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Some factors influencing the human sex-ratio.

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In 1908 R. and M. De W. Pearl¹ published data derived from the vital statistics of the city of Buenos Ayres, concerning the sex ratio in the following types of matings: (1) Italian × Italian, (2) Spanish × Spanish, (3) Argentine × Argentine, (4) Italian ♂ × Argentine ♀, (5) Spanish ♂ × Argentine ♀.

Of these crosses it will be noted that three are not racial crosses and two are. The data obtained by the Pearls stretched over a period of ten years. Although including very large numbers their data has certain minor disadvantages, for the most part frankly recognized by the authors themselves. First in importance is the fact that their data do not take still births into consideration, and second, the Argentine race may properly be considered as itself somewhat of a mixture and therefore less likely to breed as a pure race. If however the first three crosses be recorded as pure racial matings and the last two as racial hybrids, the ratio of males to 100 females in the two types may be compared as follows:

TABLE I.

	Total Cases.	♂ ♂.	♀ ♀.	Ratio.	Difference.	Diff. P. E.
Pure matings	187,925	94,993	92,932	102.21 ± .16	} 3.78 ± .42	9.0
Hybrid matings	31,591	16,255	15,336	105.99 ± .39		

It will be noted that there is a significant excess of males in the hybrids. The Pearls note this fact and state in addition that environmental differences also fail to account for the results. They further agree that experimental investigations are necessary in order to reach adequate explanations for the observed facts.

¹ *Biol. Bull.*, 15, 194-205.

It is believed that a close approximation to experimental conditions exists at the large lying-in hospitals. Here the patients are observed carefully, the sex of every offspring, including still births recorded, and the environmental conditions are for at least the period of confinement, as nearly equal as possible. The nationality of the parents of every child is recorded and the data thus obtained although not including nearly as large a number of cases as that of the Pearls, may, I believe, properly be considered accurate. During the past few months therefore, a study has been made of the records at the Sloane Lying-In Hospital, New York City. For this opportunity thanks are due to the staff and trustees of the hospital. The types of matings studied are those within each of the following races: English, Irish, Scotch, Italian, Russian, Greek, Austrian and German, and matings of all possible first generation types between these races. Matings of this latter category which produce racial hybrids are contrasted with matings within the pure races in the following table:

TABLE II.

	Total Ind.	Males.	Fe-males.	Ratio.	Difference.	$\frac{\text{Difference}}{\text{P. E.}}$
Pure stocks	5,753	2,964	2,789	106.27 \pm .91	15.29 \pm 2.26	6.76
Hybrids	1,305	716	589	121.56 \pm 2.06		

It will be observed that although the numbers are smaller, the significance of the difference between the pure and hybrid stock is distinct. It will further be noted that both ratios are considerably higher than either of the Pearls.

In considering the probable effects upon their data of the missing still births the Pearls recognize the following three possibilities.

(a) That still births are distributed pro rata in pure and hybrid matings.

(b) That still births are more frequent in pure matings than in hybrid.

(c) That still births are more frequent in cross matings than in pure matings.

They recognize the fact that if either condition (a) or (c)

existed, their conclusions, based as they are on statistics leaving these births out of consideration, would be unaltered.

A tabulation of the percentage of still births occurring among the cases studied at the Sloane hospital gives the following result:

	Total Cases.	No. of Still Births or Abortions.	Per Cent. of Still Births or Abortions.	Difference.	$\frac{\text{Difference}}{\text{P. E.}}$
Pure matings	5,753	355	6.17 \pm .21	2.19 \pm .41 } }	5.34
Hybrid matings	1,305	52	3.98 \pm .36		

In the material studied, therefore, there appears to be a significant excess of still births in the pure matings as compared with the hybrid matings. Although the Pearls appear to consider this as a result unlikely to be obtained, it would seem that did still births depend upon a recessive factor or factors peculiar to certain races, there would be less chance for two gametes containing such factors to meet in a hybrid mating than in a mating within the race possessing the factor or factors in question.

Inasmuch as many embryos may reach birth although infected with syphilis it is likely that biological factors are involved in most if not all cases of still births resulting from syphilis. Such factors would determine susceptibility of the embryo in much the same manner as other biological factors produce strains or families with susceptibility to lung infections or some other weakness. It should be noted further that the results have proved significant in spite of certain rare unavoidable errors of classification, by which "hybrid" matings may be classed as "pure" and *vice versa*. Errors of this sort would tend to mask and not aid the results obtained.

The better record as regards still births is merely another way of stating that the F_1 racial hybrids in man would tend to show the vigor which has frequently been found to characterize racial hybrids in other mammals, such as rats, mice, and guinea-pigs. Such first generation hybrids would possess the factor complexes characterizing their respective races and would benefit by the summed up effects of all *dominant* factors of both races which might make for normal growth or development. That genetic factors which result in still birth are recessive, if they exist at

all, is obvious—for their lethal effect would naturally eliminate at once the individual possessing them were they dominant and their transmission to other generations would, therefore, be impossible. If we consider then the summation of characters for normal development and the probability that gametes containing recessive lethal factors will not be so apt to meet those of their own sort in a mating with an individual of another race, as in a pure mating, we have a possible explanation for the relative excess of still births in pure as compared with hybrid matings.

The ratio of sexes in the still births is as follows:

	Male.	Female.	Uncertain.	Ratio.
Pure races	175	161	9	108.69 ± 3.84
Hybrids	29	19	7	152.63 ± 12.53

In both these cases when the ratios are compared with the ratios of Table II. it is found that the departures from the ratios there obtained are probably not significant. The difference between them being in the case of the hybrids 24 times its probable error and in the case of the pure matings only .6 times its probable error. It may, therefore, be concluded that in the material studied (1) a significant excess of males is observed in the progeny of human matings involving racial crosses as compared with matings within the race. (2) It may be predicted that racial crosses between the European races studied will produce in the first hybrid generation a significant excess of males. The economic importance of this principle to the United States is obvious, for our future population will largely be formed of such hybrids. (3) There are significantly fewer still births among the progeny of the hybrid matings studied as compared with the pure matings.