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Ethnic differences in birth gender ratio responses in the United States after the September 11 Attacks and the President Kennedy assassination

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ABSTRACT

Introduction: Male exceed female live births. The ratio is expressed as M/F (male/total live births). Many factors influence this ratio including stress, which depresses it. The 9/11 attacks lowered M/F in the United States a few months after the event. This study was carried out to identify any racial differences in the observed M/F reduction. This paper also analysed racial M/F responses to the assassination of President John Kennedy.
Methods: For the JKF assassination, births were available as White and Non-White births. For 9/11, births were available for four racial groups: American Indian/Alaska Native, Asian/Pacific, Black/African and White.
Results: For the JFK assassination (November 1963), total M/F was lowest in 1964 (1958–1970, $p \leq 0.01$). M/F dipped in March 1964 in Non-White births only ($p < 0.0001$). For 9/11, M/F dips showed a nonsignificant gradient, being greater in Asian/Pacific births, followed by White and Black/African. Baseline M/F was Asian/Pacific > White > Black/African and American Indian/Alaska Native.
Discussion: President Kennedy actively attempted to usher in civil rights, and his assassination may have stressed Non-Whites far more than Whites. For 9/11, the low Black/African M/F dips may be due to chronic stress associated with being overall disadvantaged and of lower socio-economic status. These factors decrease M/F and potentially dampen M/F dips in response to additional stressors. The observed M/F dips often exceed the perinatal mortality statistic. Public Health should be more cognizant of the effect of stress on population M/F as a sentinel health indicator.
Key guidelines:

1. The male to female ratio at birth is decreased by stressful events.
2. This is due to an excess of male foetal losses in established pregnancies.
3. Such losses in response to acute events are transient.
4. This ratio may be a useful indicator of population stress.
5. Socioeconomically deprived subpopulations, such as Black/African and American Indian/Alaska Native races may have a low ratio due to chronic stress and may thus be less responsive to stress in their ratio responses.
6. The habitually high ratio in Asian/Pacific subpopulations may be due to the former practicing gender-selective abortion, favouring male over female offspring.

Research directions:

1. Gender ratios in populations could be routinely monitored in order to assess the impact of stressful events that may reduce the male to female birth ratio.

1. Introduction

Male live births slightly exceed female live births [1]. This ratio is often expressed as M/F, denoting male live births divided by total live births.

A wide range of factors have been shown to influence this ratio [1]. These include terrorist attacks which induce stress, an exogenous factor that is known to lower M/F [2,3]. The September 11 2001 attacks were shown to transient lower M/F not only in New York [4], but also on the Western seaboard in California [4]. Moreover, M/F was transiently depressed in the entire United States (US) [5]. The M/F slump was noted to occur a few months after the events [4]. This study was carried out in order to ascertain whether there were any racial differences in the observed M/F reduction.

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This study also analysed M/F responses by race in relation to the assassination of President of John F. Kennedy in November 1963.

2. Methods

2.1. JFK assassination

Annual male and female live births for the US were obtained from a World Health Organisation Mortality database for the period 1958–1970. Comparisons were made between 1964, the year after the assassination of President Kennedy (in November 1963) and the preceding six years (1958–1963) and the following six years (1965–1970). This dual comparator (event ± 6 years) was imposed in order to avoid the potential influence of natural secular changes in M/F [6]. Natality data for 1964 was available by gender by month as White and Non-white births only [7].

2.2. September 11

Monthly male and female live births by race for New York State and for the entire US were obtained from the website of the Centers for Disease Control and Prevention (Vitalstats) for the period 1995–2007 (event ± 6 years) for the abovementioned reasons. Births were available for four racial groups: American Indian or Alaska Native, Asian or Pacific Islander, Black or African American and White.

Dips were noted in M/F in December 2001 or January 2002, three to four months after September 11. The lowest month (December 2001 or January 2002, depending on race) was compared to the amalgamation of births for 2001 and 2002. In order to minimise the effect of seasonality, M/F for the lowest month (December 2001 or January 2002) was also compared to the sum of the same months over the entire study period (1995–2007), for both New York and for the entire country.

2.3. Statistics

Excel was used for data entry, overall analysis and charting. Changes in births between races were compared using a bespoke spreadsheet (courtesy of Professor David Spiegelhalter, personal communication). This calculated a Z-statistic contrasting the two differences in M/F change. The numerator was the difference of the difference. The denominator was $\sqrt{(\text{var1} + \text{var2})}$ where var1 and var2 were the variances of the two differences in the two races being compared. The result was then compared to standard normal tables.

The quadratic equations of Fleiss were used for the calculation of 95% confidence intervals for ratios [8]. Chi tests and chi tests for trends for annual male and female births were used throughout using the BioMed-Stat Excel add-in for contingency tables [9].

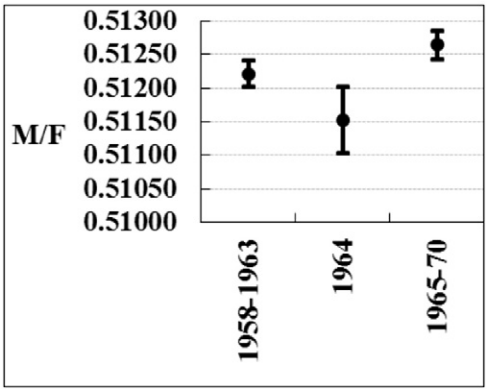

Fig. 1. M/F for all births, 1958–1970.

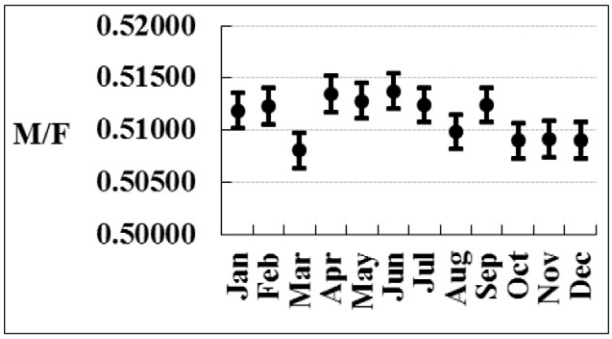

Fig. 2. Monthly M/F for all births, 1964.

Transient dips in M/F were subtracted from amalgamated M/F for 2001 and 2002 and calculated per 1000 births. A p value ≤ 0.05 was taken to represent a statistically significant result.

3. Results

3.1. JFK assassination

There were 50,918,775 live births (26,087,576 males and 24,831,199 females, M/F 0.5123; 95% CI 0.5122–0.5125) for the period 1958–1970.

For the period, for the total of both races (Whites and Non-Whites), M/F was lowest in 1964. M/F was significantly lower in 1964 than in 1958–1963 (chi = 6.4, p = 0.01) and 1965–1970 (chi = 16.9, p < 0.0001—Fig. 1). M/F dipped in March 1964 for all births, three to four months after President Kennedy's assassination (Fig. 2). No such dip was present for White births (Fig. 3), with the dip in total births accounted for by Non-White births only, which dropped to below 0.5 (Fig. 4).

M/F for March 1964 and for the rest of 1964, for White and Non-White births, is shown in Fig. 5. The reduction in M/F in March was significant for the total of all births (p = 0.0002) and for Non-White births (p < 0.0001—Table 1) only. The difference between March 1964 and the baseline M/F is expressed per 1000 live births (Table 1), and reached 30.2 for Non-White births, and 3.4 for total births.

3.2. September 11

Over the period 1995–2007, for New York, there were 3,330,859 live births (M/F 0.5122, 95% CI 0.5117–0.5128). For the entire US, there were 52,612,159 live births (M/F 0. 5117, 95% CI 0. 5116–0. 5119). Overall racial characteristics are shown in Table 2 for New York and Table 3 for the US. For this period, for all US data, M/F for Asian or Pacific Islanders was significantly higher than for White (chi = 111.3, p < 0.0001) which in turn, was significantly higher than Black or African American births (chi = 468.4, p < 0.0001). A similar M/F racial gradient was present in

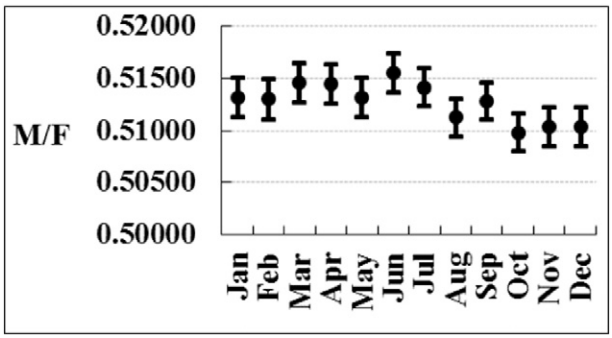

Fig. 3. Monthly M/F for White births, 1964.