A NOTE ON THE SEX DISTRIBUTION OF SIBS

BY

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It is remarkable that little attention has been given to the variation of the sex distribution of birth in the accountancy of housing policy in the present context of low fertility. When families are large, gross discrepancies between the number of girls and boys in a sibship will be rare; and the problem of providing separate accommodation for the sexes does not commonly assume a formidable aspect if there is agreement about the target mean. When sibships do not exceed two or three for a very large population the required number of houses with one or two bedrooms for the offspring assumes a matter of some importance, if, as at the present time, there is also a shortage of materials and accommodation.

If we assume equal probability of male and female birth and an exactly random distribution of 0 to r male births and 0 to r female births, in an r -fold sequence the proportions of sibships composed entirely of individuals of the same sex should be 0.5 for 2-child sibships, 0.25 for 3-child, 0.125 for 4-child, and 0.0625 for 5-child fraternities. If we assume floor-space for four children per room, one

bed-room will suffice for half the families in a community of 2-child sibships, even if the second birth occurs before the first-born has left home. On the other hand, seven-eighths of the family will require two bedrooms and one bedroom would be adequate for only one-eighth, if all marriages led to the production of four surviving children; and this is so, even if the birth of the youngest ante-dates by 2 or 3 years the displacement of the eldest.

The foregoing considerations are admittedly schematic in the sense that:

- (a) the sex ratio is not exactly unity;
- (b) a variety of more or less atypical genetic phenomena, e.g. sex-linked lethals and non-disjunction, may conceivably conspire to raise the proportion of unisexual sibships above expectation in accordance with the assumptions stated.

However, the interest of such phenomena to the biologist may give rise to gross misconception concerning how widely observed sex distributions within sibships do in fact depart from such estimates. Indeed, the issue is on all fours with the prominence

TABLE I
OBSERVED AND EXPECTED SEX DISTRIBUTION OF SIBS

No. of Males	0	1	2	3	4	5	6	7	8	Total	Size of Sibship
Observed	79	81	—	—	—	—	—	—	—	160	1
$p = 0.503$	80	80	—	—	—	—	—	—	—		
$p = 0.5$	80	80	—	—	—	—	—	—	—		
Observed	50	94	54	—	—	—	—	—	—	198	2
$p = 0.503$	49	99	50	—	—	—	—	—	—		
$p = 0.5$	50	99	50	—	—	—	—	—	—		
Observed	17	56	49	20	—	—	—	—	—	142	3
$p = 0.503$	17	53	54	18	—	—	—	—	—		
$p = 0.5$	18	53	53	18	—	—	—	—	—		
Observed	3	12	22	12	6	—	—	—	—	55	4
$p = 0.503$	3	14	21	14	3	—	—	—	—		
$p = 0.5$	3	14	21	14	3	—	—	—	—		
Observed	1	4	7	8	1	0	—	—	—	21	5
$p = 0.503$	1	3	6	7	3	1	—	—	—		
$p = 0.5$	1	3	7	7	3	1	—	—	—		
Observed	0	0	1	3	1	0	0	—	—	5	6
$p = 0.503$	0	0	1	2	1	0	0	—	—		
$p = 0.5$	0	0	1	2	1	0	0	—	—		

once given in school geography books to the flattening of the earth's poles, a circumstance of considerable interest as confirmation of the Huyghens-Newton cosmogony, although in fact the discrepancy between the polar and equatorial axes is not such as to be of much interest to the practical navigator.

The object of this note is to emphasize that deviations of sex distribution from random expectation, if calculated in terms of the observed sex ratio, are not indeed of an order which need deter those concerned with housing policy from prospecting with as much precision as need be, requirements for houses with two or more rooms for sleeping accommodation on the understanding that children of opposite sex should sleep apart. Nor is the fact that the Registrar-General's reports regrettably provide no relevant large-scale information, an insuperable obstacle to the making of such estimates. The writer has analysed the only source of information known to him relevant to Great Britain at the present time, by using the data contained in "Who's Who" (1952) for all male entries whose surname begins with F, rejecting such as refer to the issue of a known second marriage.

These 718 entries refer to a total of 687 sons and 680 daughters for a highly skew distribution of sibship size with a range of 8 and a mean sibship size of 1.9. The sex ratio is 50.3 males to 49.7 females; and if we denote the probability of a male birth as $0.503 = p$, we may alternatively assign a distribution on the assumption of randomness in accordance with the estimates $p = 0.5$ and $p = 0.503$. Table I fully summarizes the outcome of our sample analysis.

An examination of Table I suffices to show that computations on the basis of Mendelian expectation tally with observation as closely as we might wish for any practical purposes connected with housing policy; and this is so, even if we assume absolute equality of the sex ratio. For practical purposes what is relevant and confirmatory of the consideration stated at the outset can be ascertained from Table II, which sets forth the appropriate computation for a community of which we know the distribution of sibship size, if we wish to estimate the actual number of unisexual sibships, *i.e.* how many

houses will require no separate accommodation for boys and girls, if one bedroom otherwise suffices for the accommodation of the sibship. The number of fertile unions recorded for this sample in accordance, with the exclusion of second marriages as mentioned, is here $160 + 198 + 142 + 55 + 21 + 5 = 585$.

TABLE II
OBSERVED AND EXPECTED UNISEXUAL FAMILIES

Sibship Size	Number of Unisexual Families		
	Observed	Expected	
		$p = 0.503$	$p = 0.5$
1	160	160	160
2	104	99	99
3	37	35.5	35.5
4	9	6	6
5	1	2	2
6-8	0	0	0
Total ..	311	302	302

We thus obtain the following figures for a community with the given distribution of sibship size:

$$\text{Observed proportion of unisexual sibships} \quad \frac{311}{585} = 0.535$$

$$\text{Expected proportion of unisexual sibships} \quad \frac{302}{585} = 0.516$$

$(p = 0.503)$

$$\text{Expected proportion of unisexual sibships} \quad \frac{302}{585} = 0.516$$

$(p = 0.5)$

DISCUSSION

A systematic review of the literature has been made by Gini (1951), who claims that generally a marriage begins with the tendency to procreate one sex and ends with the tendency to procreate the opposite one. In a period when birth control is widely practised, this tendency, if real, might well result in a divergence from random expectation. The effect is however a complex feature, since for example families desiring a male child would tend to have an excess of female children as they would probably continue reproduction until one male child was born and then stop. Since the data do not distinguish parities we cannot analyse them in this way, and there seems no evidence here for such a belief.

REFERENCE

Gini, C. (1951). *Acta genet. (Basel)*, 2, 220.