FERTILITY AND ITS RELATION TO SOCIAL CONDITIONS

A STUDY OF THE VITAL STATISTICS OF LONDON IN 1930–2

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INTRODUCTION

THE rapid decline of the birth-rate in nearly all countries of western Europe has naturally attracted much attention. Some have studied the probable effects upon the absolute size and the age constitution of the population, and the consequence entailed upon the military and economic strength of a nation. Others have drawn attention to resulting changes in the relative importance of diseases of young, adult and old ages. Changes in mere numbers depend wholly, and the other changes to a considerable extent, upon quantitative factors; they must occur even if the quality of those born differs in no way from that of those produced when fertility was at a higher level. But, if the quality of births changes with their quantity, then the consequences of decrease of numbers may be better or worse than mere numerical changes would involve.

Thirty years ago Dr David Heron (1906) was led to conclude that the fertility of those social strata, the qualities of which were advantageous to the State, had declined more than that of socially less desirable citizens. His conclusions were based upon a statistical study of the vital statistics of the Metropolitan Boroughs of London. He found that indices of undesirable social status were substantially correlated with the birth-rate and that—so far as comparable data were available—the position 50 years earlier, in 1851, had been different. In other words, there was a differential fall in the birth-rate, a differentiation unfavourable to the quality of the people.

Whether the indices selected by Heron—or indeed any statistical indices readily obtainable—are wholly adequate measures of the group qualities he wished to test, is naturally a question which might be answered in different ways. There is, however, no doubt of the interest and importance of his pioneer study. Between 1901 and 1931 the birth-rate of London has declined from 29·1 per 1000 persons living to 15·0, a much greater fall than that between 1851 and 1901. It is of interest to know whether the statistical results reached by Heron are confirmed by the experience of our own time. I accordingly set myself the task of repeating, so far as the data permitted me to do so, the study Heron made 30 years ago.

In doing so I have made one broad change from the procedure followed by Heron. In calculating the birth-rates and death-rates he utilized the census records of 1901 and the registered births and deaths in the same year. To give a wider foundation to the rates and to avoid the effects of events peculiar to a single year, e.g. an epidemic prevalence of a disease, I have taken the births and deaths registered in three years, 1930, 1931 and 1932, and have related them to the population of 1931 (as estimated by the Registrar-General for the mid-year).

<div align="center">THE MEASUREMENT OF FERTILITY</div>

From the figures available in the various reports of the Registrar-General it is only possible to calculate the *crude* fertility of an area, viz. the number of legitimate births per 100 married women aged 15–54. In the absence of the age of the mother on the birth certificate of the child the fertility rates at different ages cannot be calculated, and both age of marriage and duration of marriage are factors influencing fertility. Table I gives these crude rates for the Metropolitan Boroughs in 1901 and 1930–2. In every borough the reduction in fertility has been very large over this period of thirty years, and broadly speaking one may say that the rate in London has been halved.

<div align="center">Table I</div>

<div align="center">Fertility rate. Legitimate births per 100 wives aged 15–54</div>

| | | 1930–2 | |
| | | | |
Metropolitan Boroughs	1901	Actual	As percentage of 1901 figures
Battersea	17·39	8·70	50·03
Bermondsey	21·86	10·92	49·95
Bethnal Green	22·74	10·32	45·38
Camberwell	17·76	8·46	47·64
Chelsea	14·97	8·28	55·31
Deptford ⎫ Greenwich ⎭	18·79*	8·91 8·80	— —
Finsbury	23·10	10·60	45·89
Fulham	18·27	7·91	43·30
Hackney	17·87	8·65	48·41
Hammersmith	16·69	8·12	48·65
Hampstead	13·52	6·59	48·74
Holborn	19·52	5·62	28·79
Islington	16·90	9·23	54·62
Kensington	14·64	8·45	57·72
Lambeth	18·05	8·29	45·93
Lewisham	16·46	7·36	44·71
Paddington	15·31	7·78	50·82
Poplar	21·85	11·10	50·80
St Marylebone	17·62	6·93	39·33
St Pancras	16·32	8·37	51·29
Shoreditch	21·26	11·44	53·81
Southwark	19·91	9·87	49·57
Stepney	23·99	11·32	47·19
Stoke Newington	14·25	8·17	57·33
Wandsworth	16·57	6·90	41·64
Westminster	12·55	5·99	47·73
Woolwich	18·20	7·89	43·35

* The figures for 1901 include the Boroughs of Deptford and Greenwich together.

Using fertility rates at ages calculated by the Registrar-General recently, and the method of indirect standardization, I had hoped to measure how far changes in the age distribution of wives between 1901 and 1931 had contributed to this decline. Unfortunately the census reports of 1901 give the age grouping of married women in London only in decennial groups at ages over 25 years, and not in the required quinquennial groups. The differences between the fertility rates in the quinquennial groups are too great for them to be justifiably amalgamated and applied to the decennial groups of the population of the wives. As an alternative but rough method of comparison I calculated the percentage distribution of married women in the age groups at the two dates. Table II shows this distribution for the years 1901 and 1931 in all the Metropolitan Boroughs taken together. At the latter date there are clearly proportionately more wives in the oldest age group where fertility is relatively low, and proportionately fewer in the younger age groups where fertility is relatively high. The differences, however, are not great enough to account for the enormous decline in fertility previously shown.

Table II. *Population of married women in different age groups
in all the Metropolitan Boroughs combined*

	1901		1931	
Age groups	Actual	Percentage	Actual	Percentage
15–19	3,847	0·55	3,226	0·45
20–24	69,015	9·94	53,625	7·41
25–34	262,322	37·78	236,184	32·61
35–44	218,544	31·47	231,681	31·99
45–54	140,627	20·26	199,440	27·54
All ages	694,355	100·00	724,156	100·00

The boroughs showing (in Table I) the least and greatest changes in fertility were Kensington and Holborn, the fertility in the former in 1930–2 being approximately 58 per cent of the 1901 level and the latter only 29 per cent. Tables III A and III B show the absolute and relative age distribution of wives in these two areas at the two dates. In Kensington there has been little change in the age distribution, and clearly the decline of 42 per cent in the fertility rate

Table IIIA. *Metropolitan Borough of Holborn*

	1901		1931	
Age groups	Actual	Percentage	Actual	Percentage
15–19	75	0·88	19	0·33
20–24	848	9·95	341	6·01
25–34	3,269	38·36	1,732	30·52
35–44	2,704	31·73	1,922	33·87
45–54	1,625	19·07	1,661	29·26

Table IIIB. *Metropolitan Borough of Kensington*

15–19	129	0·54	166	0·62
20–24	1,937	8·18	2,239	8·37
25–34	8,081	34·14	8,539	31·93
35–44	7,919	33·46	8,363	31·28
45–54	5,603	23·67	7,434	27·80

is not due to this factor. In Holborn there are, proportionately, at the later date distinctly more wives in the older age groups, and this change has no doubt contributed some part at least to the exceptionally striking fall in the fertility rate of this borough. Apart from this one, relatively small, borough, Table I shows that the fall in fertility between 1901 and 1931 has varied extremely little between one borough and another. Seventeen of the twenty-six percentages lie between 45 and 55, so that the decline does not appear to be closely related to the social and economic conditions of the different areas. The mean (weighted) fertility rate for the boroughs taken as a whole was 15·93 per cent in 1901 and 8·60 in 1930–2, a reduction of 46 per cent in the thirty years. The corresponding figures based on the wives aged 15–54 years cannot be calculated for 1851. In its place Heron calculated the number of children born per 100 wives aged 20 and upwards, and reached figures of 18·39 for 1851 and 15·93 for 1901. For 1930–2 this rate is only 6·96. The change in this ratio between 1851 and 1930–2 is certainly due in part to the changes in age distribution discussed above. In 1851 only 14·7 per cent of the total female population were at ages 50 and over, whereas the corresponding figures for 1901 and 1931 were 19·3 and 23·6. A detailed discussion of the other various factors which may be held responsible for this tremendous fall in the birth-rate is beyond the scope of this paper. Without much fear of contradiction one may remark that volitional limitation of the family has had a great deal to do with it. Other measures of fertility adopted by Heron were the numbers of children in three age groups, viz. 2–4 years, 5–14 years and 13–15 years per 100 wives aged 15–54. These have been calculated for 1931 and are shown in Table IV, together with the corresponding figures for 1901 and the mean age of wives in the different areas.

THE MEASUREMENT OF SOCIAL CONDITIONS

The measurement of the economic and social conditions of life in a particular area can only be made very roughly. No locality of any size is a homogeneous unit, inhabited only by people of the same standards of wealth, culture and social environment. In all the Metropolitan Boroughs poorer areas or slums exist in varying degrees. Our measures can therefore show only broad distinctions between areas.

As his measures of "wealth and education" Heron used the following three indices:

(a) the number of professional men per 1000 occupied males;

(b) the number of female domestic servants per 100 females aged 15 years and upwards;

(c) the number of female domestic servants per 100 families.

The census data of 1931 allowed the same indices to be calculated. With regard to (a) there has been very little change in the census classification. In the figures for 1901, persons engaged in music, sports and arts were evidently not

Table IV

Metropolitan Boroughs	Mean age of wives aged 15–54 years		Children of different age groups per 100 wives aged 15–54 years					
			2–4 years		5–14 years		13–15 years	
	1901	1931	1901	1931	1901	1931	1901	1931
Battersea	36·91	38·08	56·03	24·07	126	88·86	36·7	25·59
Bermondsey	36·64	37·87	64·68	31·85	145	118·13	40·6	32·47
Bethnal Green	36·28	38·00	68·50	32·26	146	116·78	40·6	32·74
Camberwell	37·19	38·25	57·82	23·63	135	91·21	39·5	26·75
Chelsea	37·51	38·60	48·04	21·58	112	75·96	33·1	23·29
Deptford*	36·96	37·97	59·30	24·63	135	90·75	39·5	27·08
Finsbury	36·60	37·84	58·73	31·90	130	115·71	38·4	30·59
Fulham	36·36	38·19	57·87	21·64	118	80·21	32·0	22·93
Greenwich	—	38·25	—	26·63	—	104·54	—	31·58
Hackney	36·94	37·53	56·19	23·14	128	86·62	37·6	25·00
Hammersmith	36·89	37·93	53·65	22·35	121	85·05	34·7	23·56
Hampstead	37·61	38·48	46·76	16·59	113	63·22	35·7	19·94
Holborn	36·60	38·79	43·42	19·79	101	71·24	32·2	20·69
Islington	36·83	37·52	52·26	24·11	116	85·78	33·8	23·62
Kensington	37·79	37·95	47·10	22·12	109	75·35	33·8	22·30
Lambeth	36·92	37·91	52·62	23·41	119	85·90	34·6	23·68
Lewisham	37·24	38·47	54·21	23·88	124	90·04	37·2	23·50
Paddington	37·33	37·89	46·78	19·51	105	67·58	31·8	20·03
Poplar	36·77	37·69	63·53	31·46	143	119·25	41·0	33·36
St Marylebone	37·19	38·86	46·05	18·48	102	70·52	32·5	21·13
St Pancras	36·75	37·91	50·50	22·27	115	83·52	33·4	23·19
Shoreditch	36·48	37·66	61·63	34·97	134	122·87	38·7	31·00
Southwark	36·37	37·73	57·78	28·79	126	106·04	36·2	29·04
Stepney	35·82	38·04	67·64	31·11	141	117·07	38·5	35·48
Stoke Newington	37·36	37·65	47·97	19·29	109	71·17	34·4	21·20
Wandsworth	37·14	38·82	54·18	20·31	122	78·08	35·6	23·16
Westminster	37·37	38·83	40·52	15·62	93	58·32	29·9	19·91
Woolwich	36·47	38·12	56·75	23·81	126	92·87	36·7	25·78

* Deptford and Greenwich were one area in 1901.

included in Heron's index; in 1931 the numbers so employed were separately tabulated in the *Census Reports* and consequently could be excluded; the figures are therefore reasonably comparable. With regard to (*b*) and (*c*), though the calculations for 1931 could be, and were, made on the same lines as in 1901, it must be noted that the measure is to-day probably a less effective index of wealth than 30 years ago. The employment of domestic help has declined, probably partly due to the labour-saving devices introduced in domestic work and also to the increasing difficulty experienced by employers in securing and maintaining servants for domestic duties. The number of domestic servants, therefore, is not an index of affluence to the same extent as it was at the beginning of the century. Still these indices, regarded relatively, do give some idea of the living conditions of a locality. Table V gives the indices as they were in 1901 and 1931. Considerable changes are apparent.

To measure the "poverty and lack of culture" of the different boroughs Heron used three further indices, viz.:

(*d*) the number of general labourers per 1000 occupied males;

(*e*) the number of pawnbrokers, general dealers, etc. per 1000 occupied males; and

(*f*) the number of boys and girls aged 10–14 years employed per 1000 boys and girls of the same age.

Table V

Metropolitan Boroughs	Number of professional men per 1000 occupied males		Number of female domestic servants per 100 females aged 15 upwards		Number of female domestic servants per 100 families	
	1901	1931	1901	1931	1901	1931
Battersea	32·63	24·40	7·90	5·77	12·51	8·58
Bermondsey	9·85	8·60	4·18	3·51	6·44	5·11
Bethnal Green	6·78	5·93	3·56	2·81	5·59	4·19
Camberwell	33·21	23·43	8·73	5·56	14·96	8·53
Chelsea	38·92	64·96	25·36	28·73	47·46	53·55
Deptford*	26·13	18·95	11·52	4·83	19·20	7·10
Finsbury	13·59	9·83	5·28	5·05	7·87	7·19
Fulham	34·73	29·25	10·93	7·93	17·44	11·93
Greenwich	—	28·85	—	7·75	—	12·13
Hackney	33·19	19·20	9·98	6·22	17·76	9·69
Hammersmith	37·35	24·20	10·96	7·12	18·68	10·70
Hampstead	82·94	110·89	33·08	23·98	79·88	48·28
Holborn	58·03	77·74	12·16	14·69	20·70	28·05
Islington	30·40	19·23	9·24	5·65	15·26	8·12
Kensington	67·04	83·09	32·66	24·95	74·92	49·41
Lambeth	35·60	24·63	10·65	6·69	17·63	9·96
Lewisham	52·22	42·22	18·59	7·06	35·77	11·16
Paddington	53·26	55·84	24·00	17·56	46·65	30·81
Poplar	10·26	9·00	4·90	3·51	7·96	5·16
St Marylebone	51·15	80·78	23·99	26·15	46·02	49·22
St Pancras	32·35	30·66	10·10	9·39	15·90	13·89
Shoreditch	6·44	5·14	3·55	3·21	5·50	4·65
Southwark	14·25	8·64	4·88	5·06	7·33	7·17
Stepney	11·99	12·91	5·31	4·04	8·60	6·39
Stoke Newington	46·48	33·88	14·56	8·01	27·58	12·55
Wandsworth	56·32	49·43	17·84	8·43	34·44	14·11
Westminster	43·25	57·75	27·28	29·73	53·36	58·87
Woolwich	14·63	27·82	9·02	5·25	14·12	7·78

* The figures for 1901 include the Boroughs of Deptford and Greenwich together.

With regard to (d), the proportional rates for the general labourers, Heron's figures appeared to be unduly low and did not tally with the absolute figures given in the *Census Reports* of 1901. After various tests I found that this index is really the number of general labourers *aged* 25 *years and over per cent of the occupied males at the same ages*. In its place I have used for 1931 the numbers of "General Labourers (so described)", "Labourers (so described)", "Rag, Bone, Bottle, etc., Sorters", and "Costermongers and Hawkers" (items Nos. 721, 918, 920 and 930 in the Occupation Tables of the 1931 *Census*) per 1000 occupied males at ages 15 and upwards and have termed this index: "Poorly occupied men per 1000 occupied males." Index (e), the number of pawnbrokers, general dealers, etc., could not be calculated for 1931, as the classifications in the Occupation Tables have changed too considerably. Index (f) also could not be calculated, as after the passing of the Education Act of 1921 it became incumbent on all parents and guardians to send their children and wards to school between the ages 5 to 14 years and no child below the age of 12 years could be employed (as labour hands), and at ages 12–14 not within school hours. The indices under (d) are shown in Table VI.

For "thriftlessness and poverty" Heron calculated (g) the percentage of

Table VI

Metropolitan Boroughs	Percentage of total population living more than two in a room		General labourers aged 25 and over per 1000 occupied males aged 25 and over in 1901	Poorly occupied men per 1000 occupied males in 1931
	1901	1931		
Battersea	10·88	11·92	57·7	83·25
Bermondsey	19·67	21·82	90·5	91·28
Bethnal Green	29·62	23·62	46·9	69·17
Camberwell	9·64	10·44	33·2	58·38
Chelsea	14·43	10·24	61·9	68·72
Deptford*	8·69	10·97	87·9	113·72
Finsbury	35·21	29·42	43·3	70·65
Fulham	10·85	10·54	53·7	62·79
Greenwich	—	11·09	—	122·86
Hackney	10·18	9·63	30·3	43·54
Hammersmith	11·75	10·16	69·0	70·10
Hampstead	6·36	4·13	22·9	24·27
Holborn	25·04	17·14	67·2	38·05
Islington	17·00	15·99	34·0	46·64
Kensington	14·84	12·61	51·1	65·48
Lambeth	12·22	10·56	46·9	49·56
Lewisham	2·68	4·09	42·9	43·30
Paddington	13·57	12·30	28·9	44·68
Poplar	16·41	20·09	105·4	135·37
St Marylebone	21·12	13·14	44·5	48·17
St Pancras	23·98	17·61	32·4	48·38
Shoreditch	29·95	29·13	47·8	77·05
Southwark	22·35	21·62	76·2	82·36
Stepney	33·21	23·55	70·8	72·95
Stoke Newington	5·53	6·56	12·8	24·84
Wandsworth	4·45	5·19	43·8	41·86
Westminster	13·04	7·12	33·8	30·21
Woolwich	6·59	5·66	102·5	91·95

* 1901 figures for Deptford are the combined figures for Deptford and Greenwich as worked out by Heron.

the population in each borough living more than two in a room and (*h*) the number of deaths under 1 year per 1000 live births. The same measures have been calculated from the census figures for 1931 and the Registrar-General's *Reports* for 1930–2. The overcrowding index is given in Table VI and the infant mortality rate in Table VII. It will be observed that the latter has fallen by over 50 per cent in the 30 years in nearly all the boroughs, and in some by approximately two-thirds.

It would be of interest to see how far this reduction of mortality has been uniform throughout the first year of life. Cruickshank (1930), whilst investigating infant mortality, observed: "It is a significant fact that the death-rate in the earliest weeks of life has been very little affected during the period of falling infant death-rate with the introduction of active ameliorative measures in this country." These neo-natal mortality rates, taking the unweighted averages of the annual rates in 1930, 1931 and 1932, have been calculated for the London boroughs and are shown in Table VIII. In recent years they show that of the total deaths under 1 year about 40 per cent (the unweighted mean of all the Metropolitan Boroughs is 39·7) occurs in the first 4 weeks of life and the remaining 60 per cent in the ensuing 11 months. The mortality at 1–12 months is probably the better measure of environmental conditions.

Table VII

Deaths under 1 year per 1000 live births

Metropolitan Boroughs	1901	1930–2 Actual	1930–2 Expressed as percentages of 1901 figures
Battersea	163	56·52	34·67
Bermondsey	169	59·34	35·11
Bethnal Green	153	72·25	47·22
Camberwell	142	57·43	40·44
Chelsea	138	44·58	32·30
Deptford*	138	59·52	—
Finsbury	142	71·79	50·56
Fulham	152	60·88	40·03
Greenwich	—	64·10	—
Hackney	135	54·57	40·42
Hammersmith	168	66·12	39·36
Hampstead	104	57·61	55·39
Holborn	124	78·66	63·44
Islington	140	66·45	47·46
Kensington	163	80·38	49·31
Lambeth	139	58·07	41·78
Lewisham	129	48·80	37·83
Paddington	136	90·52	66·56
Poplar	165	64·68	39·20
St Marylebone	107	70·94	66·30
St Pancras	154	65·79	42·72
Shoreditch	197	72·77	36·94
Southwark	168	63·32	37·69
Stepney	163	71·88	44·10
Stoke Newington	115	54·22	47·15
Wandsworth	132	59·35	44·96
Westminster	135	66·95	49·59
Woolwich	129	53·46	41·44

* In 1901 the Deptford and Greenwich Boroughs were combined.

Table VIII

Rates of mortality per 1000 live births 1930–2

Metropolitan Boroughs	Neo-natal deaths (under 4 weeks)	Death from 4 weeks to 12 months	All deaths under 1 year*	Neo-natal deaths as percentage of all deaths under 1 year
Battersea	25·67	31·00	56·67	45·29
Bermondsey	23·00	36·33	59·33	38·76
Bethnal Green	23·00	49·33	72·33	31·80
Camberwell	22·34	35·33	57·67	38·74
Chelsea	15·34	29·33	44·67	34·34
Deptford	23·00	36·67	59·67	38·55
Finsbury	26·00	46·67	72·67	35·78
Fulham	22·67	38·33	61·00	37·16
Greenwich	23·67	41·00	64·67	36·60
Hackney	20·67	34·00	54·67	37·81
Hammersmith	31·33	34·67	66·00	47·47
Hampstead	30·33	27·33	57·67	52·61
Holborn	30·33	48·00	78·33	38·72
Islington	25·00	41·67	66·67	37·50
Kensington	24·33	56·67	81·00	30·04
Lambeth	26·00	31·67	57·67	45·08
Lewisham	23·00	26·67	49·67	46·31
Paddington	31·67	59·00	90·67	34·93
Poplar	25·34	39·67	65·00	38·97
St Marylebone	24·33	47·33	71·67	33·96
St Pancras	23·67	42·00	65·67	36·04
Shoreditch	22·00	51·33	73·33	30·00
Southwark	23·00	40·33	63·33	36·32
Stepney	24·00	47·33	71·33	33·65
Stoke Newington	28·67	25·67	54·33	52·77
Wandsworth	28·34	31·33	59·67	47·49
Westminster	32·33	35·00	67·33	48·02
Woolwich	24·67	29·00	53·67	45·97

* These rates differ slightly from those given in Table VII, as the former were weighted averages and the present rates are unweighted averages for the 3 years.

8–2

As a further measure of health conditions Heron selected the death-rate from phthisis, which "largely marks unhealthy occupations, bad housing and poor general environment"; this is probably as true to-day as it was at the beginning of the century in spite of the general heavy fall in mortality from this cause. The male and female death-rates at ages from phthisis per 100,000 of each of the sexes separately have been calculated and standardized for the years 1930–2. The corresponding figures for cancer have also been computed and both sets of rates are shown in Table IX. For the year 1901 Heron calculated only the crude death-rates and his figures have been omitted from the table for reasons stated later. He used the cancer mortality as a contrast to the phthisis mortality, the former being "a disease not *a priori* so closely related to insanitary conditions and general degeneracy".

Table IX

Standardized rates of mortality per 100,000 in 1930–2*

Metropolitan Boroughs	Phthisis		Cancer	
	Male	Female	Male	Female
Battersea	110·0	65·4	184·6	145·6
Bermondsey	138·1	89·7	189·0	160·8
Bethnal Green	131·6	73·6	169·9	152·3
Camberwell	114·0	65·2	158·8	151·5
Chelsea	113·9	58·5	173·1	167·6
Deptford	111·3	77·7	174·8	156·2
Finsbury	150·5	80·5	167·1	163·8
Fulham	112·9	61·4	162·5	150·8
Greenwich	126·4	59·6	166·9	156·4
Hackney	89·3	58·9	163·0	158·3
Hammersmith	118·2	63·6	162·8	160·8
Hampstead	53·2	27·9	170·2	157·3
Holborn	104·7	63·0	197·9	175·3
Islington	102·0	68·2	178·4	147·0
Kensington	99·1	43·6	161·4	151·3
Lambeth	108·4	65·7	176·2	150·6
Lewisham	76·0	56·9	146·8	148·5
Paddington	94·9	51·3	179·2	153·1
Poplar	114·8	71·6	188·3	127·1
St Marylebone	102·8	46·0	182·0	156·7
St Pancras	107·9	59·1	187·3	174·1
Shoreditch	118·1	72·9	187·2	135·5
Southwark	155·0	78·6	186·0	153·7
Stepney	138·0	62·2	192·9	179·2
Stoke Newington	121·3	53·4	157·1	162·5
Wandsworth	91·0	54·7	139·9	144·5
Westminster	102·0	41·0	169·2	132·8
Woolwich	116·1	81·8	166·1	136·1

* Standardized by the direct method, the male and female population of England and Wales in 1931 being taken as standards for the males and females respectively.

As a final index of poor conditions of living Heron turned to pauperism and calculated the proportion of persons in each area relieved on the 1st January 1901, though he regarded this as an unsatisfactory measure of the state of affairs even at that date. Owing to the economic depression this measure would be of very little value for the years 1930–2, and it has been excluded from this study.

Such then are the measures of fertility and the measures of social status that Heron adopted and that I, *mutatis mutandis*, have also taken. The average of each index for all the Metropolitan Boroughs, together with its standard error, is shown in Table X.

Table X

	1931		1901	
Index	Mean	S.E.	Mean	S.E.
Legitimate births per 1000 married women aged 15–54	8·61	0·29	18·01	0·57
Professional men per 1000 occupied males	35·26	4·99	34·56	3·75
Female domestic servants per 100 females	10·31	1·57	13·34	1·68
Female domestic servants per 100 families	18·01	3·20	25·17	3·88
Poorer occupations per 1000 occupied males	64·99	5·21	—	—
General labourers 25 years and over per 100 occupied males	—	—	5·33	0·45
Number per 100 of population living more than 2 in a room	13·80	1·33	15·90	1·70
Infants dying under 1 year per 1000 live births	63·96	1·85	144·44	3·97
Infants dying at 1–12 months per 1000 live births	39·02	1·68	—	—
Neo-natal deaths per 1000 live births	25·13	0·85	—	—
Male death-rate from phthisis (standardized) per 100,000	111·48	3·92	—	—
Female death-rate from phthisis (standardized) per 100,000	62·57	2·51	—	—
Male death-rate from cancer (standardized) per 100,000	172·81	2·57	—	—
Ditto females per 100,000	153·91	2·28	—	—
Mean age of wives aged 15–54 years	38·10	0·09	36·90	0·09
Children aged 2–4 years per 100 wives aged 15–54	24·26	0·94	54·46	1·37
Ditto for children aged 5–14 years	89·74	3·46	122·00	2·66
Ditto for children aged 13–15 years	25·66	0·86	35·88	0·58

THE ASSOCIATION BETWEEN FERTILITY AND SOCIAL CONDITIONS

The degree of association between the fertility rate and the various social and environmental factors has been measured by the calculation of coefficients of correlation. Comparison of the coefficients in 1901 and 1931 is made in Table XI. There is clearly still a high inverse relationship between the fertility

Table XI

	Correlation coefficient	
Characters with which the fertility rate has been correlated	1901	1931
Proportion of occupied males engaged in professional work	− 0·781	− 0·796
Proportion of domestic servants per 100 families	− 0·764	− 0·620
Proportion of female domestic servants per 100 females	− 0·802	− 0·633
Proportion of occupied males engaged in lowest type of labour	0·517	0·609
Proportion of population living more than 2 in a room	0·697	0·775
Male deaths from cancer (standardized) per 100,000 males	—	0·324
Female deaths from cancer (standardized) per 100,000 females	—	− 0·067
Male deaths from phthisis (standardized) per 100,000 males	—	0·654
Female deaths from phthisis (standardized) per 100,000 females	—	0·652

rates and the measures of "wealth and culture"; those boroughs with high proportions of general labourers and the like and with relatively high degrees of overcrowding were, on the average, the most fertile; those boroughs with most professional men and a higher degree of comfort as measured by domestic

service had the lowest fertility. The values of the coefficients have not changed materially in the 30 years' interval, though taking the occupational indices as the best criteria of social distinctions there is a suggestion that the association of these with fertility has become a little closer. In spite of the enormous decline in fertility in the years of this century wide differences still existed in London in 1931, and the conclusion arrived at by Newsholme & Stevenson (1906) 30 years ago that "among the rich in London the prevention of child-bearing is more systematically and largely practised than amongst the very poor" appears still true to-day. On the other hand, the proportional *decline* in fertility does not differ greatly between the boroughs (*vide* Table I) and therefore can show no clear relationship with the measures of social status. I have not worked this out in detail, but Douglas & McKinlay (1935) report "that one of us did correlate the rate of decline in the birth-rate between 1911 and 1926 with certain indices of social status (similar to those used by Heron) and failed to find appreciable relationship. That is to say, so far as concerns the period and the districts investigated (Metropolitan Boroughs), the decline in the birth-rate had taken place to the same extent relatively in the districts of high and low social status". The rate of decline being roughly equivalent in the different boroughs, it follows that the initial differences in fertility apparent in 1901 must still be of the same relative magnitude in 1931.

The number of female domestic servants per 100 females or per 100 families exhibits a rather lower degree of association with fertility in recent years than it did in 1901. As was pointed out previously, the index is probably a less satisfactory measure of social status than it was 30 years ago.

Between overcrowding and the fertility rate the degree of association was much the same in 1931 as it was in 1901. Still the parents under unhealthy conditions of living contribute a greater number of children to the population.

The fertility rate was correlated separately with the male and female standardized death-rates from phthisis. The coefficients are identical for the sexes and show a high fertility rate associated on the average with a greater mortality rate from phthisis. Heron, working with the crude death-rate from this disease, found the same amount of association in 1901. As regards cancer the 1931 figures suggest some, though doubtfully significant, amount of correlation between fertility and the male mortality rate. This is partly due to the fact that men of lower social status are not only more liable to suffer from cancer of the industrial types but, as the Registrar-General has shown, there is an increase of cancer of certain sites as one goes down the social scale (1921–3 Occupational Supplement). Between the female cancer death-rate and fertility no correlation is found in 1931. On the other hand Heron, using the *crude* cancer death-rates, found coefficients of -0.156 between the male rates and fertility and -0.535 between female rates and fertility. He observed that "these results seem to indicate that the conditions of prosperity and culture which lead to a low birth-rate also conduce to a high cancer death-rate". Brown & Mohan Lal (1914) pointed out that this inference was not justified. When in

place of the crude death-rates used by Heron they substituted standardized death-rates, very little association between cancer mortality and measures of social status was to be seen. Their analysis of the 1901 figures gave much the same result as I reach with the 1931 data, the comparison being set out in Table XII.

Table XII

Characters with which the standardized death-rate from cancer for each of the sexes has been correlated	Correlation coefficient between standardized death-rate and other factors			
	1901		1931	
	Male	Female	Male	Female
Proportion of occupied males engaged in professional work	0·049	0·283	−0·143	0·149
Proportion of occupied males engaged in lowest type of labour	—	—	0·276	−0·242
Proportion of domestic servants per 100 families	0·020	0·093	−0·040	0·048

Heron in his report remarked that "where there is greatest poverty, greatest drunkenness, least thrift, there the carelessness of the child life is greatest and there the infant mortality reaches its highest proportions". As evidence he showed appreciable correlation between infant mortality and his various social indices. Newsholme (1910) concluded that: "It is unnecessary to labour the point that infant mortality is highest amongst the poor and lowest among the well-to-do. The comparative statistics of the wards of any large town, or of the divisions of any scattered district prove this.... The difference is not solely one between poverty and ease of circumstance *per se*. If it were so, the infant death-rate in Ireland and still more so in Norway should be much higher than England and Wales.... The difference in main is due to certain removable evils, which are commonly associated with poverty in this country, and from which the well-to-do in a large measure escape."

Using the figures for 1930–2 I have computed the degree of correlation between infant mortality and the fertility rate and find no association; the correlation coefficient is 0·078, in contrast to Heron's positive correlation of 0·500 in 1901. I have already pointed out that neo-natal deaths form a considerable proportion of the total infant deaths. If these deaths within the first four weeks of life be excluded and the remainder be taken as a better index of social conditions, then there appears to be some, though a relatively small, association between infant mortality and fertility, the correlation coefficient being 0·288. From these results one would be inclined to conclude that the birth-rate has been reduced so much over this period of 30 years that infant mortality due to excessive births plays very little part to-day in swelling the number of the total deaths in infancy.

The infant mortality rates for 1930–2 were also correlated with some of the social indices of the boroughs, but no association was found. In place of the total infant mortality rate, the rate based on deaths at 1–12 months was used; the coefficients of correlation were −0·011 with the proportion of professional

men and 0·116 with proportion of men engaged in lowest types of labour. It seems that some of "the removable evils" of Newsholme associated with poverty have largely disappeared with the generally better sanitary and environmental conditions affecting child life (Table XIII), though there is still (as shown later) association between overcrowding and infant mortality. The neo-natal death-rates were also correlated with the indices of social status, and here some associations are suggested. The coefficients of Table XIV indicate a slightly higher risk to the child in the first 4 weeks of life in the wealthier classes of the society than among the poorer sections. These results are consistent with those obtained by many other investigators, e.g. Brend (1918), Bruce Murray (1924), Campbell (1929). The infant mortality rates were also correlated with the numbers of children (per 100 wives aged 15–54 years)

Table XIII

Characters correlated with the infant mortality rate	Deaths of infants under 1 year per 1000 live births		Deaths of infants aged 1–12 months per 1000 live births 1931
	1901	1931	
Fertility rate	0·500	0·078	0·288
Proportion of occupied males engaged in professional work	—	—	−0·011
Proportion of occupied males engaged in lowest type of labour	—	—	0·116
Children aged 2–4 per 100 wives aged 15–54	0·588	0·105	0·305
Children aged 5–14 per 100 wives aged 15–54	0·541	0·036	0·222
Children aged 13–15 per 100 wives aged 15–54	0·391	0·036	0·165

Table XIV

Characters with which the neo-natal deaths have been correlated	Coefficient of correlation 1931
Number of professional men per 1000 occupied males	0·280
Number of poorly occupied men per 1000 occupied males	−0·312
Number of domestic servants per 100 families	0·170
Percentage living more than 2 in a room	−0·191

aged 2–4, 5–14 and 13-15 years. Had the correlations been positive and significant the conclusion would follow that infant mortality was associated with net fertility, and Heron obtained large coefficients, 0·588, 0·541 and 0·391. The values I obtained were quite insignificant: 0·105, 0·036 and 0·036. When, however, neo-natal deaths were excluded, i.e. the rate of mortality was based upon deaths in the first year of life after the first month, distinctly higher values were reached, 0·305, 0·222 and 0·165, which, although still smaller than those Heron obtained, are of the same order of magnitude.

Some further attention has been given to the question of overcrowding. The index of overcrowding adopted was, it will be remembered, the percentage of the population living more than two in a room. The mean figure for all the Metropolitan Boroughs was 15·90 per cent in 1901 and 13·80 in 1931. These means are not significantly different. The relation between overcrowding and fertility has already been discussed and a high association between the two was

apparent. When correlated with infant mortality overcrowding showed a fair degree of association, there being a positive correlation coefficient of 0·484. When the neo-natal deaths were excluded an increase in the degree of association was found, for the coefficient then became 0·631. The overcrowding index was then correlated with the standardized male and female death-rates from phthisis and, as one would expect, in each sex a fairly high degree of relationship was found, the coefficients being 0·681 and 0·562 respectively. The male and female standardized death-rates from cancer were also compared with the overcrowding index. In the males quite a high correlation, 0·617, was found; in females little association, 0·159, could be discovered. (Table XV.)

Table XV

Characters with which the overcrowding index has been correlated	Correlation coefficient 1931
Male death-rate from cancer (standardized)	0·617
Male death-rate from phthisis (standardized)	0·681
Female death-rate from cancer (standardized)	0·159
Female death-rate from phthisis (standardized)	0·562
Number of children under 1 year dying per 1000 live births	0·484
Number of children aged 1–12 months dying per 1000 live births	0·631

Heron laid great stress on the mean age of wives aged 15–54 as related to the various social and environmental factors. The figures for the different Metropolitan Boroughs for the years 1901 and 1931 are given in Table IV. The mean age of wives in the fertile age groups has increased from 36·90 to 38·10 in 30 years (a significant increase). Unless the other relevant factor, the age at marriage, is known the effect of this increase on fertility cannot be assessed. This mean age of wives aged 15–54 in 1931 was correlated with other social indices and the results are set out in Table XVI. Heron's results indicated that the greater the mean age of the wives, the lower was the fertility rate. The figures for 1931 show very little change in these 30 years. In 1901 the coefficient was −0·834, in 1931 it was −0·757. The relation between the mean age of the wives and the number of domestic servants, either per 100 females or 100 families, indicates that in areas where more domestic servants are employed the average age of wives is higher. The corresponding figures for 1901 are considerably higher, probably owing to the decline in the employment of

Table XVI

Characters with which the mean age of the wives aged 15–54 is correlated	Correlation coefficient	
	1901	1931
Number of legitimate births per 100 wives aged 15–54	−0·834	−0·757
Number of domestic servants per 100 females	0·815	0·483
Number of domestic servants per 100 families	0·823	0·498
Proportion of occupied males engaged in professional work	0·768	0·548
Proportion of occupied males engaged in lowest type of labour	−0·455	−0·253
Percentage of population living more than 2 in a room	−0·607	−0·368
Standardized death-rate from cancer per 100,000 females	—	0·056

domestic servants at the present day as suggested earlier in the text. As would be expected, a positive correlation with mean age of wives and professional men (0·548) and a negative one with the proportion of men engaged in lowest type of labour (−0·253) were also found. These coefficients are in keeping with the 1901 figures but on a lower level.

Heron attempted by means of partial correlation coefficients to find out, in fact, how far the mean age of wives had any influence on the amount of relationship that he had found between the birth-rate and his various social indices. Similar coefficients have been computed for 1931 and are given in Table XVII together with Heron's figures for 1901. At both dates the partial correlation coefficients show that the mean age of wives had a considerable effect upon the level of the birth-rate, but was not the whole explanation of the original correlations between fertility and social conditions. Apart from the lower fertility due to increased age at marriage, other factors were also active. Either there existed a lower procreative power, a "lessened exercise of fertility" or a "deliberate restraint of fertility". Comparison of the partial coefficients at the two dates suggests that in 1931 the differences in fertility between the boroughs were indeed less dependent upon differences in the mean age of wives than they were in 1901. When the mean age is kept constant the resulting coefficients are uniformly higher than those observed in 1901.

Table XVII. *Effect of mean age of wives on the coefficient of correlation between fertility and social conditions*

Characters with which the fertility rate is correlated keeping the mean age of wives constant	Correlation coefficients 1901		Correlation coefficients 1931	
	Total	Partial	Total	Partial
Domestic servants per 100 females	−0·802	−0·383	−0·633	−0·468
Domestic servants per 100 families	−0·764	−0·248	−0·620	−0·430
Professional men per 1000 occupied males	−0·781	−0·400	−0·796	−0·699
Poorly occupied men per 1000 occupied males	0·517	0·280	0·609	0·661
Percentage living more than 2 in a room	0·697	0·436	0·775	0·817

DISCUSSION OF RESULTS

I have now described the detail of my repetition of Heron's investigation. How far do the data of 1931 bear out the conclusions Heron drew from those of 1901?

In the first place we may exclude the statistical associations of cancer mortality. Heron by inadvertence used an unsuitable measure; using a more appropriate measure my results are simply in line with those deduced from more ample data by the Registrar-General.

Passing to the associations of fertility, the results for 1931 are in general agreement with those for 1901. I have found, as Heron found, that indices of, to put it at the lowest, economically unenviable social status are substantially correlated with fertility. Therefore, in so far as these indices do define socially

undesirable elements, undesirable social elements are contributing more than their proper share to the coming generation. I guard myself explicitly from asserting that these indices are perfect measures of group qualities.

So far there is statistical concordance between the 1931 and the 1901 results. When we turn to the correlates of infant mortality, we find distinct contrasts between contemporary experience and that of 30 years ago. The mortality of the first year of life as a whole is no longer correlated with fertility and, although correlation between fertility and the mortality of the 2nd to 12th months of the first year of life probably exists, its magnitude has been substantially reduced. Infant mortality, again, is no longer correlated with the ratio of older children to wives, or with the proportions of men occupied in professional or low-grade work. In other words, infant mortality is perhaps ceasing to be so sensitive a measure of unfavourable social conditions. As an offset, however, it is still sensibly associated, especially the mortality, from the 2nd to 12th months, with the degree of overcrowding.

This latter index continues to keep very bad company, but that fact has been verified on much more extensive material by both official and unofficial statisticians.

On the whole it may perhaps be said that the colours of the picture are not very different from those of Heron. Its interpretation will vary with the critic.

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