

The male:female ratio at birth is depressed by Maltese parliamentary elections and increased by other non-electoral events.

Abstract

Aims

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.

Methods

Monthly male and female births 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.

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 ($p = 0.002$).

26 **Discussion**

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

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36 **Introduction**

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

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

48

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

51

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

59

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

65

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

71

72 Politics has been mooted as the principal cause of division within Maltese society,(8)
73 and elections further expose political divisions and disagreements that might normally
74 be concealed or ignored. This may potentially stress the population, theoretically
75 impacting on M/F. This ecological study was carried out in order to ascertain whether

76 M/F was in any way influenced by upcoming parliamentary elections or following
77 elections. Other significant political events for Malta were also separately analysed.

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79

80 **Methods**

81 This study was carried out in Malta over the period April to June 2014. Monthly male
82 and female births were obtained from official Malta Government publications back to
83 1966.(9,10) Data for the last two years was obtained directly from the Maltese
84 Department of Health Information and Research in an Excel program spreadsheet.

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

91

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

97

98 Microsoft's spreadsheet program - Excel - was used for data entry, overall analysis
99 and charting. The quadratic equations of Fleiss were used for exact calculation of 95%
100 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.

Results

For the period 1966-2013, mean M/F was 0.5176 (95% CI 0.5156-0.5196).

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 (χ^2 for linear trend = 7.8, $p = 0.005$ – figure 1). The ensuing return to the baseline over the next 9 months (to month +9) did not reach statistical significance (χ^2 for linear trend = 1.2, $p = 0.3$). When extended to month +13, this still failed to reach statistical significance (χ^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; $\chi^2=6.7$, $p=0.010$).

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 (figure 2 - χ^2 for trend=8.6, $p = 0.003$). This was followed by a significant decline from month -1 to month +4 (χ^2 for trend=9.2, $p = 0.002$).

Conclusion

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

151 unexplained, as is the peak itself. The relatively slow recovery of M/F after elections
152 may be due to the fact that it takes longer for M/F to recover from stress than to be
153 influenced by stress. While there were no other large scale intercurrent factors that
154 may have influenced M/F, data that might have allowed further analysis with regard
155 to individual pregnancy and other risk factors that may have influenced M/F, was
156 unavailable.

157

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

162

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

166

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

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171 To the author's knowledge, this is the first reported instance wherein parliamentary
172 elections and other important local (non-violent) political events influence M/F.

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212 **Table 1: Maltese parliamentary elections and other significant Maltese political**
213 **events included in this study**

214

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

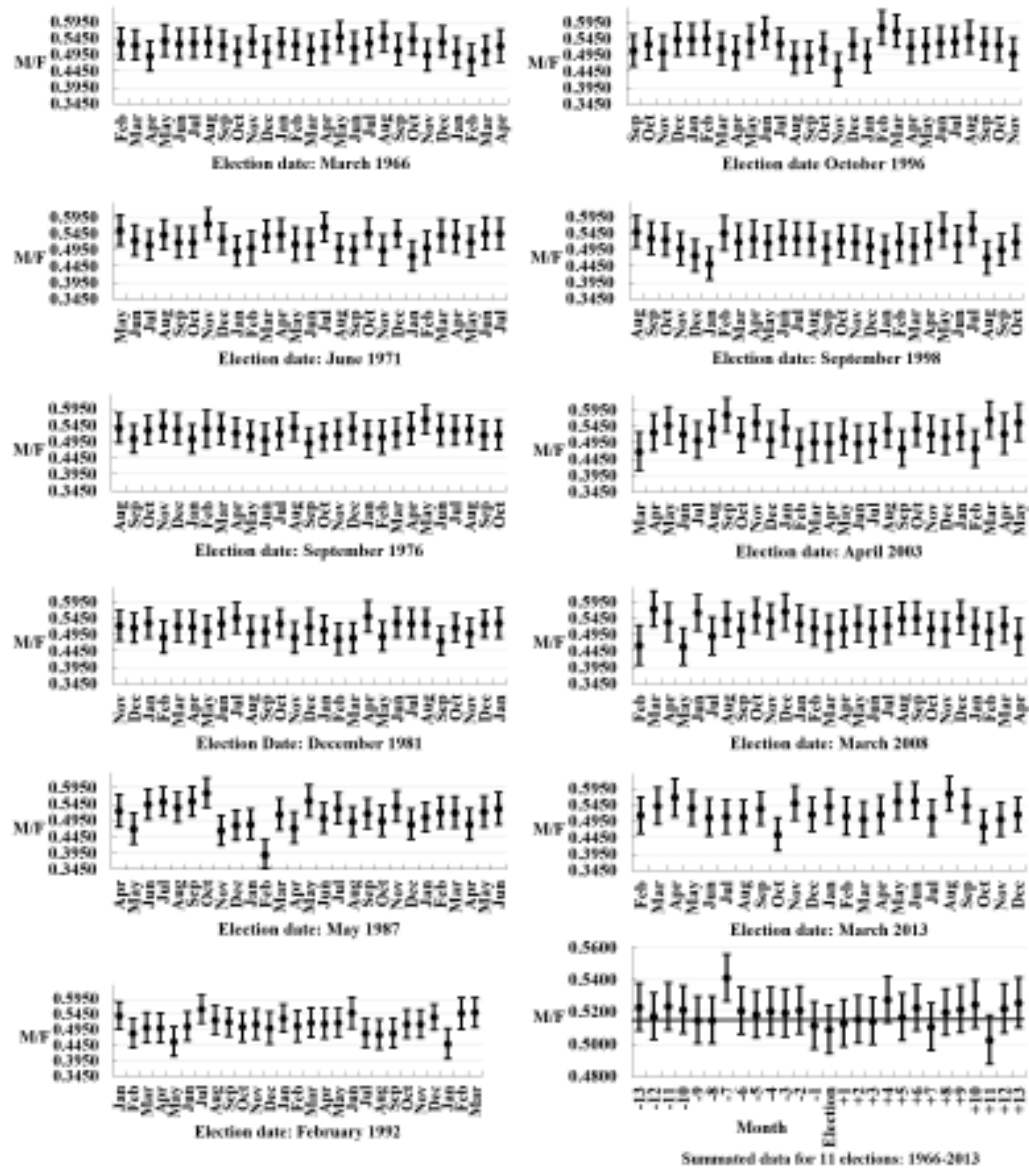
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218 **Figure 1: Male:female ratio of live births and 95% confidence intervals for the**
 219 **13 months leading up to Parliamentary elections and for the subsequent 13**
 220 **months.**



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 222 Horizontal line in last graph represents 0.518, the mean M/F for this dataset.
 223

224 **Figure 2: Male:female ratio of live births and 95% confidence intervals for the**
225 **13 months leading up to political events and for the subsequent 13 months.**

