8 February 1933.

Dr. W. Weinberg,
Hohenstaufenstrasse 7,
STUTTGART,
Germany.

Dear Dr. Weinberg:

I think I understand your problem. You have records respecting a number of propositi (marked individuals) all from families of k and you find a_1 first born, a_2 second born, ------ a_k last born. Thence you calculate

$$\frac{a_1 + 2a_2 + \ldots\ldots + ka_k}{a_1 + a_2 + \ldots\ldots + a_k}$$

which is the mean value of the variate "order of birth".

With respect to the standard error of this average, I myself should be inclined to treat it empirically, i.e. using the actual distribution observed:

$$\overset{k}{\underset{s=1}{S}} (s^2 a_s) - S^2(s a_s) \Big/ S(a_s)$$

divided by n and $n-1$, where $n = S(a_s)$, gives the sampling variance of the mean.

In the special case in which equal numbers appear from each birth order, the variance will be

$$\frac{1}{n(n-1)} \cdot \frac{(k^2-1)}{12}$$

There is always, however, in the matter of birth order, much doubt as to the causes of disturbance. E.g. If one were to pick out at the age of 12, or what might be more important, though more difficult, to try experimentally, at 50, 1200 boys or men belonging to families of 6, I very much doubt if the expectation of 200 in each birth order, would be even approximately realised. Many families of 6 are not families of 5 only because some of the earlier children have died in infancy, and are not families of 7 because the later children have not so died. I should expect the sex ratio also to be different in the last child of families of a given size.

Yours sincerely,