



Available online at www.mchandaids.org

INTERNATIONAL JOURNAL of
MATERNAL and CHILD HEALTH and AIDS
ISSN 2161-864X (Online)
ISSN 2161-8674 (Print)
DOI: 10.21106/ijma.377

SHORT RESEARCH COMMUNICATION | SINGLETONS, TWINS, MULTIPLE BIRTHS

Temporal Trends in the Rates of Singletons, Twins and Higher-order Multiple Births Over Five Decades Across Racial Groups in the United States

Liye Wang, BS¹; Deepa Dongarwar, MS²✉; Hamisu M. Salihu^{2,3}; MD, PhD

¹Department of Pharmacological and Pharmaceutical Sciences, College of Pharmacy, University of Houston, Houston, Texas, USA; ²Center of Excellence in Health Equity, Training and Research, Baylor College of Medicine, Houston, Texas, USA; ³Department of Family and Community Medicine, Baylor College of Medicine, Houston, Texas, USA

✉ Corresponding author email: deepa.dongarwar@bcm.edu

ABSTRACT

We analysed Natality data obtained from the National Vital Statistics System from 1971 through 2018. Overall, the rates of singletons declined among all racial groups over the five decades of the study. However, the rates of twins and higher-order multiples increased over the same period although for the past two decades, the rates of higher-order multiples had substantially plummeted. The global health implication of these findings is that policy changes in the US in the form of professional practice guidelines have succeeded in reducing the birth of vulnerable populations (i.e., higher-order multiples) who are predominantly created using assisted reproductive technology.

Key words: • Trends in Multiple Gestations • US • Black • White • Singletons • Twins • Higher-order multiples

Copyright © 2020 Wang et al. Published by Global Health and Education Projects, Inc. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) which permits unrestricted use, distribution, and reproduction in any medium, provided the original work, first published in this journal, is properly cited.

Introduction

Over the recent decades, developed countries have witnessed an increase in the incidence of multiple gestations¹. The increasing frequency of multiple pregnancies is attributed to diverse factors, most prominent among which are maternal age, maternal race/ethnicity, delay in childbearing, and the use of assisted reproductive technologies (ART)². The incidence of multiple pregnancies varies across maternal race/ethnicity³. Although studies on ethnic differences in twinning rate have been published from the State of California³, to our knowledge, this

is the first study on temporal trends in the rates of singletons, twins and higher-order multiples with particular emphasis on race in the US.

Methods

This was a population-based retrospective cohort study for the years 1971 through 2018, covering a total of 48 years. The Natality data files used for the analysis were obtained from the National Vital Statistics System (NVSS), which are routinely compiled by the National Center for Health Statistics (NCHS), and made publicly available by the Centers for Disease Control and Prevention (CDC). It is the

oldest system used to register all vital events such as births, deaths, marriages, divorces and fetal deaths⁴. The Natality Data contain information regarding all births occurring in the US irrespective of residence status. We classified plurality as: (1) singletons; (2) twins; and (3) higher-order multiples comprising triplets, quadruplets and above. Mother's race was available for all years in the following three categories – 1) White, 2) Black, and 3) Others (which included all races other than White or Black). We then calculated the rates of singletons, twins, and higher-order multiple births in the entire population and within each of the White and Black race categories. Temporal trends analysis was performed on the rates of singletons, twins and higher-order multiples over the study period stratified by race using joinpoint regression analysis, which enables us to evaluate the trends in the rates of the outcome over the study period. Average annual percentage change (AAPC) and 95% confidence interval were computed to capture the rate of change of the outcomes over the study period.

Results

There were a total of 170,909,755 births occurring in the US from 1971 through 2018, out of which 166,152,068 (97.22%) were singletons; 4,572,497 (2.68%) were twins; 184,881 (0.11%) were higher-order multiples; and a total of 309 (0.00018%) had no plurality assigned. Among White women, 97.38% were singleton births, 2.51% were twins and 0.11% were higher-order multiples. Among Black women, 96.95% were singleton births, 2.99% were twins and 0.07% were higher-order multiple births.

Overall, the rates of singletons among all births declined from 98.17% in 1971 to 96.63% in 2018, corresponding to an average annual drop of 0.10% [95% CI: (-0.2,-0.1)]. The temporal trajectories in the rates of singletons, twins and higher-order multiples largely varied between Blacks and Whites over the decades of the study. Among Whites, the proportion of singletons for all births dropped from 98.24% in 1971 to a low of 96.32% in 2009, after which it rose to 96.74% in 2018, corresponding to an average annual decline of 0.10% [95% CI: (-0.2,-0.1)]. For Blacks, the percentage of singletons among all

births declined progressively from 97.76% to 95.92% [AAPC= -0.10%, 95% CI: (-0.2,-0.1)] (Figure 1a).

In contrast to singletons, the rates of twins among all births climbed from 1.80% to 3.28%, with an average annual increase of 1.30% [95% CI: (1.1, 1.4)] throughout the study period. For White women, the percentage of twin deliveries surged from 1.70% in 1971 to a peak of 3.52% in 2009, after which it slid to 3.18% in 2018, representing an average annual growth of 1.30%. For Black women, the percentage of twins among all births was 3.98% in 2018, a significant expansion in rate from that in 1971 [AAPC =1.20%, 95% CI: (1.0,1.5)] (Figure 1b). Twinning rates remained consistently higher among Blacks.

The combined proportion of higher-order multiples among all births climbed from 0.03% in 1971 to a peak of 0.19% in 1998 and then stabilized around that rate until 2001. Subsequently, it decreased to 0.09% by 2018, thereby culminating in an overall significant temporal increase over the study period [AAPC =2.60%, 95% CI: (2.2, 3.1)]. For White women, the percentage of higher-order multiple births increased from 0.03% in 1971 to a peak of 0.22% in 1998, after which it declined progressively to 0.09% by 2018, corresponding to an average annual increase of 2.70% [95% CI: (2.1, 3.2)] over the years. For Black women, the incidence of higher-order multiples went from 0.03% in 1971 to 0.04% by the end of the decade and stayed the same for 13 years until 1990, after which it surged to 0.10% in 2003. From then on it remained consistent till 2018, corresponding to an average annual increase of 2.60% [95% CI: (1.7, 3.4)] (Figure 1c).

Discussion and Global Health Implications

This study examined temporal changes in plurality patterns (singleton or multiples) stratified by maternal race over the five decades. Overall, there was a decrease in the rates and AAPC of singletons, whereas the rates for twins and higher-order multiples considerably increased over the five decades. It is noteworthy that the trajectories for the higher-order multiples indicate that, for the past two decades, their rates had substantially plummeted, leading to much lower higher-order

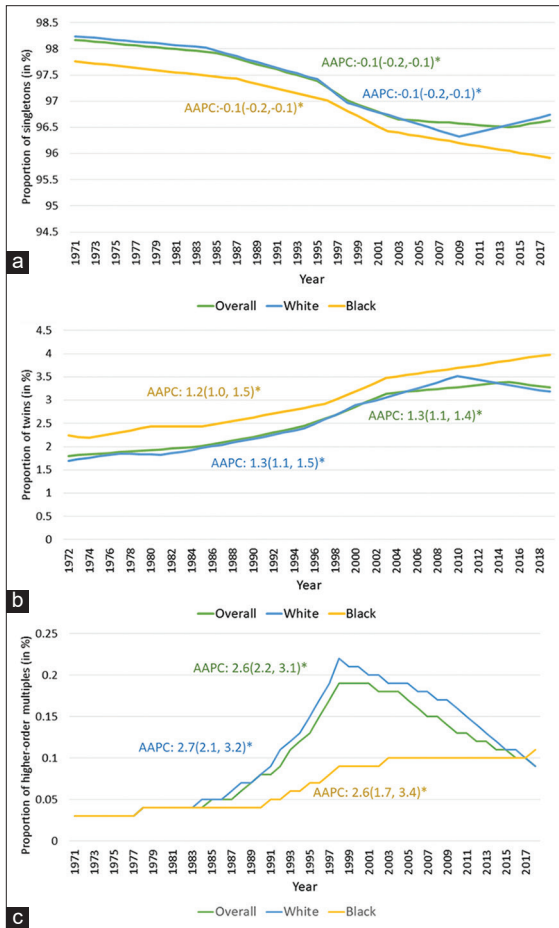


Figure 1: Trends in the incidence of singletons (a), twins (b), and higher-order multiple births (c) among all deliveries in the US by race 1971-2018

multiple rates in the current decade. The trend trajectories in the rates of higher-order multiples largely differed between White and Black women. Among Whites, there was almost a seven-fold growth (0.03% to 0.22%) in the rate of higher-order multiples from 1971 to 1998 and then a reduction (0.22% to 0.09%) from 1999-2018, which marked a huge change in birthing patterns occurring in White women over the study period. We speculate that part of the decline in higher-order pregnancies in the past two decades overall and, specifically among White women is the reduction in the number of transferred embryos during ART⁵ since higher-order multiples are, for all intent and purposes, artificially created. Another interesting finding is the

twinning rates among Black women, which remained consistently higher than for Whites throughout the decades. From our findings, it can be observed that policy changes in the US in the form of professional practice guidelines have succeeded in reducing the birth of vulnerable populations (i.e., higher-order multiples) who are predominantly created using ART.

Compliance with Ethical Standards

Conflicts of Interest: Authors declare no conflict of interest. **Financial Disclosure:** None. **Funding/Support:** The publication of this article was partially supported by the Global Health and Education Projects, Inc. (GHEP) through the Emerging Scholars Grant Program (ESGP). The information, contents, and conclusions are those of the authors' and should not be construed as the official position or policy of, nor should any endorsements be inferred by ESGP or GHEP. **Ethics Approval:** Study was deemed exempt by the Baylor College of Medicine Institutional Review Board.

Key Messages

- The rates of singletons declined among all racial groups over the five decades from 1971-2018.
- The rates of twins and higher-order multiples increased over the study period although for the past two decades, the rates of higher-order multiples plummeted substantially.

References

1. Martin JA, Hamilton BE, Osterman MJK, Driscoll AK. *Births: Final Data for 2018*. Centers for Disease Control and Prevention;2019. 13.
2. Bush MC, Eddleman KA. Multifetal pregnancy reduction and selective termination. *Clinics in perinatology*. 2003;30(3):623-641.
3. Pollard R. Ethnic comparison of twinning rates in California. *Human biology*. 1995;67(6):921-931.
4. About the National Vital Statistics System. https://www.cdc.gov/nchs/nvss/about_nvss.htm.
5. Martin JA, Osterman MJ, Thoma ME. Declines in Triplet and Higher-order Multiple Births in the United States, 1998-2014. *NCHS data brief*. 2016(243):1-8.