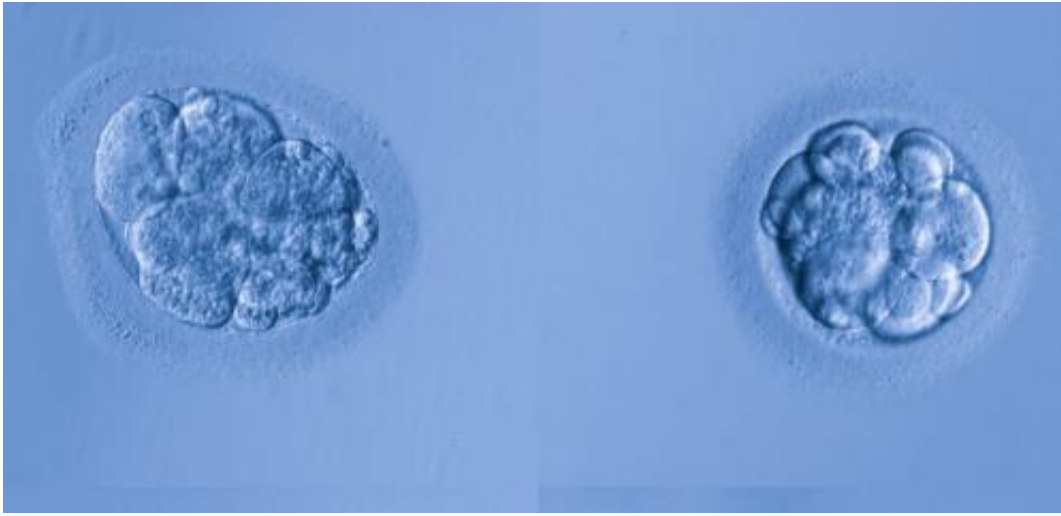


# Female embryos less likely to survive to birth

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New research has challenged the prevailing belief that the higher proportion of male babies born in the general population results from a higher proportion of males being conceived.

The conclusions suggest that embryonic death is bound up with the embryo's sex in ways that are not yet fully understood. Early embryos that are nonviable (because they show [chromosomal abnormalities](#)) and miscarried very early in [pregnancy](#) are more likely to be male, while the embryos that miscarry later in the first-trimester are more likely to be female, for reasons that remain unclear.

The study of five different data sets, the largest of its kind, [found that an equal number of male and female embryos](#) are conceived (the 'primary sex ratio'), but higher female mortality (excluding abortion) in the first half of pregnancy leads to a higher percentage of males born (the 'secondary sex ratio'). The paper is published in *Proceedings of the National Academy of Sciences*.

This study brings together five different data sets mainly from the USA, including a data on early-stage embryos, amniocentesis results from around 800,000 patients, and foetal death and live birth data from 1995 through 2004 in the USA.

The study found that chromosomal abnormalities that would normally make the embryo nonviable are more common in males. There is a specific link to one chromosome in particular, number 15, and some indication of links to chromosomes 7 and 17.

But female embryos experience higher mortality overall: that suggests something other than chromosomal abnormalities is at play, and whatever that is may subtly adjust the proportions of male and female babies born, depending on social, environmental, and geographic circumstances. The higher female embryo mortality is particularly prevalent in the first trimester, and levels off after 20 weeks.

Professor David Steinsaltz of Oxford University's Department of Statistics, one of the paper's co-authors, says: 'The higher female embryo mortality during pregnancy suggests further areas of potential investigation: we know that sex ratio can be influenced by environmental pollution and by maternal stress, but little is understood about the mechanism. Knowing that there are different sex biases in different periods of pregnancy could be an important part in helping to sharpen our picture of what happens when, and more generally how the fate of an embryo is determined.'

'Changes in sex ratio can have enormous social ramifications: there are parts of the world where sex ratios are being distorted by parents intentionally choosing boys, and changes are introduced perhaps inadvertently by reproductive technologies. We need to understand better how the human sex ratio is biologically determined, in order to understand how our manipulations might affect it.

'We were able to find these new results entirely by bringing together pre-existing data, most of which had been collected for other purposes. Some were public vital statistics data, some were generously provided by private companies in the US.'

The greater ratio of boys being born (around 51-52% of live births) has been known since the 17th century. And since the 19th century scientists have known that the mortality of male foetuses in the second half of pregnancy is higher than that of females. But what happens to the sex ratio in the first half of pregnancy has been essentially unknown.

Professor Steinsaltz says: 'The human primary sex ratio, and the trajectory of [sex ratio](#) to birth, has been a question of fascination to biologists for millennia. In addition to the purely parochial interest in ourselves, we would also like to understand how human sex determination fits into a more general picture of sex determination in nature. This would help us to understand the evolutionary pressures that shaped human gestation, gender differences, and relations between the sexes.'

Provided by Oxford University

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