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Terrorism and the male to female ratio at birth: "Anni di Piombo" in Italy

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ABSTRACT

Introduction: Males are usually born slightly in excess of females and the ratio is often expressed as M/F (male divided by total births). Many factors have been shown to influence M/F, including periods of terrorism which lower M/F through a process of excessive male foetal loss.

The Years of Lead constituted a terrorist political phenomenon that commenced in Italy, known as "Anni di Piombo" (1969-1982). This study was carried out in order to ascertain whether the era caused any fluctuations in annual M/F in Italy.

Methods: Annual birth data by gender for Italy was obtained from a World Health Organisation Database. Monthly data was unavailable.

Results: Annual M/F showed no significant annual dips. However, M/F rose between 1965-69 and 1970-4, and again between 1985-89 and 1990-94 ($p < 0.01$).

Discussion: These findings may be due to one of two reasons: a population that is unaffected or less affected by terrorism, or additional factors that may have obscured and even swung M/F upward, in the opposite direction to that expected. A potential explanation is an increase in ambient radiation following a peak of atmospheric bomb testing prior to the Partial Nuclear Test Ban Treaty in 1963, and after Chernobyl in 1986. The rise in M/F in Italy in the early 1970s may have been caused by the former and the rise in the late 1980s may have been caused by the latter. Radiation may be as strong or an even stronger influence on M/F than stress.

Keywords: Sex ratio; infant, newborn; birth rate/*trends; terrorism; Italy

INTRODUCTION

Males are born slightly in excess of females⁽¹⁾. The ratio of male-to-female live births is conventionally expressed as M/F (male births divided by total births - technically M/T not

SOMMARIO

Introduzione: I maschi, solitamente, nascono in numero leggermente superiore rispetto alle femmine e il rapporto è spesso espresso come M/F (maschi su totale delle nascite). E' stata dimostrata l'influenza di molti fattori sul rapporto M/F, incluso periodi di terrorismo in cui si ha un abbassamento del rapporto M/F attraverso un processo di eccessiva morte fetale maschile.

Gli Anni di Piombo costituiscono un fenomeno politico terroristico iniziato in Italia (1969-1982). Questo studio è stato condotto allo scopo di accertare se il periodo ha causato fluttuazioni nel rapporto annuale M/F in Italia.

Metodi: Dati annuali delle nascite divisi per genere per l'Italia, sono stati ottenuti dal Database del World Health Organisation. I dati mensili non erano disponibili.

Risultati: Il rapporto annuale M/F non ha mostrato variazioni annuali significative. Tuttavia, si è riscontrato un aumento del rapporto M/F tra il 1965-69 e il 1970-4, and di nuovo tra il 1985-89 e il 1990-94 ($p < 0.01$).

Discussioni: Questi risultati possono essere ricondotti a uno dei due seguenti motivi: o una popolazione non è influenzata o poco influenzata dal terrorismo, o altri fattori possono aver modificato il risultato facendo aumentare il rapporto M/F in direzione opposta rispetto a quanto atteso. Una potenziale spiegazione è un aumento delle radiazioni ambientali a seguito dei test nucleari nell'atmosfera prima del Trattato sulla messa al bando parziale dei test nel 1963, e dopo Chernobyl nel 1986. La crescita del rapporto M/F in Italia all'inizio degli anni '70 può essere stata causata dal primo e l'aumento negli ultimi anni '80 può essere stata causata dal secondo. Le radiazioni possono influenzare in modo sostanziale il rapporto M/F, o ancora più sostanziale di quanto ipotizzato.

M/F). Many factors have been shown to influence M/F, and indeed, all forms of stress have been shown to cause dips in M/F. Violence in particular has also been shown to reduce population M/F. This has included not only frank warfare⁽²⁾, but also simple civil unrest⁽³⁾. Terrorist attacks have also been shown to reduce M/F. This was notably shown after the September 11 attacks, following

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which transiently less males were born (four months later) not only in New York⁽⁴⁾, but in the entire United States⁽⁵⁾.

The mechanism for these dips has been shown to be due to an excess of male foetal loss in women who were already pregnant⁽⁵⁾. A similar effect was also found following the Los Angeles Rodney King riots (1992) and the Breivik (Norway - 2011) and Sandy Hook (Connecticut - 2012) shootings⁽⁶⁾. Longer periods of sectarian violence have also been shown to lower M/F, as was evidenced after “The Troubles” in Northern Ireland^(6,7).

The Years of Lead constituted a political phenomenon that arose from the Cold War. This was characterized by anarchists and by both left- and right-wing terrorism that commenced in Italy and spread to the rest of Europe. In Italy, these were referred to as the “Anni di Piombo”, a period of socio-political turmoil that mostly affected Northern Italy and lasted from the late 1960s into the early 1980s (1969–1982). This era was notable for violent waves of terrorist acts and summary executions of both civilian and military victims. Violence erupted in 1969 with public protests, the occupation of the Fiat automobile factory in Milan, the death off the policeman Antonio Annarumma and the bombings of Piazza Fontana in Milan and that of the monument to Victor Emmanuel II in Rome, among others⁽⁸⁾.

This study was carried out in order to ascertain whether the Anni di Piombo caused any fluctuations in annual M/F in Italy.

METHODS

Annual birth data by gender for Italy was obtained from a World Health Organisation Database (HFA (Health for All) Database) for 1950-99. Monthly data was unfortunately unavailable and not forthcoming.

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⁽⁹⁾. 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⁽¹⁰⁾. A p value ≤ 0.05 was taken to represent a statistically significant result.

RESULTS

Annual M/F showed no significant individual variation/s for the period 1950-1999. Five year M/F values for this period are shown in **Figure 1**.

M/F rose between 1965-69 and 1970-4, and again between 1985-89 and 1990-94. These rises are highly statistically significant (**Table 1**).

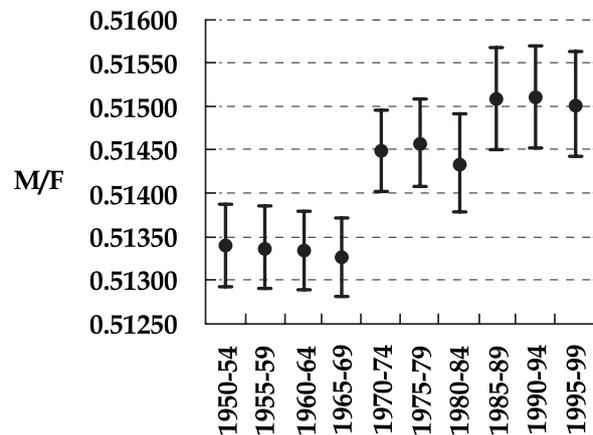


Figure 1.
M/F for Italy, 1950-99.

Table 1.
Totals and M/F for the three eras: 1950-69, 1970-84 and 1985-99, along with significance testing.

	1950-69	1970-84	1985-99
Male	9373273	5844502	4268449
Female	8885697	5515501	4018605
Total	18258970	11360003	8287054
UCI	0.5136	0.5148	0.5154
M/F	0.5134	0.5145	0.5151
LCI	0.5131	0.5142	0.5147
	1950-69		1970-84
	vs		vs
	1970-84		1985-99
chi	35.7		6.8
p	<0.0001		0.0093

DISCUSSION

Research regarding the field of M/F has repeatedly shown that M/F dips follow catastrophic or tragic events if these are felt to be momentous enough and/or to cause sufficient population stress or privation, whether or not these are associated with violence. For example, an M/F dip was noted in the United Kingdom after the accidental death of the Lady Diana, Princess of Wales in 1997, a loved public figure⁽¹¹⁾. A dip in M/F was also noted in Quebec a few months after a closely-run referendum proposing secession from Canada⁽¹²⁾.

This is 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. In polygynous species, a robust son who is conceived under favourable environmental conditions has greater reproductive opportunities than an equivalent daughter who is 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 survive to reproductive age, and if so, would compete poorly with more robust males. However 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 males⁽¹³⁾.

This may have been the mechanism for the decline noted in M/F in Northern Ireland during "The Troubles" (1969-1998). The ethno-nationalist conflict was political with ethnic and sectarian influences, with a majority Unionist/Loyalist population who did not want the country to secede from the United Kingdom, and a minority Nationalist/Republican Roman-Catholic population who wished to leave the United Kingdom. Over 3500 individuals died in the Troubles and this was associated a decline in M/F^(6,7).

This study shows the converse effect, a rise in M/F. These findings may be due to one of two reasons: a population that is unaffected or less affected by terrorism, or additional factors that

may have obscured and even swung M/F upward, in the opposite direction to that expected.

One such potential influence is ionising radiation, the only toxin that has repeatedly been shown not only to cause foetal losses, but also cull more female than male foetuses, thereby raising M/F in ensuing cohorts. Irradiated men sire an excess of males⁽¹⁴⁾, and irradiated females give birth to an excess of females⁽¹⁵⁾. This is attributed to the hypothesis that if an X-linked recessive lethal gene is induced in a mother's germ cell line by ionising radiation, it would have no effect on a heterozygous daughter but would be lethal to a hemizygous male zygote. X-linked dominant lethal mutations in mothers would be equally lethal to both genders⁽¹⁶⁾. X-linked dominant mutations induced in fathers would suppress only female offspring. Recessive X-linked lethal mutations in fathers would not influence M/F as sons do not receive the paternal X-chromosome and daughters carry (and are protected by) a second X-chromosome from their mother⁽¹⁶⁾.

M/F is thus influenced through increased but gender-biased foetal mortality. It has been hypothesised that the skew toward higher female mortality may be due to the fact that the X chromosome contains more genetic material and is physically larger, and hence, may be more easily struck by ionising radiation. Another possibility is that ova and sperm afford their genetic material different levels of protection^(16,17).

The effect of radiation was shown, for example, in areas in close proximity to nuclear facilities⁽¹⁷⁾, worldwide following a peak of atmospheric bomb testing prior to the Partial Nuclear Test Ban Treaty in 1963⁽¹⁸⁾, and after Chernobyl in 1986^(17,19).

The rise in M/F in Italy in the early 1970s may have been caused by the former and the rise in the late 1980s may have been caused by the latter⁽²⁰⁾. If this is the case, then radiation may be as strong or an even stronger influence on M/F than stress.

COMPETING INTERESTS STATEMENT

There are no real/potential conflicts, financial or otherwise.

REFERENCES

- 1) James WH. **Proximate Causes of the Variation of the Human Sex Ratio at Birth.** *Early Hum Dev.* 2015;91:795-9.
- 2) Grech V. **Conflicts in the last fifty years and subsequent effects on the male:female ratio at birth.** *Br J Med Med Res* 2015;5:1247-1254.
- 3) Grech V. **Population Stress, Civil Unrest and the Male to Female Ratio at Birth in Chile, Argentina, Australia and Finland.** *Int J Tropical Dis Health* 2015;6: 27-34.
- 4) Catalano R, Bruckner T, Marks AR, Eskenazi B. **Exogenous shocks to the human sex ratio: the case of September 11, 2001 in New York City.** *Hum Reprod.* 2006;21:3127-31.
- 5) Bruckner TA, Catalano R, Ahern J. **Male fetal loss in the U.S. following the terrorist attacks of September 11, 2001.** *BMC Public Health.* 2010;10:273.
- 6) Grech V. **Terrorist attacks and the male-to-female ratio at birth: The Troubles in Northern Ireland, the Rodney King riots, and the Breivik and Sandy Hook shootings.** *Early Hum Dev.* 2015;91:837-40.
- 7) Grech V. **The male to female ratio at birth in the Republic of Ireland and Northern Ireland: influence of societal stress.** *Ulster Med J.* 2015;84:157-60.
- 8) Weinberg L. **The end of terrorism?** New York: **Routledge**; 2013.
- 9) Fleiss JL. **Statistical methods for rates and proportions.** New York: **John Wiley and Sons**; 1981:14-15 (2nd edition).
- 10) Slezák P. **Microsoft Excel add-in for the statistical analysis of contingency tables.** *Int J Innovation Educ Res* 2014;2:90-100.
- 11) Grech V. **Historic Royal events and the male to female ratio at birth in the United Kingdom.** *Eur J Obstet Gynecol Reprod Biol.* 2015 May 30;191:57-61.
- 12) Grech V. **The male:female ratio at birth was depressed in Québec by the sovereignty referendums.** *Obstet Gynaecol Can* 2015;37:405-411.
- 13) Trivers RL, Willard DE. **Natural selection of parental ability to vary the sex ratio of offspring.** *Science.* 1973;179:90-2.
- 14) James WH. **The sex ratios of offspring of people exposed to non-ionising radiation.** *Occup Environ Med.* 1997;54:622-3.
- 15) Schull WJ, Neel JV. **Radiation and the sex ratio in man.** *Science.* 1958;128:343-8.
- 16) Vogel F, Motulsky AG. **Human genetics.** 2nd ed. Berlin: Springer; 1986.
- 17) Scherb H, Voigt K. **The human sex odds at birth after the atmospheric atomic bomb tests, after Chernobyl, and in the vicinity of nuclear facilities.** *Environ Sci Pollut Res Int.* 2011;18:697-707.
- 18) Grech V. **The Chernobyl accident, the male to female ratio at birth and birth rates.** *Acta Medica (Hradec Kralove).* 2014;57:62-7.
- 19) Grech V. **Atomic bomb testing and its effects on global male to female ratios at birth.** *Int J Risk Saf Med.* 2015;27:35-44.
- 20) Scherb H, Voigt K. **Response to F. Bochud and T. Jung: Comment on the human sex odds at birth after the atmospheric atomic bomb tests, after Chernobyl, and in the vicinity of nuclear facilities, Hagen Scherb; Kristina Voigt, Environ Sci Pollut Res (2011) 18:697-707.** *Environ Sci Pollut Res Int.* 2012;19:4234-41.