



Original research article

# Changing disparities in teen birth rates and repeat birth rates in Georgia: implications for teen pregnancy prevention<sup>☆</sup>

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## ABSTRACT

**Objective:** To understand teen birth trends in Georgia by racial and geographic factors.**Study design:** We analyzed overall birth and repeat teen birth rates by race, urban/rural status and adequacy of obstetric care from 2008 to 2016 using vital records from all Georgia counties.**Results:** Overall birth rates among teens analyzed decreased dramatically in Georgia, from 45.63 births per 1000 teens in 2008–2010 to 26.28 per 1000 teens in 2014–2016. Repeat birth rates followed a similar decline, from 9.40 to 4.53 repeat births per 1000 teens over the same time period. These rates decreased in all subgroups of teens but to varying degrees. The difference in birth and repeat birth rates between black and white teens decreased fourfold during this time period, whereas the declines in these rates for teens living in rural versus urban counties and with inadequate versus adequate obstetric care were less pronounced.**Conclusion:** While remarkable reductions in teen birth and repeat birth rates have occurred since 2008, these declines have not been equally experienced by all groups of teens.**Implications:** Our analysis suggests that persistent disparities in teen birth and repeat birth rates exist, particularly in areas with limited or threatened access to reproductive health care. Applying targeted teen pregnancy prevention initiatives to these areas could help ensure equitable health and social outcomes for teens.

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## 1. Introduction

Nationally, teen birth rates have declined substantially, from 61.8 to 22.3 live births per 1000 teens between 1991 and 2016 [1]. While teen birth rates have declined for all groups of teens, significant disparities in teen birth rates by race and urban/rural residence have persisted and widely vary by region [2–4]. Teen birth remains a pertinent public health issue as it is associated with poor social and health consequences for teen mothers and their infants, as well as high taxpayer costs. Teen mothers have lower educational attainment, fewer socioeconomic opportunities and worse health outcomes compared to their counterparts who delay motherhood [5,6]. Additionally, repeat teen birth, which accounted for one sixth of all teen births in 2015, exacerbates these barriers in achieving social and health well-being that already accompany teen parenting [7].

Georgia has made some compelling strides in reproductive health but still experiences many health outcomes that are below national averages. Georgia ranked 19th nationally for highest teen birth rate in 2015 and was one of five Southeastern states where over 20% of teen births were repeat births between 2007 and 2010 [8,9]. Notably, Georgia is experiencing a dearth of obstetric care in rural areas [10]. This ecologic study aimed to examine changes in birth and repeat birth rates among different groups of teens in Georgia.

## 2. Methods

### 2.1. Data source and calculations

We used data from the publicly available Online Analytical Statistical Information System (OASIS) published by the Georgia Department of Public Health (<https://oasis.state.ga.us/>) [11]. We abstracted yearly birth, repeat birth and population counts by county for females ages 15 to 19 years that identified as white or black/African-American. We collated these counts over three time periods: 2008–2010, 2011–2013 and 2014–2016. Birth rates were calculated as number of live births

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divided by the female population per county. Repeat birth rates were calculated similarly with a numerator of number of live births that were not first live births.

## 2.2. Exposure classification

Predictor variables included individual race (black/African-American or white) and county-level urban/rural status and adequacy of obstetric care; births that were not classified within these race parameters were excluded from this analysis. Stratification by Hispanic ethnicity was not possible due to missing data. The 2000 US Census data defined rural counties as those with fewer than 35,000 total population and urban counties otherwise. We specified adequacy of obstetric care by county based on levels of care delivered in 2011, as collected by the Georgia Maternal and Infant Health Research Group (GMIHRG) [10]. Following this work, we classified inadequate obstetric care as counties with no obstetric services or those with average annual births per provider greater than 166, and adequate obstetric care otherwise.

## 2.3. Statistical analysis

We tested unadjusted differences in birth and repeat birth rates by each predictor using two-sample *t* tests. We also conducted a three-way analysis of variances (ANOVA) to test independent and interaction associations of our three predictor variables on birth and repeat birth rates. Statistical analyses were performed using Statistical Analytic Software (SAS) 9.4 (SAS Institute Inc., Cary, NC, USA).

## 3. Results

### 3.1. Descriptive characteristics of data

Of 159 counties in Georgia, 108 (68%) were rural and 51 (32%) were urban. Additionally, 57 counties (36%) had inadequate obstetric care and 102 counties (64%) had adequate obstetric care.

### 3.2. Trends in birth and repeat birth rates by individual predictor variables

Among the teens analyzed, Georgia-wide teen birth and repeat birth rates decreased. The birth rate in 2008–2010 was 45.63 births per 1000 teens, which declined to 34.00 births per 1000 teens in 2011–2013 and 26.28 births per 1000 teens in 2014–2016. Repeat birth rates reflected a similar trend, with 9.40 repeat births per 1000 teens in 2008–2010, 6.52 repeat births per 1000 teens in 2011–2013 and 4.53 repeat births per 1000 teens in 2014–2016.

Teen birth rates and repeat birth rates in Georgia also decreased for all subgroups analyzed; however, the magnitude of decline differed by each predictor (Fig. 1). Between 2008 and 2016, the differences in birth and repeat birth rates between black and white teens decreased approximately fourfold each, from 20.25 ( $p<.001$ ) to 4.87 ( $p=.01$ ) births per 1000 teens and 5.43 ( $p<.001$ ) to 1.15 ( $p=.04$ ) repeat births per 1000 teens. The declines in teen birth and repeat birth rates over time between rural and urban counties were less pronounced compared to those observed for race, with rural counties experiencing consistently higher rates. The difference in births per 1000 teens between rural and urban counties was 11.26 ( $p<.001$ ) in 2008–2010 and 9.14 ( $p<.001$ ) in 2014–2016; the rural/urban difference in repeat birth rates during this time were 2.33 ( $p=.02$ ) and 1.47 ( $p=.02$ ) repeat births per 1000 teens, respectively.

Our third predictor, adequacy of obstetric care, was used as a proxy for access to reproductive health care. Notably, 44.4% of rural counties were classified as having inadequate obstetric care compared to 17.6% of urban counties. Consequently, the disparities in birth and repeat birth rates between counties with inadequate versus adequate care were similar to those of rural versus urban counties. Compared to counties with adequate care, counties with inadequate care

experienced a higher birth rate by 11.69 births per 1000 teens ( $p<.001$ ) and a higher repeat birth rate by 3.44 repeat births per 1000 teens ( $p=.001$ ) in 2008–2010; these differences continued in 2014–2016, with a birth rate difference of 8.38 births per 1000 teens ( $p<.001$ ) and repeat birth rate difference of 1.35 repeat births per 1000 teens ( $p=.03$ ).

## 3.3. ANOVA results

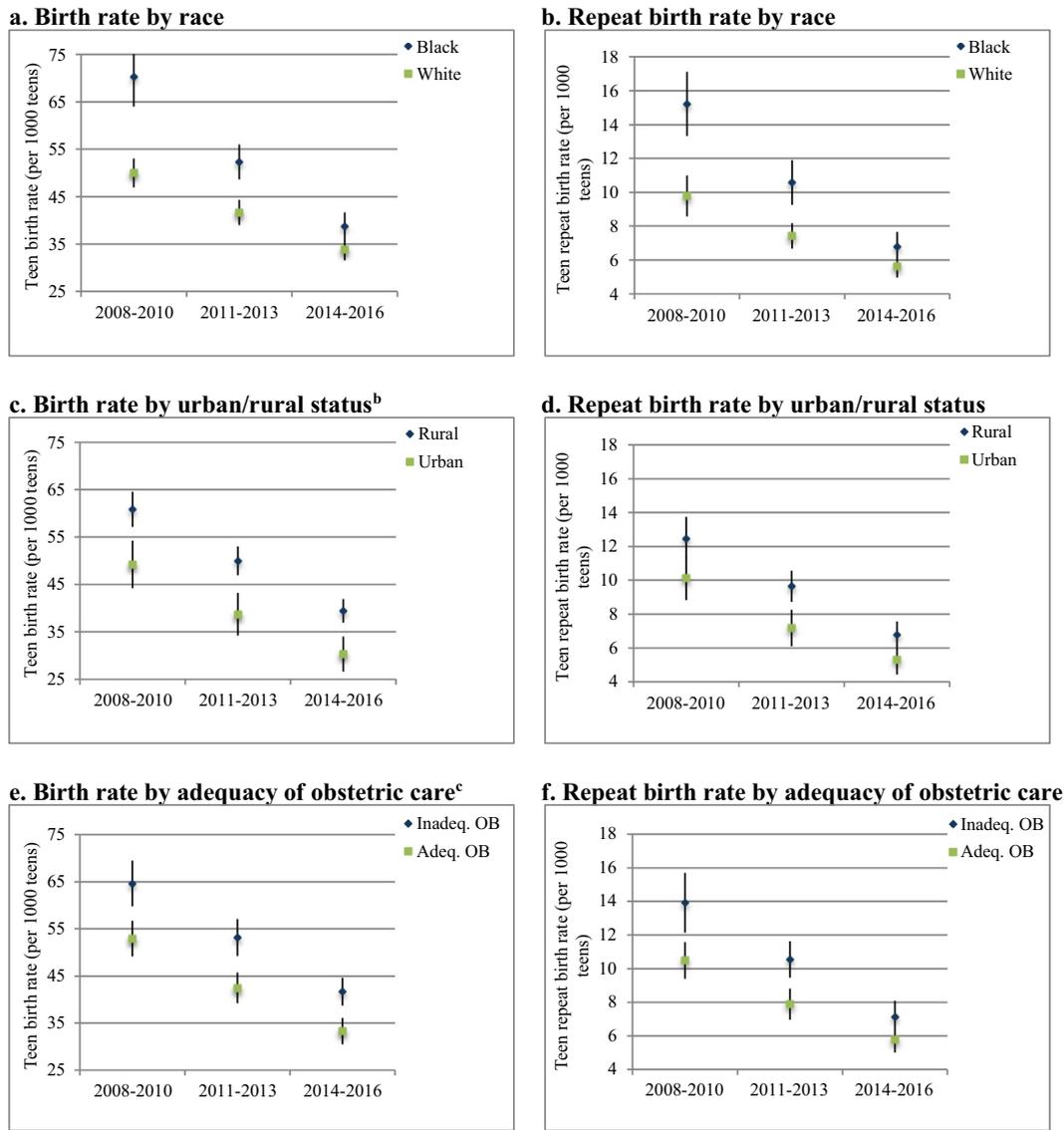
Birth and repeat birth rates were calculated by race and stratified by urban/rural status and adequacy of obstetric care (Table 1). Black rural teens with inadequate obstetric care had the highest birth rates across all time periods, and white urban teens with adequate obstetric care had the lowest; repeat birth rates demonstrated more variation. When using three-way ANOVA to assess independent and interaction associations, race was the only variable with significant association between 2008 and 2010 ( $p<.001$ ). However, all three predictors, i.e., race, urban/rural status and adequacy of obstetric care, had statistically significant associations with birth rate in 2011–2013 (race:  $p<.001$ ; urban/rural status:  $p=.01$ ; adequacy of obstetric care:  $p=.001$ ) and 2014–2016 (race:  $p=.02$ ; urban/rural status:  $p=.01$ ; adequacy of obstetric care:  $p<.001$ ). When comparing repeat birth rates, race and adequacy of obstetric care were significantly associated with repeat birth rates in 2008–2010 (race:  $p<.001$ ; adequacy of obstetric care:  $p=.04$ ) and 2011–2013 (race:  $p<.001$ ; adequacy of obstetric care:  $p=.02$ ); only adequacy of obstetric care was significantly associated with repeat birth rates between 2014 and 2016 ( $p=.03$ ). For all of these analyses, no statistical interaction was observed.

## 4. Discussion

Teen birth and repeat birth rates have decreased among all teens in Georgia, similar to observed national trends [1]. However, the extent of decline in these rates varied by race and geographic factors. Our data suggest that racial disparity in teen birth and repeat birth rates in Georgia has narrowed over the past decade. Conversely, the gaps in these rates for rural versus urban areas and for areas with inadequate versus adequate obstetric care have persisted during this time period. Examining stratified birth and repeat birth rates by all three predictors reveals potentially shifting trends, and no interaction associations were found between these factors.

Our analysis was strengthened by our reliance on population-based vital records. However, our study used dichotomous definitions for covariates, which may have masked finer variation. We also used definitions for urban/rural status and adequacy of obstetric care that were determined in 2000 and 2011, respectively, and these values for a county may have changed during our time period of interest. However, when analyses were repeated using a more conservative coding schema, the observed trends remained statistically significant. Additionally, data for other variables that could have confounded our results were not available through OASIS. Prior research suggests that racial and regional disparities in birth rates may be related to structural variables, such as educational attainment [12]. Further research beyond this descriptive analysis is warranted to assess for potential confounding.

Declining teen pregnancy rates are likely due to improved contraception use and changing sexual behaviors [13]. Our descriptive findings suggest that this progress is unevenly shared. Reducing disparities in teen pregnancy is pivotal to achieving equitable health outcomes and social opportunities for all teens. Our analysis implies a need to apply teen pregnancy prevention strategies that have been effective for reducing the racial disparity in Georgia teen birth and repeat birth rates towards rural areas of the state and those with barriers in accessing reproductive health services. Additionally, our analysis suggests that tracking changes in provision of reproductive health services may be useful in assessing reproductive health outcomes. With a



**Fig. 1.** Comparison of teen birth rates and repeat birth rates among Georgia counties by race, urban/rural status and adequacy of obstetric care, 2008–2016.<sup>a</sup> <sup>a</sup>Calculated rates are from data provided the Online Analytical Statistical Information System published by the Georgia Department of Public Health (<https://oasis.state.ga.us/>). <sup>b</sup>Rural counties were defined as those with less than 35,000 total population by 2000 US Census data, and counties were defined as urban otherwise. <sup>c</sup>Counties with inadequate obstetric care (“Inadeq. OB”) were defined as those with no obstetric services or those with average annual births per provider greater than 166, and counties were defined as having adequate obstetric care (“Adeq. OB”) otherwise.

**Table 1**

Teen birth rates and repeat birth rates among Georgia counties (N=159) by race, stratified by urban/rural status and adequacy of obstetric care<sup>a</sup>

|                             | Teen birth rate <sup>b</sup> |           |           | Teen repeat birth rate <sup>b</sup> |           |           |
|-----------------------------|------------------------------|-----------|-----------|-------------------------------------|-----------|-----------|
|                             | 2008–2010                    | 2011–2013 | 2014–2016 | 2008–2010                           | 2011–2013 | 2014–2016 |
| Rural, inadequate OB (N=48) |                              |           |           |                                     |           |           |
| Black                       | 74.35                        | 60.47     | 46.83     | 16.71                               | 12.42     | 8.07      |
| White                       | 55.53                        | 47.86     | 38.92     | 12.21                               | 9.06      | 6.12      |
| Rural, adequate OB (N=60)   |                              |           |           |                                     |           |           |
| Black                       | 70.34                        | 52.48     | 38.58     | 14.51                               | 10.03     | 6.46      |
| White                       | 51.73                        | 42.75     | 34.35     | 9.18                                | 7.40      | 5.94      |
| Urban, inadequate OB (N=9)  |                              |           |           |                                     |           |           |
| Black                       | 76.46                        | 57.97     | 43.74     | 17.85                               | 12.40     | 7.50      |
| White                       | 52.00                        | 42.26     | 36.22     | 10.41                               | 7.54      | 6.75      |
| Urban, adequate OB (N=42)   |                              |           |           |                                     |           |           |
| Black                       | 64.42                        | 42.03     | 28.99     | 14.02                               | 8.95      | 5.62      |
| White                       | 40.90                        | 32.81     | 27.11     | 7.76                                | 5.56      | 4.42      |

<sup>a</sup> Calculated rates are from data provided the Online Analytical Statistical Information System published by the Georgia Department of Public Health (<https://oasis.state.ga.us/>). Race was reported to OASIS from vital records; urban/rural status was obtained from 2000 US Census parameters; obstetric care was classified as adequate (“adequate OB”) or inadequate (“inadequate OB”) based on levels of care delivered in 2011 collected by GMIHRG.

<sup>b</sup> Birth rate and repeat birth rates are reported per 1000 females ages 15 to 19 years.

growing health care need in rural areas, policymakers and community stakeholders should focus on these areas in order to reduce teen birth.

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