Papers and Originals

Immigration—a New Social Factor in Obstetrics

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In the past, immigrants into Britain generally came to escape political or religious persecution in Europe, though more recently they have come in search of employment. The influx of Irish labour into industrial Britain began in the late eighteenth century (Jackson, 1963) and is now accepted without comment, but the past 10 years has seen an increase in the entry of non-European immigrants from the Commonwealth. Ever since the abolition of slavery in 1834 West Indians have gone in search of work to the United States, but in 1952 the MacCarron-Walter Act limited entry into that country from the British islands (Bertram, 1962). As a result increasing numbers of West Indians have come to Britain.

The part of south London shown in Fig. 1 provided 80% of the obstetric patients at Lambeth Hospital in the period 1958-60. This district includes a stable Irish population as well as one of the main areas of West Indian settlement (Glass and Pollins, 1960, p. 31). These patients have been studied retrospectively to compare the obstetric behaviour of the immigrant groups with that of the indigenous population.
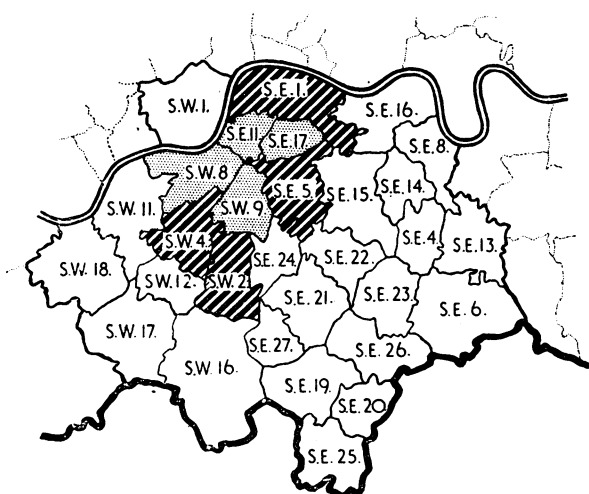

Areas each supplied 10% or more of the patients

Areas each supplied 5-9% of the patients. The remaining 20% came mainly from other S. London areas.

FIG. 1.—Map showing the source of 80% of patients delivered at Lambeth Hospital during 1958-60.

The Survey

Selected items of data were transferred to coding sheets and thence to punched cards from the case records of the 6,025 patients delivered at Lambeth Hospital between 1 January 1958 and 31 December 1960. The abstraction of data was done by a graduate research assistant according to a comprehensive set of instructions provided by one of us (S. L. B.), who also personally scrutinized all points of difficulty. Subsequently the punched cards were processed on tabulating machinery at the South Metropolitan Cancer Registry, Sutton, and on the Orion computer at Rothamsted Experimental Station, Harpenden. Information (for the most part on maternal height) was incomplete for 170 patients, many of whom were admitted to hospital as emergency cases. Seventy-three patients had a twin pregnancy ; they have been included in the section of the paper describing the composition of the sample but have otherwise been excluded.

Four nationality groups have been considered in the analysis—namely, British, West Indian, Irish, and a miscellaneous group termed "other nationalities." The population of the British West Indies is of mixed racial origin, the greater part being of West African stock (Ruck, 1960) but no attempt has been made to distinguish between ethnic groups within the West Indian sample. The other-nationalities group consists of Cypriots, and women from Continental Europe and the Commonwealth. It is so heterogeneous that in nationality comparisons it has been regarded as a residual group of no special interest.

Composition of the Sample

Table I shows that the annual number of deliveries rose during the survey period and that West Indian patients formed an increasing proportion of the total.

TABLE I.—*Composition of the Sample by Nationality in Each of the Three Years of the Survey (Numbers and Percentages of All Patients)*

Nationality	1958		1959		1960		Total	
	No.	%	No.	%	No.	%	No.	%
British	1,222	67·5	1,282	64·3	1,436	64·6	3,940	65·5
West Indian	240	13·3	290	14·5	369	16·6	899	14·9
Irish	201	11·1	247	12·4	241	10·9	689	11·4
Other	147	8·1	175	8·8	175	7·9	497	8·2
All nationalities	1,810	100·0	1,994	100·0	2,221	100·0	6,025	100·0

Marital Status.—About 35% of West Indian patients were unmarried at the time of booking, in comparison with 11.1% of the British and 9.6% of the Irish women. Corresponding figures for the County of London for the years 1959 and 1960 were 10.4 and 11.4% respectively (London County Council, 1959, 1960).

Social Class.—There was a much higher proportion of patients from the semi-skilled and unskilled social classes among the two major immigrant groups than among the British (Table

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II). The social classification of the West Indian immigrants must be accepted with some reserve because many accept jobs less skilled than those they would have been doing in their own country (Glass and Pollins, 1960).

TABLE II.—*Social Class Structure of the National Groups (Percentages of All Patients)*

* Nationality	Social Class				Total
	A	B	C	Other	
British	8·2	48·1	36·3	7·4	100·0
West Indian	3·8	22·0	65·5	8·7	100·0
Irish	3·9	37·2	54·4	4·5	100·0
Other	16·9	32·5	45·7	4·9	100·0
All	7·7	41·7	43·4	7·2	100·0

A is equivalent to Registrar-General's Classes I and II (General Register Office 1960).
B is equivalent to Registrar-General's Class III.
C is equivalent to Registrar-General's Classes IV and V.
Other—includes unemployed ; members of armed Forces ; occupation obscure.

Age and Parity.—Only 19% of the West Indians were having their first infant as compared with 40% of the British and the Irish (Table III). The age distribution of the West Indian primiparae was very similar to that of the British, but the Irish primiparae were older on the average (Fig. 2).
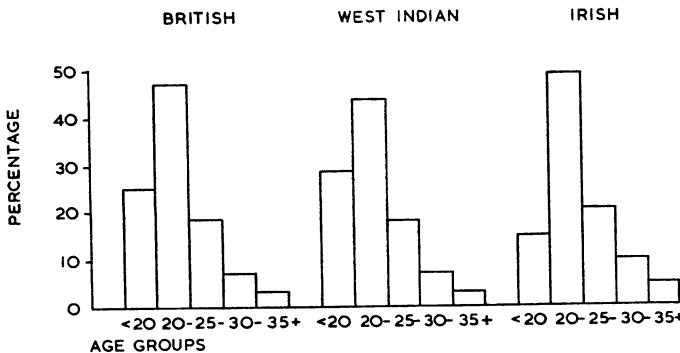

FIG. 2.—Age Distribution of primiparae.

TABLE III.—*Parity Structure of the National Groups (Parity is Defined as the Number of Previous Viable Infants) (Percentages of All Patients)*

Nationality	Parity			Total
	0	1–3	4+	
British	39·8	52·9	7·3	100·0
West Indian	19·3	63·3	17·4	100·0
Irish	40·2	52·5	7·3	100·0
Other	39·7	55·1	5·2	100·0
All	36·9	54·6	8·5	100·0

Maternal Height.—The well-established association between social class and maternal height (Baird and Illsley, 1953) was apparent in the present data, but there were also differences between the nationality groups which were consistent within all social classes (Table IV). The British women were on the average 0.7 in. (1.78 cm.) taller than the Irish women, with the West Indians in between.

Antenatal Care.— Table V shows that the quality of antenatal care was similar for each of the main nationality groups.

TABLE IV.—*Mean Maternal Height in Inches in Relation to Nationality and Social Class (All Patients)*

Social Class	Nationality				Mean
	British	West Indian	Irish	Other	
A	64·0	63·2	63·1	62·4	63·6
B	62·4	62·2	61·9	61·0	62·3
C	62·3	62·1	61·7	60·7	62·1
Other	62·4	62·3	61·8	61·1	62·3
Mean	62·5	62·2	61·8	61·1	62·3

TABLE V.—*Quality of Antenatal Care in Relation to Nationality of Patient (Percentages of All Patients)*

Quality of Antenatal Care	Nationality				Mean
	British	West Indian	Irish	Other	
Adequate	82·2	81·8	80·3	81·9	82·0
Poor	16·3	17·7	16·7	16·5	16·5
None	1·5	0·5	3·0	1·6	1·5
Total	100·0	100·0	100·0	100·0	100·0

Adequate = Regular attendance at an antenatal clinic since before 36 weeks.
Poor = Good attendance at an antenatal clinic after 36 weeks or very irregular attendance throughout.
None = Emergency admission.

Results of the Survey

Some Diseases Complicating Pregnancy (Table VI)

Uterine Fibroids.—Uterine fibroids, which occur more often in negresses than in white women (Haines and Taylor, 1962), were three times as common among the West Indian patients as among the British.

Pulmonary Tuberculosis.—A chest x-ray examination was part of the routine antenatal care at Lambeth Hospital. Among the survey patients pulmonary tuberculosis was diagnosed most frequently in the Irish (2.7%) and least frequently in the West Indians (0.3%), a nationality trend already noted by Springett et al. (1958) in Birmingham, and Davies (1963) in St. Pancras, London.

TABLE VI.—*Percentage Incidence of Certain Diseases During Pregnancy (Single Births Only)*

Disease	Nationality				Mean
	British	West Indian	Irish	Other	
Uterine fibroids	0·87	2·60	0·59	1·62	1·16
Pulmonary tuberculosis:					
Quiescent	1·49	0·34	1·78	1·41	1·35
Active	0·36	—	0·89	0·20	0·35
Positive Wassermann reaction (all causes)	0·15	5·10	0·15	0·40	0·91
Other types of venereal disease	0·15	0·34	0·15	0·20	0·19
No. of patients at risk	3,886	883	675	495	5,940

Venereal Disease.—Patients with positive serological tests for syphilis were investigated at the Venereal Diseases Clinic, St. Thomas's Hospital ; some other patients were already known to be attending this clinic. There was an extremely high incidence (5.1%) of positive Wassermann reactions among the West Indian patients. The significance of this figure is difficult to assess because of the frequent occurrence of yaws in children in the West Indies (Ruck, 1960).

Anaemia.—A haemoglobin estimation was done at the patient's first attendance and was repeated twice during pregnancy, usually around the 28th and 34th weeks. All patients were encouraged to take an oral iron preparation. Those who developed anaemia (defined as less than 10 g. of haemoglobin per 100 ml. of blood) were more extensively investigated and were appropriately treated with parenteral iron or folic acid. Sixteen per cent of the British women were anaemic at some time during pregnancy compared with 20% of the West Indians and 21% of the Irish. The difference between the British and the immigrant groups is small but statistically significant (0.01>P>0.001).

Complicated Pregnancy

Essential Hypertension, Pre-eclamptic toxaemia, and Eclampsia.—Any patient with a diastolic blood-pressure of 90 mm. Hg or more up to the 26th week of pregnancy, or with a past history of elevated blood-pressure, was considered to have essential hypertension. Under this definition essential hypertension was diagnosed more often in the British and Irish than

in the West Indians (P<0.05) (Table VII). Pre-eclamptic toxaemia was diagnosed whenever a patient presented two or more of the cardinal features of that disorder—namely, a diastolic blood-pressure of 90 mm. Hg or more (recorded on at least two occasions after the 26th week of pregnancy), albuminuria, or oedema not due to a local cause. Among both primiparae and multiparae pre-eclamptic toxaemia was only one-third as common among the West Indians as among the British or Irish (Table VII). There was some evidence from the survey that pre-eclamptic toxaemia in the West Indians was more often of a fulminating type than in the British or Irish. The difference was not statistically significant, but the numbers were small and further clinical experience by one of us (S.L.B.) since the survey has strengthened the impression of a nationality difference. Four out of a total of 17 cases of eclampsia occurred in West Indians (Table VII). There was no significant difference in the nationality incidence of any form of antepartum haemorrhage.

TABLE VII.—*Percentage Incidence of Essential Hypertension, Pre-eclamptic Toxaemia, and Eclampsia in Relation to Maternal Nationality (Single Births Only) (Numbers of Patients Affected Shown in Parentheses)*

Disorder	Nationality				Mean
	British	West Indian	Irish	Other	
Essential hypertension	4·1 (158)	2·5 (22)	4·7 (32)	1·8 (9)	3·7 (221)
Pre-eclamptic toxaemia:					
Primiparae ..	12·4 (192)	4·1 (7)	14·6 (40)	12·7 (25)	12·1 (264)
Multiparae ..	6·8 (160)	2·9 (21)	6·0 (24)	4·4 (13)	5·8 (218)
Mean ..	9·1 (352)	3·2 (28)	9·5 (64)	7·7 (38)	8·1 (482)
Eclampsia	0·18 (7)	0·45 (4)	0·44 (3)	0·61 (3)	0·29 (17)

Labour

Duration of the Second Stage of Labour.—Fig. 3 shows that, on average, the West Indian primiparae had a far shorter second stage of labour than either the British or the Irish. A second stage of labour prolonged for more than 90 minutes occurred among 18% of the Irish primiparae and parallels the high forceps rate in the patients of that nationality (cf. forceps delivery). The nationality differences in the duration of the second stage of labour were also apparent among multiparae: 41% of the West Indian multiparae had a second stage of labour shorter than 10 minutes compared with 23% of the British and 22% of the Irish. The duration of the second stage of labour was also related to maternal age and infant birth-weight. The proportion of primiparae having a long second stage (more than 90 minutes) doubled as maternal age increased from under 20 to over 29 years and similarly as infant birth-weight increased from up to 5½ lb. (2,500 g.) to over 8 lb. (3,630 g.). Inspection of multi-way tables showed that the nationality differences already described do not merely reflect the effects of maternal age and infant birth-weight.

Episiotomy and Perineal Tears.—All patients delivered by forceps or caesarean section were excluded from this analysis.
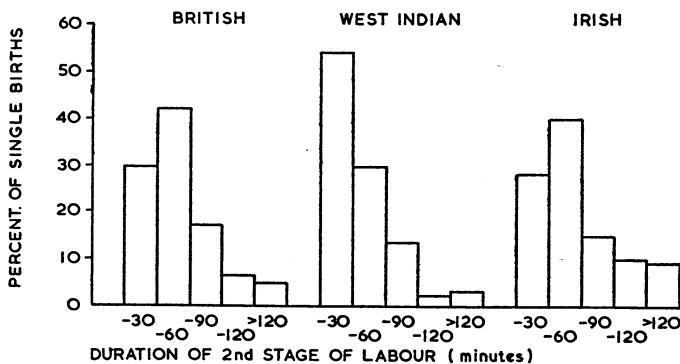

FIG. 3.—Duration of second stage of labour in primiparae.

The incidence of intact perineum after delivery in primiparae fell with increasing maternal age: from 40% in those aged 19 or less to 20% in those aged 30 or over. Nearly 70% of multiparae escaped perineal injury, and age made very little difference. In general the lighter the infant the more likely was the mother to escape perineal injury (Fig. 4). An exception occurred with birth-weights between 3½ and 5½ lb. (1,590 and 2,500 g.), where episiotomy was done to prevent injury to the foetal head. The West Indian patients, both primiparae and multiparae, had a far higher incidence of intact perineum after delivery than either the British or the Irish (Table VIII). Analysis of these results by fitting constants to multi-way tables (see Appendix) has shown that the nationality difference is not accounted for by the effects of maternal age and infant birth-weight.
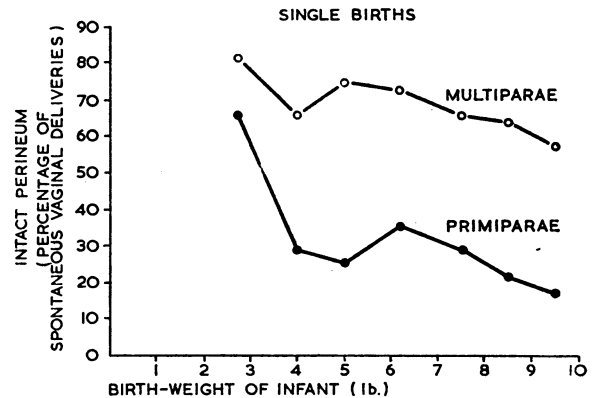

FIG. 4.—Intact perineum after delivery in relation to infant birth-weight.

TABLE VIII.—*Differences Between the Nationality Groups in the Frequency of Intact Perineum After Delivery; Percentages of Spontaneous Vaginal Deliveries (Single Births Only)*

	Nationality				Mean
	British	West Indian	Irish	Other	
Primiparae	27·1	57·8	27·9	30·1	30·0
Multiparae	60·9	92·3	57·1	75·5	67·7

Forceps Delivery.—This was far less frequent among the West Indian primiparae (3.6%) than among the British (10.7%) or Irish (17.9%) but there were no important differences in the relative frequencies of the main indications for the operation. The frequency of forceps delivery in British and Irish primiparae was very strongly associated with maternal age (Table IX). This age trend was not apparent in the West Indians, but the patients were too few to assess the significance of this observation. The incidence of forceps delivery rose rapidly with increasing infant birth-weight but showed little relation to maternal height. Analysis of the forceps rates for the British and the Irish primiparae (by the method of fitting constants) showed that about 40% of the difference between them was explained by the greater age of the Irish and the heavier weight of their infants (cf. birth-weight).

TABLE IX.—*Relationship Between Forceps Delivery in Primiparae and Maternal Age and Nationality (Percentages of Single Births) (Numbers of Patients Delivered by Forceps Shown in Parentheses)*

Nationality	Age Groups				Mean
	≤19	20–	25–	30+	
British	5·4 (21)	7·3 (54)	17·9 (48)	28·2 (42)	10·7 (165)
West Indian ..	3·9 (2)	2·8 (2)	3·6 (1)	5·9 (1)	3·6 (6)
Irish	2·4 (1)	16·3 (22)	19·3 (11)	36·6 (15)	17·9 (49)
Other	3·5 (1)	8·8 (7)	13·6 (8)	27·6 (8)	12·2 (24)
Mean	4·9 (25)	8·3 (85)	16·5 (68)	26·8 (66)	11·2 (244)

Caesarean Section.—There were only 149 caesarean sections during the three years of the survey—too few for detailed analysis. Table X shows that the British patients overall had

a slightly lower caesarean section rate than either of the immigrant groups.

TABLE X.—*Caesarean Section in Relation to Maternal Nationality and Parity; Percentages of Single Births (Numbers of Patients Delivered by Caesarean Section Shown in Parentheses)*

		Nationality			
		British	West Indian	Irish	Other
Primiparae	.. ..	2·13 (33)	4·73 (8)	2·55 (7)	5·07 (10)
Multiparae	.. ..	2·22 (52)	2·80 (20)	4·48 (18)	0·34 (1)
Mean	.. ..	2·19 (85)	3·17 (28)	3·70 (25)	2·20 (11)

Abnormality of the Third Stage.—There was no significant difference between the nationality groups in the incidence of post-partum haemorrhage or retained placenta.

Perinatal Mortality

There were 196 stillbirths and first-week deaths during the three years of the study. The rates per 1,000 for the different nationality groups did not vary significantly, and were: British, 32.8, West Indian 35.0, Irish 31.0, others 30.8, and overall 32.9. Analysis of the perinatal mortality rates for the different nationality groups, taking into account variation in the representation of such factors as maternal age, parity, social class, and height, was precluded by the small amount of data. Approximate calculation, however, suggests that the crude perinatal mortality rates given above are not unduly biased.

Birth-weight

A detailed account of the analysis of the data on birth-weight will be recorded elsewhere (Barron and Vessey, in preparation), and only a summary of the main findings is given here. Fig. 5 shows the association between birth-weight and maternal nationality, social class, parity, and height. On the average Irish infants were 0.13 lb. (60 g.) heavier than British infants, which were in turn 0.18 lb. (81 g.) heavier than West Indian ones.

A statistical analysis (Barron and Vessey, in preparation) showed that the nationality differences in mean birth-weight are not explained by the unequal representation of the different birth ranks, social classes, and maternal heights within the nationality groups.
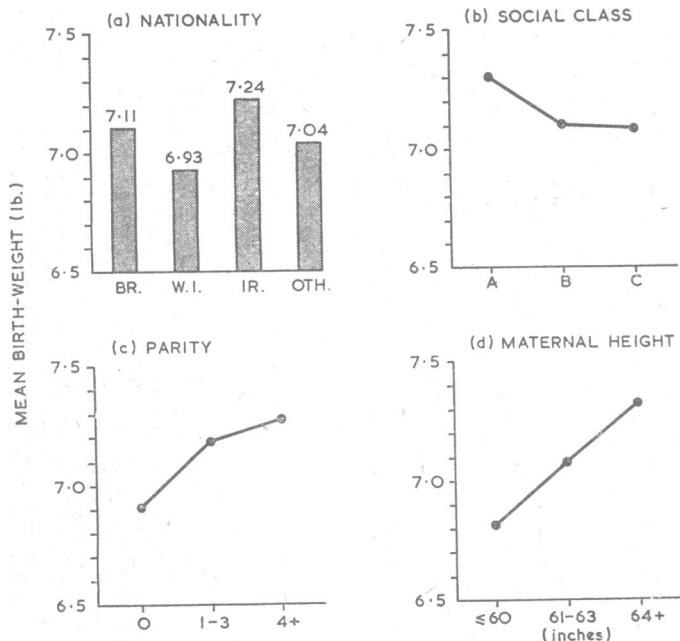

FIG. 5.—Factors associated with mean birth-weight (single births only).

Breast-feeding

A higher proportion of the West Indian patients were breast-feeding at the time of discharge from hospital than the British or Irish (Fig. 6), a nationality difference already noted by McEwan (1964) in Birmingham. West Indian women regard breast-feeding as a normal and fashionable procedure, and only about 2% refused to make any attempt to suckle their infant, compared with 11% of British and Irish women.
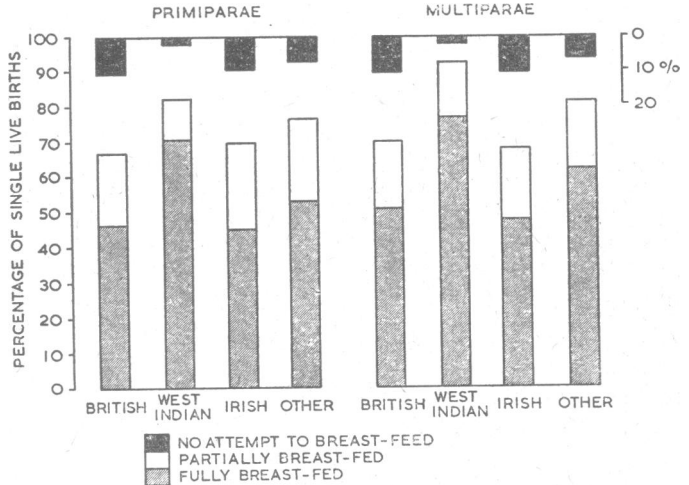

FIG. 6.—Nationality differences in breast-feeding at the time of discharge from hospital.

The older the mother the less likely was she to be breast-feeding at the time of discharge from hospital, but the nationality differences were almost unaltered after making allowance for the effect of this factor by the method of fitting constants.

Discussion

The selection of patients in accordance with the recommendations of the Cranbrook Committee (Ministry of Health, 1958) is an important reason why the survey sample is not entirely representative of the child-bearing population of the area shown in Fig. 1. Immigrant groups are themselves highly selected, because migrants tend to be the more energetic and mobile members of the community from which they come (Comas, 1960). Thus during the period from 1943 to 1951 70% of all female immigrants from Southern Ireland were under 25 (Jackson, 1963); 83% of immigrants from Jamaica in 1960 were aged 15 to 35 (Davison, 1962).

A difference in reproductive pattern between the immigrants in the present survey and their home community is shown by a comparison of ages at maternity (Table XI). In both the major immigrant groups in the present survey the age at maternity shows a trend towards the norm for London and

TABLE XI.—*Comparison of the Age at Maternity in Different Populations*

Population	Age				
	< 20	–24	–29	–34	35 +
Ireland*	1·6	13·6	26·0	27·9	30·9
Irish (present survey)	7·5	35·9	26·7	19·1	10·8
Jamaica, 1956†	16·5	31·0	24·5	15·5	12·4
West Indian (present survey) ..	8·7	33·4	29·1	17·9	10·9
London and South-East‡ ..	6·6	30·0	31·0	19·5	12·7
British (present survey) ..	12·6	37·5	25·0	14·1	10·8
Boroughs of Battersea. Lambeth, and Southwark§	40·7		47·1		12·2
Present survey	47·1		42·4		10·5
	11·0	36·1	26·7	15·7	10·5

* Central Statistics Office, Ireland (1960).   † United Nations (1960).
‡ Registrar-General (1962).   § Registrar-General (1965).

the South-east. The late average age at maternity in Ireland is due to economic factors and the strong disapproval of illegitimacy, which may itself be a reason for migration (Jackson, 1963).

Irish Immigrants

In comparison with the British, more of the Irish women in the survey were of low social class, of small stature, and had pulmonary tuberculosis or anaemia. The mean birth-weight of their infants was high, and this was partly responsible for the relatively high incidence of a prolonged second stage of labour and of forceps delivery.

It is impossible to compare the heights of the Irish patients in our survey with similar groups in Ireland because the relevant statistics are lacking.

West Indian Immigrants

The high percentage of unmarried mothers must be viewed in the light of the social pattern of the Caribbean. The Government of Jamaica recognizes the state of " common law union," in which a couple live together in a stable relationship without being married. The Jamaican census of 1943 showed that only 33% of mothers were legally married, and in 1956 71.9% of births in Jamaica were illegitimate (United Nations, 1960).

Compared with the British the West Indians were a little younger, and included a higher proportion of grande multiparae—two features consistent with their known high fertility (Waterhouse and Brabban, 1964).

An outstanding finding was the ease of delivery ; a short second stage of labour was associated with a very low incidence of forceps delivery and of perineal laceration. It is possible that some West Indian " primiparae " had had an infant before coming to this country, but the attitude of West Indian migrants towards sex and procreation is untinged by puritanism (Patterson, 1964), and there is no motive for concealing a previous illegitimate infant. The fact that for multiparae, as well as for primiparae, delivery was easier among the West Indians than among the British or Irish is further evidence that the nationality differences are real. Since these differences are not explained by variations in birth-weight, maternal stature, or age, they are probably due to ethnic factors.

In the period following this survey we were made aware that patients from rural areas in the Caribbean are prone to hookworm infestation (Miller and Bamforth, 1961), and we have since been able to demonstrate the ova in many West Indian patients suffering from anaemia. It is therefore a little surprising that there was not a greater nationality difference in the incidence of anaemia in the present survey (see Steingold, 1962).

Essential Hypertension and Pre-eclamptic Toxaemia

The difficulties of definition and classification are widely appreciated (Nelson, 1955 ; Baird, 1961), and the accuracy of our data must be tempered by the knowledge that they were obtained retrospectively. With this reservation, there was a large nationality difference in the incidence of pre-eclamptic toxaemia, which occurred only one-third as often in the West Indian patients as in either the British or Irish. Essential hypertension showed a similar but smaller nationality difference.

The evidence regarding the geographical distribution of hypertension and of pre-eclamptic toxaemia is conflicting. Environment and especially urbanization appear to be as important as genetic factors in determining the occurrence of hypertension. A recent comparison of the distribution of blood-

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pressures in Jamaicans and the Welsh showed that, among women in particular, the Jamaicans had the higher blood-pressures overall. There was, however, a larger difference between the blood-pressures of urban and rural Jamaican women than between urban Jamaican women and Welsh women (Miall and Cochrane, 1961).

Doll and Hanington (1961) studied the incidence of eclampsia and of hypertension in late pregnancy in 10 countries. They reported that among those surveyed a diastolic pressure of 95 mm. Hg or more occurred in the second half of pregnancy in 23.5% of the women in Ireland, 17.5% of the women in England, and in 10.5% of the women in Jamaica. The incidence of eclampsia in Jamaica was 2.6% compared with 1.2% in Britain. These trends are in agreement with those of the present survey.

Doll and Hanington concluded that there may be nationality differences in the arterial response to pregnancy ; this would explain our observation that when pre-eclampsia did occur in the West Indian patients it was of rapid onset. Lawson (1961) reported that, in Nigeria, the conventional upper limit for normal blood-pressure in pregnancy of 140/90 mm. Hg is unsatisfactory and that the rise in pressure during pregnancy is a more reliable guide. It may be that we should consider a similar approach towards this problem in West Indian immigrants.

Summary

A retrospective survey has been made of all births occurring at Lambeth Hospital during the period 1958–60. Nationality differences in the various social factors which may influence the course of pregnancy and childbirth are described and discussed.

Some important differences have been established between the indigenous population and immigrant patients from the West Indies and Ireland:

1. Uterine fibroids were three times as common among the West Indians as among the British and Irish.

2. Active or quiescent pulmonary tuberculosis was diagnosed in 2.7% of the Irish patients and in 1.8% of the British patients, but in only 0.3% of the West Indians.

3. The Wassermann reaction was positive in 5.1% of the West Indian patients in comparison with only 0.2% of the British and Irish.

4. Pre-eclamptic toxaemia was only one-third as common among the West Indian patients as among the British or Irish.

5. West Indian patients had a shorter second stage of labour, a lower forceps rate, and a higher incidence of intact perineum after delivery than the British or the Irish.

6. The mean birth weight of infants born to West Indian mothers was 0.18 lb. (81 g.) less than the British infants. In contrast, infants born to Irish mothers were 0.13 lb. (60 g.) heavier than the British ones.

7. A far higher proportion of West Indian mothers were breast-feeding at the time of discharge from hospital than either the British or the Irish.

Statistical Addendum

The χ^2 test was applied to some of the simple two-way tables of proportions to give a sense of perspective in considering their interpretation. Careful inspection was all that was necessary for the evaluation of some of the more complex two-way or multi-way tables, but, where there was some doubt about the interpretation of marginal means, constants were fitted after transforming the proportions to logits. An outline of the principles involved in this technique can be found in published work by Yates (1955, 1960) and by Dyke and Patterson (1952). General programmes to fit constants for selected combinations

of main effects or interactions written for the Rothamsted computer were used for these analyses.

The statistical analysis of the data on birth-weight is described elsewhere (Barron and Vessey, in preparation).

We should like to express our thanks to the many people who have helped with this work, and especially to the Director, Mr. P. Payne, and Miss M. Martin and her staff of the South Metropolitan Cancer Registry, who did much of the data processing ; to Mrs. A. Moulton and Mrs. M. Thomas, who so painstakingly abstracted the case notes ; to Mr. Hammond and his staff of the medical records department at Lambeth Hospital ; and to Mrs. E. Thompson for secretarial assistance.

We are grateful to Miss L. Hurter and Mr. (now Professor) Philip Rhodes for permission to study patients under their care and to Professor Rhodes for his help and encouragement in the initiation of the study. Professor Sir Dugald Baird and his colleagues of the Obstetric Research Unit (M.R.C.) and Professor R. Illsley, of the Department of Sociology at Aberdeen, have given much advice and encouragement, and we are also grateful to Dr. Roma Chamberlain, of the Ministry of Health, for her help with background information.

The facilities for much of the analysis were made available through the kindness of Dr. F. Yates, F.R.S., head of the Department of Statistics, Rothamsted Experimental Station.

Financial assistance for the survey and analysis was provided by the Regional Research Committees of the South-west, and later, the North-east Metropolitan Regional Hospital Boards.

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Faecal Fat Excretion and Stool Colour After Vagotomy and Pyloroplasty

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Because of the popularity of vagotomy and pyloroplasty in the treatment of chronic duodenal ulcer, any nutritional defect resulting from this operation is of importance. The studies of Elliot-Smith, Painter, and Porter (1961), Cox, Bond, Podmore, and Rose (1964), Logan (1964), Orr (1964), and Butler and Eastham (1965) indicate that faecal fat excretion is raised after vagotomy and gastrojejunostomy. Information relating to this after vagotomy and pyloroplasty is lacking. with the exception of an investigation by Kiekens and Van Geertruyden (1963) of six patients in whom raised faecal fat excretion was also noted, and a study in Mysore by Tovey (1965), who found no significant difference in the mean faecal fat output between patients with total or selective vagotomy with pyloroplasty and controls.

In addition, it has been stated that after vagotomy and gastro-jejunostomy the stools are lighter in colour (Grimson, Baylin, Taylor, Hesser, and Rundles, 1947 ; Burge, Rizk, Tompkin, Barth, Hutchison, Longland, McLennan, and Miln, 1961 ; Elliot-Smith *et al.*, 1961 ; Cox and Bond, 1964 ; Goligher, Pulvertaft, and Watkinson, 1964), but a review of the subject fails to reveal any information about pigment excretion before and after operation.

The occurrence of diarrhoea after any operation involving vagotomy is extensively reported (Cox and Bond, 1964), but

the incidence, severity, therapy, prophylaxis, and cause have for some time been a matter for discussion. At the present moment the most commonly advocated preventive measure is that of selective vagotomy, in which either or both of the main extragastric branches of the abdominal vagus are preserved (Burge, 1964).

This paper presents a study of the effect of vagotomy and pyloroplasty on faecal fat excretion, faecal urobilinogen excretion, and bowel frequency. In order to provide as accurate an investigation as possible only those patients were included for fat studies where detailed interrogation ensured that total faecal collections had been obtained—a source, we found, of considerable error. Patients with other intra-abdominal disease found at operation were also excluded.

The type of vagotomy was randomly distributed between total and anterior selective—that is, with preservation of the hepatic branch from the anterior vagus—so that the effect of the preservation of the vagal supply to the liver, biliary tree, head of the pancreas, and the first part of the duodenum could be determined.

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