Sex-Ratios, Maternal-Infant Health, and Missing Girls*

Given the historical availability of the population sex ratios, the SR1 might also be able shed light on the question of missing girls.[1] As explained here, a low SR1 is unambiguous and implies poor maternal-infant conditions. Similarly, a high SR1 implies sex-discrimination against girls. A biologically healthy SR1, e.g. 106, on the other hand, might be caused by a combination of offsetting forces, with poor maternal-infant conditions driving down the SR1 even as female infanticide and mortal neglect inflate it.

This ambiguity can be seen clearly in modern data, where we have access to both sex ratios and infant mortality. Consider an example from figure one from our front page. While Iran and the Netherlands both have an SR1 of 105, this apparent similarity masks drastically different experiences in terms of infant mortality. During the period at hand, 1953-1988, in the Netherlands infant mortality was near zero, while in Iran it was nearly 15%. In the Netherlands, the SR1 of 105 represents a healthy population. In Iran, excess female mortality masks poor maternal-infant conditions, resulting in a seemingly healthy SR1.

The ambiguity of a healthy SR1, however, can be resolved with the help of sex ratios of the same cohort later in life. A high SR1 in an unhealthy population must be driven by excess female mortality from sex-discrimination. Assuming that this sex-discrimination *continues into childhood*, this excess female mortality will be apparent as the population ages. If girls are dying at a greater rate than boys, than for the same cohort, the sex ratio during childhood will be *greater* than the sex ratio of infants. In a population where mortality follows the natural survival advantage of females,[2] the sex ratio during childhood should be *less* than the sex ratio of infants.

We apply this basic framework to census data from late-19th-century Europe and India. Here we have *a-priori* beliefs that Europe had better living standards and less sex-discrimination. We will see that these beliefs are supported by the available census data. The following sex-ratios are taken from various countries in Europe and regions of British India.

Table 1: The sex ratio of infants aged 0-1, and of children aged 5-9, across regions of India and countries in Europe. The Indian data comes from the 1891 British census of India, while the European data comes from censuses in 1880-1881, with the exception of the Spanish data, which comes from Tapia and Gallego-Martinez (2017).

Region	SR1	SR5-9	Difference
India	98.0	106.8	8.8
Bengal	94.8	105.2	10.4
Madras	95.4	101.0	5.6
Bombay	98.4	106.2	7.7
Sindh	107.3	122.7	15.4
Punjab	103.0	118.3	15.4
England and Wales	100.2	99.4	-0.8
Scotland	104.0	102.5	-1.5
Ireland	105.0	102.4	-2.7
Italy	104.6	103.5	-1.1

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[1]For the original work on "missing women" see Sen 1990.

[2]See here for a detailed explanation of this natural advantage.

Region	SR1	SR5-9	Difference
Sweden	102.6	102.2	-0.3
Austria	99.9	99.6	-0.3
Spain (1860)	104.4	102.5	-1.9

Consider first the SR1's. In India, the SR1 is generally less than 100, suggesting abject maternal-infant conditions. For much of Europe, on the other hand, the SR1 is above 104, suggesting relatively good maternal-infant conditions. However, this simple comparison breaks down once we include the Northwest of India, regions Sindh (in modern-day Pakistan) and Punjab. Here the SR1's are 107 and 103 respectively. Do these represent healthy populations? Moreover, can we draw inferences on relative living standards across populations by comparing only the SR1? With an SR1 of 103 compared to 100, Punjab appears to be healthier than England and Wales, for example.

An obvious confounder in such a comparison is the role of sex-discrimination. Female infanticide, passive or active, will drive up the SR1, regardless of underlying maternal-infant health. We might hypothesize that the "healthy" SR1 in Punjab is similar to that of Iran discussed above, where excess female mortality masks an unhealthy population.

The SR5-9 suggests exactly this interpretation. In Punjab, a relatively healthy SR1 morphs into a grossly distorted sex ratio in late childhood, with boys outnumbering girls by nearly 20 percent. The increase of the sex ratio implies female mortality well in excess of natural occurrence. In England and Wales, on the other hand, the sex ratio *decreases* with age, showing no evidence of sex-discrimination.

More generally, we see that for every European country the SR5-9 is less than the SR1, as expected in the absence of sex-discrimination. In every region of British India, the reverse is true. This is direct evidence of female infanticide and mortal neglect in British India. This is despite the fact that the SR1 is *generally lower* in India than in Europe, most likely due to the abject poverty of the region. In the absence of sex-selective abortion, the SBR will reflect only maternal health. Thus, by comparing the sex-ratio across ages, we can begin to make inferences about not only the health of the population, but also the extent of sex-discrimination.

References

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