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I

MULTIPLE BIRTH FREQUENCY ACCORDING TO PARITY AND MATERNAL AGE

by

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In a recent analysis of the Registrar General's statistics of multiple births in England and Wales during the period from mid-1938 to the end of 1945 (1) it was shown that the average numbers of previous children reported as having been born to mothers delivered of twins were consistently greater at each quinquennial age group than the average numbers reported as having been born to mothers delivered of a single child. The averages shown in Table 3 of the paper compared as follows:

	Under 20	20-	25-	30-	35-	40-	45-49
Twin maternities	0.13	0.48	1.05	1.82	2.93	4.54	6.13
Single maternities	0.11	0.42	0.93	1.59	2.61	4.18	5.97

The weighted excess amounted to 13 percent. and two possible reasons for this were suggested, namely hereditary tendency for twinning to be repeated and some obscure tendency for twin frequency to increase with parity independently of maternal age. It does not appear from the studies which have been made of the hereditary tendency that this could account for more than a small part of the 13 percent. excess; and hitherto the evidence found for any effect of parity at constant maternal age upon twinning frequency has not been conclusive.

It has been suggested in a personal communication from Dr W. Lenz of the Universitäts Kinderklinik at Hamburg — Eppendorf that the differences in the averages quoted above might be accounted for, in part at least, by the differing age distributions of the mothers of twins and mothers of single children *within* the 5 year age groups. In order to test the effect which this could have on the average numbers of previous children born to the mothers at grouped ages, I have made the following calculation. The exact mean ages of the mothers delivered of single children within the age groups « Under 20, 20–, 25–, 30–, 35–, 40–, 45–49 » were first calculated, and the average numbers of previous children were plotted against them on graph paper and a smooth curve drawn through the points. At each age $15\frac{1}{2}$, $16\frac{1}{2}$, $17\frac{1}{2}$ etc. up to $49\frac{1}{2}$ the number of previous children per mother was then read from the graph. A histogram was then constructed for the numbers of twin maternities which occurred during the $7\frac{1}{2}$ years from mid-1938 to 1945 at quinquennial age groups (as given in Table 3 of my previous paper), a smooth graph was fitted to it and the estimated frequencies at each separate year of age were read from the graph and adjusted to make the five-year totals correct. By multiplying together these two series of figures at each year of age within each 5-year period and summing the products, I obtained the averages of previous children at twin maternities to be expected if the rates at each separate age had been the same as those recorded at single maternities. The results are shown in Table 1, and it is evident that the correction accounts for only a small portion of the excess of previous children recorded at twin maternities. There remains unaccounted for an excess of about 11 percent. at ages between 25 and 45, and about 7 percent. at ages under 25, to which hereditary tendency contributes an unknown but probably small fraction.

Table 1 - Effect of Correction on Differences between average previous children recorded at twin and single births

Age of mother	No. of twin maternities	Average no. of previous children at			Percent excess of actual over expected
		Single births	Twin maternities		
			Expected	Actual	
Under 20	939	0.11	0.12	0.13	8
20–	9540	0.42	0.45	0.48	7
25–	15757	0.93	0.95	1.05	11
30–	15976	1.59	1.63	1.82	12
35–	10629	2.61	2.63	2.93	11
40–	2601	4.18	4.13	4.54	11
45–	109	5.97	5.82	6.13	5

In 1940 Yerushalmy and Sheerar (2) published an analysis of births in New York State (exclusive of New York City) during 1936 and 1937 in which they determined the frequency of twin deliveries according to maternal age and order of birth. The total deliveries were 166,120 and the twin deliveries 1,830. The rates of twinning per 1,000 deliveries, extracted from Table 5 of their paper, are shown in Table 2. A tendency for twinning frequency to increase from left to right along each horizontal row, that is with

increasing parity, was apparent in respect of each quinquennial age group (cfr. tab. 2).

A similar analysis of births in Italy during 1948 and 1949 has now been made by Norma McArthur (3), showing the frequency of multiple births amongst all births according to age of mother and rank of birth. Since the numbers of births were approximately the same in each year, arithmetic means of the rates for the two years may be derived from the published tables in absence of the original data, and these are shown in Table 3 for maternal age groups between 21 and 39, and birth ranks 1 to 7 (cfr. tab. 3).

At ages between 20 and 30 the Italian frequency rates agree remarkably with those for New York, but between 30 and 40 they tend to be higher. The upward trend of

Table 2 - Twin frequency per 1,000 deliveries in New York State by order of birth and age of mother, 1936-37

Age of mother	Order of birth					
	1st	2nd	3rd	4th	5th	6th or more
Under 20	5.2	9.6	9.4	(62.5)	—	—
20-	7.3	9.5	11.9	13.7	18.9	—
25-	9.8	11.2	10.9	13.5	14.4	17.4
30-	10.4	11.1	15.8	14.2	12.5	15.3
35-	8.4	14.6	12.0	11.7	14.9	21.4
40 and over	3.3	5.0	8.2	14.5	15.7	13.4

Table 3 - Multiple birth frequency per 1,000 total birth in Italy by rank of birth and age of mother (Arithmetic means of rates in 1948 and 1949)

Age of mother	Rank of birth						
	1st	2nd	3rd	4th	5th	6th	7th
21-24	8.45	8.30	9.95	10.90	18.10	19.45	—
25-29	10.60	10.60	12.25	12.90	14.85	17.50	15.85
30-34	13.80	13.65	15.80	17.40	17.65	20.85	21.55
35-39	16.25	14.95	18.45	19.40	20.90	19.30	21.90

frequency with increasing maternal age is clear and pronounced for ranks 1, 2, 3 and 4. An upward trend of multiple births frequency with increasing parity is apparent from the 2nd to the 5th or 6th birth at each maternal age group, and it seemed advisable to estimate how much of this apparent increase could be accounted for by the grouping together of ages.

The true mean maternal ages of the groups 15-20, 21-24, 25-29, 30-34, 35-39 and 40-44 for first births were assumed to approximate to those found for first births so grouped in England and Wales in 1949 (4), namely 19.6, 23.0, 27.3, 32.3, 37.1, 41.7 years. Knowing the multiple birth frequencies at first maternities in Italy in 1948-49 to be 6.45, 8.45,

10.60, 13.80, 16.25 and 13.90 per 1,000 for the six age groups, the frequency corresponding to each separate year of age from 21½ to 39½ was estimated by curve fitting and adjustment to make the quinquennial totals correct. Assuming that the maternal ages at a given order of birth were distributed within an age group in the same proportions as they were in England and Wales in 1949 (4) for that birth order and age group, the expected frequency of multiple births for each age group if the rates at separate years of age at first births applied also to every other order of birth were calculated, and are shown in Table 4.

Comparing Tables 3 and 4, it is evident that the correction for the error produced by age grouping can account for only a small portion of the observed rise in multiple birth

Table 4 - Multiple birth frequency (per 1,000 total births) in maternal age groups which would have resulted if the rate at each year of age had been the same at each order of birth as at first births in Italy 1948-49

Age of mother	Rank of birth						
	1st	2nd	3rd	4th	5th	6th	7th
21-24	8.45	8.63	8.75	8.78	8.96	8.98	8.95
25-29	10.60	10.72	10.82	10.92	11.03	11.17	11.24
30-34	13.80	13.85	13.92	14.01	14.06	14.22	14.24
35-39	16.25	16.25	16.27	16.29	16.32	16.33	16.34

frequency with increasing parity. A curious point noticeable in Table 3 is the absence of any such increase in passing from first births to second births, but the reason for this may be that when the first delivery produces twins the next delivery will not be recorded in rank 2 but in rank 3, since there have already been two children born. This introduces a selection into the rank 2 births by excluding all mothers who have previously had a multiple birth, and since such mothers are rather more likely to have another multiple birth than mothers whose first birth was single, the rates for rank 2 must be slightly depressed by such selection.

Taking into account the evidence from three independent sources, England and Wales, Italy and New York, it would seem that parity has an effect upon frequency of multiple birth which cannot be explained by its close association with maternal age.

Summary

The Author has examined the published statistics of multiple births in England and Wales 1938-45, in Italy 1948-49 and in New York 1936-37, to see to what extent the apparent increase in frequency of twin births as parity increases amongst mothers of a quinquennial age-group is exaggerated by the mere fact of grouping. He concludes that the effect of the 5 year grouping on the rates is small, and that the data from the three countries indicate that at certain ages the probability that a birth will be multiple tends to increase with the order of the birth.

References

1. STOCKS, P., *Recent statistics of Multiple Births in England and Wales.*, A.Ge. Me. Ge. 1, 1. 1952.
2. YERUSHALMY, J. and SHEERAR, S. E., *Studies on Twins*, Human Biology, 12, 1. 1940.
3. MCARTHUR, N., *Statistics of Multiple Births in Italy in the Years 1948-1949*, A.Ge. Me. Ge. 1, 3. 1952.
4. Registrar General's Statistical Review for England and Wales for 1949, Tables, part II, Civil, Table MM.

RIASSUNTO

L'Autore ha esaminato le statistiche delle nascite multiple pubblicate in Inghilterra e Wales (1938-45), in Italia (1948-49) e in New-York (1936-37) per vedere in quale misura l'aumento apparente nella frequenza delle nascite gemellari, quando aumenta la parità fra madri raccolte in gruppi di cinque anni, venga accresciuto per il fatto del raggruppamento.

Si conclude che l'effetto dei gruppi quinquennali sulla quota d'aumento è basso e che i dati provenienti dai tre paesi indicano che a determinate età la probabilità che una nascita sia multipla tende ad aumentare secondo l'ordine delle nascite.

RÉSUMÉ

L'Auteur a examiné les statistiques de naissances multiples publiées en Angleterre et Pays de Galles (1938-45), en Italie (1948-49) et à New-York (1936-1937) pour voir dans quelle mesure l'augmentation apparente dans la fréquence des naissances gemellaires, quand augmente le nombre des naissances parmi des mères réunies en groupes de 5 ans, est accentuée par le fait du groupement.

Il conclut que l'effet des groupes quinquennaux sur la proportion de l'augmentation est faible, et que les données provenant des trois pays indiquent qu'à certains âges la probabilité qu'une naissance sera multiple tend à augmenter selon l'ordre des naissances.

ZUSAMMENFASSUNG

Der Verfasser hat die vorerfentlichten Statistiken ueber Mehrlingsgeburten in England und Wales (1938-1945), in Italien (1948-1949) und in New York (1936-1937) untersucht, um daraus zu ersehen, inwieweit sich das scheinbare Anwachsen der Haeufigkeit der Mehrlingsgeburten bei Paritaetsanstieg unter Muettern, die in Gruppen zu je fuef Jahren zusammengestellt sind, durch diese Gruppierung steigert.

Man kann daraus schliessen, dass der Einfluss der Fuenfjahresgruppen auf die Anstiegsquote gering ist und dass, gemass den aus den drei Laendern herruehrenden Angaben hervorgeht, dass in gewissen Zeiten die Wahrscheinlichkeit einer Mehrlingsgeburt im Verhaeltnis zu der Anzahl der Geburten zur Erhoehung neigt.