

The geographical variation in neonatal and post-neonatal mortality in South Africa, 1978-1982

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Summary

Early neonatal, neonatal and post-neonatal mortality rates were systematically calculated according to the statistical regions of South Africa for the white and coloured populations over a 5-year period. The geographical variation is wide and the statistical significance in these mortality rates for coloured infants in rural areas of the Cape and the Orange Free State are particularly high and call for urgent attention.

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In a previous article, the spatial distribution of infant mortality rates (IMRs) in South Africa for the year 1982 was studied in some detail.¹ Comparisons between IMRs from different areas are made even more meaningful, however, if the data are divided into narrow age groups. These components of the IMR, namely early neonatal (< 8 days of age), neonatal (< 28 days) and post-neonatal deaths (1-12 months), are considered here. It is recognised that early neonatal deaths are mainly due to congenital defects, immaturity and complications during delivery. Consequently, the early neonatal mortality rate (ENMR) is not only an indicator of the availability, access to and actual use made of maternal and antenatal care, but is also a reliable criterion of the quality and efficacy of care provided during pregnancy. The neonatal mortality rate (NMR) reflects not only problems related to pregnancy and delivery but also complications occurring during the first weeks of life. These are particularly common in low-birth-weight infants. On the other hand, the post-neonatal mortality rate (PNMR) is affected by socio-economic and environmental factors that increase the risk of infection and malnutrition.

It was the aim of this study to examine the geographical variation of these mortality rates among the white and coloured populations (as identified in terms of the South African Population Registration Act²) of South Africa during the period 1978-1982. (The use of these categories in this paper does not imply the legitimacy of such racial terminology.) Unfortunately blacks, who comprise three-quarters of the South African population, were excluded from this analysis owing to inadequate coverage and quality of their birth and infant death data.³

Methods

The study area was the RSA as officially defined. This excludes Bophuthatswana, Ciskei, Transkei, and Venda since their independence, as well as the self-governing national states of

QwaQwa, Gazankulu, KaNgwane, KwaNdebele, KwaZulu and Lebowa. The changes in the country's boundaries do not greatly affect the numbers of the white and coloured populations.

Data pertaining to all births notified during 1978-1982 were obtained from reports produced annually by Central Statistical Services.⁴ The sources of mortality data were computer tapes containing an abstract of each registered death for whites and coloureds for the period 1978-1982, as supplied by Central Statistical Services. These data also contained the *de jure* location of death, by statistical region (SR).⁵ The spatial analysis was based upon the standard SRs defined by the 1980 national census. Overall, 57 discrete regions were analysed for geographical variation.*

An exact date of birth and date of death was not recorded in every case. For each SR the percentage distributions of infant deaths with exact dates of birth and death and the percentage distributions of early neonatal, neonatal and post-neonatal deaths were calculated. The proportions were then applied to total infant deaths in each SR to calculate the expected numbers of deaths in each group. Deaths were not analysed by cause, because the effects of inaccuracies in death certification are particularly serious when infant deaths are analysed.

Definitions

The ENMR is calculated as the number of deaths at less than 8 days of age, divided by the total number of live births, multiplied by 1 000; similarly, the late neonatal mortality rate consists of deaths between 8 and 27 days inclusive expressed per 1 000 live births. The NMR combines both early and late neonatal deaths. The PNMR is defined as all deaths from 28 days up to but not including 12 months, per 1 000. The IMR combines neonatal and post-neonatal deaths.

Results

The mortality rates of white and coloured infants in the four provinces are set out in Table I. ENMRs and especially PNMRs and IMRs, were higher for coloureds than for whites. The mortality rates for whites varied little between the provinces. A wider range was found for coloureds, with the Cape and the Orange Free State having the highest and Natal and Transvaal the lowest mortality rates.

Table II gives the early and late neonatal and post-neonatal contributions to the IMR. While more than half of the deaths of white infants occurred in the first week of life, the number falls to a quarter for coloureds. In the latter group most deaths occurred when the infant was over a month old, especially in the Cape Province and the Orange Free State. Most neonatal deaths occurred in the first week of life.

* The spatial coding of mortality by Central Statistical Services sometimes lags behind the changes in the standard code list for magisterial and statistical regions.⁵ Consequently, deaths under 5 years of age occurring in Kimberley (code 22), East London (code 28) and Pietermaritzburg (code 38) were in fact included in SRs 26, 29 and 37 respectively.

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TABLE I. TOTAL BIRTHS AND INFANT DEATHS, 1978-1982 (MORTALITY RATES/1 000 LIVE BIRTHS)

	Live births	Early neonatal mortality		Neonatal mortality		Post-neonatal mortality		Infant mortality	
		No.	Rate	No.	Rate	No.	Rate	No.	Rate
White									
Cape	90 945	797	8,8	987	10,9	577	6,3	1 564	17,2
OFS	31 164	231	7,4	284	9,1	143	4,6	427	13,7
Transvaal	214 848	1 734	8,1	2 096	9,8	836	3,8	2 932	13,6
Natal	40 663	310	7,69	366	9,0	157	3,9	523	12,9
RSA	377 620	3 072	8,1	3 733	9,9	1 713	4,5	5 446	14,4
Coloured									
Cape	317 754	5 254	16,5	7 982	25,1	13 137	41,4	21 119	66,5
OFS	6 131	147	24,0	227	37,0	561	91,5	788	128,5
Transvaal	33 577	573	17,1	799	23,8	909	27,1	1 708	50,9
Natal	13 222	146	11,0	216	16,3	186	14,1	402	30,4
RSA	370 684	6 120	16,5	9 224	24,9	14 793	39,9	24 017	64,8

TABLE II. PERCENTAGE CONTRIBUTION OF NEONATAL AND POST-NEONATAL MORTALITY TO OVERALL INFANT MORTALITY

	Early neonatal*	Late neonatal*	Neonatal	Post-neonatal
White				
Cape	51,0	12,1	63,1	36,9
OFS	54,1	12,4	66,5	33,5
Transvaal	59,1	12,4	71,5	28,5
Natal	59,3	10,6	69,9	30,1
RSA	56,4	12,1	68,5	31,5
Coloured				
Cape	24,8	13,0	37,8	62,2
OFS	18,7	10,1	28,8	71,2
Transvaal	33,5	13,3	46,8	53,2
Natal	36,3	17,4	53,7	46,3
RSA	25,4	13,0	38,4	61,6

* As a percentage of infant mortality (< 1 year of age).

TABLE IV. PROPORTION (%) OF URBAN AND RURAL POPULATION*

	Urban		Rural	
	No.	%	No.	%
White				
Cape	1 114 911	87,9	153 649	12,1
OFS	269 715	82,5	57 219	17,5
Transvaal	2 104 370	88,8	264 169	11,2
Natal	508 212	90,8	51 494	9,2
RSA	3 997 208	88,4	526 531	11,6
Coloured				
Cape	1 644 062	73,6	589 687	26,4
OFS	36 649	64,3	20 312	35,7
Transvaal	207 577	90,6	21 578	9,4
Natal	83 310	91,1	8 108	8,9
RSA	1 971 598	75,5	639 685	24,5

* Source: 1980 census.⁶

The geographical variation of mortality rates according to province is set out in Table III. The range is much wider for coloured infants than for whites. The widest range is for coloured PNMRs, especially in the Cape and the OFS.

Table IV gives the percentages of urban and rural populations, as defined in the 1980 census.⁶ Most whites live in urban areas, but 26,4% and 35,7% of coloureds in the Cape and the OFS respectively live in rural areas.

TABLE III. VARIATION OF NMR AND PNMR (/1 000), INCLUDING MINIMA AND MAXIMA, ACCORDING TO PROVINCE

	ENMR		NMR		PNMR	
	Mean	Range	Mean	Range	Mean	Range
White						
Cape	8,8	3,9 - 17,6	10,9	6,7 - 22,8	6,3	4,0 - 24,2
OFS	7,4	5,2 - 8,6	9,1	6,9 - 10,5	4,6	3,8 - 13,8
Transvaal	8,1	6,5 - 10,5	9,8	7,3 - 12,8	3,8	2,8 - 4,8
Natal	7,6	7,0 - 9,5	9,0	8,5 - 12,7	3,9	3,3 - 12,8
RSA	8,1	3,9 - 17,6	9,9	6,7 - 12,8	4,5	2,8 - 24,2
Coloured						
Cape	16,5	11,1 - 29,0	25,1	16,3 - 48,4	41,4	15,0 - 124,1
OFS	24,0	16,8 - 34,9	37,0	17,7 - 66,4	91,5	46,2 - 147,2
Transvaal	17,1	9,2 - 23,6	23,8	11,5 - 42,7	27,1	16,4 - 89,5
Natal	11,0	5,2 - 25,7	16,3	14,1 - 41,6	14,1	10,8 - 48,3
RSA	16,5	5,2 - 34,9	24,9	11,5 - 66,4	39,9	15,0 - 147,2

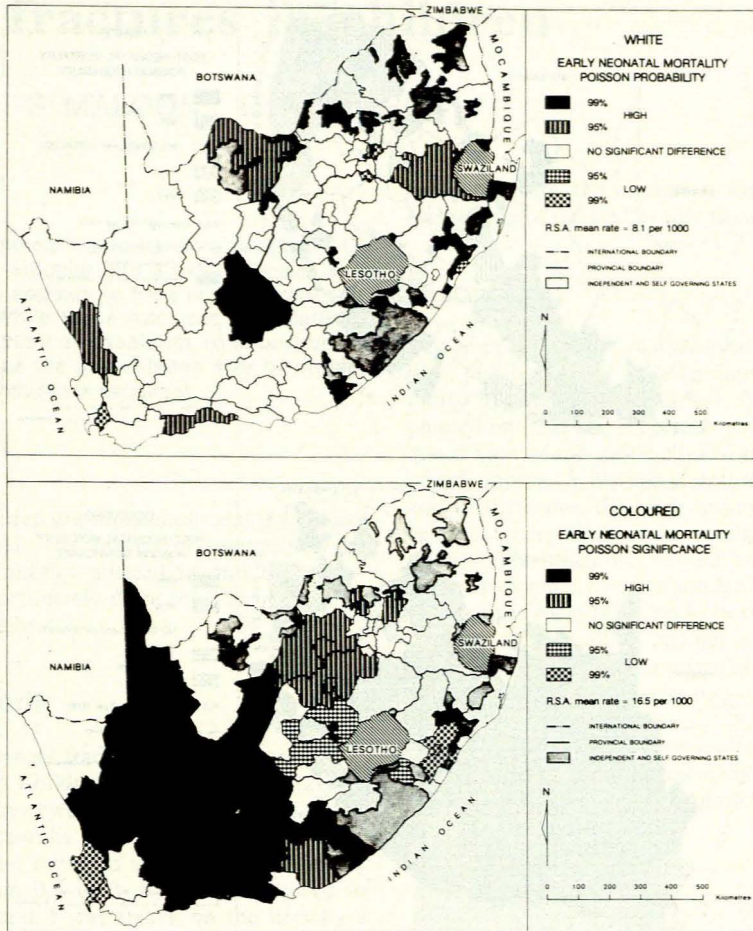


Fig. 1. Spatial variation of ENMRs for white and coloured infants according to Poisson probability criteria.

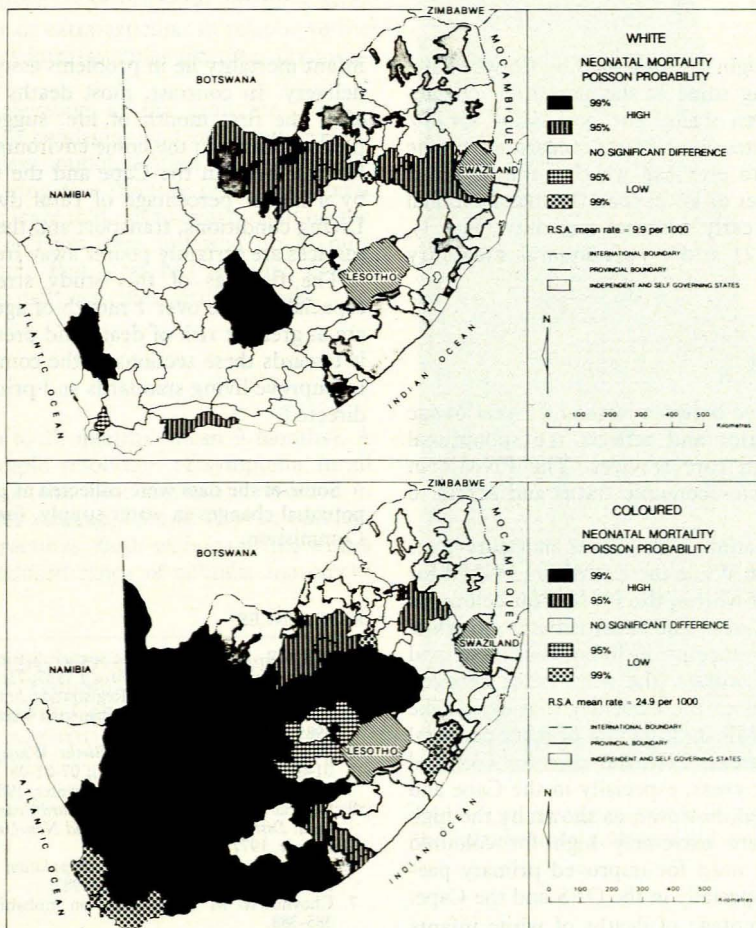


Fig. 2. Spatial variation of NMRs for white and coloured infants according to Poisson probability criteria.

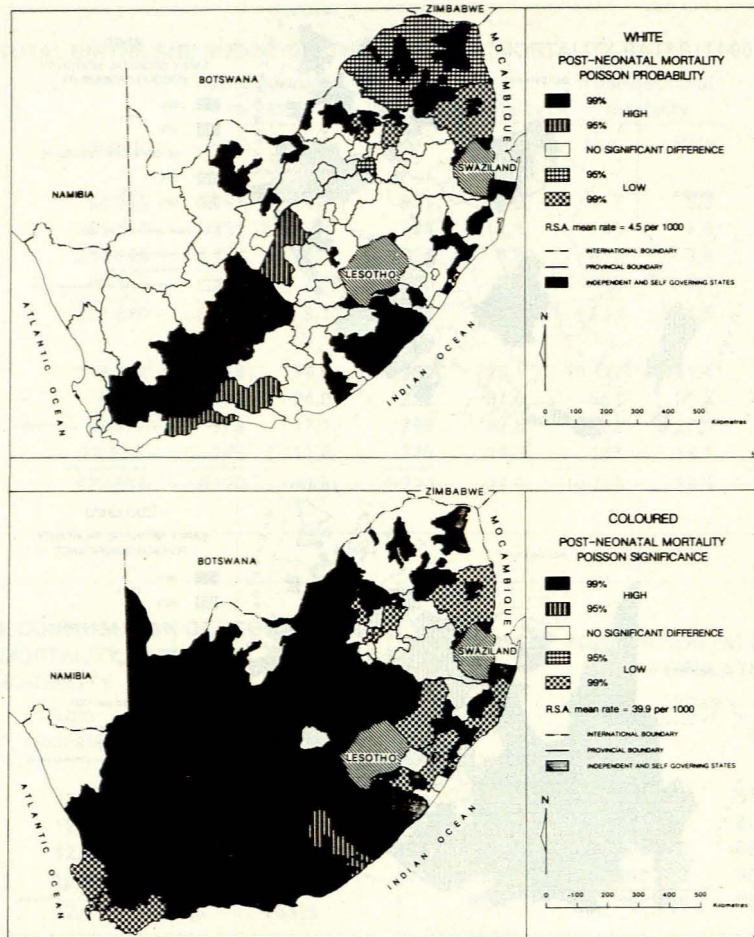


Fig. 3. Spatial variation of PNMRs for white and coloured infants according to Poisson probability criteria.

The probability map as originally presented by Choynowski⁷ is one method of identifying some of the significant characteristics of data at any given scale. The population group/region-specific mortality rates were tested according to the Poisson probability model to establish whether the observed rates were significantly higher or lower than the mean national rate.⁸ Maps are drawn for early neonatal mortality (Fig. 1), neonatal mortality (Fig. 2) and post-neonatal mortality (Fig. 3).

Discussion

The mortality rate for children between birth and 1 year of age remains high in South Africa and reflects the suboptimal living conditions and health care services. The PNMR in particular is an index of socio-economic status and access to health care.

The most striking observation is the lower mortality rates for whites than for coloureds. While the ENMR and NMR for coloureds are twice those for whites, the PNMR for coloureds is almost 9 times that for whites. The small variation in white mortality rates suggests a uniformity in living conditions and access to medical care. In contrast, the wide range between provinces for coloureds stresses the extremes that exist. The relatively low ENMR and NMR indicate that primary perinatal care is provided in many areas. Perinatal care for coloured mothers and infants in some areas, especially in the Cape and the OFS, should be improved, however, as shown by the high maximum rates. PNMRs are extremely high for coloured infants, stressing the urgent need for improved primary paediatric care in many areas, especially in the OFS and the Cape.

The fact that a high percentage of deaths of white infants occur in the neonatal period suggests that the main causes of

infant mortality lie in problems associated with pregnancy and delivery. In contrast, most deaths of coloured infants occur after the first month of life, suggesting that the causes lie predominantly in the home environment. The elevated PNMRs for coloureds in the Cape and the OFS are largely explained by a higher percentage of rural dwellers in these provinces. Living conditions, transport and the availability of health care services are certainly poorer away from larger towns.

The findings of this study stress that coloured infants, especially those over 1 month of age and living in rural areas, are at greatest risk of death and presumably also morbidity. It is towards these sections of the community that urgent efforts to improve living standards and primary health care should be directed.

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REFERENCES

1. Rip MR, Bourne DE. The spatial distribution of infant mortality rates in South Africa, 1982. *S Afr Med J* 1987; **73**: 224-226.
2. South African Population Registration Act (Act 30 of 1950), as amended.
3. Botha JL, Bradshaw D. African vital statistics — a black hole? *S Afr Med J* 1985; **67**: 977-981.
4. Central Statistical Services. *Births: White, Coloured and Asian* (Reports 07-01-06 (1978); 07-01-07 (1979); 07-01-08 (1980); 07-01-09 (1981); 07-01-10 (1982)). Pretoria: Government Printer, 1981-1985.
5. Central Statistical Services. *Standard Code List for Statistical Regions, Magisterial Districts, Cities, Towns and Non-Urban Areas*. Pretoria: Government Printer, 1977-1982.
6. Central Statistical Services. *Population Census 1980* (Report 02-80-02). Pretoria: Government Printer, 1982.
7. Choynowski M. Maps based on probabilities. *J Am Stat Assoc* 1959; **54**: 385-388.
8. McGlashan ND. The reality of spatial variations of morbidity and mortality. *S Afr Med J* 1974; **48**: 1621-1624.