

# Terrorist attacks and the male to female ratio at birth: The bombings of Madrid (3/2004) and London (7/2005)

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## Abstract

**Introduction:** Males are usually in excess of females at birth and the ratio is often expressed as M/F (male divided by total births). Several factors have been shown to be associated with changes in M/F, including major terrorist attacks. These are associated with a transient lowering of M/F for a one month period, three to five months after such events. This study was carried out in order to ascertain whether the Madrid March 2004 bombings and the London July 2005 bombings were similarly associated with changes in M/F in their respective populations.

**Methods:** Monthly live births by gender for Madrid and Spain for 2004 and for England and Wales for 2005 were obtained from the two countries' National Statistics Offices.

**Results:** There were no significant dips in M/F for any of the months following the March 2004 bombings in Madrid or in Spain. There were no significant dips in M/F for any of the months following the July 2005 London bombings.

**Discussion:** Research to date has shown M/F dips following catastrophic or tragic events, including major terrorist actions with extensive media coverage. Equivalent dips were not noted in this study for the terrorist acts in these instances. The reasons for this may be one or a combination of the following. The population size was not sufficiently large in order to detect an M/F dip. Alternatively, the events were not felt to be sufficiently momentous by the populace such that an M/F dip was not produced. Yet another possibility is that these particular populations are somehow hardier and more resistant to such influences. Not all terrorist events universally cause a significant reduction in M/F.

## Key Words

Sex Ratio, Infant, Newborn, Birth Rate/\*trends, Terrorism, Madrid, London

## Introduction

Males are born slightly in excess of females,<sup>1</sup> and the ratio of male-to-female live births is often (albeit technically incorrectly) expressed as M/F (male births divided by total births). Many factors have been shown to be linked to this ratio and this appears to be in accordance with the Trivers-Willard hypothesis which states that evolution should have favoured parents who can influence M/F according to conditions around conception and during pregnancy. This is because in polygynous species, a strong son who is conceived under favourable environmental conditions has greater reproductive opportunities than an equivalent daughter who is biologically constrained by pregnancy and lactation. Conversely, under unfavourable conditions, a male foetus (which is weaker than a female foetus) will be less likely to be carried to term and to survive to reproductive age. Furthermore, such surviving adult males would compete poorly with more robust males. However,

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a frail female is likelier to survive and reproduce. Hence, under unfavourable conditions, the parental passage of genes is favoured if less males are produced through the culling of weaker male.<sup>2</sup>

Many forms of population level stress have been shown to be linked to a reduction in M/F, including not only frank warfare,<sup>3</sup> but also civil unrest.<sup>4</sup> Terrorist attacks have also been shown to be linked to a sudden lowering of M/F. This was noted after the September 11 attacks, after which transiently less males were born not only in New York,<sup>5</sup> but in the entire United States.<sup>6</sup>

The mechanism for these M/F dips has been demonstrated to be that of excess of male foetal loss.<sup>5</sup> For example, after September 11, it was shown that an excess of male foetal losses were responsible, with a decline in male births three months after September 11, implying an effect on women who were already pregnant.<sup>6</sup> A similar result was also noted following the Los Angeles Rodney King riots (1994) and the Breivik (Norway, 2011) and Sandy Hook (Connecticut, 2012) shootings.<sup>7</sup> Furthermore, the same effect was noted after the assassination of President John Kennedy.<sup>8</sup>

The Madrid bombings (also known in Spain as 11-M) on 11 March 2004 occurred just three days before Spain's general elections and exactly 911 days after the 11 September 2001.<sup>9</sup> The bombings consisted of ten coordinated and almost simultaneous explosions on Madrid's Cercanías commuter train system on four trains during rush hour on a Monday morning between 07:37 and 07:40.<sup>9</sup> Deaths totalled 191 and there were an additional 1500 injured individuals. The official investigation concluded that the attacks were directed by an al-Qaeda-inspired terrorist cell.<sup>10</sup>

The 7 July 2005 London bombings (often referred to as 7/7) consisted of a series of coordinated terrorist suicide bomb attacks in central London.<sup>11</sup> These attacks targeted civilians using the public transport system during the morning rush hour and were conducted by four Islamist extremists.<sup>11</sup> They detonated three bombs in quick succession aboard the London Underground trains across the city and, later, a fourth on a double-decker bus in Tavistock Square.<sup>11</sup> This resulted in 52 deaths and over 700 injuries, constituting the United Kingdom's worst terrorist incident since the 1988 Lockerbie bombing. This was also the country's first ever Islamist suicide attack.<sup>11</sup>

This study was carried out in order to ascertain

whether the Madrid March 2004 bombings were linked to changes in M/F in Spain or in Madrid, and whether the London July 2005 bombings influenced M/F in England and Wales.

### Methods

An ecological study was conducted linking routinely available monthly birth data by gender with the timing of major terrorist events.

For Spain, monthly birth data by gender for 2004 for the entire country and for Madrid alone was available from the website of the The National Institute of Statistics (Instituto Nacional de Estadística: INE).

For England and Wales, monthly birth data by gender for 2005 was obtained from the English Office for National Statistics (Ms. Debbie Hague, Life Events & Population Sources – personal communication). No other related data at greater level of detail (e.g. for England or for London alone) was available.

Excel was used for data entry, overall analysis and charting. The quadratic equations of Fleiss were used for the calculation of 95% confidence intervals for ratios.<sup>12</sup> 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.<sup>13</sup> A p value  $\leq 0.05$  was taken to represent a statistically significant result.

### Results

There were no significant dips in M/F for any of the months following the March 2004 bombings in Madrid or in Spain. A small dip but nonsignificant M/F dip was present in August 2004 (five months after the event) for all of Spain and also for Madrid.

There were no significant dips in M/F for any of the months following the July 2005 London bombings (table 1, figure 1).

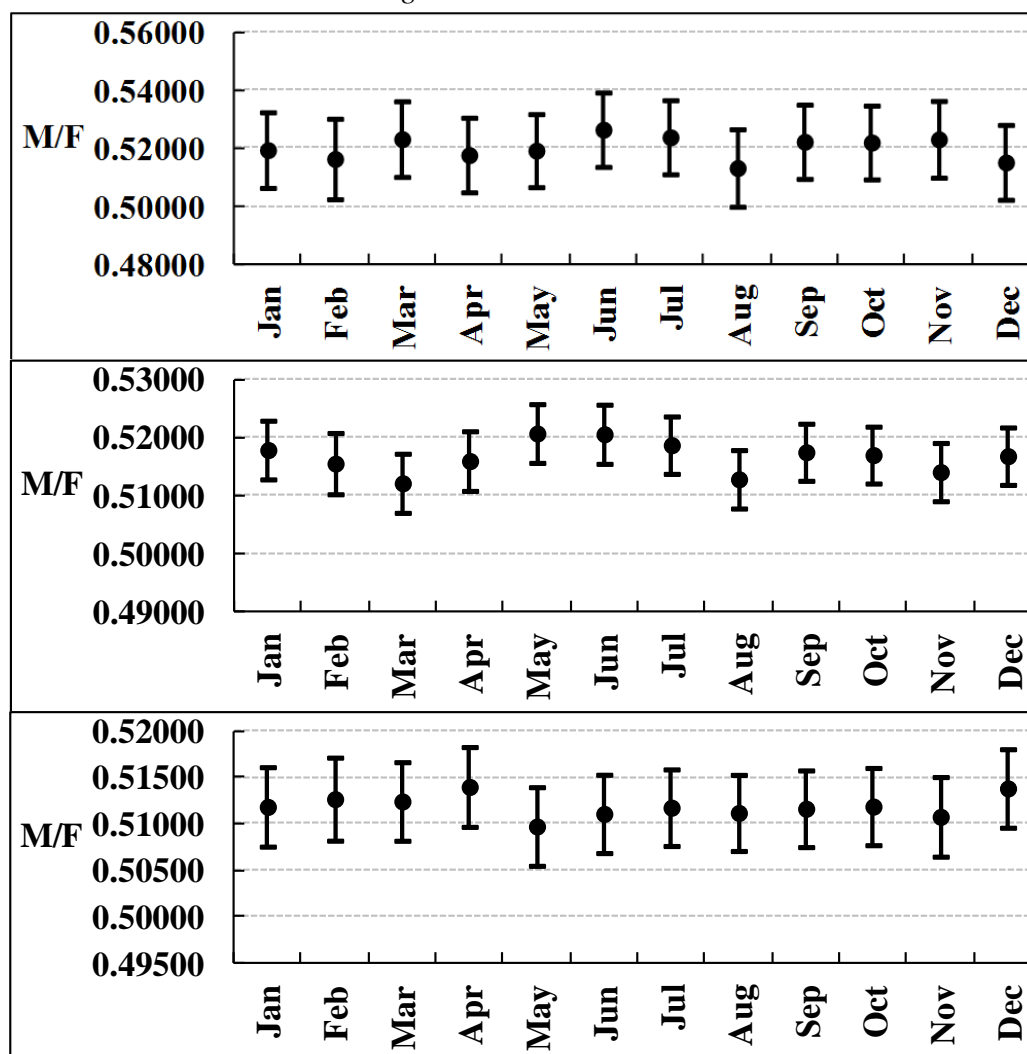
### Discussion

Extant research has documented M/F dips following catastrophic or tragic events if these were felt to be momentous enough or to cause sufficient population stress. For example, an M/F dip was noted in the United Kingdom after the accidental death of Lady Diana, Princess of Wales in 1997, a loved public figure.<sup>14</sup> A dip in M/F was also noted in Quebec a few months after a closely-run referendum proposing secession from Canada.<sup>15</sup>

**Table 1:** M/F ratios with 95% confidence intervals by month for: top, Madrid 2004; middle, Spain 2004; bottom, England and Wales 2005

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spain 2004	Male	19474	17794	18996	18776	19521	19263	20373	19475	20566	20707	19642	20288
	Female	18129	16721	18095	17613	17966	17738	18902	18500	19175	19344	18566	18967
	Total	37603	34515	37091	36389	37487	37001	39275	37975	39741	40051	38208	39255
	UCL	0.5229	0.5208	0.5172	0.5211	0.5258	0.5257	0.5237	0.5179	0.5224	0.5219	0.5191	0.5218
	M/F	0.5179	0.5155	0.5121	0.5160	0.5207	0.5206	0.5187	0.5128	0.5175	0.5170	0.5141	0.5168
	LCL	0.5128	0.5103	0.5070	0.5108	0.5157	0.5155	0.5138	0.5078	0.5126	0.5121	0.5091	0.5119
Madrid 2004	Male	2966	2616	2986	3039	3181	3092	3116	2787	3101	3134	2892	3003
	Female	2744	2450	2721	2831	2945	2781	2832	2643	2836	2869	2636	2826
	Total	5710	5066	5707	5870	6126	5873	5948	5430	5937	6003	5528	5829
	UCL	0.5325	0.5302	0.5362	0.5306	0.5318	0.5393	0.5366	0.5266	0.5351	0.5348	0.5364	0.5281
	M/F	0.5194	0.5164	0.5232	0.5177	0.5193	0.5265	0.5239	0.5133	0.5223	0.5221	0.5232	0.5152
	LCL	0.5064	0.5025	0.5102	0.5048	0.5067	0.5136	0.5111	0.4999	0.5095	0.5093	0.5099	0.5023
England and Wales 2005	Male	26886	24650	27503	26761	27327	27639	28928	29256	28855	28468	26703	27624
	Female	25641	23430	26168	25303	26283	26439	27598	27974	27541	27146	25576	26136
	Total	52527	48080	53671	52064	53610	54078	56526	57230	56396	55614	52279	53760
	UCL	0.5161	0.5172	0.5167	0.5183	0.5140	0.5153	0.5159	0.5153	0.5158	0.5160	0.5151	0.5181
	M/F	0.5119	0.5127	0.5124	0.5140	0.5097	0.5111	0.5118	0.5112	0.5116	0.5119	0.5108	0.5138
	LCL	0.5076	0.5082	0.5082	0.5097	0.5055	0.5069	0.5076	0.5071	0.5075	0.5077	0.5065	0.5096

**Figure 1:** M/F ratios with 95% confidence intervals by month for: top, Madrid 2004; middle Spain 2004; bottom, England and Wales 2005



It has been reported that the Madrid bombings engendered significant stress and other negative emotions throughout the country.<sup>16</sup> Similarly, the London bombings also caused strong emotions in the United Kingdom.<sup>17</sup>

Following the Los Angeles Riots (1994), the Breivik (2011) and the Sandy Hook (2012) shootings, a transient dip in male births was noted for a single affected month. This dip was calculated at 4.3, 23.2 and 24.6/1000 births respectively.<sup>7</sup> An equivalent M/F dip was not noted in this study. The reasons for this may be one or a combination of the following. The population size was not sufficiently in order to detect an M/F dip.

Alternatively, the events were not felt to be sufficiently momentous by the populace such that an M/F dip was not produced. Yet another possibility is that these particular populations are somehow hardier and more resistant to such influences. The latter is unlikely, at least for the UK population, in that the death of Lady Diana transiently but significantly reduced M/F.

As with all ecological studies, data is not individually linked and is subject to *ecological fallacy*. It is difficult to detect exposure-outcome relationships with such studies. This, in addition to the fact that data is all retrospective implies there is no claim to any causative links here.

This study has therefore shown that not all terrorist events universally may be linked with a significant reduction in M/F.

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