No great degree of accuracy can be expected in reconstructing the capacity of a skull from a single measurement, but the remarkable difference of formula (11) for negro skulls from the corresponding German formula is of course due to their referring to different measurements of the height. If we insert $H=133.8$ in (11), which is the mean total height of the Bavarian skulls we get $C=1356.7 \pm \frac{96}{\sqrt{n}}$ instead of the measured mean $C=1503$ cm³.

Similarly equation (9) gives $C=1555.6 \pm \frac{105}{\sqrt{n}}$ instead of 1503 when we insert the German mean $B=150.5$.

Thus 9—14 are of little use for our purpose.

VII. Note on a Negro Piebald. (C. D. MAYNARD.)

THE remarkably interesting photograph of a negro piebald on Plate X has been forwarded to the Editor by Dr C. D. Maynard. The native comes from the district round Chai Chai. Dr Maynard writes from Ressano Garcia, and states that the hospital attendant took the photograph. The extraordinary interest of the case arises from the fact that the thighs and feet are of normal negro pigmentation, but in the other patches we have varying degrees of pigmentation of the skin down to albinotic white. Unfortunately there is no dorsal view, but the back is stated to be also affected with albinotic areas. The boy reported that he was in the same condition when born, and that the nature and areas of the pigmentation had not altered.

VIII. Note on Infantile Mortality and Employment of Women, from the *Report on Condition of Woman and Child Wage-earners in the United States*, Volume XIII. Infant Mortality and its Relation to the Employment of Mothers.

By ETHEL M. ELDERTON.

THE author of this *Report* emphasizes the difficulty of determining the effect of women's employment and points out that

"It would be possible to draw positive conclusions as to the relative importance of this particular factor only by point-to-point comparison of the infant mortality for a period of years in two large communities, or two classes of large communities, in which all the material conditions were substantially common, with the single important exception that in one a considerable proportion of the married female population of child-bearing age were at work outside of their homes and in the other community with which the comparison was made none of the women were so employed.

To admit of entirely sound conclusions, it would be necessary that the populations—and especially the women—of both communities should be of like ages, races, and physical health, that their living conditions should be practically identical, and that, in a general way, the child-bearing women should be of about the same grade of intelligence.....In default of some such comparison on a broad scale of the mortality of the infants of working and non-working women of similar ages, races, intelligence, and living conditions, no one can determine accurately how many of the deaths of working women's infants are due to the mother's work and how many to the other conditions of their lives and environment." (p. 18).

The author illustrates the point by taking the six New England States and giving the infant deathrate, percentage of women of 16 years and over who are breadwinners, percentage of foreign-born to the population and percentage of population living in towns of 4000 and more inhabitants, and showing that, though the states with the highest infant mortality have also the largest

number of women employed, they have also the largest percentage of foreign-born and of those living in urban surroundings, and that it is therefore impossible without further investigation to assign the infant deathrate to any of these three factors.

A further investigation has been undertaken into the 32 Massachusetts cities and the death-rate under a year is given, the percentage of foreign-born, the births per 1000 of the population*, the percentage of women gainfully employed and the percentage illiterate, and a comparison is made between the ten cities with the highest and the ten cities with the lowest infant deathrate and percentage of women employed and the other factors enumerated. The conclusion is reached that "These comparisons indicate, superficially at least, that a more direct relation exists between infant mortality and the birthrate, the percentage of foreign-born, and the percentage of female illiteracy than between infant mortality and the employment of women." (p. 38).

There can be no doubt that a direct study of the infant mortality in relation to women's employment can only properly be made, when we confine our attention to women, employed and unemployed, who are actually mothers and live in the same town, and when we correct for age†, and if possible home conditions. Still if we take a series of different towns the right method must be to correct by the method of partial correlation for such divergent factors as we are able to ascertain and allow for in the series of towns investigated. I have endeavoured to apply modern statistical methods to the data of this Report, taking as measures of the environmental conditions in the towns: D the general deathrate, i =percentage of illiteracy, f =percentage of foreign-born population, e =percentage of females employed 10 years of age and upwards (*note, not percentage of employed mothers*, so we may be largely measuring effect of child labour on future motherhood), and d =deaths under one year per 1000 births. Then we have for correlations:

$$r_{de} = .68, \quad r_{di} = .70, \quad r_{df} = .74.$$

Hence numbers of foreign-born and of illiterate appear to be slightly more influential on infantile mortality than employment of women. These values are certainly high and the first is the sort of crude value which is used as an argument against the employment of women. Proceeding to partial correlations we have

$$\begin{aligned} r_{de}^{*} &= .36, & r_{de}^{*} &= .43, & r_{ei}^{*} &= .48, \\ r_{di}^{*} &= .42, & r_{df}^{*} &= .57, & r_{di}^{*} &= .31. \end{aligned}$$

We next corrected for two factors and found:

$$r_{de}^{**} = .34, \quad r_{di}^{**} = .12, \quad r_{df}^{**} = .43.$$

Thus we see that illiteracy has least influence on the infantile deathrate and the presence of foreign-born most.

But even the presence of foreign-born and of illiterates is not a very complete measure of environmental effects liable to influence the infantile mortality in different towns as apart from employment of women. Many women employed means industrial conditions and possibly generally had environment. I have taken as a measure of this the general deathrate D and find

$$r_{Dd} = .71, \quad r_{De} = .47, \quad r_{Di} = .60, \quad r_{Df} = .49.$$

Whence I find:

$$\begin{aligned} D r_{de} &= .57, & D r_{di} &= .62, & D r_{df} &= .75, \\ D r_{fe} &= .49, & D r_{ei} &= .61, & D r_{if} &= .68, \end{aligned}$$

showing very substantial relations after correction for a general measure of poor environment.

* The author is not very confident of the full accuracy of the complete registration of births.

† Young women are often employed up to the birth of their first one or two children, but the death-rate of these elder-born is heavier than the deathrate of those who immediately follow.

Next proceeding to allow for two factors we find

$$r_{di} = .23, \quad r_{ci} = .44, \quad r_{de} = .35,$$

the latter result shows that general deathrate and illiteracy are about equally influential on the relation of employment of women to infantile mortality. Finally I corrected for all three factors and found:

$$r_{de} = .28$$

or 60 % of the crude correlation $r_{de} = .68$ is due to women being most employed in towns where the general deathrate is high, where illiterates are frequent and the population is largely foreign-born. How much further the relationship would be reduced, could we equalise other features of these Massachusetts cities, it is not possible to predict. The examination of the individuals in one city appears to me to be the only satisfactory method of disentangling the numerous factors which influence infant mortality. We commend, however, the study of the first part of this *Report*, as it deals very clearly with the difficulties which arise, and will counteract the tendency, which is prevalent, to assert causation whenever association is observed. The author lays stress on avoiding such logical confusions.

Part II of the *Report* deals with infant mortality and its relation to the employment of mothers in Fall River, Massachusetts. In 1908 the attempt was made to visit the homes of each of the mothers of the 859 infants who died during the year and to ascertain details concerning her occupation, etc. In 279 cases the family could not be traced. In 266 cases prior to the birth of the child the mother was at work outside the home while in 314 cases the mother's work was limited to household duties or other work carried on entirely at home. Thus only the cases of *deaths* are dealt with and the causes of death are compared in the two groups of cases (1) when the mother was at work outside the home prior to the birth of the child and (2) when the mother's work was carried on entirely in the home.

I hold that this method will never prove as satisfactory as that employed in districts in England; in England certain districts are chosen and every baby within that area is visited and the deathrate per number born in one group can be compared with another and the circumstances surrounding those babies who survive and those who die in the first year of life in a given district can be analysed.

I do not think that the fact that a rather higher percentage of all deaths from gastritis etc. in Fall River occur when the mother works away from home and a rather higher percentage from congenital debility at birth when the mother does not work away from home will help us much in discovering the influence of the employment of the mother on infant mortality, nor do I think it will throw much light on the question of stillbirths with which the *Report* also deals. It is found that there are no more stillbirths proportional to all deaths when the mother is industrially employed, but it seems to me that this tells us nothing about the number of stillbirths proportional to all births. The real question is whether mothers employed away from home in factory or workshop, whose other circumstances are the same, lose more children in the first year of life or have more children stillborn than the mothers who are only employed in their homes and I do not think a comparison of causes of death will lead us much further, and I think it may lead to difficulties.

When dealing with the mother's work after childbirth in relation to the causes of infant mortality it is pointed out that the smaller percentage of deaths from congenital disease among the children of mothers who returned to work after childbirth was owing to the fact that most of the children dying from this group of causes died in the early weeks of life before the mother returned to work. For this same reason the number of deaths from gastritis etc. of children whose mothers returned to work is exaggerated, for we are missing out a whole series of illnesses

which have ceased to add to the child deathrate by the time the mother returns to work and we must increase in this way the percentage of deaths of any disease of the later months of a child's first year of life.

It seems to me that a comparison of deaths in this way will really give very little information; an excess of deaths from one disease means a defect in some other disease; it is shown that when the baby is nursed exclusively by the mother 26.0 per cent. of the deaths were from diarrhoea, gastritis, etc.; when partly nursed the percentage was 52.3 and when artificial food was exclusively employed the percentage of deaths from diarrhoea etc. was 42.9; the baby certainly dies less from gastritis when it is breast fed but it dies in greater numbers from other causes. Here again there is a difficulty; deaths from congenital diseases fall on the first weeks of life when breast feeding is the rule, while deaths from gastritis etc. fall on the later months of child life when "partial breast feeding" has become more common and I do not think it is possible to draw any conclusions from a comparison of deaths from one disease to deaths from all diseases as to the importance of artificial feeding in relation to deaths from gastritis.

Interesting information is given as to the reasons for artificial feeding; the numbers are not large enough to justify any definite conclusions, but this is such an important part of any inquiry into the influence of artificial feeding on the infant deathrate that one welcomes its inclusion in a report of this kind.

WE have been requested by Professor F. M. Urban to insert the accompanying announcement.

ANNOUNCEMENT.

A prize of One Hundred Dollars (\$100.00) is offered for the best paper on the Availability of Pearson's Formulae for Psychophysics.

The rules for the solution of this problem have been formulated in general terms by William Brown. It is now required (1) to make their formulation specific, and (2) to show how they work out in actual practice. This means that the writer must show the steps to be taken, in the treatment of a complete set of data (Vollreihe), for the attainment in every case of a definite result. The calculations should be arranged with a view to practical application, i.e. so that the amount of computation is reduced to a minimum. If the labour of computation can be reduced by new tables, this fact should be pointed out.

The paper must contain samples of numerical calculation, but it is not necessary that the writer have experimental data of his own. In default of new data, those of F. M. Urban's experiments on lifted weights (all seven observers) or those of H. Keller's acoumetrical experiments (all results of one observer in both time-orders) are to be used.

Papers in competition for this Prize will be received, not later than December 31st, 1914, by Professor E. B. Titchener, Cornell Heights, Ithaca, N.Y., U.S.A. Such papers are to be marked only with a motto, and are to be accompanied by a sealed envelope, marked with the same motto, and containing the name and address of the writer. The Prize will be awarded by a committee consisting of Professors William Brown, E. B. Titchener and F. M. Urban.

The committee will make known the name of the successful competitor on July 1, 1915. The unsuccessful papers, with the corresponding envelopes, will be destroyed (unless called for by their authors) six months after the publication of the award.

Corrigendum. Dr Derry has most kindly pointed out a slip on p. 307, Vol. VIII; the value of $100(B-H)/L$ for Congo female crania is +1.9 and not -1.9, which brings these crania nearer to their proper place, and the remarks on this point p. 308 should accordingly be cancelled.