J. of Population Studies, No. 10
Pp. 77-96, June 1987
Taipie: Population Studies Center, NTU

INFANT MORTALITY LEVELS, PATTERNS, AND DIFFERENTIALS IN PAPUA NEW GUINEA*

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INTRODUCTION

The measurement of infant mortality in Papua New Guinea (PNG) is severely hampered by lack of vital statistics data and inadequate information on infant deaths in the censuses data. As a result, our knowledge on the levels, trends, and differentials of infant mortality in PNG is limited. Despite the absence of adequate data, there are some estimates of infant mortality levels for various communities of the country. Almost all the estimates before the 1966 and 1971 population censuses were based on small community studies (Malcolm, 1969, 1970; Seragg, 1970; Sturt, 1972 etc.) One major problem inherent in most of these studies is the small sample size and the poor methodologies employed and in most cases the results are difficult to verify.

Some more recent estimates were based on the 1966, 1971, and 1980 population censuses data. Van de Kaa (1971), and Nou-Taboro (1978) used the Brass (1968, 1975) technique to estimate infant mortality utilizing the 1966 and 1971 population censuses data respectively. Rafiq (1979) combined the Brass technique and the Feeney (1976) method to estimate the decline in general mortality as well as infant and child mortality. More recently Bakker (1983) estimated infant mortality for all the provinces and regions of PNG using the 1980 population census data.

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* The view expressed in this paper are those of the author and not necessarily those of the United Nations or any of its agencies.

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Accurate measurements of the levels of infant mortality rates are important because the rates are taken as sensitive indices of socioeconomic level as well as the standard of living of a given population. Accordingly, the study of infant mortality is important because: (i) infant mortality contributes largely to the total loss of life, (ii) the causes of infant mortality are distinct from those of other age groups, and (iii) the level of infant mortality is an excellent indicator of the state of health and the living standard of a given society.

The purposes of this paper are (i) to report new estimates of infant mortality rates for PNG based on direct method and on the application of an indirect method; and (ii) to compare the resulting estimates for sex of child, rural-urban residence as well as the four main geographical regions in order to detect similarities or differences in the rates.

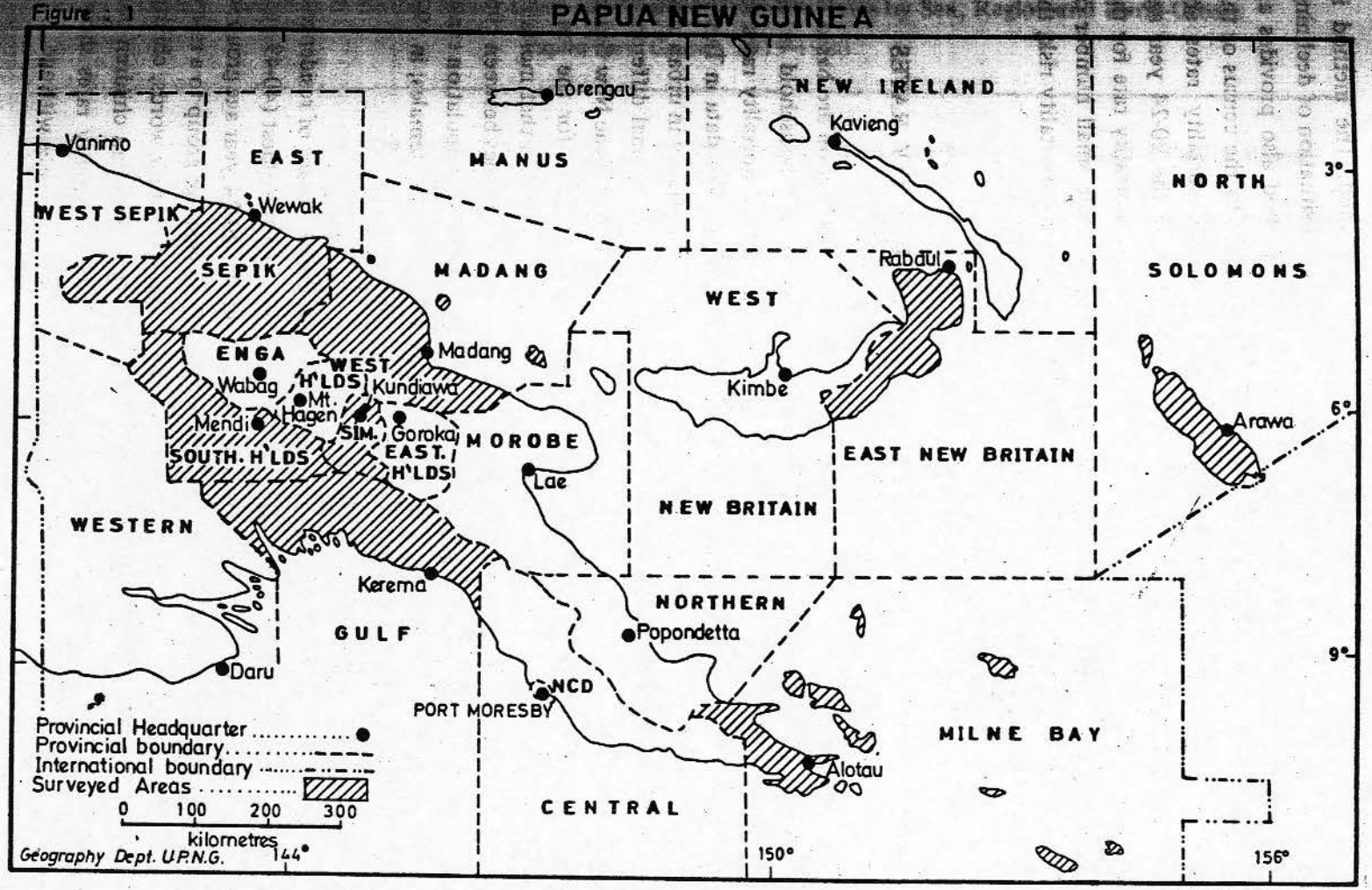
DATA AND METHODOLOGY

The estimates of infant mortality levels, trends, and differentials are based on a sample survey (for details of the survey, see Agyei, 1984a) of 3,986 females in the child-bearing age group (15-49 years old). Sampling was carried out in 65 cluster units (35 in urban areas and 30 in rural areas) in eight provinces between November, 1979 and March, 1980. The provinces included Milne Bay, Gulf, Chimbu, Southern Highlands, Madang, East Sepik, East New Britain, and North Solomon's (where sampling was limited to the urban areas of Kieta/Arawa/Panguna.) The provinces are shown in Figure 1. One thousand, eight hundred and fifty-seven respondents were interviewed in the rural areas, and 2,129 respondents were also interviewed in the urban areas. An urban area for purposes of this survey is defined as a town having a population of 5,000 or more.

The data for our analysis were derived from (i) the recorded retrospective fertility (number of children ever born) of all the respondents; (ii) deaths recorded as occurring in each household in the twelve months preceding the survey; (iii) a complete pregnancy history of all the respondents; and (iv) the recorded age-sex structure.

The indirect method employed for further estimates of infant mortality rates

Figure : 1



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in addition to the direct method is the Feeney (1976) method. The method is designed to provide estimates of infant mortality rate ($_1q_0$) in a situation of declining mortality whereas the rate of decline is unknown. The method also provides an estimate of time trends for approximately fifteen "years prior to the census or the survey" to which the infant mortality applies. The infant mortality rates are computed for 5 years age groups starting with the mothers in the 20-24 year age group through to those in the 45-49 year age group. Infant mortality rate for the 15-19 year age group is particularly liable to errors due to the small number of children born and as this age group has an above average infant mortality risk, the rate is not included in the indirect estimates.

DIRECT ESTIMATES OF CURRENT INFANT MORTALITY RATES

The estimates of infant mortality rates presented in this section are based on the number of births and deaths recorded as occurring in each household in the twelve months preceding the survey. Table 1 presents the infant mortality rates for rural-urban residence and the four geographical regions of PNG. The data in Table 1 reveal some rural-urban, regional, and sex differences. Infant mortality in urban areas was 17 percent lower than that for the rural level. In terms of regional differences, the Highlands region recorded the highest infant mortality rates and the New Guinea Islands region had the lowest rates. The level of infant mortality for the female infants is lower than that for the male infants. The pattern suggests that mortality has probably declined more sharply for the females than for the males between 1966 and 1980. This finding confirms the change observed in the 1971 population census data. In 1966, life expectancy at birth for males exceeded that for females; in 1971 the reverse was true (McDevitt, 1982).

Table 2 presents infant mortality rates by current age and place of residence of the mother. As expected, the youngest (15-19 years old) and the oldest (40-49 years old) have higher infant mortality rates than mothers in the 20-24 year age group for the rural areas. The rates increase steadily after the 20-24 year age group to a rate of 130.4 per 1000 live births for the 45-49 year age group. In other words, children born to the youngest and oldest mothers are more likely to die than children born to mothers in the 20-24 year age group. The rural infant mortality rates show a consistent pattern which apart from the 15-19 year age group increases with age.

Table 1. Number of Births, Infant Deaths and Infant Mortality Rates by Sex, Region and Rural-Urban: Papua New Guinea 1979-1980

Region/Area	Number of Livebirths			Number of Infant Deaths			Infant Mortality Rates*		
	Males	Females	Both Sexes	Males	Females	Both Sexes	Males	Females	Both Sexes
Papua	198	184	382	18	16	34	91.0	87.0	89.0
Highlands	296	276	572	32	26	58	108.1	94.2	101.4
New Guinea Mainland	317	294	611	32	27	59	101.0	91.8	96.6
New Guinea Islands	236	220	456	20	16	36	84.7	72.7	78.9
Rural	536	460	996	57	44	101	106.3	95.6	101.4
Urban	511	514	1,025	45	41	86	88.1	79.8	83.9
All Regions/Areas	1,047	974	2,021	102	85	187	97.4	89.8	92.5

*Infant Mortality Rates are given per 1000 Livebirths

Table 2. Infant Mortality Rates by Current Age and Residence of Mother: Papua New Guinea 1979-1980

Age of Mother	Number of Livebirths			Number of Deaths			Rate per 1000 Livebirths		
	Rural	Urban	All Sectors	Rural	Urban	All Sectors	Rural	Urban	All Sectors
15-19	84	77	161	9	7	16	107.1	90.9	99.4
20-24	220	208	428	20	17	37	90.9	81.7	86.4
25-29	257	260	517	25	20	45	97.3	76.9	87.0
30-34	180	201	381	18	15	33	100.0	74.6	86.6
35-39	137	134	271	14	12	26	102.1	89.5	95.9
40-44	68	84	152	8	8	16	117.6	95.2	105.3
45-49	46	58	104	6	7	13	130.4	120.7	125.0
Not Stated	4	3	7	1		1	–	–	–
All Ages	996	1,025	2,021	101	86	187	101.4	83.9	92.5

The infant mortality rates for the urban areas are slightly different from the rates for the rural areas. The lowest infant mortality rate was recorded for mothers in the 30-34 year age group. Although Ruzicka and Kanitkar (1973) found the lowest infant mortality rate among the 30-34 year age group in their study in Bombay, we feel the rate for the urban areas in PNG is suspect which is probably due to under-reporting of infant deaths or age misreporting or both.

We have also presented in Table 3 estimates of infant mortality rates for the 1971 and 1980 population censuses data as well as those from the survey data for comparative purposes for the geographical regions of PNG. The pattern for the three sets of data are similar and the levels have declined for all the regions between 1971 and 1980. The rapid declines in infant mortality revealed in Table 3 are probably related to improvements in maternal and child health care services and the promotion of breastfeeding by the PNG government. According to Agyei (1984b) the promotion of breastfeeding as a reliable method of infant feeding has been instrumental in reducing the level of infant mortality in PNG. However, the magnitude of the declines in infant mortality rates between 1971 and 1980 based on the estimates of the two censuses data is rather dramatic. In other words, the estimated infant mortality rates based on the 1980 census data are rather too low. This could be due to under-reporting of infant deaths in the census or age misreporting or both.

INDIRECT ESTIMATES OF INFANT MORTALITY RATES

The estimates of infant mortality ($_1q_0$) in this section of the paper are based on the information collected on the number of children ever born and children surviving to women in age groups 15-19 years old through 45-49 years old. The data used for our estimates are presented in Tables 4 and 5 for rural-urban and the geographical regions of PNG respectively. The levels and patterns of the estimated infant mortality rates for the rural-urban and the four regions are presented in Tables 6 and 7 respectively. If we consider the nature of retrospective data, on omission errors it is possible for the older women to omit infant deaths in the past. Therefore the estimate of infant mortality from indirect method will be more dramatic than the actual one. So the comparison of the 1971 census data with the 1980 census data is not "absolutely" unbelievable.

Table 3. Infant Mortality Rates* by Sex, and Region:
Papua New Guinea 1971, 1979-1980 and 1980

Region	1971 Population Census**			1980 Population Census**			1979-80 Demographic Survey***		
	Males	Females	Both Sexes	Males	Females	Both Sexes	Males	Females	Both Sexes
Papua	115.0	101.0	108.0	60.0	56.0	58.0	91.0	87.0	89.0
Highlands	160.0	141.0	151.0	95.0	74.0	85.0	108.1	94.2	101.4
New Guinea Mainland	147.0	134.0	141.0	80.0	72.0	76.0	101.0	91.8	96.6
New Guinea Islands	86.0	75.0	81.0	53.0	49.0	52.0	84.7	72.7	78.9
All Regions	142.0	125.0	134.0	78.0	66.0	72.0	97.4	89.8	92.5

* Infant Mortality Rates are given per 1000 Livebirths

** Taken from M.L. Bakker, Working Paper No. 4–Spatial Differentiation of Mortality in PNG. A. Classification Based on the Results of the 1980 Census (1983).

*** Source: Table 1.

Table 4.7 Average Number of Children Ever Born (P_i), Average Number of Deceased Children and Proportion Dead (D_i) by Current Age and Residence of Mother: Papua New Guinea 1979-1980

Age of Mother	Interval (i)	Average Number of Children Ever Born (P_i)			Average Number of Deceased Children			Proportion Dead (D_i)		
RURAL AREAS		Males	Females	Both Sexes	Males	Females	Both Sexes	Males	Females	Both Sexes
15-19	1	0.079	0.075	0.154	0.009	0.008	0.017	0.114	0.107	0.110
20-24	2	0.692	0.659	1.351	0.084	0.074	0.158	0.121	0.112	0.117
25-29	3	1.494	1.435	2.929	0.214	0.198	0.412	0.143	0.138	0.141
30-34	4	2.176	2.065	4.241	0.357	0.316	0.673	0.164	0.153	0.159
35-39	5	2.618	2.484	5.102	0.483	0.445	0.928	0.184	0.179	0.182
40-44	6	2.867	2.742	5.609	0.604	0.557	1.161	0.211	0.203	0.207
45-49	7	3.319	3.165	6.484	0.810	0.718	1.528	0.244	0.227	0.236
URBAN AREAS										
15-19	1	0.072	0.069	0.141	0.004	0.004	0.008	0.056	0.058	0.057
20-24	2	0.681	0.648	1.329	0.077	0.068	0.145	0.113	0.105	0.109
25-29	3	1.415	1.360	2.775	0.198	0.182	0.380	0.140	0.134	0.137
30-34	4	1.991	1.890	3.881	0.323	0.286	0.609	0.162	0.151	0.157
35-39	5	2.353	2.233	4.586	0.399	0.368	0.767	0.170	0.165	0.167
40-44	6	2.734	2.604	5.348	0.526	0.485	1.011	0.192	0.186	0.189
45-49	7	3.106	2.961	6.067	0.731	0.649	1.380	0.235	0.219	0.227
ALL SECTORS										
15-19	1	0.074	0.071	0.145	0.007	0.005	0.012	0.095	0.070	0.083
20-24	2	0.685	0.653	1.338	0.083	0.068	0.151	0.121	0.104	0.113
25-29	3	1.474	1.417	2.891	0.208	0.191	0.399	0.141	0.135	0.138
30-34	4	2.111	2.012	4.123	0.346	0.305	0.651	0.164	0.151	0.158
35-39	5	2.526	2.407	4.933	0.462	0.401	0.863	0.183	0.167	0.175
40-44	6	2.844	2.710	5.554	0.573	0.528	1.100	0.201	0.195	0.198
45-49	7	3.245	3.093	6.338	0.779	0.691	1.470	0.240	0.223	0.232

Table 5. Average Number of Children Ever Born (P_i), Average Number of Deceased Children and Proportion Dead (D_i) by Region and Current Age of Mother: Papua New Guinea 1979-1980

Age of Mother	Interval (i)	Average Number of Children Ever Born (P_i)			Average Number of Deceased Children			Proportion Dead (D_i)		
		Males	Females	Both Sexes	Males	Females	Both Sexes	Males	Females	Both Sexes
PAPUA REGION										
15-19	1	0.076	0.072	0.148	0.007	0.005	0.012	0.092	0.069	0.081
20-24	2	0.675	0.644	1.319	0.078	0.070	0.148	0.116	0.109	0.112
25-29	3	1.436	1.380	2.816	0.200	0.185	0.385	0.139	0.134	0.137
30-34	4	2.100	1.993	4.093	0.341	0.303	0.644	0.162	0.152	0.157
35-39	5	2.518	2.390	4.908	0.439	0.406	0.845	0.174	0.170	0.172
40-44	6	2.877	2.732	5.609	0.553	0.513	1.066	0.192	0.188	0.190
45-49	7	3.214	3.063	6.277	0.761	0.675	1.436	0.238	0.220	0.229
HIGHLANDS REGION										
15-19	1	0.079	0.075	0.154	0.007	0.007	0.014	0.089	0.093	0.091
20-24	2	0.728	0.693	1.421	0.089	0.078	0.167	0.122	0.113	0.118
25-29	3	1.496	1.437	2.933	0.216	0.200	0.416	0.144	0.139	0.142
30-34	4	2.178	2.067	4.245	0.369	0.327	0.696	0.169	0.158	0.164
35-39	5	2.619	2.487	5.106	0.484	0.447	0.931	0.185	0.180	0.182
40-44	6	2.883	2.737	5.620	0.611	0.564	1.175	0.212	0.206	0.209
45-49	7	3.329	3.172	6.501	0.851	0.754	1.605	0.256	0.238	0.247
NEW GUINEA MAINLAND REGION										
15-19	1	0.073	0.069	0.142	0.007	0.006	0.013	0.096	0.087	0.092
20-24	2	0.668	0.637	1.305	0.080	0.070	0.150	0.120	0.110	0.115
25-29	3	1.560	1.499	3.059	0.220	0.203	0.423	0.141	0.135	0.138
30-34	4	2.202	2.091	4.293	0.365	0.323	0.688	0.168	0.154	0.160
35-39	5	2.644	2.510	5.154	0.478	0.442	0.920	0.181	0.176	0.179
40-44	6	2.904	2.757	5.661	0.604	0.557	1.161	0.208	0.202	0.205
45-49	7	3.346	3.190	6.536	0.840	0.745	1.585	0.251	0.234	0.234
NEW GUINEA ISLANDS REGION										
15-19	1	0.075	0.071	0.146	0.006	0.005	0.011	0.080	0.070	0.075
20-24	2	0.682	0.650	1.332	0.076	0.067	0.143	0.111	0.103	0.107
25-29	3	1.406	1.350	2.756	0.197	0.181	0.378	0.140	0.134	0.137
30-34	4	1.981	1.881	3.862	0.307	0.273	0.580	0.155	0.145	0.150
35-39	5	2.343	2.224	4.567	0.392	0.362	0.754	0.167	0.163	0.165
40-44	6	2.734	2.595	5.329	0.499	0.460	0.959	0.183	0.177	0.180
45-49	7	3.097	2.951	6.048	0.667	0.591	1.258	0.215	0.200	0.208

Table 6. Infant Mortality Rates and Year to Which the Estimate Applies From the Number of Children Ever Born by Current Age and Residence of Mother: Papua New Guinea 1979-1980

Age of Mother	RURAL			URBAN			ALL SECTORS		
	Proportion Dead	Infant Mortality	Year	Proportion Dead	Infant Mortality	Year	Proportion Dead	Infant Mortality	Year
15-19	0.110	–	–	0.056	–	–	0.083	–	–
20-24	0.117	94.6	1977.4	0.109	86.6	1977.3	0.113	90.0	1977.3
25-29	0.141	98.8	1976.6	0.137	95.1	1975.4	0.138	96.0	1975.4
30-34	0.159	101.4	1973.4	0.157	99.5	1973.2	0.158	101.1	1973.3
35-39	0.182	109.1	1970.8	0.167	98.8	1970.6	0.175	104.0	1970.6
40-44	0.207	115.2	1967	0.189	103.6	1967.5	0.198	109.0	1967.5
45-49	0.236	118.7	1964.5	0.227	112.8	1964.2	0.232	115.5	1964.3

Table 7. Infant Mortality Rates and Year to Which the Estimate Applies From the Number of Children Ever Born by Current Age of Mother and Region: Papua New Guinea 1979-1980

REGION:	PAPUA			HIGHLANDS			NEW GUINEA MAINLAND			NEW GUINEA ISLANDS		
Age of Mother	Prop. Dead	Infant Mortality	Year	Prop. Dead	Infant Mortality	Year	Prop. Dead	Infant Mortality	Year	Prop. Dead	Infant Mortality	Year
15-19	0.081	–	–	0.091	–	–	0.092	–	–	0.075	–	–
20-24	0.112	89.1	1977.3	0.118	95.1	1977.4	0.115	92.6	1977.4	0.107	85.0	1977.3
25-29	0.137	95.2	1975.4	0.142	99.4	1975.5	0.138	96.5	1975.5	0.137	95.1	1975.4
30-34	0.157	99.5	1973.2	0.164	105.5	1973.3	0.160	102.0	1973.3	0.150	95.0	1973.2
35-39	0.172	102.0	1970.6	0.182	109.0	1970.8	0.179	107.0	1970.8	0.165	97.6	1970.6
40-44	0.190	104.2	1967.5	0.209	116.2	1967.7	0.205	113.8	1967.7	0.180	98.3	1967.5
45-49	0.229	113.9	1964.2	0.247	124.3	1964.4	0.243	122.1	1964.4	0.208	102.8	1964.3

It is evident from the estimates in Tables 6 and 7 that over the past 15 years, infant mortality has declined consistently for PNG. The percentage decline for the rural areas was 20 percent and that for the urban areas was 22 percent between 1964 and 1977 respectively. As regards the geographical regions, the magnitude of the decline was highest for the New Guinea Mainland which experienced 24 percent decline in infant mortality between 1964 and 1977. The Highlands region is next with 23 percent decline, Papua with 22 percent and the New Guinea Islands region with 17 percent. In other words, the Highlands and the New Guinea Mainland regions which are relatively worse off in terms of infant mortality, experienced the most declines during the 15 years prior to the survey.

The patterns of infant mortality for the rural and urban areas are basically the same. Except for the 35-39 year age group among the urban respondents where the infant mortality rate is approximately the same as that in the 30-34 year age group. This is unexpected and may be due to under-reporting of deceased children in the 35-39 year age group. Two patterns are evident in the regional data. The Highlands and the New Guinea Mainland regions have relatively high infant mortality compared with the Papua and New Guinea Islands regions. Accordingly, the Highlands and the New Guinea Mainland regions show similar infant mortality patterns, while the Papua and New Guinea Islands regions also have a similar pattern.

DIFFERENTIALS IN INFANT MORTALITY

We have briefly discussed differentials by current age and place of residence of the mother under the section on direct estimates of infant mortality rates. However, the indirect estimates offer us some additional differentials. In this section, we focus on differentials by sex of child, rural-urban residence as well as geographical regions.

It is generally accepted that males have higher mortality than females at all ages except where maternal mortality is rather high. The estimated infant mortality rates presented in Table 8 show that male infants are more vulnerable to death than female infants in the first year of life. Although the sex differential holds for the rural-urban as well as regional, the differences are not pronounced. Strangely enough the rates for the 45-49 year age groups are relatively more pronounced than those for

the younger women.

In most countries, infant mortality is relatively low in urban areas and high in rural areas. A comparison of the data presented in Table 6 shows that in PNG infants in urban areas have only a slight advantage of survival over those born in the rural areas. This urban advantage in infant mortality reflects differentials in many associated characteristics such as standard of living, access to health facilities, knowledge and economic ability for child care.

The regional differentials are presented in Table 7. The estimates of infant mortality rates indicate that the Papua and the New Guinea Islands regions are in advantageous position, in that their infant mortality rates are lower than those for the Highlands and the New Guinea Mainland regions. The data reveal some substantial differences between the New Guinea Islands region and the other three regions. The New Guinea Islands region exhibits the lowest infant mortality rates for the four regions. As a matter of fact, the infant mortality rates for the New Guinea Islands region are similar to those estimated for the urban areas in Table 6, except among the 40-44 and 45-49 year old age groups where the rates are lower for the New Guinea Islands region. The differences between the New Guinea Islands region and the other three regions may be attributed to the higher education and economic levels characterizing several areas of the New Guinea Islands region and better health services.

DISCUSSION AND CONCLUSION

This paper provides documentation of infant mortality levels, patterns and differentials in PNG. Infant mortality has declined in the rural and urban areas as well as in the four geographical regions in approximately the 15 years prior to the survey. The decline is due mainly to improvements in health services, although some remote rural areas still lack adequate health services. The relatively higher male infant mortality rates observed are consistent with over-whelming evidence that male biological risk of death is higher than female, although the male excess mortality is less pronounced in our analysis. The lower infant mortality in urban areas is expected because of the concentration of health services in the urban areas and hence easy access to such services. We have also observed marked differences in the

levels of infant mortality between the regions, especially the New Guinea Islands region and the other three regions (Papua, Highlands and New Guinea Mainland). The New Guinea Islands region in general is more progressive in terms of socio-economic development than the other regions. Accordingly, the lower levels of infant mortality are probably associated with the levels of development and relatively better education and also the provision of better health care services.

In conclusion, the indirect estimates revealed some substantial declines in infant mortality in PNG over the past 15 years, however, the levels are still high by world standards. The differentials of infant mortality levels observed in the rural and urban areas as well as in the regions in our study strongly suggest a need for implementation of the currently existing health care services particularly those that focus on infant care.

The data which we have presented in this paper are important because they point to changes in infant mortality levels in PNG. They indicate trends, differentials or similarities which assist in the long term aim of extending human life. The data furthermore enable the areas of greatest concern to be more easily pinpointed for further research and better government action for additional health facilities.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the financial support of the Population Research Programme of the Office of Environment and Conservation, and the contribution of the University of Papua New Guinea. Data processing for this paper were carried out in the Department of Demography, Australian National University, Canberra, Australia, and at Howard University, Washington D. C., U.S.A. The author is grateful to Mrs. J. Widdowson, Mrs. M. Dennis, Ms. L. Joyce, Mrs. C. Swift and Mr. K. Ronga for their help.

This study was conducted during the author's appointment in 1978-1982 as United Nations Expert in Demography assigned to the Government of Papua New Guinea.

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INFANT MORTALITY LEVELS, PATTERNS, AND DIFFERENTIALS IN PAPUA NEW GUINEA

(ABSTRACT)

This paper presents new estimates of infant mortality levels, patterns, and differentials for Papua New Guinea through the application of direct and indirect techniques. The estimates are derived from data collected between November, 1979 and March, 1980 on fertility, mortality (infant and child), and contraception. The results indicate that infant mortality has declined in all parts of the country in the past 15 years. The results also reveal a slightly lower mortality for female infants than male infants. Furthermore, we observed the existence of moderate rural-urban infant mortality differential and substantial regional differences in the infant mortality levels.