

## Ethnic differences in perinatal mortality—a challenge

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**SUMMARY** The perinatal mortality rates of mothers who delivered at St. Thomas's Hospital from 1969 to 1976 have been examined. The rate in the West Indian population was significantly higher than in the United Kingdom white population. The increased West Indian mortality was confined to infants with a birth weight of more than 2.0 kg and a gestational age of more than 37 weeks. The relative risk of perinatal death for West Indian mothers compared with UK white mothers was 1.4 at birth weights of 2.5 kg to 2.9 kg, rising to 4.3 at 4.0+ kg. West Indian perinatal mortality in term babies of normal birth weight was higher in all maternal age and parity groups except parity 3, but the difference was greatest in women aged 30 or over. The African perinatal mortality rate was not significantly greater than the UK white rate although it followed the West Indian trends. Pre-eclampsia and forceps delivery were associated with a greatly increased perinatal mortality in West Indian babies.

The excess West Indian mortality could not be explained completely by differences in the proportions of stillbirths and early neonatal deaths nor by the distribution of births by parity, maternal age, or social class. Possible explanations for the differences in mortality are discussed.

Although increasing attention is being focused on perinatal health in the United Kingdom<sup>1</sup> there is a lack of comprehensive statistical information about ethnic differences in perinatal mortality. This is an important gap since clinical experience indicates that large differences do exist. Published studies of racial differences in the outcome of pregnancy have been too small to allow comment on mortality or investigations into the influence of social and demographic factors.<sup>2 3 4</sup>

We have examined the perinatal mortality rates of mothers delivering at St. Thomas's Hospital between 1969 and 1976. Attention has been directed towards parents of British, West Indian, and African origin in an attempt to discover whether perinatal mortality differences exist, and, if so, to see whether they can be explained by population differences in social class, parity, maternal age, birth weight, gestational age, and other factors.

### Method

The computerised obstetric records of 17 858 deliveries at St. Thomas's Hospital<sup>5</sup> between 1969 and 1976 were used in the study. Variables examined were parents' ethnic origin, recorded as England, Scotland, or Wales but excluding Ireland (British mothers), the West Indies and Africa (no distinction was made between immigrant or UK-born West Indian or African mothers); social class (I and II, III, IV and V, other) based upon the Registrar General's classification of husband's occupation; maternal age; parity (number of previous births); gestational age at delivery (in completed weeks from the first day of the last menstrual period); birth weight; type of delivery; and presence of pre-eclamptic toxæmia (PET).

Analysis of the data was carried out using cross-tabulations. Differences between ethnic groups were tested by calculating standard normal

deviations for differences in proportions using pooled estimates of standard errors. The relationships between birth weight, gestational age, and perinatal mortality were examined using a model-fitting statistical technique in which the dependent variable was the logit transformation of the probability of perinatal death. The GLIM<sup>®</sup> computer program package was used.

## Results

The number of deliveries over the eight-year period (1969–76) when obstetric data were computerised, and the overall perinatal mortality rates (PNMR) in the groups studied, are shown in Table 1. The

Table 1 Deliveries, perinatal deaths, and perinatal mortality rates per 1000 births by ethnic group

	Total deliveries	Perinatal deaths	Perinatal mortality
British	12 892	276	21.4
West Indian	3 063	94	30.7
African	1 903	55	28.9

difference between the rates for UK mothers (21.4/1000) and West Indian mothers (30.7/1000) was statistically significant ( $t = 2.76$   $p = <0.01$ ). The difference between the PNMR of UK mothers and African mothers (28.9/1000) marginally exceeded conventional limits of statistical significance ( $t = 1.86$   $p < 0.1$ ).

### (a) BIRTHWEIGHT AND GESTATIONAL AGE

Babies weighing less than 2.5 kg comprised 7.3% of UK births, 8.5% of West Indian births, and 6.5% of African births, but there were no significant ethnic differences in perinatal mortality (PNM) in these low-birthweight infants. The PNM difference between the ethnic groups began to emerge in the 2.0–2.5 kg group and increased with increasing birth weight (Table 2). Above 2.5 kg the PNMR was 6.5/1000 in UK mothers, 13.3/1000 in West Indian mothers, and 11.8/1000 in African mothers: the

difference between the UK and West Indian PNMR was statistically significant ( $t = 2.97$ ,  $p < 0.01$ ).

The highest relative risk for West Indian mothers compared with UK mothers was 4.3 in the 4.0+ kg birthweight group and for the African mothers it was 4.8 in the same group. Using the model-fitting approach, the trend of increasing PNM risk in West Indian mothers with increasing birth weight was shown to be statistically significant.

The excess West Indian mortality was confined to term babies (Table 3). Below 37 weeks' gestation the West Indian mortality was significantly less than the UK rate ( $t = 3.14$   $p < 0.01$ ).

Since the excess West Indian mortality was confined to term babies and those of normal weight, births of 37 weeks' gestation or more and 2.5 kg or more ('mature') have been analysed separately by social class, parity, and maternal age. In 64 UK births (17 perinatal deaths), 19 West Indian births (eight perinatal deaths), and three African births (0 perinatal deaths), data on birth weight and gestational age were incomplete and these births were omitted from the Tables. These cases were evenly distributed through the social class, parity, and maternal age groups.

### (b) SOCIAL CLASS

For UK births overall, PNM tended to increase with decreasing social class, though this trend was not as clearly seen in term babies of normal birth weight. In the West Indian group, social class III had the highest mortality. In social class III and in classes IV and V the West Indian PNMR was greater than that for UK mothers (Table 4). In African mothers the trend of increasing PNM with decreasing social class was not seen but in each group the rate exceeded that of the UK mothers. In term babies of normal birth weight the West Indian and African PNMR exceeded that of the UK mothers.

### (c) PARITY

West Indian mothers tended to be of a higher parity than UK mothers. Of the UK mothers 44% were primiparous compared with 29% of the West Indian

Table 2 Number of deliveries, perinatal mortality rates per 1000 births, and relative risks by birth weight and ethnic group

Ethnic group		BIRTH WEIGHT (kg)							Not known
		Under 1.5	1.5–	2.0–	2.5–	3.0–	3.5–	4.0–	
British	Deliveries	144	168	625	2472	5002	3418	1034	29
	PNMR	674	280	64	13	5.2	4.4	4	517
West Indian	Deliveries	40	42	179	794	1209	615	173	11
	PNMR	600	286	73	18	10.8	11.4	17	728
African	Deliveries	30	19	75	399	822	448	108	2
	PNMR	733	316	80	18	9.7	8.9	19	—
Relative risk	West Indian	0.9	1.0	1.1	1.4	2.1	2.6	4.3	
	African	1.1	1.1	1.3	1.4	1.9	2.0	4.8	

Table 3 *Number of deliveries, perinatal mortality rates per 1000 births, and relative risks by gestational age and ethnic group*

Ethnic group		GESTATIONAL AGE (WEEKS)						Gestational age unknown
		<30	30-32	33-34	35-36	37-42	>42	
British	Deliveries	88	139	217	530	10 524	1359	35
	PNMR	557	259	175	87	8.4	13	57
West Indian	Deliveries	33	61	90	228	2 409	233	9
	PNMR	424	180	89	57	17.4	26	—
African	Deliveries	22	24	41	112	1 589	113	2
	PNMR	636	333	73	36	15.1	18	—
Relative risk	West Indian	0.8	0.7	0.5	0.7	2.1	2.0	—
	African	1.1	1.3	0.4	0.4	1.8	1.4	—

Table 4 *Relative risk of perinatal death by ethnic group, social class, parity, and maternal age\**

Ethnic group		Social class				Parity					Maternal age				
		I & II	III	IV & V	Other	0	1	2	3	4+	-20	-24	-29	-34	35+
West Indian	All births	—	2.0	1.2	1.0	1.1	1.3	1.9	0.8	1.4	0.8	0.9	1.2	1.4	1.9
	Mature births	—	2.0	2.5	2.1	1.8	2.2	4.0	0.7	1.7	2.0	1.3	1.9	3.5	2.3
African	All births	1.8	1.4	1.2	1.3	2.2	0.9	1.3	1.0	1.2	0.8	2.0	1.5	1.0	1.2
	Mature births	5.8	2.3	1.3	1.8	4.0	1.6	2.6	1.0	1.0	—	3.9	1.5	3.0	1.8

\*Detailed tables are available on request.

Table 5 *Numbers of deliveries, perinatal mortality rates per 1000 births, and relative risk by antenatal problem and ethnic group*

Ethnic group		Normal antenatal period	Pre-eclampsia or eclampsia	Ante partum haemorrhage	Others	Problem unknown
		British	Deliveries	6523	2084	634
	PNMR	10.6	21.1	93.1	28.4	—
West Indian	Deliveries	1610	462	120	868	3
	PNMR	14.9	54.1	75.0	40.3	—
African	Deliveries	996	236	77	590	4
	PNMR	10.0	33.9	116.9	44.1	—
Relative risk	West Indian	1.4	2.6	0.8	1.4	—
	African	0.9	1.6	1.3	1.6	—

mothers and 23% of the African mothers. Five per cent of UK mothers had had four or more previous births compared with 23% of West Indian mothers and 14% of African mothers. Thirty-three per cent of the perinatal deaths among West Indian mothers were in this high-risk group, compared with 7% of the UK and 16% of the African deaths. The PNMR in West Indian mothers was higher in all parity groups except parity 3 (Table 4). Differences between African and UK mothers were most marked in first pregnancies.

#### (d) MATERNAL AGE

Overall, up to the age of 25 the West Indian PNMR was lower than that for UK mothers, but after this age the West Indian rate steadily worsened both in absolute terms and in relation to the UK rates (Table

4). In term babies of normal birth weight the West Indian PNMR was 1.3 to 3.5 times the UK rate in each maternal age group. The better performance of young West Indian mothers was due to the lower mortality of preterm and low-birthweight babies in this ethnic group.

#### (e) PREGNANCY AND DELIVERY

In deliveries after a normal antenatal period the West Indian PNM was greater than that of UK mothers, but the difference was not statistically significant (Table 5). Pre-eclampsia or eclampsia occurred in 16% of UK mothers, 15% of West Indians, and 12% of Africans, and in each group this was associated with an increased mortality. In West Indian mothers, however, the PNMR was 2.6 times that of UK mothers ( $t = 3.03$   $p < 0.01$ ). Antepartum

haemorrhage occurred in 4–5% of mothers in each ethnic group and was not associated with any differential PNM.

The proportions of mothers delivered by forceps differed greatly between the ethnic groups—14% of UK mothers, 6% of West Indians, and 8% of Africans. The PNMR in West Indian and African mothers who had forceps-assisted deliveries was four times ( $t = 2.84$   $p < 0.01$ ) and three times ( $t = 1.76$   $p < 0.1$ ) that of the UK mothers (Table 6). But in unassisted deliveries there was no significant difference in the PNMR between the groups.

#### (f) CAUSE OF DEATH OF TERM BABIES OF NORMAL WEIGHT

Data on the cause of death were obtained by a search of records and were classified according to the recommendation of Wigglesworth.<sup>7</sup> Significant differences were not found in the proportions of stillbirths and early neonatal deaths occurring in each ethnic group (Table 7). Similar proportions of severe congenital malformations and asphyxial deaths were seen in each group. Two West Indian and two African mothers had abnormal haemoglobins and in each group one mother had haemoglobin AS and one haemoglobin AC.

#### Discussion

Recent reports of ethnic differences in PNM have been confusing. The Children's Research Fund in its publication *Britain's babies* asserts that 'immigrants do not fare worse than other members of the population'.<sup>8</sup> The Office of Population Censuses and Surveys (OPCS), on the other hand, notes that babies of West Indian and African Commonwealth-born

women have respectively 1.3 and 1.4 times the PNM of the offspring of UK born mothers.<sup>9</sup> The results of our study are remarkably close to the OPCS findings, with the West Indian and African PNMR approximately 1.4 times the UK rate.

Of the mothers delivering at St. Thomas's Hospital over the period analysed, 90% came from the local London boroughs of Lambeth, Southwark, and Wandsworth, and although the study was not population-based, we have no reason to suppose that these mothers were atypical with respect to differences between ethnic groups. It is possible that some West Indian and African mothers born in the UK were included in the UK category but this bias would have tended to reduce the differences between the groups. Confidence in the data is enhanced by the observation that relationships between PNM and birth weight, gestational age, parity, and maternal age all follow well-established trends.<sup>10</sup> In this respect our findings differed from those of Grundy and Hood,<sup>2</sup> who were unable to show a relationship between PNM and birth weight in their study.

Our most important finding was that the significantly higher PNM in West Indian mothers became apparent only in term babies and those weighing 2.0 kg or more, that is, in those babies whose chances of survival were the greatest. The relative risk of death in the West Indian babies compared with the UK babies increased from 1.1 at 2–2.5 kg to 4.3 at 4.0+ kg. The African mothers were also found to have a higher PNM but this difference was not statistically significant, probably because of the small numbers involved.

It is a widely held clinical impression that West Indian families are more likely to suffer adverse

Table 6 Numbers of deliveries, perinatal mortality rates per 1000 births, and relative risk by type of delivery and ethnic group

Ethnic group		Cephalic presentation				
		Unassisted	Forceps	Breech	Caesarean section	Type of delivery unknown
British	Deliveries	9936	1863	310	783	0
	PNMR	16.8	16.1	148	42.1	—
West Indian	Deliveries	2649	187	39	187	1
	PNMR	21.9	69.5	256	69.5	—
African	Deliveries	1472	148	29	253	1
	PNMR	18.3	47.3	345	43.5	—
Relative risk	West Indian	1.3	4.3	1.7	1.7	—
	African	1.1	2.9	2.3	1.0	—

Table 7 Cause of death in mature babies

Ethnic group	Total deaths	Congenital malformations (Stillbirths and neonatal deaths)			
		Macerated stillbirths	Asphyxia	Other	
British	61 (100%)	18 (30%)	13 (21%)	23 (38%)	7 (11%)
West Indian	32 (100%)	10 (31%)	6 (19%)	12 (38%)	4 (13%)
African	20 (100%)	5 (25%)	3 (15%)	10 (50%)	2 (10%)

social influences and that these may account for their poorer PNMR. West Indian mothers delivered at St. Thomas's Hospital were indeed underrepresented in the higher social class groups. Only 1% came from social classes I and II compared with 12.5% of the UK and 11.5% of the African mothers. This skewed social class distribution would be expected to increase the West Indian PNMR even in the absence of ethnic factors. However, when the social class-specific PNMR of the UK mothers were applied to the West Indian population, an expected West Indian PNMR of 22.1/1000 was obtained, leaving 90% of the excess mortality to be explained by other factors. It is possible, though, that social class as usually measured may not be a good indicator of the social environment of ethnic minorities.

The excess West Indian mortality was not explicable by the distribution of births by parity or maternal age. When the parity-specific and maternal age groups-specific PNMR of UK mothers were applied to West Indian mothers the expected rates were only 1/1000 greater than the UK rates in each case. In every parity group the overall West Indian PNM was greater than the UK rate except for parity 3, but, in each case, the difference was due to the poorer outcome of West Indian term babies of normal weight. For preterm and small babies the West Indian PNMR was lower in women delivering their first or second baby. West Indian mothers aged under 25 had a lower PNMR for all births than UK mothers but with increasing age PNMR differences appeared and in the age group 35+ the West Indian PNMR was twice that of the UK mothers. In term babies of normal birth weight the maternal age-specific West Indian PNM rates were about twice that of UK mothers. In preterm and small babies the West Indian PNMR exceeded the UK rate only in the oldest maternal age group.

One of the possible explanations considered for these findings was the existence of a generation effect. The older West Indian mothers of higher parity were more likely to have been born in the West Indies and may have suffered childhood nutritional deficiencies which were later reflected in their relative inability to deliver normal-sized babies. However, the outcome of babies with a normal gestational age and a normal birth weight was poorer even among younger West Indian mothers.

An important finding in term babies weighing more than 2.5 kg was that the proportions of stillbirths and early neonatal deaths were similar in each ethnic group. Furthermore, in this group there were no significant ethnic group differences in the proportions of congenital malformations or asphyxial deaths. Abnormal haemoglobins played no part in the excess PNM in this study, though haemoglobin S

has been said to be a contributory factor to the higher PNM in Nigeria.<sup>11</sup>

West Indian mothers with pre-eclampsia or eclampsia were at particularly high risk and we have no explanation for this. The data on type of delivery suggested that mechanical factors such as pelvic size and shape could have explained part of the difference. The prevalence of forceps-assisted deliveries differed between ethnic groups and UK mothers had the highest rate. It is therefore possible that the higher forceps-related West Indian and African PNM described here is an artefact, although this is unlikely because the West Indian and UK rates for caesarean section were similar.

Clearly, more data are urgently needed to uncover the factors associated with the increased risk of perinatal death in West Indian and, possibly, African mothers. The finding that excess mortality is confined to term babies of normal weight suggests that avoidable factors may be important and offers hope that the disparity can be reduced.

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## References

- <sup>1</sup> Anonymous. Better perinatal health. *Lancet* 1979; **ii**: 1058-9.
- <sup>2</sup> Grundy MFB, Hood J. Birth weight standards in a community of mixed racial origin. *Br J Obstet Gynaecol* 1978; **85**: 481-6.
- <sup>3</sup> Barron SC, Vessey MP. Immigration, a new social factor in obstetrics. *Br Med J* 1966; **i**: 1189-94.
- <sup>4</sup> Terry PB, Condie RG, Settatree RS. Analysis of ethnic differences in perinatal statistics. *Br Med J* 1980; **iv**: 1307-8.
- <sup>5</sup> South J, Rhodes P. Computer service for obstetric records. *Br Med J* 1971; **iv**: 32-5.
- <sup>6</sup> Baker RJ, Nelder JA. *The GLIM system; release 3, generalised linear interactive modelling manual*. London: Royal Statistical Society, 1978.
- <sup>7</sup> Wigglesworth JS. Monitoring perinatal mortality, a pathophysiological approach. *Lancet* 1980; **ii**: 684-6.
- <sup>8</sup> Taylor D. *Britain's babies*. London: Children's Research Fund, 1980: 4.
- <sup>9</sup> Davies IM. Perinatal and infant deaths: social and biological factors. *Population Trends* 1980; **19**: 19-21.
- <sup>10</sup> Lambert P. Perinatal mortality, social and environmental factors. *Population Trends* 1976; **4**: 4-8.
- <sup>11</sup> Platt HS. Effect of maternal sickle-cell trait on perinatal mortality. *Br Med J* 1971; **iv**: 334-6.