Studies in The Human Sex Ratio

5. A Genetic Explanation of the Wartime Increase in the Secondary Sex Ratio

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ONE OF THE most controversial subjects in the study of the human sex ratio is the assertion that there is a marked rise in the proportion of male births toward the end and immediately after a major war. Even those investigators who seem to have proven the existence of an increase do not agree on its causes. Most of the European investigators such as Savorgnan (1921) and Marbe (1940) are agreed that, at least for England, France, and Germany, the increase is statistically significant and have offered one or more of the following explanations: The proportion of first births is increased in wartime; The average age of the mother is lower; There are fewer miscarriages; The interval between births is greater; etc.

All of the above mentioned explanations were disproven statistically in two recent papers (Ludwig and Boost, 1943, MacMahon and Pugh, 1954). MacMahon and Pugh also have refuted the claim made by some biometricians that the secondary sex ratio did not change significantly in the U. S. A. during either World War I or II. Such erroneous conclusions are arrived at, as these writers have shown, when one works with birth registration data of the *whole* U. S. A. which, for the pre-World War II years were incomplete and unreliable in many states.

When MacMahon and Pugh examined birth data from only those states in which 98 per cent or more of white live births are known to have been reported (R. I., N. J., Mass., N. Y., and Conn.), a statistically significant rise in the secondary sex ratio was found for the years 1945 to 1947 inclusive, the peak occurring in 1946.

Neither Ludwig and Boost, nor MacMahon and Pugh offer explanations for the wartime sex ratio rise. In 1948, this author published a paper in which she gave some indication of how an alternative explanation could be developed. She demonstrated on 880 individuals in "Wer Ists?" the German "Who's Who", with at least one child born during World War I and another born either before or after the war, that the wartime rise does not occur *within* individual families. The sex ratio for 1,080 children born between 1915 and 1918 inclusive was about half-way between that of their siblings born either before or after the war. On the other hand, the sex ratios for both the pre-war and post-war periods were higher in these 880 families than in another group also listed in "Wer Ists?" married during the same interval but with no offspring born during the war. In 1948 the author stated that she believed that at least one cause of the wartime rise in the sex ratio might be a proportional increase in births from families with a higher incidence of male births at any time.

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The statisticians of the Metropolitan Life Insurance Co. (1949), though not believing in a general wartime rise, had stated that "during the war period there appears to have been some increase in the sex ratio of total births among white mothers under 25 years of age". Assume that wives of soldiers tend to be less than 25 years old, and are separated from their husbands for long periods of time with diminished opportunity for fertilization. Doubtless, some couples conceive more easily than others. If such differences are associated with differences in the primary sex ratio then, in wartime there should be a shift in the sex ratio in the direction of that for offspring from families which conceive more easily.

The tenth edition of "Wer Ists?" lists date of marriage and birth date of children for each of its entrants which makes it possible to determine the time interval between onset of marriage and birth of first child. Of course, the question arises whether illegitimacy and birth control could have affected these data to any appreciable amount. The author is inclined to rule out illegitimacy entirely for families listed in the German "Who's Who". The largest single group listed is the higher aristocracy, mostly members of the princely houses which ruled Germany until 1918. They married almost only among themselves and both weddings and births were events accompanied by much publicity; premarital relations of male members were confined to the servant class. Another large group are professors and other university graduates with M.D., Ph.D., or L.L.D. degrees, their wives being chosen almost always from the upper middle class (occupation of father-in-law is also listed) and large dowries were the rule, at least until the inflation. Here also premarital relations of the males, who usually did not marry until they had established themselves in their profession, were confined to the servant class. The author does not believe that in these classes birth control before a first or second child was much in practice. The ruling classes wanted heirs and the upper middle class desired at least one or two children and were financially able to provide for them.

A sample of 2,000 families in which the parents were married between 1900 and 1919 was drawn and divided into two groups: (a) a more quickly fertile group in which the first child was born within the first 18 months after date of marriage, and (b) a more slowly fertile group in which the first child was born more than 18 months after date of marriage. We chose 18 months as time of division because the sex ratio, rising towards the end of the war, remained high for about 18 months after demobilization, though by trial and error it seemed that the choice of 15 months as time of division might have given more significant results. Since parity is known to have considerable influence on the sex ratio, I computed the ratio for first born only.

RESULTS

In group (a) 55.3 per cent of a total of 1,178 children were sons, whereas in group (b) only 49.8 per cent of 822 children were sons. The difference of 5.5 per cent was 2.4 times its standard error and statistically significant at the two per cent level.

CONCLUSIONS

In wartime, when opportunity for fertilization is decreased in a large segment of the population because husbands are away in the armed forces except for short leaves,

proportionally more children will be born to the "more quickly fertile" parents and, since "more quickly fertile" parents apparently have more than the average number of sons, the overall sex ratio will be raised. Of course, another cause for the difference in secondary sex ratio between the two groups differing in ease of reproduction may be differences in the frequency of abortions. Abortions are known to be more likely males than females and, since an abortion will delay the event of a live birth within a single family, abortions would tend to decrease the sex ratio of the more slowly fertile group; i.e., abortions might be one cause of the existence of the more slowly fertile group. Another cause may be differences in strength of sexual drive, a theory based on a related finding in the animal world. Dr. E. W. Rasmussen of the Genetics Institute of the University of Oslo, Norway, supplied us with a small set of birth statistics on two strains of albino rats with sexual drives of differing strength. For rats with strong sexual drive the proportion of male offspring was found to be 54.6 per cent as against only 48.2 per cent for rats with weak sexual drive. Because of the small number of cases (314) the difference is statistically not reliable, but the result is in the direction anticipated and gives some indication of a possible cause for differences in speed of fertility observed in the present set of data.

The above results may be considered further support for the theory advanced by the author (1951 and 1954) that in man we have the same lines for high and low sex ratio obtained by King (1918) in selection experiments on rats. This theory recently found added support in an anthropological study by Martinez-Gustin (1956) who found a strong relationship between the somatotype of parents (expressed by Rohrer's index for both father and mother and combined into a common ratio M) and the sex ratio of offspring. This relationship between M and the sex ratio of the children was particularly strong in the unisexual sibships of Martinez's data.

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