G. L. Dasvarma

Infant Mortality in Indonesia : A Review of Recent Evidence

1. Introduction

IN countries with well developed vital registration systems, measures of infant mortality are derived directly from the registered numbers of births and infant deaths in respective years. Where such data are not available with the required amount of completeness and accuracy, as is the case in Indonesia, estimates of infant mortality must be made by a retrospective survey, asking a direct question on the numbers of live births and infant deaths during a specified period in the recent past; or by indirect procedures based on proportions of children dead to mothers in different age-groups, on the analysis of birth cohorts from pregnancy histories or from proportion of the dead among recent births to all mothers.

The most widely used procedures for estimating infant and child mortality in Indonesia have been the "Brass type" methods, which are employed for converting the proportion of children dead by age-group of mothers into probabilities of dying in infancy or childhood (for example *Choet aL,* 1980; Soemantri 1983 etc.). In some instances pregnancy histories have also been used to analyse the survival of birth cohorts and arrive at estimates of infant mortality (for example McDonald *et a!.,* 1976; Kadarusman 1982). All such estimates have generally been accepted as representing the prevailing situations. Some of them have also been used as the "official" figures.

As with other demographic parameters, estimates of infant mortality in Indonesia prior to 1961 were rather scarce. In fact the period is characterised by very poor quality of data and generally imverifiable estimates (McDonald *et* a/,, 1976: 55). However, some estimates pertaining to the early 1940's have been derived from data collected under the vital registration system, introduced in

a few selected "kabupatens" (regencies) of the country. From these estimates, the total Indonesian infant mortality rate in the 1940's was inferred to be around 200 per 1000 live births (McDonald *et a!.).* The period since 1961 is mirked by a gradual improvement in data collection, suitable for estimating infant mortality. Although still far from achieving a complete vital registration coverage, several demographic enquiries in the last decade have produced a number of estimates of infant mortality in the country, both at the national and the provinciallevels. Estimates of differentials by social and economic characteristics are also available for the recent period.

This article reviews the recent estimates of infant mortality in Indonesia. Those for the most recent period arc derived from data collected in various enquiries, almost all of which were coincidentally undertaken in 1981.[1] However, as a background, estimates from data collected in 1960s and 1970s will be presented before those based on data collected in 1980 are discussed.

2. Estimates Based on Data Collected in 1960s

During 1960s, the nation's first modern census in 196! and later, the national social and economic survey (SUSENAS) in 1964 included questions on children ever born and children surviving to mothers of various age-groups. Such information was converted into measures of infant mortality through Brass type procedures. However, data collected at these enquiries suffered from a number of shortcomings which affected the estimates they yielded (Utomo, 1982: 305). The 1961 Census, for example, did not provide national level information due to the complete breakdown of data processing activities caused by political disturbances, resulting in a loss of data for all parts of the country except Jakarta, Yogyakarta and East Java (McDonald *et a!.).*

Estimate of infant mortality derived from the 1961 Census data by Hull and Sunaryo (1978: 3) show rates of 195 for Jakarta, 175 for Hast Java and 113 for Yogyakarta-, all figures referring to late (958 *or* early 1959. An infant mortality rate of 176 for East Java in the late 1960's was also estimated by Iskandar (1970) from the same data base.

The only known source of estimate ofinfant mortality for the whole country in 1960s is the Social-Economic Survey (SUSENAS) of 1964. Two separate estimates are available from this enquiry, Sastrasuunda (1969) reported a rate of 142 for both sexes for 1964, while for the same year, i.e. 1964, Suhartono and Suardi (1970) estimated an infant mortality of 188 for males and 167 for females. The latter source also gave estimates for rural Java with rates of 160 for males and 144 for females. Judging from estimates for more recent period,

1. **The exception is the Second Round** of the Multiround East **Java Population Survey, conducted in mi.**
2. **Infant mortality** rates **quoted in** this **paper** refer to number of infant deaths **per 1000 live births.**

the figure reported by Sastrasuanda appears to be nearer the prevailing actual level. Unfortunately however, not much confidence is placed on either of these estimates, because the SUSENAS 1964 suffered from problems of sample size, sampling frame and other methodological issues (Hull and Sunaryo, 1978: 3-4).

3. Estimates Based on Data Collected in the 1970s

3.1. *Data Sources*

The nation's second modern census in 1971 marked the beginning of much better coverage and processing of data, allowed for detailed analyses of mortality differentials and served as a benchmark for later studies of trends (Hull and Sunaryo, 1978: 4). The differentials in mortality mentioned above refer to infant and child mortality, partly because of the availability of data on child survivorship and the newly developed procedures for indirect estimation, and possibly also because of the interest of health planners in this important aspect of mortality (Conccpcion and Smith, J977: 14).

The 1971 Census was followed by the national Fertility-Mortality Survey (popularly known as the F-M Survey), conducted in 1973 by the Demographic Institute, University of Indonesia. This data source, consisting of pregnancy histories, has produced *estimates of levels as well as* trends in *infant and child* mortality. Doth birth cohort survivorships and child survival procedures were employed to estimate infant mortality rates. Three years later, the Indonesian Fertility Survey (IPS), conducted in conjunction with the Intercensal Survey (SUPAS) of 1976 by the Central Bureau of Statistics, included questions designed to produce maternity history and child survivorship data.[3]

The data generated by it have produced estimates of levels and differentials of infant and child mortality. This survey also marked the beginning of the collection of a new type of data, that is information on the year of the most recent births (last live births) to ever married women and the survival status of such births, which was analysed by Hull (1978) to produce estimates of infant mortality for Indonesia 1975. The Sample Vital Registration Project, carried out by the Central Bureau of Statistics between 1974 and 1977 provided direct estimates of infd.nl muitulity fui the piojeu area which consisted of nine Kecamatans and Jakarta selected to represent a variety of social, cultural and socio-economic settings (Gardiner, 1978: 28). The national social and economic survey (SUSENAS) of 1979 also yielded data on child survivorship, which have recently been analysed, by Soemantri (1983) for estimating infant mortality rates.

3. This enquiry was a part of the World Fertility Survey.

3.2. *Estimates of Infant Mortality*

Estimated infant mortality rates, their data bases, and periods of reference are given in Table 1.

Using the census survival technique, Heligman (U.S. Bureau of the Census, 1975) constructed life tables for Indonesian males and females for the period 1961-1971. He also constructed life tables for 1961 and 1971 from estimated trends during 1961-1971. The decadal infant mortality rates were 155 for males and 142 for females, which, according to the trend implied a male infant mortality of 151 in 1961 and 132 in 1971. The correspondin grates for females were 136 and 118 respectively. Note that the figures for 1961 are lower than the averages for the decade and reflect the increase in mortality in the country between 1963 and 1968.

Analysis of retrospective data on children ever born aud surviving, collected by the 1971 Census and the 1973 F-M Survey have produced estimates of infant mortality pertaining to the late 1960's. According to them, the rate for Indonesia was more than 140 per 1000 live births (Hull and Sunaryo, 1978; McDonald *eta!.*, 1976; Cho *etal,* 1980; Socmantri, 1983 and Kasto, 1983). The rate for males was almost 18% higher than that for females in the country as a whole (Cho *ct al.*, 1976: 62). Considerable rural-urban differentials were observed. For example, corresponding to an infant mortality rate of around 140 for the whole country, the rates for rural and urban areas were found to lie between 143 and 150 and between 114 and 117 respectively (McDonald *et al'*, Cho *et al.).* Similarly, large regional variations were also found. In a recent analysis of the 1971 Census data, Soemantri (1983) estimated an infant mortality rate of 98 in Yogyakarta and 219 in West NusaTeuggara for the late 1960's, corresponding to a national average of 143. The 1971 Census data analysed according to educational level of mother showed, for all provinces and for both sexes of infants, that higher the educational level of the mother, lower was her chance of infant loss (Cho *et al,* 1976, p. 65).

Official estimates based on the SUPAS 1976 data show an infant mortality rate of 121 per thousand live births for Java-Bali. This estimate was based on analysis of child survivorship data and was preferred to the direct estimate of 91 per 1000 live births obtained from time reference period data, which were suspected to be suffering from omissions of infant deaths and misreporting of ages of infants (CBS 1978, p. 63). Hull (1978) analysed the data on last births from SUPAS 1976 and estimated an infant mortality rate of 114 per 1000 live births for mid 1975. Kadarusman (1982) estimated infant mortality rates for Java and Ball from SUPAS 1976 data using birth cohort survival methods and reported that the rates for males and females were respectively 106 and 89 in the late 1960's. She also analysed the data with respect to several socio-economic variables, the chief among which showed the expected inverse association between infant mortality and the level of education of mother and also of

TABLE 1-SOME ESTIMATES OF INDONESIAN INFANT MORTALITY RATES **FROM** THE LATE 1960's TO 1980

Serial No.	*Data base and method of estimation*	*Time of reference*	*Infant Mortality Rate per 1000 live births*				*Source*
			Province Region	*Total*	*Rural*	*Urban*	
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1.	1961 and 1971 Censuses. Inferred from 1961-71 Life tables made by Census Survival Technique	1%1	N*				U. S. Bureau of the Census (1975)
			Male	151	—	—	
			Female	136	–	—	
2.	1971 Census Child Survival (Brass) Technique	Average 19fiO-1970	N**	141	150	114	*Choetal.(\9W,* p. 20)
3.	1961 and 1971 Censuses Census survival	Average 1961-1971	N				U. S. Bureau of the Census (1975)
			Male	155	—	~	
			Female	!42	—	—	
4.	1973 Fertility-Mortality Survey. Child Survival (Sullivan) method	Around mid 1967	N	140	143	117	McDonald *el al.* (1976)
			West Java	161	166	129	
			C. Java	140	142	118	
			East Java	119	121	110	
			Sumatra	137	142	110	
			Sulawesi	147	150	129	
			Ball	133	--	—	
5.	1971 Census. Child Survival (Trussell West)	1968	N	143	—	—	Hull and Sunaryo (1978)
		1967-68	"	144	—	--	Soemantri (1983)
6.	1971 Census. Child Survival (Trussell South)	1967-68	N	134	–	—	Socmanln (1983)
7.	1976 Indonesia Fertility Survey Birth Cohort Survival	Late 1960's	Java-Bali				Kadarusman (1982)
			Male	106	—	—	
			Female	89	—	—	

Table 1 *(coatcl. on page* 66)

Table 1 (*contd. from page* 65)

1	2	3	4	5	6	7	8
8.	1971 Census Child Survival—Brass	Late 1968	N	142	—	—	Kasto (1983)
	—Sullivan	,,	,,	143	—	—	
	—Trussell	,,	,,	144	—	—	
	—Feeney	Mid 1968	,,	137	—	—	
9.	1971 Census—Census Survival	1971	N				U. S. Bureau of the Census (1975)
			Male	132	—	—	
			Female	118	—	—	
10.	1971 Census Child Survival (Brass)	1971	N	137	141	112	McNicoll and Mamas (1973)
			Java	132	136	110	
			Other Islands	147	151	116	
11.	1976 Indonesia Fertility Survey—Direct Estimates	Early 1970's	N	Between 95-103	—	—	Sullivan and Wilson (1982a)
12.	1976 Indonesia Fertility Survey. Child Survival—Direct Estimate	Early 1970's	Java-Bali	121	—	—	C. B. S. (1978)
			,,	91	—	—	
13.	1976 Indonesia Fertility Survey. Child Survival—						
	Trussell West	1972-1973	N	114	—	—	Hull and Sunaryo (1978)
	Trussell South	1972-1973	N	111	—	—	
14.	1976 IFS Child Survival, Trussell West						Hull and Sunaryo (1978)
	—Standard Age Groups	1975	N	139	—	—	Hull and Sunaryo (1978)
	—Off-peak ,, ,, (of mothers)	Late 1974	N	122	—	—	
15.	1976 IFS Survival of last Births	Mid 1975	N	114	—	—	Hull (1978)

16.	Sample Vital Registration Project—Direct Estimate	1974-77	Proj. Area				
			Male	140	214	102	Gardiner(l978)
			Female	121	199	88	
17-	1979 Socio-Economic Survey—Trussell South	1975-76	N	108	—	—	soemant(1983)
				106	—	—	
18.	1980 Census						
	—Trussel1;West	Mid 1977	N	109	—	—	Soemantri (1983)***
	—Trussell South			107	—	—	
19.	1980 Census						
	—Brass	Late 1977	N	110	—	—	Kasto (1983)****
	—Sullivan	Late 1977	N	113	—	—	
	—Trussell	Late 1977	N	113	~	—	
	—Feeney	Mid 1977	N	108	—	—	
20.	East Java Population Survey : 1980 round						
	—Child Survival	1978	East Java	98	101	83	Sullivan and Wilson
	--Direct estimate	1978-80	"	83	90	5S	(1982a)
21.	National Household Health Survey 1980 Direct Esiimales	1980	Survey Areaf	88	—	—	Budiarso(1983)
22.	1980 Census	1980	N	97	106	63	Dasvarma(1983)
	—Survival of Last Live Births		East Java	91	96	70	
23.	East Java Population Survey : 1981 round—Direct	1980-81	East Java	70	75	45	Sullivan and Wilson (19826)

••Except where specified, the estimates refer to both sexes-

•N stands for nation as a whole.

'•'Estimates based on data for sample households selected for detailed studies.

•"'Estimates were based on preliminary figures of 10% of the sample households.

tWest, Central and East Java, North Sumatra, South Kalimantaoand South Sulawesi.

father (pp. 87, 92). Estimates based on successive birth cohorts indicated declining trends in infant mortality (p 57J.

From a re-analysis of 1976 SUPAS data, Sullivan and Wilson (1982a: 98-112) have concluded that indirect estimates of infant mortality based on child survivorship data were positively biased because of violations of the underlying assumptions such as non-linear changes in mortality, non-homogeneous mortality, mis-specification of the mortality patterns etc. Although direct estimates based on maternity history data were also likely to be affected by misreporting of age at death, timing of death etc., the effects of these biases were considered smaller than those affecting the child survivorship data. They suggest that it is preferable to estimate infant mortality by direct procedures and adjust the estimates for age misreporting. After allowing for an assumed 10 percent under reporting of age at death, in the intcrcensal survey of 1976 Sullivan and Wilson concluded that the infant mortality in Java-Bali was of the order of 103 instead of the higher figure of 121 as reported by the Central Bureau of Statistics (C.B.S. (1978).

However, the facilities for collection of elaborate data such as maternity histories and child survivorship in the same survey are not always available. Such enquiries have to be highly specialised and are also expensive to be conducted at regular intervals. Child survivorship data are relatively simple to collect and have become regular features of population censuses and demographic sample surveys. Therefore, there seems to be no alternative to estimating infant mortality by indirect procedures based on child survivorship. Nevertheless, the tendency of child survivorship methods to over-estimate infant mortality should be kept *in mind* while *interpreting such estimates. Further, such estimates can* at least be complemented by estimates based on suitable adjustments of information on the survival of the most recent births (last births) to women. In Indonesia, these types of estimates have been attempted with the 1976 SUPAS (Hull, 1978) and the 1980 Census (Dasvarma, 1983), and have been found to provide plausible figures of infant mortality in the country for the respective time periods.

The Sample Vital Registration Project run by the Central Bureau of Statistics during 1974-1977 has enabled the construction of life tables for males and females and for low and high mortality areas. It was a pilot study carried out in only ten areas (generally sub-districts) spread around the country. It is not certain how much the results could represent the national situation (Gardiner, 1978). For the project area as a whole, infant mortality for males was 140 and that for females 121 during 1974-1977. The rural areas showed rates of 214 and 199 for males and females respectively, while the corresponding figures for the urban areas were 102 and 88 (Gardiner, 1978: 37-40).

The 1979 SUSENAS daia on child survivorship have been analysed by Soemantri (1983), with the main objective of showing the trend in infant mortality in Indonesia. The estimated infant mortality rate in the middle of the 1970's

was foil id to lie between 106 and 108 per 1000 live births, very close to estimates cl e rived from the 1980 Census data by the same author,

Soem intri also showed that the rate of decline in infant mortality rates between th: periods implied by the 1971 Census and the 1976 SUPAS was appreciably ' irger (4.2 percent per annum) than that between the periods implied by the I 376 SUPAS and the 1980 Census (1.1 per cent per annum). This observation s iggests a retardation in the pace of decline in infant mortality in Indonesia at dis in accordance with the recent findings by Gwatkin (1980) that unusuall y rapid decline in mortality of the developing countries has at least been tempora rily halted. Such a finding has particularly important implications for the **Go'** vernment's policies and targets for future levels of infant mortality. Prospects ol further declines in infant mortality in Indonesia and their implications are disc assed later.

4. Most **Recent Estimates**

4.1. Data Sources

As mentioned before, all but one of the most recent data sources for estimat ing infant mortality rates consist of enquiries conducted in the year 1980, These include :

(i) The National Population Census;
(ii) Household Health Survey of the Ministry of Health; Government of Indonesia in six provinces (West Java, Central Java, East Java, North Sumatra, South Sulawesi and South Kalimantan), covering over 120,000 persons in about 25,000 households (Budiarso 1983);
(iii) The Morbidity and Mortality Survey of the Demographic Institute, University of Indonesia, covering about 3000 households from six villages ch isen according to socio-economic levels (Munir *et al.* 1982);
(iv) The 1980 round (baseline) of the East Java Population Survey (EJPS), with a sample of 19,200 households, conducted by the Central Bureau of Statistics in collaboration with the Population Laboratories of the Universit; of North Carolina (Sullivan and Wilson 1982a);
(v) Tt 5 1981 round (second round) of the East Java Population Survey.

4.2. *The Estimates*

The 1980 household health survey includes information to provide an estimated infant mortality rate of 88 per 1000 live births according to birth cohort survival and 100 per 1000 live births according to conversion of death rate under one year of age in to a probability of dying before the first birthday (Budiarso, 1983). Neonatal deaths arc reported to account for 40 percent of all infant deaths. The survey also included information on causes of death, which

shows, among others, that one fourth of the infant deaths were caused by diarrhoeal diseases, over one-fifth by infections of the lower respiratory tract and about one fifth by tetanus. This highlights the predominance of exogenous causes influencing the level of infant mortality in Indonesia. Such findings suggest that there is considerable scope of reducing the level of infant mortality by means of improved public health and hygienic practices, which do not necessarily have to be preceded by large scale economic development. Examples of such cases from other developing countries are given by Taylor (1983).

In spite of the fact that the methods of data adjustment and analysis do not appear sound, the survey provides some rare information on neonatal deaths and causes of infant deaths in Indonesia, and the findings can be utilised in planning and executing similar studies in the future.

The Morbidity and Mortality Survey of Yogyakarta and Lombok (Munir *et al.* 1982) suffered from problems of sample size and small numbers. **Hence** detailed estimates are not possible. However, infant mortality rates estimated from child survivorship data confirm the high levels prevailing in Lombok (around 200) and the *low* rates found in Yogyafcarta *(below 60). This* leaves us with the more extensive data sources, the 1980 Census and 1980 and 1981 rounds of the East Java Population Survey.

The 1980 Census data have been analysed by several researchers for estimating levels of infant mortality. Child survivorship data have been used by Kasto (1983) and Soemantri (1983) for estimating the levels and trends in infant mortality rates in Indonesia. The former based his calculations on advanced tabulations for ten per cent of the sample households, while the latter used data from all the sample households.[4] The estimates, however, do not vary much from each other. Soemantri's estimate provide more details regarding provincial differentials, trends during 1971-J980 and projected infant mortality rates to the year 2000, based on the rates of decline observed during 1971-198Q. As such, the discussion will include only this paper in preference to that by Kasto. Another reason for its selection is that Soemantri's findings appear to be used more or less as "official" figures.

According to Soemantri (1933), the infant mortality rate in Indonesia was 107 per thousand live births in the middle of 1977. This rate was dispersed among the provinces with a high level of 187 in West Nusa Tenggara and a low of 62 in Yogyakarta. Estimates derived by the same author from 1971 Census data also show these two provinces as having the highest and the lowest rates respectively.

If the sources of bias affecting indirect estimates of infant mortality (Sullivan and WiJson, 19S2; 102-112) are present also in the 1980 Census data (there is no reason to believe otherwise), then Soemantri's estimate of an

4. Five per cent **of** the **households visited** during the complete **enumeration were** selected **for detailed demographic enquiries.**

infant mortality rate of 107 per 1000 live births for Indonesia may be positively biased.[5]

However, there is an alternative estimate of infant mortality for Indonesia in 1980. This has been derived from information on the *survivorship of the* most recent births to ever married women.[6] After proper adjustment of the data, the infant mortality rates were estimated at 97, 106 and 63 for total, rural and urban areas of Indonesia respectively. The reference period is the year 1980 (Dasvarma 1983). If an "optimistic" 3.2 per cent annual reduction rate (ARR) in infant mortality is applied to Soemantri's estimate of 107 for mid 1977 (p. 188), then the infant mortality in 1980 would become 97, exactly the same level estimated from last live birth data. If, however, an ARR of 1.1 per cent ("Pessimistic") pertaining to the latter half of the seventies (p, 181) is applied to the estimate for 1977, then infant mortality in 1980 would become 103, six per cent higher than the figure estimated by Dasvarma (1983). In any event, it appears that the infant mortality in Indonesia in 1980 was in the close vicinity of 100. Given either the optimistic or the pessimistic rate of reduction, current levels of infant mortality might well have gone below 100, thus justifying the prediction made five years ago by Hull and Sunaryo (1978: 38).

The 1980 round (baseline) of the East Java Population Survey (Sullivan and Wilson 1*982a)* provides estimates of infant *mortality for the* province by both direct and indirect methods. The indirect method (child survivorship gives estimated levels of infant mortality of 98 for all East Java and 83 and 101 for the urban and rural areas respectively for the year 1978. The directly estimated rates, referring to 1979, arc 83 for all East Java, 58 for urban and 90 rural areas.

From the second round (1981) of the East Java Survey (Sullivan and Wilson 1982b),direct estimates of infant mortality rate for total, urban and rural areas of the province were obtained as 70, 45 and 75 respectively. In comparison with the direct estimate for 1978-80, this implies a reduction by around 16 percent

5. It has been observed that the total fertility rate declined by 7 per cent from 1967-70 to 1971-75, and by 10 percent from 1971-75 to 1967-79 (Mamas, 1983; II). But the effect of this on the indirectly estimated IMR will not be much, as shown by Sullivan and Wilson (1982a), Non-linsur change *in* mortality can, however, affect indirect estimates. There is evidence that the decline of IMR from the late 'sixties, to the late 'seventies has not been linear, the decline was much faster during 1971-76 than during 1976-80 and the trends in infant mortality estimated for each source of data also suggest that the decline was not linear (Soemantri, 1983: 181 and 183).

6. Information on last births offers a relatively new but simple procedure for estimating infant mortality. It does not involve restrictive assumptions on past fertility and mortality and provides estimates with greater degree of timeliness. More expanded questions on last births, that is including those on penultimate births and any possible subsequent pregnancies would provide better quality data, which could produce better estimates of infant mortality. It has been suggested to include such expanded questions in the forthcoming intercensal survey of 1985 and in subsequent censuses.

in the rate for all East Java, which according to the authors is too large for a sustainable secular decline. As mentioned before, the investigators of the EJPS prefer the directly estimated rates to the indirect estimates even though the former are much lower. They question the g:neral confidence placed on indirectly estimated rates on the grounds of violation of basic assumptions and provide supporting evidence by comparing the two kinds of data from SUPAS 1976.

Estimates of infant mortality from last live birth data for East Java 1980 are 91, 69 and 95 respectively for total, urban and rural areas (Dasvarma, 1983). The set of estimates from last live birth data may be comparable to those based on EJPS reference period data in that both arc direct estimates. However, there arc differences between the two sets of figures, the reason for which could include differences in sampling, quality of data and methods of estimation and it is not possible at this stage to pin-point any specific reason for the difference.

4.3. *Socio-economic Differentials*

Analyses of data collected during the 1970's have shown that infant mortality is inversely related to mother's education, quality of housing (Hull and Sunaryo, 1978), father's education, and occupation (Kadarusman, 1982). In particular all studies dealing with differential infant mortality confirm the findings from the Nigerian study by Caldwell (1979) and subsequent elaborations of the same with data from other countries (Caldwell and McDonald 1982) that parental education is of major importance in reducing infant mortality.

According to provisional figures from the analysis of the 1980 census data, infant mortality rates for Indonesia as a whole are found to vary from a high of 127 for women with no schooling to a low of 63 for women who have completed Senior High School (Adioetomo, forthcoming). The same source indicates an inverse relationship between age at marriage of women and infant mortality. There are no data on income, but using total floor space of households as a proxy for economic standing, it is found that households with larger floor areas have lower infant mortality.

4.4 *Prospects of Further Decline*

Despite substantial reductions in infant mortality during the seventies, Indonesia has one of the highest levels in the South-East and East Asian region. In terms of infant and child mortality, the Indonesian rates are about three times those found in such countries of the region, as Malaysia, the Republic of Korea, Hongkong and Singapore (Jones, 1978: 51).

One of the goals of the Government of Indonesia is to reduce the level of infant mortality to 45 per 1000 live births by the year 2000. If the annual

reduction rale of 3.2 per cent per annum observed during 1971-1980 is applied to the infant mortality rate of 107 for the mid-year 1977, then the level for Indonesia in the year 2000 will still be over 50 per 1000 live births (Soemantri 1983: 188). This projected overall rate Will consist of a low rate of less than 20 for Yogyakarta and a still high rate of over 125 for West Nusa Tenggara. If, however, the 3977 rate is projected to the year 2000 according to the "pessimistic" rate of annual reduction of 1.6 per cent (Soemantri, p. 192), then the infant mortality at the end of the century is expected to become 73 per 1000 live births, more than one and half times the target set by the Government. The "pessimistic" rate appears to be more in agreement with the slackened pace of decline observed for the latter half of the seventies by Soemantri (p-18I).

As such, the achievement of th- target under continuation of current conditions appears even more difficult. Therefore, the decline of infant mortality has to be accelerated. To do this, public health programmes and related activities have to be substantially increased (Utomo 1983a). Another simultaneous approach should be directed towards the reduction of differentials. Geographical differentials have already been identified, the next step is to find out why these differentials occur and introduce remedial measures to control the factors responsible for the differences.

5. Conclusion

Available recent evidence has shown that infant mortality in Indonesia has declined and is currently below 100 per 1000 live births. Regional differentials exist with almost the same magnitude as they did ten years ago. However, the speed of decline in the infant mortality rate has been reduced, which needs to be made much faster (about 4 per cent per annum), if the rate is to be brought to the targeted level of 45 per thousand live births by the year 2000.

Increased public health and socio-economic developmental activities have been advocated by several researchers (Utomo 1983. Soemantri 1983). However, even simpler expediencies such *as oral rehydration therapy to combat* diarrhoea! diseases, immunisation of expecting women against tetanus and other measures to control deaths from the already identified causes could achieve significant reductions in infant mortality even without much material progress in socio-economic status, as has been observed iu Sri Lanka and Kerala. In other words, the formulation and implementation of'local solutions' (Taylor 1983) is as importantly needed as the other more sophisticated measures.

However, the measures referred to above may help in reducing mortality but not morbidity. Infants and children may survive, but may not be healthy. This calls for good nutrition and other aspects of the socio-economic environment which ensure good quality of life. The answer does not lie simply in the improvement of public health facilities alone, which if pursued, may prove

too costly in the face of other competing priorities of development.

For a country like Indonesia, which has embarked on development on varied fronts, it calls for the adoption of a proper "mix" of socio-economic development in general and improvement of public health facilities per se in particular, and needless to say, a proper implementation of primary health care, be that centralised or carried out through regional governmental agencies.

References

1. Adioetomo, Sri Moertiningsih, (forthcoming). Diferensial Mortalitas Bayi dan Anak-anak di Jakarta dan Indonesia. (Differential Infant and Child Mortality in Jakarta and Indonesia). (In Indonesian).
2. Budiarso, Ratna, 1983, Angka Kematian Bayi: Survei Kesehatan Rumah Tangga. (Infant Mortality Rate: Household Health Survey).
   Seminar on Infant Mortality Rale in Indonesia. *Central Bureau of Statistics.* Jakarta, February 1-3, 1983. (In Indonesian).
3. Caldwell, J.C., 1979, Education as a Kactor in Mortality Decline—An Examination of Nigerian Data. *Population Studies* 33 : 395-413.
4. Caldwell, J.C- and Peter McDonald, 1982, Influence of Maternal Education onlnfant and Child Mortality—Levels and Causes. H*ealth Policy and Education : 2 :* 251-267-
5. Clio, Lee-Jay, Sam Suharto, Geoffrey McNicoll ami Made Manias, S.G. 1976, Estimates of Fertility and Mortality in Indonesia based on the 1971 Population Census. *Biro Pusat Statistik,* Jakarta.
6. Cho, Lee-Jay, Sam Suharto, Geoffrey McNicoll and Made Mamas, S.G., 1980. Population Growth of Indonesia. An Analysis of Fertility and Mortality based on the 1971 Population Census. The University Press oi' Hawaii, Honolulu.
7. Conccpcion, Mercedes B- and Peter Smith. 1977, The Demographic Situation in the Philippines: An Assessment in 1977- *Papers of the East-West Population Institute,* 44: Honolulu.
8. C.H.S., 1978, Indonesia Fertility Survey 1976. *Principal Report* 1. Jakarta. *Central Bureau of Statistics.*
9. Dasvarma, G-L., 1983, Indonesian Infant Mortality Estimates for 1980 from Last Live Birth Data. Seminar on Infant Mortality Rate in Indonesia. *Central Bureau of Statistics.* Jakarta. February 1-3, 1933.
10. Gardiner, Peter, 1978, Age Patterns of Mortality in Indonesia. (An Analysis of results of the Indonesian Sample Vital Registration Project 1974-1977). *Indonesian Population Dynamics Project. Working Paper No. 12.* Population Institute. University of Gadjah Mada. Yogyakarta.
11. Gwatkin, Davidson R., 1980, Indications of Change in Developing Country Mortality Trends: The End of an Era? *Population and Development Review. 6* (4).
12. Hull, T- H-, 1978, An Estimate on Infant Mortality for Indonesia 1975, *UGM-Indonesian Population Dynamics Project. Working Paper no. 10.* Yogyakarta.
13. Hull, T. H. and Sunaryo, 1978, Levels and Trends of Infant and Child Mortality in Indonesia. Lembaga Kependudukan, Gadjah Mada University, Yogyakarta
14. Iskandar, N. 1970. Some Monographic Studies on the Population in Indonesia, *Demographic Institute, Faculty of Economics,* University of Indonesia, Jakarta.
15. Jones, Gavin W., 1978 Social Science Research on Population and Development in South-East and East Asia: A Review and Search for Directions. *International Review Group.* El Colegio de Mexico, Mexico City.
16. Kadarusman, Julianti, 1982, Infant and Child Mortality Differentials in Java-Bali. *M.A. Thesis.* The Australian National University, Canberra.

17. Kasto, 1983, Perkiraan Tingkat Kematian Bayi di Indonesia (Estimation of Infant Mortality Rate in Indonesia). Seminar on Infant Mortalily Rate in Indonesia, *Central Bureau of Statistics.* Jakarta. February 1-3, 1983 (In Indonesian).

18. Mamas, Si Gde Made, 1933, Tren dan Vuriasi Angka Kekihiran Indonesia menurut Propinsi. (Trends and Variation in Fertility Rale in Indonesia by Province). *Central Bureau of Statistics and BKKB*V. *Seminar* on *Fertility in Indonesia. Jakarta, 30 May to* I June 1983 (In Indonesian).

19. Munir, Rozy, Bud! Utotno and Bambang Sutrisna, 1982, Morbiditas dan Mortalitas di Indonesia. Seri I, Bagian l. Laporm Utama. (Morbidity and Mortality in Indonesia. Series 1, Section 1. *Lembaffa Demografi, Fakultax Ekonami,* Universitas Indonesia, Jakarta (In Indonesian).

20. **McDonald, Peter F,** Moliammad Yasin and Gavin W. Jones, 1976, Levels **and Trends** in Fertility and Childhood Mortality in Indonesia. *Leinbaga Demografi, Faknltas Ekonotni,* Universitas, Indonesia, Jakarta.

21. McNicoll, Geofrrcy and Si Gde Made Mamas, 1973, The Demographic Situation in Indonesia. *Paper presented at the Annual Meeting of the Pup idation Association of America,* New Orleans, April 1973.

22. Sastrasuanda, Toto E., 1969, Fertility and Mortality in Indonesia. Demographic Training and Research Centre, Bombay.

23. Soemantri, S., I983, Pola Perkembangan dan Perbandingan antar Dacrab Angka Kematian Bayj. {Patterns of Change in Infant Mortality Rate and their Inter Provincial Comparisons). Seminar on Infant Mortalily Rate in Indonesia. *Central Bureau of Statistics.* Jakarta, February !-3, 1983. (In Indonesian).

24. Suhartono, P. and Hadma Ali Suardi, 1970, Estimation of Mortalily of the Rural Population Of Java-Madura, *Demographic Training and Research Centre, Bombay.*

25. Sullivan, Jeremiah, M. and Steve, E., Wilson, 19S2n, The 1980 Baseline Round of the East Java Population Survey: A Fimil Report. *Central Bureau of Statistics,* Jakarta.

26. Sullivan, Jeremiah, M. and Steve, E. 19826, The Second Round (1981) of the East Java Popular/on *Survey :* A *Final Report. Central Bureau of Statistics,* Jakarta.

27. Taylor, Carl E., 1983, The Impact of Health Care on Infant Mortality. Seminar on Infant Mortality Rate in Indonesia. *Central Bureau of Statistics,* Jakarta. February 1-3, 1983.

28. U.S. Bureau of the Census, 19?.\ Levels and Trends of Mortality in Indonesia, 1961 to 1971, by Larry Heligman. *International Research Document No. 2* (ISP-RD-2). U.S. Government Printing Office. Washington D.C.

29. Utomo, Rudi, 198?., Mortality Trends and Differentials in Indonesia 1950-1975. In : Mortality in South and East Asia : A Review of changing Trends and Patterns, 1950-1975, *WHO'ESCAP Meeting,* Manila 1-5 December 1980.

30. Utomo, Budi, 1983a Prospek Angka Kematian Bayi dan Anak di Indonesia Menjelang Tahun 2000. (Prospects of Infant and Child Mortality in Indonesia until the year 2000.) *Third National Congress of IPADI.* Bogor 4-7 October 19S3. (In Indonesian).