

**Israel Exhibits a Homogenous Male to Female Ratio at Birth for All Races and Religions**  
V Grech

**ABSTRACT**

**Objective:** Male live births occur in excess of female live births and their ratio (M/F) is usually expressed as male divided by total births. The value of M/F varies, declining with stress. Israel has been shown to have a relatively stable M/F. This study was carried out in order to ascertain whether there were any racial or religious differences in M/F in Israel, and to compare with totals for Europe and North America.

**Methods:** Annual data for male and female live births was available from the Israel Central Bureau of Statistics for the period 2002-2011. Excel was used for data entry, overall analysis and charting. For race, data was available as Jews and others, and Arabs. For religion, data was available as Jews and Moslems.

**Results:** There were a total of 1523956 live births. Overall M/F was 0.5127 (95% CI 0.5119-0.5135). There were no significant differences between the races and no significant trends with time. M/F is mid-way between that of Europe and the North American.

**Conclusion:** The psychological and psychiatric effects of stress in Israel are well documented. However, there was no apparent effect on M/F that is manifested as racial or religious differences in M/F. This could be due to equal levels of stress in all groups or insufficient levels of stress or insufficient births to affect M/F.

**Keywords:** Birth Rate-trends, infant, Israel, newborn, politics, sex ratio

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## **INTRODUCTION**

Male live births occur in excess of female live births and their ratio (commonly referred to as M/F) is usually expressed as male divided by total births. The value of M/F varies. It has been shown to exhibit broad secular trends (1) and to be sensitive to stress (2) Indeed, all forms of stress have been shown to reduce M/F and these include natural calamities (3, 4).

Manmade events, such as terrorist attacks, have also been shown to reduce M/F. For example, following the September 11 attacks, M/F was shown to have dropped not only in New York,(5) but also in the entire United States.(6) Short periods of war have also been shown to reduce war(7) as has economic turmoil and uncertainty (8).

Overall, Israel has been shown to have a relatively stable M/F with no influence from maternal or paternal age, gravidity or parity over the period 2003-2006 (9). However, a study over a longer period showed a significant decline in M/F from 1950 to 1989 with one outlier year (1981) in temporal relation to the destruction of a nuclear reactor that was still under construction near Baghdad. It was speculated that the spectre of war may have resulted in sufficient stress to cause a dip in M/F in this year (10).

Racial differences in M/F have also been demonstrated in countries wherein such races coexist (11). This study was carried out in order to ascertain whether there were any racial or religious differences in M/F in Israel.

## **SUBJECTS AND METHODS**

Annual data for male and female live births was available from the website of the Israel Central Bureau of Statistics for the period 2002-2011. Excel was used for data entry, overall analysis and charting. For race, data was available as Jews and others, and Arabs. For religion, data was available as Jews and Moslems.

The quadratic equations of Fleiss were used for exact calculation of 95% confidence intervals for ratios (12). 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 (13). A p value  $\leq 0.05$  was taken to represent a statistically significant result.

Overall M/F for Israel was also compared to amalgamated data for Europe and for the North American Continent (14).

## **RESULTS**

There were a total of 1523956 live births for the period 2002-2011. Overall M/F was 0.5127 (95% CI 0.5119-0.5135). Annual M/F for the study period overall, and by race and by religion are shown in table 1. There were no significant differences between races and religions and no significant trends with time.

For Europe, over the period 1950-99, M/F was 0.5142 (0.5142-0.5143) while for the North American Continent, M/F over the period 1958-97 was 0.5112 (0.5111-0.5112). M/F for Israel was significantly less than for Europe ( $p=0.0002$ ) but significantly greater than for the North American Continent ( $p=0.0001$ ), as per table 2.

## **DISCUSSION**

Manmade stress is known to reduce M/F. This may be due to contracting economies,(15) hotly contested political referenda,(16) and even civil strife(17) that falls short of actual warfare.(7) M/F in Israel appears to be mid-way between that of Europe and the North American Continent, with no racial or religious differences within the country and significant time trends over the period studied.

The psychological effects of stress in Israel [manifesting even in psychosomatic manifestations] (18) along with the outright psychiatric effects have been well documented in this region (19). However, there was no apparent effect on M/F that is manifested as racial or religious differences in M/F. This could be due to one or more of the following reasons:

All individuals may be equally stressed so that there may be no difference in M/F outcomes.

Another alternative is that the stress levels present are insufficient to affect M/F. Another possibility is that the number of births available for study is too small to detect M/F changes, which may be subtle and require larger numbers of births in order to manifest.

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Table 1: M/F overall and by race and by religion, 2002-2011

<b>All</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Total</b>
<b>M</b>	71318	74272	74694	73956	76078	77830	80254	82398	85415	85162	781377
<b>F</b>	68217	70664	70513	69957	72092	73849	76669	78644	80840	81134	742579
<b>Total</b>	139535	144936	145207	143913	148170	151679	156923	161042	166255	166296	1523956
<b>UCI</b>	0.5137	0.5150	0.5170	0.5165	0.5160	0.5156	0.5139	0.5141	0.5162	0.5145	0.5135
<b>M/F</b>	0.5111	0.5124	0.5144	0.5139	0.5135	0.5131	0.5114	0.5117	0.5138	0.5121	0.5127
<b>LCI</b>	0.5085	0.5099	0.5118	0.5113	0.5109	0.5106	0.5089	0.5092	0.5114	0.5097	0.5119
<b>Jews and</b>											
<b>others</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Total</b>
<b>M</b>	50480	53220	53554	54062	56136	57697	60018	62158	64572	64626	576523
<b>F</b>	48124	50379	50803	51050	53052	54846	57455	59085	60933	61924	547651
<b>Total</b>	98604	103599	104357	105112	109188	112543	117473	121243	125505	126550	1124174
<b>UCI</b>	0.5151	0.5168	0.5162	0.5174	0.5171	0.5156	0.5138	0.5155	0.5173	0.5134	0.5138
<b>M/F</b>	0.5119	0.5137	0.5132	0.5143	0.5141	0.5127	0.5109	0.5127	0.5145	0.5107	0.5128
<b>LCI</b>	0.5088	0.5107	0.5101	0.5113	0.5112	0.5097	0.5080	0.5099	0.5117	0.5079	0.5119

Gender Ratio at Birth in Israel

<b>Arabs</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Total</b>
<b>M</b>	20838	21052	21140	19894	19942	20133	20236	20240	20843	20536	204854
<b>F</b>	20093	20285	19710	18907	19040	19003	19214	19559	19907	19210	194928
<b>Total</b>	40931	41337	40850	38801	38982	39136	39450	39799	40750	39746	399782
<b>UCI</b>	0.5140	0.5141	0.5224	0.5177	0.5165	0.5194	0.5179	0.5135	0.5163	0.5216	0.5140
<b>M/F</b>	0.5091	0.5093	0.5175	0.5127	0.5116	0.5144	0.5130	0.5086	0.5115	0.5167	0.5124
<b>LCI</b>	0.5042	0.5044	0.5126	0.5077	0.5066	0.5095	0.5080	0.5036	0.5066	0.5118	0.5109
<b>Jews</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Total</b>
<b>M</b>	48365	50915	51319	51742	53729	55377	57600	59764	62085	62051	552947
<b>F</b>	45962	48212	48743	48915	50784	52609	55203	56835	58588	59469	525320
<b>Total</b>	94327	99127	100062	100657	104513	107986	112803	116599	120673	121520	1078267
<b>UCI</b>	0.5159	0.5167	0.5160	0.5171	0.5171	0.5158	0.5135	0.5154	0.5173	0.5134	0.5138
<b>M/F</b>	0.5127	0.5136	0.5129	0.5140	0.5141	0.5128	0.5106	0.5126	0.5145	0.5106	0.5128
<b>LCI</b>	0.5095	0.5105	0.5098	0.5109	0.5111	0.5098	0.5077	0.5097	0.5117	0.5078	0.5119
<b>Moslems</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Total</b>
<b>M</b>	18439	18588	18683	17579	17560	17796	17857	17868	18481	18207	181058



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<b>F</b>	17760	17841	17555	16638	16777	16776	17003	17385	17740	17040	172515
<b>Total</b>	36199	36429	36238	34217	34337	34572	34860	35253	36221	35247	353573
<b>UCI</b>	0.5145	0.5154	0.5207	0.5191	0.5167	0.5200	0.5175	0.5121	0.5154	0.5218	0.5137
<b>M/F</b>	0.5094	0.5103	0.5156	0.5138	0.5114	0.5148	0.5122	0.5069	0.5102	0.5166	0.5121
<b>LCI</b>	0.5042	0.5051	0.5104	0.5084	0.5061	0.5095	0.5070	0.5016	0.5051	0.5113	0.5104

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UCI: Upper 95% confidence interval; LCI: Lower 95% confidence interval.

Table 2: A comparison of M/F for Israel vs. amalgamated data for Europe and the North American Continent.

	<b>Europe</b>	<b>Israel</b>	<b>North America</b>
<b>Years</b>	1950-99	2002-11	1958-97
<b>M</b>	159194981	781377	127034732
<b>F</b>	150384968	742579	121488464
<b>Total</b>	309579949	1523956	248523196
<b>UCI</b>	0.5143	0.5135	0.5112
<b>M/F</b>	0.5142	0.5127	0.5112
<b>LCI</b>	0.5142	0.5119	0.5111
<b>chi</b>	13.7		15.0
<b>p</b>	0.0002		0.0001