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## THE SEX RATIO AMONG HUMAN STILLBIRTHS

IT has long been known that among human births there is a marked and fairly constant excess of males over females, the observed sex ratio for living births in the United States, for example, being about 105 or 106 males per 100 females. This surplus of males at birth might be explained by postulating a higher intra-uterine death-rate for females than for males. An examination of the sex ratio among stillbirths,[1] however, does not support this view; on the contrary, it discloses an even greater excess of males among those gestations which are interrupted prematurely than among those which terminate in normal, living births. The published data on this subject are adequately summarized in a paper by Holmes and Goff[2] and by Schultz[3] in his comprehensive study of the sex incidence in abortions, to which the reader is referred for a more detailed discussion of the matter.

The purpose of this paper is to call attention to the sex ratio computed from official statistics[4] covering 51,810 stillbirths which occurred in a selected area[5] of the United States, during the years 1926, 1927 and 1928. In Table I these cases are arranged according to their recorded sex and age. To aid in

TABLE I

STILLBIRTHS FROM A LIMITED AREA* OF THE UNITED STATES DURING 1926, 1927 AND 1928, SHOWING THE NUMBER OF MALES AND FEMALES AND THE SEX RATIO, ARRANGED ACCORDING TO THE PERIOD OF UTERO-GESTATION

| | Under 4 months | | | 4 months | | |
|---|---|---|---|---|---|---|
| | ♂ | ♀ | Sex ratio | ♂ | ♀ | Sex ratio |
| 1926 | 170 | 52 | 326.92 | 359 | 165 | 217.57 |
| 1927 | 222 | 58 | 382.75 | 405 | 196 | 206.63 |
| 1928 | 205 | 57 | 359.64 | 470 | 192 | 244.79 |
| Total | 597 | 167 | 357.48 | 1,234 | 553 | 223.14 |

| | 5 months | | | 6 months | | |
|---|---|---|---|---|---|---|
| | ♂ | ♀ | Sex ratio | ♂ | ♀ | Sex ratio |
| 1926 | 678 | 473 | 143.34 | 881 | 653 | 134.91 |
| 1927 | 756 | 541 | 139.74 | 1,096 | 868 | 126.26 |
| 1928 | 839 | 617 | 135.98 | 1,117 | 879 | 127.07 |
| Total | 2,273 | 1,631 | 139.36 | 3,094 | 2,400 | 128.91 |

| | 7 months | | | 8 months | | |
|---|---|---|---|---|---|---|
| | ♂ | ♀ | Sex ratio | ♂ | ♀ | Sex ratio |
| 1926 | 1,052 | 941 | 111.79 | 1,184 | 989 | 119.71 |
| 1927 | 1,364 | 1,144 | 119.23 | 1,486 | 1,113 | 133.51 |
| 1928 | 1,340 | 1,136 | 117.95 | 1,421 | 1,164 | 122.07 |
| Total | 3,756 | 3,221 | 116.60 | 4,091 | 3,266 | 125.26 |

| | 9 months | | | 10 months | | |
|---|---|---|---|---|---|---|
| | ♂ | ♀ | Sex ratio | ♂ | ♀ | Sex ratio |
| 1926 | 4,278 | 3,107 | 137.68 | 205 | 126 | 162.69 |
| 1927 | 5,088 | 3,712 | 137.06 | 186 | 126 | 147.61 |
| 1928 | 4,864 | 3,535 | 137.59 | 175 | 125 | 140.00 |
| Total | 14,230 | 10,354 | 137.43 | 566 | 377 | 150.13 |

SUMMARY

| Age | ♂ | ♀ | Sex ratio |
|---|---|---|---|
| Less than 4 months | 597 | 167 | 357.48 |
| 4 months | 1,234 | 553 | 223.14 |
| 5 months | 2,273 | 1,631 | 139.36 |
| 6 months | 3,094 | 2,400 | 128.91 |
| 7 months | 3,756 | 3,221 | 116.60 |
| 8 months | 4,091 | 3,266 | 125.26 |
| 9 months | 14,230 | 10,354 | 137.43 |
| 10 months or more | 566 | 377 | 150.13 |
| Total | 29,841 | 21,969 | 135.83 |

* Including Connecticut, Illinois, New Jersey, Oregon, Utah, Washington, Baltimore, Maryland, District of Columbia, and New York. (Figures for 1927 and 1928 include the entire state of New York; those for 1926 are for New York City only.)

[1] As employed by U. S. Bureau of the Census, the term "stillbirth" apparently includes all interruptions of pregnancy, regardless of their cause or the period at which they occurred.

[2] S. J. Holmes and J. C. Goff, "The Selective Elimination of Male Infants under Different Environmental Influences," "Eugenics in Race and State," II, 247–248, Baltimore, Williams and Wilkins Company, 1923.

[3] Adolph H. Schultz, "Sex Incidence in Abortions," Carnegie Institution Publication No. 275, Washington, 1921.

[4] Birth, Stillbirth and Infant Mortality Statistics for the Birth Registration Area of the United States, 1926, 1927 and 1928.

[5] Including Connecticut, Illinois, New Jersey, Oregon, Utah, Washington, Baltimore, Maryland, District of Columbia and New York. (Figures for 1927 and 1928 include the entire state of New York; those for 1926 are for New York City only.)

comparison, the number of individuals of each sex and the sex ratio are listed separately for each year and for each age group, while the last horizontal line of the table contains corresponding values for the three years considered together.

The average number of males per 100 females for each age group is as follows: less than 4 months, 357.48; 4 months, 223.14; 5 months, 139.36; 6 months, 128.91; 7 months, 116.60; 8 months, 125.26; 9 months, 137.43; 10 months or more, 150.13. It will be observed that in these data the excess of males among stillborn cases decreases, at first abruptly and later more gradually, up to and including the seventh month of pregnancy. At eight and at nine months, the percentage increases again, due, probably, to the fact that the somewhat larger average size of male infants increases the likelihood of their incurring fatal injury during parturition.

The very great excess of males recorded among embryos of less than four months' development should not, however, be accepted without some qualification. It is probable that many listed as males in this group are really females, and that the observer mistook the clitoris for a penis, due to the similarity in appearance of these two structures during early development. Since, however, it is possible to distinguish between the sexes of human embryos as young as six or seven weeks, on the basis of the relative length of the urethral groove, the angle at which the phallus meets the body, etc., the sex of the majority of cases at which a qualified physician was in attendance was probably correctly diagnosed. But we do not know what proportion of these earliest cases were examined by competent observers, so it can not be determined to what extent the apparent sex ratio of the group has been affected by this source of error. Since, however, the sex ratio during the fourth, fifth, sixth and seventh months shows a constantly decreasing excess of stillborn males, it seems reasonable to assume that the true sex ratio among those of less than four months' development is definitely higher than that of the next older group, in which the sexes should not easily be confused. It is likely that the recorded age of embryos and fetuses in this material is based on estimates by the mother rather than on accurate measurements, yet in so large a number of cases this procedure should introduce no serious error.

The findings of this study agree essentially with those of Nichols[6] and of Schultz,[3] in showing that the excess of males among stillborn children is much lower during the middle third of intra-uterine development than during either the first or the last third of it. They suggest, too, that the wastage of male embryos during the first three months of pregnancy must be very great.

Much interest attaches to the sex ratio among stillbirths, especially among those which occur during the early months of gestation. The available evidence concerning the relative number of stillborn males and females during the later months of pregnancy proves conclusively that the excess of the former sex at the time of conception is even greater than is indicated by the sex ratio among living births. Information concerning the relative mortality of the two sexes during the first three months of development is of even greater importance in this connection, for more than 50 per cent. of all abortions are supposed to occur during this time,[3] and it has been estimated that there is one abortion for every 4.5 pregnancies which proceed to term.[7] Unfortunately, this is the very period for which the available statistics are least reliable. The majority of early abortions are probably concealed; and, of those which are reported, information as to sex must, of course, be limited to those cases which occur after the external genitalia are distinguishable, *i.e.*, after the sixth week of development. As pointed out above, however, there is reason to question the accuracy of the reported sex of even those cases.

Once we have some reliable data on the sex of stillborn embryos during the period from the sixth to the twelfth weeks of intra-uterine development, it may be possible to estimate fairly accurately the sex ratio at the time of conception. Such an estimate must, however, await the compilation of a large number of records of early cases in which the age and sex are known to have been determined by competent observers.

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[6] John B. Nichols, "The Numerical Proportions of the Sexes at Birth," Memoirs of the American Anthropological Assn., Vol. I, 267.

[7] J. W. Williams, "Obstetrics," 4th ed., New York, 1917 (quoted by Schultz).

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