

# The Male-female Birth Ratio in California and the 1992 April Riots in Los Angeles

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## ABSTRACT

**Objective:** Male live births slightly exceed female live births. This is usually expressed as M/F, the ratio of male to total live births. A multitude of external influences have been shown to reduce this ratio, including stress provoked through witnessing violent events; M/F dips occur three to four months later. The April 1992 Los Angeles riots constituted six days of extreme civil unrest in the city of Los Angeles. This study was carried out in order to ascertain whether M/F dipped in California following this event.

**Methods:** Monthly male and female live births for California were obtained from the Centers for Disease Control and Prevention for the state of California for 1992 and for January 1993.

**Results:** This study analysed 649 073 live births; M/F was lowest in August 1992 (0.5085). This was significantly lower than for the period after (September 1992 to January 1993;  $p = 0.044$ ). The ratio of male to total live births was higher in January to July 1992 than in August 1992 but this difference was not statistically significant.

**Conclusion:** Stress has been shown to reduce M/F through an excess of male fetal loss during gestation and/or from gender-biased conception favouring females. Only the former mechanism is supported by these findings. This is the first time that violent events at state level have been shown to have potentially influenced M/F.

**Keywords:** Birth rate, birth trends, civil disorders, infant, Los Angeles, newborn, sex ratio, United States of America

# Proporción de Sexos al Nacer en California y los Disturbios de Abril de 1992 entre la Juventud de Los Angeles

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## RESUMEN

**Objetivo:** El número de niños nacidos vivos excede ligeramente el de niñas nacidas vivas. Esto se expresa generalmente en V/H, la proporción de varones con respecto al total de nacidos vivos. Se ha mostrado que hay un gran número de influencias externas que reducen esta proporción, incluyendo en particular el estrés que produce ser testigos de hechos violentos; las caídas en V/H ocurren tres o cuatro meses más tarde. Los disturbios de abril de 1992 en Los Ángeles constituyeron seis días de extrema agitación civil en la ciudad de Los Angeles. Este estudio se llevó a cabo con el fin de determinar si se produjo una caída en la proporción M/H en California después de este evento.

**Métodos:** Se obtuvieron datos de los varones y hembras nacidos vivos en California, tomados de los Centros para la Prevención y Control de las enfermedades del Estado de California en el año de 1992 y enero de 1993.

**Resultados:** Este estudio analizó 649 073 nacidos vivos. La razón V/H alcanzó su punto más bajo en agosto de 1992 (0.5085). Esta proporción fue significativamente menor que la del período posterior (septiembre de 1992 a enero de 1993,  $p = 0.044$ ). La proporción de varones con respecto al total de nacidos vivos fue mayor de enero a julio de 1992 que en agosto de 1992, pero esta diferencia no fue estadísticamente significativa.

**Conclusión:** Se ha evidenciado que el estrés reduce la V/H mediante un exceso de pérdida fetal masculina durante la gestación, o por una predisposición de género a la hora de la concepción a favor de las hembras, o por ambas cosas. Sólo el primero de estos mecanismos anterior es sustentado por los ha-

*Ilazgos de esta investigación. Esta es la primera vez que se evidencia que hechos violentos a nivel estatal han influido potencialmente en la proporción V/H.*

**Palabras claves:** Tasa de natalidad, tendencias de nacimiento, disturbios civiles, niños, Los Ángeles, recién nacidos, proporción de sexos, Estados Unidos de América

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**INTRODUCTION**

Male live births occur slightly in excess of female live births. This ratio is conventionally expressed as M/F, designating male to total live births (1). A wide variety of influences have been shown to perturb M/F (1, 2). These principally include privation (3), environmental pollutants (4), natural disasters such as earthquakes (5) and momentous man-made events. All of these tend to reduce M/F, with a reduction in male births. Man-made events that reduce M/F include contracting economies (6), hotly contested parliamentary elections (7), short wars (8) and terrorist assaults (9).

The 1992 Los Angeles riots (also known as the Rodney King riots) constituted a short period of extreme civil unrest in the city of Los Angeles in April 1992. They were precipitated following the acquittal of white police officers who had been videotaped brutally attacking Rodney King, a defenceless African-American man, after a high-speed pursuit. Video footage clearly showed King being beaten by police officers while lying on the ground (10, 11).

This became a *cause célèbre*, a focus for intense media attention and a rallying point for activists. Riots, lootings, arsons, murder and general civil disturbance commenced in south central Los Angeles on 29 April 1992 and spread into the surrounding areas for six days following the verdict’s announcement. The disorders only ceased after army intervention and a dusk to dawn curfew (10, 11).

It has been shown that M/F dips four months after weighty acts of violence (9, 12). This study was carried out in order to ascertain whether M/F dipped in the nine months following the riots.

**METHODS**

Monthly male and female live births for California were obtained from the website of the Centers for Disease Control and Prevention (CDC) for the state of California for 1992 and for January 1993, thereby encompassing the nine-month period following the riots. There was a clear dip in M/F in August, three months after the riots and, hence, comparisons were made between August and the preceding and following months. Excel was used for data entry, overall analysis and charting. The quadratic equations of Fleiss were used for exact calculation of 95% confidence intervals for ratios (13). Chi tests and chi tests for trends for annual male and female births were used throughout using the Bio-Med-Stat Excel add-in for contingency tables (14). A *p*-value ≤ 0.05 was taken to represent a statistically significant result.

**RESULTS**

This study analysed 649 073 live births from January 1992 to January 1993. These comprised 332 646 male and 316 427 female births (M/F 0.5137; 95% CI 0.5113, 0.5125). The ratio of male to total live births was lowest in August (0.5085; 95% CI 0.5042-0.5129).

The Figure depicts M/F for the three periods under study. Significance testing is shown in Table 1. The ratio of male to total live births in August 1992 was significantly lower than for the period after (September 1992–January 1993; *p* = 0.044). The ratio of male to total live births was also lower in August 1992 than in January–July 1992, but this difference was not statistically significant.

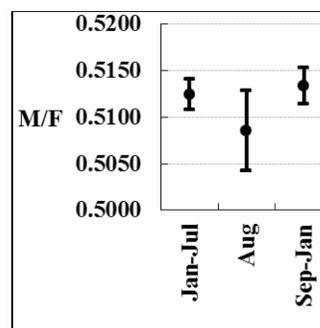


Figure: The monthly ratio of male to total live births (M/F) for California for 1992.

Table: Significance testing for M/F for August 1992 versus the months before and after

	Jan-Jul	Aug	Sep-Jan
<b>M</b>	178949	26268	127429
<b>F</b>	170266	25386	120775
<b>Total</b>	349215	51654	248204
<b>UCI</b>	0.5141	0.5129	0.5154
<b>M/F</b>	0.5124	0.5085	0.5134
<b>LCI</b>	0.5108	0.5042	0.5114
	<b>Jan-Jul vs Aug</b>		<b>Aug vs Sep-Jan</b>
<b>Chi</b>	2.7		4.1
<b>p</b>	0.098		0.044

M/F: ratio of male to total live births; UCI: upper confidence limit; LCI: lower confidence level

**DISCUSSION**

The ratio of male to total live births has been shown to drop after violent events that stress populations. This was shown in New York after the September 11, 2001 attacks (9). The at-

tack also affected non-threatened populations, with a dip in M/F in California (12). Furthermore, this particular event was shown to have affected the entire country, with a transient lowering of M/F due to an excess of male fetal losses (15).

The Los Angeles riots were the gravest episodes of civil unrest witnessed in the United States of America with the worst death tolls in over a century. The riots officially ended on 4 May 1992, after just six days. Estimates of property damage exceeded one billion dollars, along with 53 deaths and over 2000 people injured. Rioters included not only Blacks but also Hispanics and even Caucasians (16).

It is interesting that M/F dips can be shown to have occurred even on microdata at this scale, studying births solely from the state of California. The reason why M/F for the period before August was not significantly higher may be a type 2 error due to the relatively small sample size.

Stress has been shown to reduce M/F. This complies with the Trivers-Willard hypothesis which proposes that in polygynous species (such as humans), natural selection favours parents who are able to influence offspring M/F depending on conditions experienced during pregnancy. This is because, in summary, it is advantageous for mothers in good condition to produce a son since males are not constrained in number of children they can sire, unlike a daughter who is limited by a gestational and nursing period. On the other hand, a mother in poor condition would be better off producing a daughter who is naturally more robust than an equivalent male and likelier to survive to be born, survive childhood and reproduce. Conversely, a mother in poor condition may not successfully carry a son to term, and if so, would be likelier to produce a frail son who might not survive to adult life. Should he survive, he would not be able to successfully compete with more robust males for breeding privileges (17).

The mechanism whereby M/F falls after exposure to stress may be that of gender-biased conception favouring females (1, 2) and/or an excess of male fetal loss during gestation (15). In the former, M/F would fall after approximately nine months and in the latter, post-conceptual events would reduce M/F a few months (and not nine months) later. The observed M/F dip occurred three to four months after the riots, favouring the latter mechanism.

Fetal loss after stressful events has been quantified in a dose-dependent fashion. For example, after Hurricane Katrina, it was shown that fetal losses were dose-related to property damage, such that for every 1% increase in the destruction of housing stock, there was a 1.7% increase in fetal losses (18). Large-scale natural or man-made catastrophic events are uncommon. Furthermore, fetal loss is a relatively obscure population health marker. These factors predictably relegate M/F studies to a low priority among the multitude of other public health concerns. The numerical reality, however, is that such events cause appreciable losses that approach infant mortality rates. For example, after the September 11 events, the in-

creased fetal death rate associated with this event after 20 weeks of gestation (6.2/1000 live births and fetal deaths) was calculated as not far short of the infant mortality rate [6.9/1000 live births] (15).

It has been proposed that M/F may serve as a sentinel health indicator such that a falling ratio might indicate the presence of pollutants or other environmental toxins (19). This ratio may be equally invaluable in assessing impacts of stressful events on entire populations.

To the author's knowledge, this is the first time violent events at state level have been shown to have potentially influenced M/F.

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