> because the intent to become pregnant may act as a strong motivator to change unhealthy behaviors to improve the prospects of that pregnancy. Although teen mothers have exhibited improved self-care behaviors during and after pregnancy,<sup>21</sup> it is not clear whether adolescents, whose motives, attitudes, and awareness toward pregnancy planning may be particularly complex,<sup>25</sup> tend to adopt healthier behaviors before an intended conception occurs.

Many health promotion strategies rely on tailoring to specific characteristics of a population, including attitudes and behavioral intentions. Further, health behaviors tend to cluster in the same individuals<sup>26</sup>; conversely, unhealthy behaviors co-vary considerably and may cluster in different patterns between adolescent age groups.<sup>27</sup> Identifying how risk and protective factors cluster will further inform the development of health promotion strategies.

The primary aim of this study was to determine whether periconceptional health conditions and behaviors, particularly those relevant to birth defects prevention, vary among teen mothers by age subgroups. An additional aim was to investigate whether selected behaviors vary according to whether teen mothers indicated having planned their pregnancies and whether those patterns also vary for older and younger teens.

## Subjects and Methods

### Study Population

We conducted a nested cross-sectional analysis of responses given by control participants in the National Birth Defects Prevention Study (NBDPS). The NBDPS is a multi-center case-control study with 3 major components: (1) collection and categorization of information regarding the index infant and maternal demographics obtained from state birth defects registries, (2) a 1-hour computer-assisted telephone interview of the mother, and (3) collection of DNA from maternal, paternal, and child buccal cell samples. The interview, which must be concluded within 2 years after the index delivery, includes questions regarding periconceptional health, such as dietary habits, exposures during pregnancy, occupation, and health status around the periconceptional period. Control mothers gave birth to liveborn infants selected from the same base population as cases but their children had no major malformations and they had an estimated date of delivery occurring in the same year as cases. They are selected from either birth certificates or birth hospitals by using a stratified random sampling scheme.<sup>28</sup> Responses from control mothers who were younger than 20 years and gave birth to a child without a birth defect covered by the NBDPS between 1997

and 2007 form the basis of the present analysis. The NBDPS has been described in greater detail elsewhere.<sup>28,29</sup>

The NBDPS was approved by the Office of Management and Budget and the appropriate institutional review boards at the Centers for Disease Control and Prevention and each participating site.

### Data Analyses

Variables of interest were behaviors or characteristics that are known risk factors for birth defects, with particular attention to behaviors that, based on a review of the literature, could be expected to vary among the age groups of interest (eg, alcohol use, high blood pressure). A priori power calculations were performed for the selected variables, which indicated that maternal smoking, environmental tobacco exposure, drinking, high blood pressure, obesity, folic acid use, and maternal nativity were within the capacity of this analysis to identify meaningful associations with the age groups of interest. In contrast, medications other than oral contraceptives and prepregnancy diabetes were eliminated from further analyses due to insufficient power.

Responses regarding the 3 months before and 1 month after conception were included for behavioral variables (eg, folic acid supplementation, binge drinking); dietary recall, however, refers to average consumption during the 1 year before pregnancy. (A detailed description of variables is given in Table 1.)

We calculated  $\chi^2$  values or 2-sided Fisher's exact estimates in cases where cell sizes were less than 5 for our risk factors of interest and for the 4 age categories (13–15, 16–17, 18, and 19 years). Three separate binary logistic regression models were run for each of the 3 teen subcategories against 19-year-olds (ie, 13- to 15-year-olds, 16- to 17-year-olds, and 18-year-olds versus 19-year-olds) for all maternal risk factors. Both crude and adjusted multivariate models were assessed adjusting for all other factors considered significant in at least 1 of the crude models. All statistical calculations were performed with SAS software, version 9.3 (SAS Institute Inc, 2011).

Recognizing that adolescent risk behaviors often occur together, we constructed a composite periconceptional behavior index (CPBI) by computing mean behaviors by age group for the following reported behavioral characteristics, which are known to play a role in preventing certain birth defects. Cumulative responses to 4 known risk/protective factors for birth defects were grouped by age and number of positive responses (smoking and drinking were inverted so that the positive corollary could be compared to the protective factors). The 4 behaviors were (a) not smoking (3 months before to 1 month after conception), (b) not drinking any alcohol (3 months before to 1 month after conception), (c) consuming at least 5 servings of fruits or vegetables per day in the year before conception (proxy for a balanced diet),<sup>30</sup> and (d) taking folic acid supplements (3 months before to 1 month after conception).

We used the CPBI in 2 analyses used to determine if composite behavior patterns differed by age groups: (a) cumulative percent reporting each level of the CPBI (potential range 0–4,

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