The Male: Female Ratio at Birth is Depressed by Maltese Parliamentary Elections and Increased by Other Non-electoral Events

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Original Research Article

ABSTRACT

Aim: The male to female ratio at birth declines with stress. In Malta, parliamentary elections are highly divisive and stressful. This paper looked at the association of M/F with parliamentary elections and other important political events in Malta.
Methodology: A retrospective analysis of monthly male and female births was carried out. These were obtained from official Malta Government publications back to 1966. Index months were months in which parliamentary elections were held. Eleven elections were included which comprised all those wherein elections were essentially contested by two parties between 1966-2013. The monthly sums for live births for each gender were summated for the months prior and following each election and for four other political but non-electoral events. Analysis was carried out with chi tests and chi tests for trend.

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Results: This study analysed a total of 168795 live births. For the period 1966-2013, mean M/F was 0.5176 (95% CI 0.5156-0.5196). For elections, a peak in M/F was found at month -7, followed by a decline down to the election month, and this decline was statistically significant (p=0.005). The ensuing return to the baseline over the next few months did not reach statistical significance. The converse was noted in non-electoral events, with an increasing trend in M/F from month -10 to month -1 (p=0.003). This was followed by a significant decline from month-1 to month +4 (p=0.002).

Conclusions: In Malta, since the early 1970s, the country has developed one of the purest two-party systems in existence, a structure that has produced intense political polarization of most of the Maltese society. It possible that stress leading up to elections suffices to depress M/F in Malta. The converse occurred in relation to non-electoral events. To the author's knowledge, this is the first reported instance wherein local elections and other political events influence M/F.

1. INTRODUCTION

The male to female ratio at birth for live births is defined (albeit technically incorrectly) as male births divided by total births, and is conventionally referred to as M/F. This ratio is expected to approximate 0.515, with a 3% excess of males [1].

M/F has been shown to be influenced by a plethora of factors [1-3]. In brief, stressors (such as unemployment and workplace factors) and toxins tend to reduce the ratio since under such circumstances, pregnant women tend to spontaneously abort, losing male pregnancies at a greater rate than female pregnancies [1,2]. This is in accordance with the Trivers–Willard hypothesis (1973) which proposes that female mammals have evolved the ability to influence M/F so as to favour the propagation of their genes under conditions of stress [4].

It has also been shown that M/F may be influenced by a variety of maternal hormonal influences, such as (among others) excess cortisol secretion [5].

Politics has rarely been shown to influence M/F. It has been demonstrated that legislation enacted by the United States in order to facilitate migration from Communist Cuba to the United States was temporally associated with a fall in M/F in the same or the following years, resulting in three significant dips in this ratio over the period 1960-96 [6]. Moreover, the effect not only of conflict but also the ratification of agreements between warring countries has also been shown to potentially have influenced M/F [7].

Malta is a small island in the centre of the Mediterranean with a total population of just under half a million, a developed country with low infant mortality and long life expectancy. Infectious diseases are progressively on the decline and the few disadvantaged groups comprise the chronically unemployed, single mothers and migrants/asylum seekers from North Africa [8].

Independence was gained in 1964 and parliamentary elections are held approximately every 5 years. Elections are hotly contested and highly divisive and stressful, with voter turnout approaching 100%. Since 1966, the political situation has firmed into a two party system, Labour and Nationalist (Conservative), with overall relatively small but absolute majorities deciding election results [8].

Politics has been mooted as the principal cause of division within Maltese society, [8] and elections further expose political divisions and disagreements that might normally be concealed or ignored. This may potentially stress the population, theoretically impacting on M/F. This ecological study was carried out in order to ascertain whether M/F was in any way influenced by upcoming parliamentary elections or following elections. This was deemed possible since stress is known to reduce M/F and political events in Malta are known to cause stress. Other significant political events for Malta were also separately analysed.

2. METHODS

2.1 Data

This study was carried out in Malta over the period April to June 2014. Monthly male and female births were obtained electronically from official Malta Government publications back to 1966 by the author [9,10]. Data for the last two years was obtained directly from the Maltese Department of Health Information and Research in an Excel program spreadsheet.

Index months were months in which parliamentary elections were held. Eleven elections were included which comprised all those wherein elections were essentially contested by two parties between 1966-2013 (Table 1). For each pre- or post-election month, live births were summated for all elections periods, ranging from month -13 to month +13 after the election.

Table 1. Maltese parliamentary elections and other significant maltese political events included in this study

Parliamentary elections		
March	1966	
June	1971	
Sept.	1976	
Dec.	1981	
May	1987	
Feb.	1992	
Oct.	1996	
Sept.	1998	
April	2003	
March	2008	
March	2013	
Other political events		
Dec.	1964	Declaration of independence
Dec.	1974	Declaration of the Maltese Republic
April	1979	English military base decamped
May	2004	European Union accession

Four other important political events were identified (Table 1) and were analysed together but separately from Parliamentary elections. Births studied ranged from month -13 to month +13 after the event, and data was summated as above. For all of these events, no other unusual inter current factors (such as extraordinary natural events) were present.

2.2 Analysis

Microsoft's spreadsheet program (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 [11]. Chi tests (for 2x2 tables) and chi tests for trend (for 2xn tables) were used for trend testing of male and female births [12,13]. These tests were performed using the Bio-Med-Stat Excel add-in for contingency tables.(14). An Excel add-in is designed to complement the basic functionality offered by Excel in the Windows environment. These software packages add optional commands and features to Excel as soon as Excel loads.

A p value≤0.05 was taken to represent a statistically significant result.

The null hypothesis was that parliamentary elections and other important local political events in Malta did not influence M/F.

3. RESULTS

For the period 1966-2013, mean M/F was 0.5176 (95% CI 0.5156-0.5196). Mean M/F for inter election years (1969, 1974, 1979, 1984, 1990, 1994, 1997, 2001, 2006, 2011) was 0.5210 (95% CI 0.5166-0.5255, 25560 males and 23497 females).

3.1 Elections

There were 121010 live births (62783 males and 58227 females) related to election years. Mean M/F was 0.5188 ranging from month -13 to month +13 before and after election months (95% CI 0.5160-0.5216).

A decline in M/F was present from seven months prior (month -7) to the election month, and this decline was statistically significant (chi^2 for linear trend=7.8, p=0.005, Fig. 1). The ensuing return to the baseline over the next 9 months (to month +9) did not reach statistical significance (chi^2 for linear trend=1.2, p=0.3). When extended to month +13, this still failed to reach statistical significance (chi^2 for linear trend=1.1, p=0.3).

M/F rose significantly at month -7 when compared with the summated data for the five months before this month (months -12 to -8; chi^2=7.8, p=0.005) and the five months after (months -6 to -2; chi^2=6.7, p=0.010).

3.2 Non-election Events

There were 47785 live births (24794 males and 22991 females) related to the other events listed in Table 1. Mean M/F was 0.5189 ranging from month -13 to month +13 before and after the event (95% CI 0.5144-0.5234).

An overall increasing trend in M/F was present from month -10 to month -1 (Fig. 2 - chi^2 for trend=8.6, p=0.003). This was followed by a significant decline from month -1 to month +4 (chi^2 for trend=9.2, p=0.002).
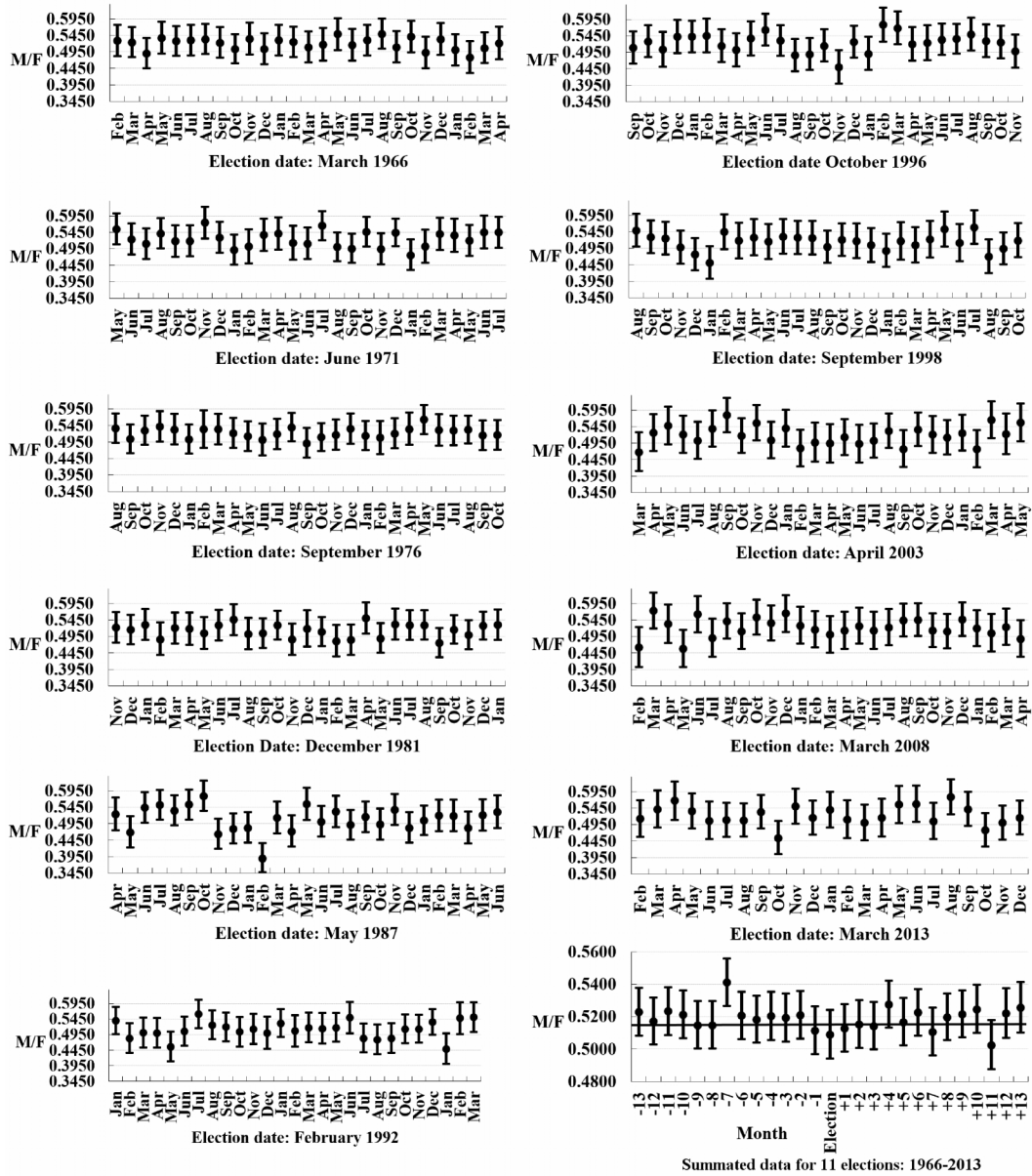
Fig. 1. Male:female ratio of live births and 95% confidence intervals for the 13 months leading up to Parliamentary elections and for the subsequent 13 months
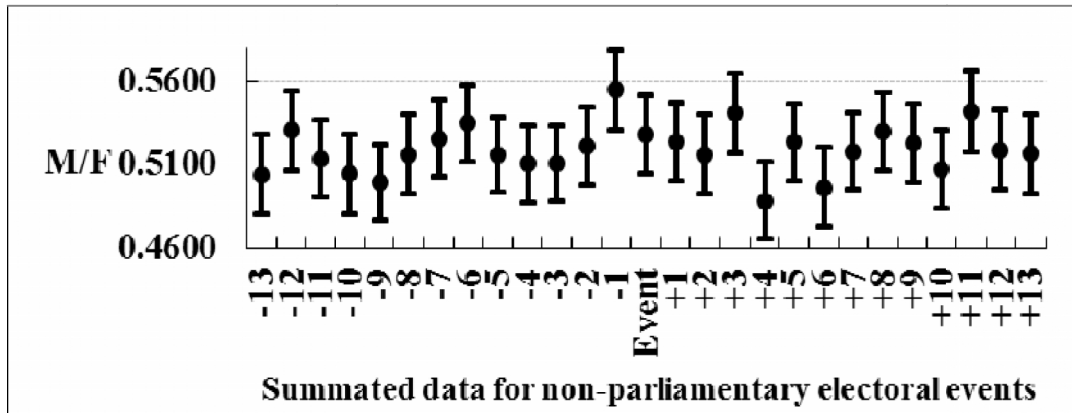*Horizontal line in last graph represents 0.518, the mean M/F for this dataset*

Fig. 2. Male:female ratio of live births and 95% confidence intervals for the 13 months leading up to political events and for the subsequent 13 months

4. DISCUSSION

This study shows that parliamentary elections in Malta do influence M/F in the direction anticipated by the M/F-stress lowering hypothesis, and the null hypothesis is therefore rejected.

Since the early 1970s, the country has developed one of the most unalloyed two-party systems in existence, a structure that has produced intense political polarization of most of the Maltese society [15].

Stress is a known factor that reduces M/F. It would appear that in Malta, the stress leading up to the election suffices to depress M/F. The effect appears to peak well before the actual election, tailing off rapidly afterwards. The relatively low M/F well prior to the elections, with a significant peak at month -7 leading up to the election is unexplained, as is the peak itself. The relatively slow recovery of M/F after elections may be due to the possibility that it may take longer for M/F to recover from stress than to be influenced by stress. While there were no other large scale inter current factors that may have influenced M/F, data that might have allowed further analysis with regard to individual pregnancy and other risk factors that may have influenced M/F, was unavailable.

The obverse was noted in non-parliamentary electoral events. Rises of this nature have been associated with long duration warfare [16] and this has been attributed to increased copulation rates [17]. It is impossible to ascertain whether such a factor may have contributed to the rise in M/F.

It must be noted that this study bears certain limitations. Certain non significant findings may be due to the relatively low number of births involved, potentially leading to a type 2 statistical error.

Warfare is an extreme political event that has been shown to increase M/F if of long duration, and to decrease M/F if of short duration [18]. However, no extreme violence occurred in Malta in relation to any of the events studied in this paper.

The stress-M/F lowering hypothesis is supported by studies that followed up the effects of stressful events on populations. For example, M/F fell in New York City three months after the terrorist attacks of September 11, rather than seven or more months later as would be the case were male conceptions to have been reduced by this event [19]. These findings are further supported by a simultaneous increase in premature births which also rapidly recovered [20].

Similar findings were noted for the same time period, following the above mentioned terrorist attack, in California [21] suggesting that witnessing harm befalling on others induces biological responses that resemble those in the persons harmed [22]. This was confirmed in a study that investigated all fetal deaths at or greater than 20 weeks of gestation in this country from 1996 to 2002 [23].

Thus, male mortality is higher than female mortality during gestation. Improved socioeconomic conditions and medical care have been shown to be associated with a lowering of prenatal mortality rates. The amelioration of gestational conditions and a reduction in factors that predispose to spontaneous abortion will therefore spare more male than female births, increasing M/F.

This is evidenced in developed countries where the decline in stillbirth rates has been drastic, with, for example, the ratio of stillbirths to live births dropping from 30-40/1000 in the late 1800s in Sweden and Belgium to 10/1000 in the 1970s. This was paralleled by a decline in M/F of stillbirths [24].

This finding is attributed to stress in early pregnancy increasing spontaneous abortion rates, with male pregnancies being affected more than female pregnancies [25]. It was shown, for example, that malformed and otherwise abnormal embryos and fetuses of both genders are spontaneously equally aborted, whereas normally formed embryos and fetuses favour male loss in excess of female loss [26].

5. CONCLUSION

Stress reduces M/F in accordance with the Trivers-Willard hypothesis [4]. To the author's knowledge, this is the first reported instance wherein parliamentary elections and other important local (non-violent) political events influence M/F.

CONSENT

Not applicable.

ETHICAL APPROVAL

Not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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