

# Mortality from congenital malformations by mother's country of birth

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**SUMMARY** Mortality from congenital malformations by mother's country of birth was examined in England and Wales between the years 1976 and 1980, based on stillbirths and infant deaths. There were 18 870 stillbirths and infant deaths attributed to congenital malformations in this period, of which 2 375 (13%) were to mothers born outside the United Kingdom. There were excess deaths from malformations among Pakistani, Indian/Bangladeshi, African, and Irish mothers. In contrast, West Indian mothers had a consistent deficit in deaths from malformations over the study period. The significance of these findings is discussed.

## Background

The aetiology of most congenital malformations is unknown. The incidence of certain malformations is known to be related to factors such as the age of the mother, season of birth, and ethnicity. The variations between the different ethnic groups may be the consequence of environment, genetic predisposition or possible interactions of these two factors.

In England and Wales in 1980, about 13% of all live births were to mothers born outside the United Kingdom, of which 8.5% were to those born in the New Commonwealth and Pakistan. We have in this study analysed all stillbirths and infant deaths in England and Wales for the years 1976–80 to explore variations in mortality from congenital malformations according to the mother's country of birth. Our analysis at the national level has been restricted to mortality from congenital malformations as the National Congenital Malformation Monitoring Scheme<sup>1</sup> does not record information on the country of birth or ethnic origin of the mother.

## Material and methods

All stillbirths and infant deaths in England and Wales with congenital malformations as the underlying cause of death were extracted from the Office of Population Censuses and Surveys linked files<sup>2</sup> for the years 1976–80 by mother's country of birth. Age

specific malformation mortality rates for England and Wales were computed by mother's age in five year age groups (15–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45+) using all still and live births in England and Wales as the denominator. These were applied to the corresponding age specific total births by country of birth of the mother to generate expected deaths. The total observed and expected deaths were examined in the form of a standardised mortality ratio (SMR). The analysis was done separately for two calendar periods, 1975–78 and 1979–80, to check consistency and to allow for any possible variations due to the change in the revisions of the International Classification of Diseases<sup>3</sup> in 1979. The malformations and their corresponding ICD categories are given in table 1.

## Results

There were 18 870 stillbirths and infant deaths attributed to congenital malformations in England and Wales between 1975 and 1980. Of these, 16 495 (87.4%) were to mothers born within the United Kingdom; 1 260 (6.7%) to mothers from the Indian subcontinent (India, Pakistan, and Bangladesh); 304 (1.6%) to mothers from Africa; 368 (2.0%) to mothers from the Irish Republic; 154 (0.8%) to mothers from the West Indies; and 289 (1.5%) to mothers born elsewhere. The SMRs for all malformations were highest among infants born to mothers from Pakistan—179 (1975–8) and 226

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Table 1 *Malformations and ICD categories*

Group malformations	ICD category	
	8th Revision	9th Revision
Anencephalus	740	740
Spina bifida	741	741
Other central nervous system anomalies	742-743	742
Circulatory system anomalies	746-747	745-747
Respiratory system anomalies	748	748
Cleft palate and cleft lip, and other anomalies of upper alimentary tract and digestive system	749-751	749-751
Anomalies of genital organs and urinary system	752-753	752-753
Limb and other musculoskeletal anomalies	754-756	754-756

(1979-80)—followed by those from India and Bangladesh, 137 and 136; Africa, 119 and 123; and the Irish Republic, 109 and 117. West Indian mothers had low SMRs of 68 and 60 for the two periods in the study.

**CENTRAL NERVOUS SYSTEM MALFORMATIONS**  
 There were 9 317 deaths attributed to the central nervous system, of which 42% were due to anencephaly and 37% to spina bifida. The SMRs, by country of birth of mother, for this group are shown in table 2. SMRs from anencephaly were highest in infants born to Indian/Bangladeshi mothers followed by infants born to Pakistani and Irish mothers. The differences among these groups are less marked for spina bifida, though all of them show excess deaths compared to the home population. Other central nervous system anomalies showed significant excesses in the infants born to Pakistani mothers, with SMRs of 229 and 358, followed by infants born to Indian/Bangladeshi and Irish mothers.

Table 2 *SMRs and numbers for infant deaths and stillbirths, by country of birth of mother, for central nervous system anomalies*

Mother's country of birth	Anencephalus		Spina bifida		Other central nervous system anomalies	
	1975-78 SMR Obs <sup>†</sup>	1979-80 SMR Obs	1975-78 SMR Obs	1979-80 SMR Obs	1975-78 SMR Obs	1979-80 SMR Obs
United Kingdom	102	2 700	105*	2 260	101	1 165
New Commonwealth	96	171	67*	98	93	74
Bangladesh/India	157*	109	110	63	124	39
Africa	97	36	75	23	85	14
West Indies	16*	6	26*	8	57	10
Australia, Canada, and New Zealand	76	8	58	5	21	1
Malta, Gibraltar, and Cyprus	42*	6	17*	2	110	7
Remainder of New Commonwealth	77	14	13*	2	49	4
Pakistan	134*	62	110	42	229*	49
Irish Republic	116	63	108	48	115	29
Not stated and/or at sea	428*	16	329*	10	122	2

<sup>†</sup> Observed deaths

\* p < 0.05

**ANOMALIES OF THE CARDIOVASCULAR AND RESPIRATORY SYSTEMS**

SMRs, by country of birth of mother, for malformations of the cardiovascular system are shown in table 3. There were 4 574 deaths attributed to malformations of the cardiovascular system. Infants born to Pakistani mothers again featured the greatest excess followed by infants born to African and Indian/Bangladeshi mothers. Infants born to Irish mothers did not show a consistent excess for this group of malformations.

Anomalies of the respiratory system were relatively fewer in number, accounting for only 3% of deaths from malformations. Infants of mothers of African, Indian/Bangladeshi, and Irish origin showed consistent excess deaths in this group.

**OTHER CONGENITAL ANOMALIES**

SMRs for three groups of malformations are shown in table 3. There were excess deaths for cleft palate, cleft lip, and other anomalies of the upper alimentary tract and the digestive system among infants born to mothers from India/Bangladesh, Pakistan, Africa, and Ireland. The SMRs were highest for those of Indian/Bangladeshi origin.

Anomalies of the genital organs and urinary system were excessive among infants born to Pakistani mothers, followed by those born to Indian/Bangladeshi mothers. Infants born to Irish mothers did not show any excess nor did infants born to African or West Indian mothers.

Limb and other musculoskeletal anomalies accounted for 589 (3%) deaths overall. Again infants born to Pakistani mothers showed very high SMRs of 502 and 259 for the two periods, the only other group with consistent excess being the infants born to

Table 3 SMRs and numbers for infant deaths and stillbirths, by country of birth of mother, for circulatory system and respiratory system anomalies

Mother's country of birth	Circulatory system anomalies				Respiratory system anomalies			
	1975-78		1979-80		1975-78		1979-80	
	SMR	Obs <sup>†</sup>	SMR	Obs	SMR	Obs	SMR	Obs
United Kingdom	100	2 692	100	1 277	96	299	98	205
New Commonwealth	126*	234	115	107	168*	35	97	15
Bangladesh, India	139*	102	132	48	147	12	133	8
Africa	158*	62	131	30	343*	15	105	4
West Indies	102	40	78	13	66	3	72	2
Australia, Canada, and New Zealand	121	14	105	6	457*	6	208	2
Malta, Gibraltar, and Cyprus	75	11	140	10	60	1	85	1
Remainder of New Commonwealth	99	19	58	6	186	4	—	—
Pakistan	169*	83	200*	61	74	4	237*	12
Irish Republic	109	66	73	16	118	8	239*	9
Not stated and/or at sea	370*	14	404*	4	229	1	607*	1

† Observed deaths

\* p &lt; 0.05

African mothers. Infants born to Indian and Irish mothers did not show a consistent excess.

### Discussion

The study examines stillbirths and infant deaths in England and Wales between the years 1976 and 1980. The analysis is based on the underlying cause of death, as stated by the certifying doctor, and therefore excludes cases where the malformations may have been a contributory factor to death. However, there is no evidence to suggest that there are significant differences in certifying practices for deaths of infants to mothers from different ethnic backgrounds. Malformations not resulting in death are excluded from the study. Clearly the ability of the data on mortality to reflect incidence will depend on the specific condition being studied. The analysis

covers stillbirths and all infant deaths to exclude any possible problems of differential reporting of stillbirth and early infant deaths between the different groups investigated in the study. There could also be variations among the groups in the pattern of survival of infants with congenital malformations. The proportions dying within the first year could vary.

Though the analysis is based on the information on country of birth of mother, it is considered a reasonable proxy to ethnicity in the childbearing ages. In the analysis we did not attempt to distinguish between Indian and Bangladeshi mothers, who were grouped together. The Bangladeshi group, however, is relatively small compared to the Indians in this group.

Excess mortality from all malformations was greatest among infants born to Pakistani mothers

Table 4 SMRs and numbers for other malformations

Mother's country of birth	Cleft palate and cleft lip and other anomalies of upper alimentary tract and digestive system				Anomalies of genital organs and the urinary system				Limb and other musculoskeletal anomalies			
	1975-78		1979-80		1975-78		1979-80		1975-78		1979-80	
	SMR	Obs <sup>†</sup>	SMR	Obs	SMR	Obs	SMR	Obs	SMR	Obs	SMR	Obs
United Kingdom	99	511	96	198	97	401	102	217	93	220	99	273
New Commonwealth	122	44	183*	27	117	33	112	17	144	24	95	19
Bangladesh/India	160*	23	295*	17	157	17	137	8	121	8	77	6
Africa	163	12	197	7	67	4	104	4	237*	8	124	6
West Indies	88	7	75	2	84	5	39	1	83	3	83	3
Australia, Canada, and New Zealand	137	3	440*	4	167	3	—	—	105	1	83	1
Malta, Gibraltar, and Cyprus	35	1	88	1	135	3	256	3	153	2	65	1
Remainder of New Commonwealth	27	1	—	—	136	4	59	1	179	3	138	3
Pakistan	193	19	124	6	280*	21	164	8	502*	23	259*	17
Irish Republic	118	14	143	5	96	9	31	1	39	2	174	8
Not stated and/or at sea	556*	2	—	—	526*	3	—	—	303	1	—	—

† Observed deaths

\* p &lt; 0.05

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followed by those to Indian/Bangladeshi, African, and Irish mothers. In contrast, infants born to West Indian mothers showed fewer than expected deaths.

Infants born to Pakistani mothers showed excess deaths in all categories of malformations, especially in limb and musculoskeletal anomalies, anomalies of the genital organs and urinary system, other central nervous system anomalies, and cardiovascular anomalies. Infants born to mothers from India and Bangladesh showed overall SMRs of 137 and 136 for the two periods, and they, too, had excess deaths in all categories in the two periods except limb and musculoskeletal defects. The excesses tended to be lower than in infants of mothers from Pakistan except for anencephaly, clefts, and gastrointestinal defects where they appear to be higher.

Leck,<sup>4</sup> in his study of Birmingham births between 1960 and 1965, showed that Indian and Pakistani mothers as a group did not have a significantly different incidence of congenital malformations, including neural tube defects, oral clefts, and reduction deformities of the limbs. Recent studies from Birmingham have been contradictory. Terry *et al*, based on their series of 3 996 births in 1979,<sup>5</sup> reported the highest rate for all malformations in Pakistani (29.6/1000) and Bangladeshi (32.6/1000) mothers. Indian mothers had a lower rate (19.5/1000) than that of the European mothers (21.2/1000). In a subsequent study<sup>6</sup> from the same centre, over a three year period which included 1979, their malformation rates were of a different order of magnitude. The European mothers had a rate of 8.5/1000, the highest rate being for Indian mothers (14.2/1000) followed by Pakistani mothers (12.2/1000). There are difficulties in the interpretation of their findings as the denominators used are not clearly specified. Also small numbers may have affected the rates in some groups, there being only two congenital malformations in Bangladeshi mothers between 1979 and 1981. In our study there is a clear excess of deaths attributed to malformations among Pakistani and Indian and Bangladeshi groups.

Death rates from malformations overall were raised among infants born to mothers from Africa (SMRs 119 and 123). The malformations that featured most excess among this group were cardiovascular, respiratory, clefts and other gastrointestinal defects, and limb deformities. In contrast to the African mothers, the West Indian mothers showed fewer than expected deaths for practically every malformation. Our findings in the West Indians are in agreement with previously published reports. A low incidence of malformations both in the West Indian population in this country<sup>4</sup> and in American blacks<sup>7</sup> has been reported

previously. While we found excess malformations in immigrants from Africa, many of these are of Asian origin. It is estimated that just over 60% of the England and Wales populations in mid-1976 of Commonwealth African origin (excluding Europeans) were of Asian ethnic origin, this population having risen rapidly from less than 50% in mid-1971.<sup>8</sup>

Infants born to Irish mothers showed overall excess deaths for malformations and especially for those of the central nervous system, respiratory system, cleft lip and palates, and gastrointestinal system. Our findings correspond with the reports of significant excess neural tube defects in those of Irish descent in Birmingham in the 1960s.<sup>4</sup>

Environmental and genetic factors and their interactions, and the uptake of medical care, need to be considered as possible reasons for the variations in mortality among the different ethnic groups. Poor uptake of antenatal facilities and lack of screening may explain some of the differences for certain malformations such as neural tube defects, and chromosomal abnormalities. However this does not correspond with the finding of low mortality in infants of West Indian mothers.

Immigrants from the Indian subcontinent could also possibly suffer as a result of a greater incidence of consanguineous marriages. Terry *et al*, in their investigation,<sup>5</sup> showed that in a sample of 314 Pakistani mothers 79% had married relatives whereas only 26% of 78 Bangladeshi mothers and 3% of 486 Indian mothers in their study had done so. There were no marriages to relatives among West Indians and Europeans in their study. This is likely to influence further any genetic susceptibility among those of Asian origin.

Nutritional factors, diseases such as anaemia, osteomalacia, and diabetes, and cultural influences (eg, application of surma) could be contributory to pregnancy outcome in these ethnic groups. On the other hand, mothers from the Indian subcontinent are less likely to consume alcohol or tobacco.

The lower incidence in the West Indians could have a genetic basis as they are more likely to be of mixed descent in contrast to those of African origin. Ascertainment of incidence in the countries of origin, though difficult, will shed further light on the ethnic variation of congenital malformations.

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