Mortality of children under age five is an important indicator of the health status of a population. It reflects overall socioeconomic conditions as well as the effectiveness of a health system in providing preventive care, such as immunizations, and curative care against childhood diseases. As a new cohort is born every year, infant mortality (children aged 0–1) and child mortality (children aged 1–5) reflect changing conditions more rapidly than other health status indicators, such as life expectancy (see box). Childhood mortality is also reliably measured by surveys—an advantage in countries where vital registration is not available.

This Watching Brief discusses the findings from the *Indonesian Demographic and Health Survey 1997* (DHS), assesses the trend in infant and child mortality in different regions since the previous surveys in 1994, 1991, and 1987, and compares the findings with those of an earlier study (Saadah, Hill, Chapman, and Hill 1997). Trends in the determinants of childhood mortality are also presented. Data from the 1998 SUSENAS (household survey) are used to validate the most recent estimates of infant and child mortality rates.

The DHS data were collected during September to December 1997, and the mortality rates calculated from the data refer to the 0–4 year period before the survey. The results therefore provide a good baseline for evaluating the impact of the economic crisis in the future.

### Trends in childhood mortality

Figure 1 shows that childhood mortality has declined substantially, both during the first year of life and during the next four. The decline has been particularly rapid in the five years before the survey, as compared with the preceding five years. Between 1982–87 and 1992–97, infant mortality dropped by 30 percent, child mortality (ages 1–5) by 58 percent, and overall...
under-five mortality by 39 percent. The slowest decline occurred in mortality during the first month of life: neonatal mortality dropped by 23 percent.

These trends in the rates over time are based on the reported birth histories in the 1997 DHS only. A different way to assess the trend is to compare the most recent estimates obtained in the four Demographic and Health Surveys that have been carried out in Indonesia since 1987. Figure 2 presents a comparison of the infant and under-five mortality rates measured by the DHS in 1987, 1991, 1994, and 1997 for the five-year period immediately preceding the surveys. The trend is essentially the same as the results from the 1997 DHS for past periods: both infant and child mortality have dropped considerably since the mid-1980s through the mid-1990s.

A detailed analysis of the earlier DHS results by Saadah, Hill, Chapman, and Hill supports these findings. Their analysis of the 1994 DHS showed a decline of 40 percent in the under-five mortality rate between 1984 and 1994, and of 28 percent in the infant mortality rate, which is almost identical to the 1997 results.

In order to verify whether the most mortality has been correctly measured by the DHS, data from the January 1998 SUSENAS (Indonesian National Socioeconomic Survey) were analyzed. This large household survey did not include the detailed birth histories the DHS obtained, but included questions on the number of children women had given birth to, and on the number of surviving children. Such questions allow the estimation of child mortality through the use of an indirect demographic estimation method, which converts the proportion of children that has died into mortality rates. The estimated mortality rates vary by the specific model-life table on which the estimates are based; the results shown below use the “Coale-Demeny West” model. The results of the SUSENAS are slightly higher, but largely consistent with the 1997 DHS (table 1).

<table>
<thead>
<tr>
<th>Table 1. Comparison of the 1997 DHS with the 1998 SUSENAS</th>
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</thead>
<tbody>
<tr>
<td>Infant mortality rate</td>
</tr>
<tr>
<td>Child mortality rate</td>
</tr>
<tr>
<td>Under-five mortality rate</td>
</tr>
</tbody>
</table>
Data and methodology

The 1997 Indonesia Demographic and Health Survey (DHS) is a nationally representative survey of 28,810 ever-married women aged 15–49. The data are representative for each of the 27 provinces. This is the fourth in a series of DHSs in Indonesia. Previous DHSs were conducted in 1987, 1991, and 1994. These surveys collect information on reproductive health services, fertility, and maternal and child health.

Infant and child mortality rates are derived from questions in which respondents are asked aboutchildbearing experiences (“retrospective birth histories”). For each live birth, information on the date of birth, sex, and survivorship status is collected. For living children, information about the age of child at his or her last birthday is recorded. For children who have died, the respondent is asked to provide the age at death. A life table approach is used to estimate probabilities of dying between two exact ages.

The DHS data is used to estimate a number of different childhood mortality rates:

- **Under-five mortality:** the probability of dying between birth and exact age five years ($q_0$);
- **Infant mortality:** the probability of dying between birth and exact age one year ($q_1$);
- **Neonatal mortality:** the probability of dying between birth and exact age one month;
- **Postneonatal mortality:** the difference between infant and neonatal mortality;
- **Child mortality:** the probability of dying between exact ages one and two years ($q_4$).

Infant and child mortality rates in relatively low fertility settings are based on a small number of deaths in any given year. The data on deaths are therefore aggregated for five-year periods, and the mortality rates are presented as averages for the 0-4 years before the survey. While the quality of data for estimating childhood mortality is generally good, heaping in age of death may bias estimates somewhat. Recall error and the fact that no women over age 50 are included may bias estimates for earlier periods. Furthermore, children of nonsurviving mothers, who are likely to be at greater than average mortality risk, cannot be included.

Table 2. Infant and under-five mortality by island group, 1970–74 to 1992–97

<table>
<thead>
<tr>
<th>Period</th>
<th>Sumatra</th>
<th>Java-Bali</th>
<th>Other Islands</th>
<th>Kalimantan</th>
<th>Sulawesi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Infant</td>
<td>Under-five</td>
<td>Infant</td>
<td>Under-five</td>
<td>Infant</td>
</tr>
<tr>
<td>1970-74</td>
<td>77</td>
<td>142</td>
<td>97</td>
<td>166</td>
<td>110</td>
</tr>
<tr>
<td>1975-79</td>
<td>67</td>
<td>118</td>
<td>94</td>
<td>150</td>
<td>111</td>
</tr>
<tr>
<td>1980-84</td>
<td>71</td>
<td>112</td>
<td>79</td>
<td>118</td>
<td>101</td>
</tr>
<tr>
<td>1985-89</td>
<td>60</td>
<td>93</td>
<td>77</td>
<td>106</td>
<td>84</td>
</tr>
<tr>
<td>1990-94</td>
<td>53</td>
<td>74</td>
<td>51</td>
<td>66</td>
<td>72</td>
</tr>
<tr>
<td>1992-97</td>
<td>49</td>
<td>67</td>
<td>42</td>
<td>50</td>
<td>53</td>
</tr>
</tbody>
</table>

**Regional differences in childhood mortality levels**

DHS 1997 shows that differences in infant- and child mortality in different regions of Indonesia persist. Table 2 combines data from Saadah, Hill, Chapman, and Hill (1997) and the 1997 DHS to show trends in childhood mortality by island groups. The decline in the infant mortality rate has been most rapid in Java-Bali and the Other Islands group, and slowest in Sumatra and Kalimantan. Only Java-Bali has infant and child mortality rates below the national average. The mortality rates in Sumatra, Kalimantan, Sulawesi, Kalimantan, and the provinces of the Other Islands have converged and are now only slightly different from each other.

Within island groups, large variations persist among provinces. In Java, for example, West Java’s children are subject to a 2.8 times higher risk of mortality than children in East Java. Large differences also exist among provinces within the other island groups, particularly in Sumatra, Other Islands, and Sulawesi. Figure 3 ranks all provinces by the level of the under-five mortality rate for 1992–97.

**Components of childhood mortality**

As childhood mortality drops, the proportion of child deaths that occur in the first months of life tends to increase. This trend has occurred in Indonesia as well (table 3). Both neonatal and post-neonatal mortality have dropped quite rapidly in the past five years, but not as much as child mortality. Child mortality has been reduced through interventions such as immunization and better nutrition. Mortality in the first months of life is frequently related to congenital factors and maternal conditions during pregnancy and delivery. Acute
respiratory infections that require early diagnosis and treatment are also critical. In order to achieve further large reductions in child mortality, it will be necessary to pay increasing attention to these causes of death during early infancy.

**Determinants of childhood mortality**

A multivariate analysis to identify which factors have contributed to the rapid decline in childhood mortality is beyond the scope of this paper. It is possible to point at likely reasons for the decline:

- Reduced prevalence of childhood malnutrition. Undernutrition among young children decreased from 35 percent in 1992 to 30 percent in 1998 (See Watching Brief Issue 1). Malnutrition is a major contributing factor for mortality from many causes.
- An increase in the proportion of pregnant women receiving tetanus toxoid vaccinations during pregnancy. The percentage of women who did not receive any tetanus toxoid injection decreased from 43 percent in 1991, to 33 percent in 1994, and to 26 percent in 1997. This reduces the risk of infant deaths due to neonatal tetanus.
- An increase in the proportion of children aged 1 year who received all or some vaccinations. The proportion of children fully immunized has increased from 48 percent in 1991, to 50 percent in 1994, and 55 percent in 1997. Measles immunization increased from 58 to 71 percent during this period; DPT2 from 65 to 75 percent.
- An increase in births attended by trained providers from 32 percent in 1991 to 37 percent in 1994 and 43 percent in 1997.
- Improved knowledge by mothers of oral rehydration therapy, reaching 94 percent in 1997, up from 85 percent in 1991, and an increased proportion of children with diarrhea receiving oral rehydration salts.
- A higher proportion of children taken to health facilities or providers for diarrhea and acute respiratory infections. In 1997, 69 percent of children with cough and rapid breathing were taken to a health facility or provider, versus 50 percent in 1991.
- A reduction in the proportion of births to very young women, in the proportion of short birth intervals, and of high parity births, which carry higher risks of childhood mortality.

**Conclusions**

The findings of the 1997 DHS showed continued decline in childhood mortality indicators. These results will be a valuable baseline for estimating the impact of the current economic crisis on child mortality trends in future surveys.

As the overall level of child mortality has declined rapidly, the differences among island groups have become smaller. Only Java-Bali stands out as having lower childhood mortality than the other islands. Within these groupings, however, there are large differences among provinces, indicating a need for focussing interventions.

Child mortality has declined more rapidly than infant mortality, and the proportion of child deaths to neonates has increased since the 1980s. To achieve significant future reductions in childhood mortality, the causes of neonatal mortality need to be addressed in order to maintain the downward trend.
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