



Historic Royal events and the male to female ratio at birth in the United Kingdom



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ABSTRACT

Introduction: The male to female ratio of live births is expressed as the ratio of male live births divided by total live births (M/T). Factors which reduce M/T include toxins, stress and privation. Britain remains enamoured of the Monarchy. This study was carried out in order to ascertain whether Royal events influenced M/T in the UK.

Materials and methods: Live births were analysed in relation to the birth of Prince Charles (1948), the Coronation of Queen Elizabeth II (1952), the Silver Jubilee (1977), the wedding of Diana Spencer to Charles, Prince of Wales (July 1981), the birth of Prince William (1982), the death of Lady Diana (August 1997), the wedding of Kate Middleton to Prince William (2011) and the Golden Jubilee (2002).

Results: This study analysed 29,293,240 live births. There was a significant dip in M/T in the Coronation year ($p = 0.03$). M/T dipped significantly in relation to the Royal Wedding, commencing a year before ($p < 0.0001$). There were no significant M/T changes in relation to the Silver and Golden Jubilees. The birth of Prince William in 1982 resulted in a rise in M/T in the following year only ($p = 0.016$). Analysis by quarter in relation to Lady Diana's death showed a decline in M/T 4–5 months later in the first quarter of 1998 ($p = 0.046$).

Comments: The anticipation and stress leading to the Coronation and Royal Wedding may have depressed M/T. Increased coital rates associated with exuberance in relation to Prince William's birth may have raised M/T. Lady Diana's death was temporally associated with a decline in M/T. Royalty events may affect M/T ratios in Britain.

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Introduction

In mammals, gender is determined at conception and in humans, male live births occur slightly in excess. The male to female ratio of live births is expressed as the ratio of male live births divided by total live births and may be expressed as M/T [1].

Stress and M/T

Many factors have been shown to influence M/T [1,2]. These include exposure to toxins (both occupational and population exposures) [2], natural calamities such as earthquakes [3] and floods [4], stress [5], and privation [6]. All of these factors tend to reduce M/T.

Stress has been shown to be a particularly strong influence. For example, after the September 11 terrorist attacks on New York,

M/T fell sharply just three to four months later and recovered equally quickly [5]. Similarly, the 10-day war in Slovenia transiently but significantly depressed M/T [7]. However, conflicting results regarding the effects of stress have also been shown using similar datasets. For example, an analysis of the births in the Danish National Registers for 1980–1992 showed that exposure to severe life events tended to lower M/T [8]. In contrast, a study on the same but extended dataset (by one decade from 1993 to 2002) failed to replicate these findings [9].

Royalty and the public

Despite British cynicism towards traditional institutions such as Parliament, the City, the press and the police, the populace remains wedded to the notion of a Monarchy. Indeed, surveys consistently show that less than a fifth of British subjects wish to abolish the Royal institution [10]. For these reasons, the actions of Royalty are avidly watched and for many, have a significant impact on everyday life, an interest that is further fuelled by the increasingly ubiquitous media [11].

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The British Isles have already been studied with regard to broad secular trends in M/T. There was an overall rise in M/T from the 1950s up to the late 1970s, followed by a decline thereafter. The step-down for the periods of 1975–1979 to 1980–1984 was highly significant ($p = 0.001$). An overall decreasing trend in M/T was noted ($p = 0.04$) [12]. It has also been shown that warfare did not significantly affect M/T, as, for example, in relation to the Falklands War [13].

This study was carried out in order to ascertain whether historic Royal occasions influenced M/T in the UK.

Materials and methods

Important dates related to the Monarchy for which M/T data was available included the birth of Prince Charles in 1948, Coronation of Queen Elizabeth II in 1952, the Silver Jubilee in 1977, the wedding of Diana Spencer to Charles, Prince of Wales in July 1981, the birth of Prince William in 1982, the death of Lady Diana in August 1997, the wedding of Kate Middleton to Prince William in 2011 and the Golden Jubilee in 2002.

Annual male and female live births were obtained directly from a World Health Organisation Database (HFA (Health for All) Database) for all of the UK. Data was available for the period 1950–2012. For the periods 1946–1950 and 2009–2013, data was available for England and Wales only from the Office for National Statistics, and this was used for the analysis pertaining to the birth

of Prince Charles and the wedding of Prince William and Kate Middleton.

Comparisons of M/T for these five index years were made with the two preceding and following years. This was to minimise the influence of natural secular variation in M/T [14].

Monthly data (male and female live births) for England and Wales only was also available from 1997 to 2008 from the Life Events & Population Sources, Office for National Statistics, Hants, UK. This data was used to identify any potential fluctuations in M/T related to the death of Lady Diana in 31 August 1997 and the Golden Jubilee in 2002.

Excel was used for data entry, overall analysis and charting. Sex odds were also calculated and tabulated (male divided by female births). The quadratic equations of Fleiss were used for exact calculation of 95% confidence intervals for ratios [15]. 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 [16]. A p -value ≤ 0.05 was taken to represent a statistically significant result.

Results

This study analysed a total of 29,293,240 live births. Annual M/T for the index years and for the previous and following two years are shown in Table 1.

Table 1
M/T (and 95% confidence intervals) for the eight index years and two years prior and following each year.

Birth of Prince Charles ^a						Wedding of Prince Charles to Diana Spencer					
	1946	1947	1948	1949	1950		1979	1980	1981	1982	1983
M	422,299	453,590	399,112	376,064	358,715	M	378,836	385,792	374,830	368,995	370,820
F	398,420	427,436	376,194	354,454	338,382	F	355,708	367,475	355,890	350,004	350,418
T	820,719	881,026	775,306	730,518	697,097	T	734,544	753,267	730,720	718,999	721,238
UCI	0.5156	0.5159	0.5159	0.5159	0.5158	UCI	0.5169	0.5133	0.5141	0.5144	0.5153
M/T	0.5145	0.5148	0.5148	0.5148	0.5146	M/T	0.5157	0.5122	0.5130	0.5132	0.5141
LCI	0.5135	0.5138	0.5137	0.5136	0.5134	LCI	0.5146	0.5110	0.5118	0.5121	0.5130
RR	1.0599	1.0612	1.0609	1.0610	1.0601	RR	1.0650	1.0498	1.0532	1.0543	1.0582
Coronation						Death of Lady Diana					
	1950	1951	1952	1953	1954		1995	1996	1997	1998	1999
M	421,440	409,942	406,992	413,929	408,686	M	375,133	376,395	371,913	367,457	359,444
F	396,981	386,703	385,925	390,340	386,083	F	356,749	356,768	353,707	349,431	340,532
T	818,421	796,645	792,917	804,269	794,769	T	731,882	733,163	725,620	716,888	699,976
UCI	0.5160	0.5157	0.5144	0.5158	0.5153	UCI	0.5137	0.5145	0.5137	0.5137	0.5147
M/T	0.5149	0.5146	0.5133	0.5147	0.5142	M/T	0.5126	0.5134	0.5125	0.5126	0.5135
LCI	0.5139	0.5135	0.5122	0.5136	0.5131	LCI	0.5114	0.5122	0.5114	0.5114	0.5123
RR	1.0616	1.0601	1.0546	1.0604	1.0585	RR	1.0515	1.0550	1.0515	1.0516	1.0555
Silver Jubilee						Golden Jubilee					
	1975	1976	1977	1978	1979		2000	2001	2002	2003	2004
M	359,243	347,356	337,559	354,688	378,836	M	347,941	342,709	343,155	356,578	367,586
F	338,275	328,170	317,880	333,930	355,708	F	331,088	326,414	325,622	338,971	348,410
T	697,518	675,526	655,439	688,618	734,544	T	679,029	669,123	668,777	695,549	715,996
UCI	0.5162	0.5154	0.5162	0.5163	0.5169	UCI	0.5136	0.5134	0.5143	0.5138	0.5145
M/T	0.5150	0.5142	0.5150	0.5151	0.5157	M/T	0.5124	0.5122	0.5131	0.5127	0.5134
LCI	0.5139	0.5130	0.5138	0.5139	0.5146	LCI	0.5112	0.5110	0.5119	0.5115	0.5122
RR	1.0620	1.0585	1.0619	1.0622	1.0650	RR	1.0509	1.0499	1.0538	1.0519	1.0550
Birth of Prince William						Wedding of Prince William and Kate Middleton ^a					
	1980	1981	1982	1983	1984		2009	2010	2011	2012	2013
M	385,792	374,830	368,995	370,820	373,379	M	362,135	370,966	370,974	374,346	358,383
F	367,475	355,890	350,004	350,418	356,022	F	344,113	352,199	352,939	355,328	340,129
T	753,267	730,720	718,999	721,238	729,401	T	706,248	723,165	723,913	729,674	698,512
UCI	0.5133	0.5141	0.5144	0.5153	0.5130	UCI	0.5139	0.5141	0.5136	0.5142	0.5142
M/T	0.5122	0.5130	0.5132	0.5141	0.5119	M/T	0.5128	0.5130	0.5125	0.5130	0.5131
LCI	0.5110	0.5118	0.5121	0.5130	0.5108	LCI	0.5116	0.5118	0.5113	0.5119	0.5119
RR	1.0498	1.0532	1.0543	1.0582	1.0488	RR	1.0524	1.0533	1.0511	1.0535	1.0537

UCI and LCI: upper and lower confidence intervals.

^a England and Wales only

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