



Introduction

The male to female ratio at birth



Keywords:

Sex Ratio

Infant

Newborn

Birth Rate/*trends

1. Introduction

The human sex ratio (males:females) varies depending on when it is measured. The primary sex ratio is that present at fertilisation. The secondary sex ratio is that recorded at birth. The tertiary sex ratio is that of the sexually mature members of any particular population and the quaternary ratio is that of the surviving populace at post-reproductive age. This introduction and the subsequent papers in this collection will deal with the secondary sex ratio (M/F).

The study of M/F has a chequered history. Charles Darwin famously refused to entangle himself in the issue, stating “I now see that the whole problem is so intricate that it is safer to leave its solution for the future” [1]. Since then, research and hypotheses as to what might influence M/F has multiplied and indeed, as far back as 1908, Gini noted that “even before the 19th century, Dreilincourt had already listed 262 ‘unfounded’ hypotheses on the nature and cause of sex, [...]”. Since then, the number of hypotheses has more than doubled [...] and this number continues to grow day by day” [2].

To some individuals, the study of M/F remains as an esoteric subject, constituting a “rather technical, if not abstruse investigation better left to demographers” [3]. However, M/F continues to attract scientific attention simply because it is such an easy outcome to measure [4].

Thus, with this inevitable plethora of datasets, “it is hardly surprising that striking findings emerge”. And “when they do, imaginative researchers have no trouble constructing plausible biological mechanisms” [4]. However, certain findings and patterns are repeatable, such that “among this welter of evidence, it is possible to pin down a few facts” [5].

2. This collection

In humans, male live births almost invariably slightly exceed female live births, and a veritable plethora of factors have been implicated as influencing M/F. William H. James will explore general aspects of such influences, as well as the prevailing theories as to the mechanisms that influence M/F [6].

Shige Song will review the effects of stress and privation [7] while Victor Grech, in two related papers, will investigate the influence of terrorism on the ratio. The first paper will demonstrate, through novel analyses that terrorist acts tend to reduce M/F sharply and transiently [8]. The second paper will show that the assassination of President

John Kennedy in November 1963 and the September 11, 2001 attacks on the United States had different racial effects on M/F [9].

Hagen Scherb will review the effects of radiation on M/F and will illustrate the unique nature of this toxin which tends to increase M/F [10]. Masukume’s paper will highlight yet another aspect of M/F, which is that M/F may be influenced by relatively mundane incidents, such as sporting events [11].

Temporal and regional trends are also considered. Vlad Melnikov provides a synopsis of seasonal M/F variations [12], while Dario Pavić reviews secular trends and latitude differences [13]. In a related paper, Johan Fellman focuses on such trends in Nordic countries [14].

However, all of the above are overshadowed by femicide, the selective destruction of female fetuses in societies (primarily Asian) which prize males more than females, a topic that will also be reviewed by Grech [15]. Finally, Grech will also review evidence of the global effects of genocide and stress on a United Nations dataset [16].

The study of M/F has been compared to “following Ariadne’s thread to a series of clues that bind the calculation of the proportion of boys and girls at birth” [17]. However, we must be cognizant of the fact that M/F is “particularly vulnerable both to false positive reports and fanciful interpretation” [4].

The authors thus sincerely hope that this collection of papers will not only broadly review the subject of M/F but will also shed some additional light on this fascinating subject.

Conflict of interest

The author declare no conflict of interest.

References

- [1] Darwin C. *The Descent of Man, and Selection in Relation to Sex*. Revised and Augmented 2nd ed. London: John Murray; 1874 252–6[1874].
- [2] Gini C. *Il sesso dal punto di vista statistico. Le leggi della produzione dei sessi*. Milano: Biblioteca Sandron di Scienze e Lettere; 1908.
- [3] Attané I, Guilmo C. Watering the neighbour’s garden: The growing demographic female deficit in Asia. Paris: Committee for International Cooperation in National Research in Demography; 2007.
- [4] Bonde JP, Wilcox A. Ratio of boys to girls at birth. *BMJ* 2007;334:486–7.
- [5] James WH. The human sex ratio. Part 1: A review of the literature. *Hum Biol* 1987; 59:721–52.
- [6] James WH. Proximate Causes of the Variation of the Human Sex Ratio at Birth. *Early Hum Dev* 2015;91:795–9 [in this issue].
- [7] Song S. Identifying the causal effect of maternal malnutrition and stress on sex ratio at birth in humans. *Early Hum Dev* [this issue].
- [8] Grech V. Terrorist attacks and the male to female ratio at birth: The Troubles in Northern Ireland, the Rodney King riots and the Breivik and Sandy Hook shootings. *Early Hum Dev* 2015;91:837–40 [in this issue].
- [9] Ethnic differences in birth gender ratio responses in the United States after the September 11 Attacks and the President Kennedy assassination. *Early Hum Dev* 2015;91:829–36 [this issue].
- [10] Scherb H, Voigt K, Kusmierz R. Ionizing radiation and the human male to female ratio at birth. *Early Hum Dev* 2015;91:841–50 [in this issue].

- [11] Masukume G, Grech V. The sex ratio at birth in South Africa after the 2010 FIFA World Cup in South Africa. *Early Hum Dev* 2015;91:807–9 [in this issue].
- [12] Melnikov V. xx. *Early Hum Dev* [this issue].
- [13] Pavić D. xx. *Early Hum Dev* [this issue].
- [14] Fellman J. Temporal and regional trends in the secondary sex ratio: the Nordic experience. *Early Hum Dev* 2015;91:801–6 [in this issue].
- [15] Grech V. Gendercide and femineglect. *Early Hum Dev* 2015;91:851–4 [in this issue].
- [16] Grech V. Evidence of economic deprivation and female foeticide in a United Nations global births by gender dataset. *Early Hum Dev* 2015;91:801–6 [in this issue].
- [17] Brian E, Jaisson M. The descent of human sex ratio at birth: A dialogue between mathematics, biology and sociology. New York: Springer; 2007.

Victor Grech

Academic Department of Paediatrics, Mater Dei Hospital, Malta

E-mail address: victor.e.grech@gov.mt