FERTILITY DECLINE IN INDONESIA 1971-1991

James A. Palmore
Si Gde Made Mamas
Yohandarwati Arifiyanto

Abstract. *Since Indonesia does not have a good vital statistics registration system, fertility rates for the country as a whole and any administrative subdivisions must be estimated indirectly. This paper summarizes estimates resulting from the application of four indirect estimation techniques to seven Indonesian data sets. The own-children method, the last live birth method, the Palmore method, and the Rele method were applied to all seven data sets. Estimates were prepared for the whole country and its three major regions for 1971 through 1991. Estimates for individual provinces were also calculated for some dates. In addition, estimates from other methods, available for some dates and subnational areas, are presented. The data sets used are the 1971 Census, the 1976 Intercensal Survey, the 1980 Census, the 1985 Intercensal survey, the 1987 National Indonesia Contraceptive Prevalence Survey, the 1990 Census, and the 1991 Indonesia Demographic and Health Survey. The results show that fertility in Indonesia fell by at least thirty-nine percent between 1971 and 1991, but the various methods do not agree on the levels of fertility, particularly for the earliest dates. By 1991, however, three estimates of the total fertility rate for Indonesia as a whole are in as a whole are in a small range: from a low estimate of 3.22 to a high of 3.35. Fertility declined rapidly in all of the major regions of the country, although fertility started at higher levels outside of Java and Bali and hence remains at higher levels today despite rapid declines.*

1. Introduction

Indonesia is widely recognized as having one of the most successful family planning programs in Asia, and rapidly declining fertility is part of the evidence for this success. In the two decades between 1971 and 1991, the total fertility rate in Indonesia declined by at least thirty-nine percent. In 1971, the total fertility rate was between 5.29 and 5.81. By 1991, the total fertility rate was between 3.22 and 3.35, and several provinces had total fertility rates close to replacement level given current mortality conditions.

This report documents the dramatic changes in Indonesia's fertility, and presents information on how the fertility decline has varied in the regions and provinces of the country. Some of this story is already known, of course, but there are several features of the present effort that distinguish it from earlier work. One is the fact that new fertility estimates, not available before, are presented. Second, past reports on trends in fertility have often used inconsistent methods (method A for time 1 and method B for time 2) to assess the trends, resulting in trends of doubtful interpretation. This report presents estimates from 1971 through 1991 for several indirect fertility estimation techniques, allowing trend assessments using the same method for each time point.

2. Background

Since Indonesia does not have a good vital registration system, termining fertility levels and trends has been problematic for many years. Beginning almost three decades ago, efforts have been made to indirectly estimate Indonesia's fertility rates. In 1964, the Central Bureau of Statistics' first National Socio-economic Survey SUSENAS) collected information on births in the past few years and attempted to estimate fertility rates from this data. Another notable early attempt used the own-children method produce fertility estimates using the 1976 Intercensal Survey. Later, the own-children method was also applied to the 1971 and 1980 Censuses and the 1985 Intercensal Survey (see, for example, Cho et al. 1976; United Nations Economic and Social Commission for Asia and the Pacific 1987; Mamas 1983, 1989). More recently, the last live birth method has been applied to 1980 and 1985 data (Dasvarma and Hull 1984; Hull and Dasvarma 1987). Unfortunately, the own-children method and the last live birth method have frequently yielded inconsistent results, particularly for subnational areas outside of Java and Bali. Assessing fertility levels has been complicated even further by "direct" method estimates recently introduced in connection with the 1987 National Indonesia Contraceptive Prevalence Survey (NICPS) and the 1991 Indonesia Demographic and Health Survey (IDHS). As shown later in this report, the last live birth and "direct" method estimates of the total fertility rate (TFR) are usually lower than other indirect estimates.

Further, results using different estimation techniques for different dates have often been combined to assess trends in Indonesia's fertility. Several of the most recent assessments of Indonesia's fertility trends are not exceptions. One example is Table 6.2 in the main national report on the 1987 NICPS, Indonesia's first DHS. There, applications of the own-children method, results from using the last live birth method, and calculations based directly on birth history data (the "direct" method) are used together to provide a "broad picture of the recent decline in Indonesian fertility" (Central Bureau of Statistics et al. 1989, p. 53).

A second example is Table 3.1 in the first country report on the 1991 IDHS, which combines own-children and "direct" method estimates to show trends from 1971 to 1991 (Central Bureau of Statistics et al. 1992, pp.27-28).

The considerations above strongly suggest the potential utility of producing estimates for a wide range of data sets with an increased number of estimation methods to obtain a better fix on fertility levels in Indonesia. In addition, one can then evaluate changes in fertility using the same methods, rather than making comparisons across time using different estimation techniques for each time period. Mamas, Palmore, and Arifiyatno began this process using data from 1971 through the 1987 NICPS (Mamas et al. 1991; also see Central Bureau of Statistics 1990). The present paper continues this process, incorporating the 1990 Census data, extending the analysis through the 1991 IDHS, and providing estimates for individual provinces as well as broad regions, details not given in the earlier work.

3. Data and Methods

The data sets used in the current assessment were the 1971 Census, the 1976 Intercensal Survey, the 1980 Census, the 1985 Intercensal Survey, the 1987 National Indonesia Contraceptive Prevalence Survey, the 1990 Census, and the 1991 Indonesia Demographic and Health Survey. Four indirect estimation techniques were applied to all of these seven data sets. Two of the techniques were those already mentioned as having been used often with Indonesian data: the own-children method (Cho Retherford and Choe 1986) and the last live birth method (see, for example, Dasvarma and Hull 1984). Two other methods were added, each of them in common use outside of Indonesia: the Palmore method (Palmore 1978) and the Rele method (Rele 1967). In addition, "direct" method estimates are available for 1987 and 1991 and Adioetomo et al. (1989) prepared estimates for 1987 using yet another methodology.

The Palmore and Rele methods have been well explained in the citations listed and have been applied often in other countries (for example, Rao, Rele, and Palmore 1987; Hanenberg 1983; Swamy et al. 1993; United Nations Economic and Social Commission for Asia and the Pacific 1987 and 1988). For this reason, a complete description of each method is not given here, although an Appendix provides a summary.

What is important for the present application is to remember the type of estimation technique and the data required. The own-children method is essentially a reverse survival technique. The last live birth method is more direct, relying on asking women when their last live birth occurred or on a recent birth history. The technique is particularly sensitive to date misreporting (see Mamas 1989, p. 43).

The Palmore and Rele methods are both regression techniques that rely on commonly available census or survey tabulations. The Palmore and Rele equations rely on the child-woman ratio, the ratio of children ages 04 to women aged 15-49, with adjustments for mortality. The Palmore equations also adjust for nuptiality patterns in the population. In situations where the number of children ages 0-4 are likely to be severely over -or under- counted, both the Palmore and Rele estimates will reflect the inaccurate counts.

4. Fertility Estimates for Indonesia, 1971 - 1991

Using the four estimation techniques for the seven data sets results in three clear findings: (1) fertility in Indonesia has been declining rapidly and this decline is shown by all of the estimation methods; (2) the estimates from the four techniques do not tally very well before 1980; but that (3) the estimates converge and agree closely in 1990 and 1991 with the exception of the last live birth method. Table 1 and Figure 1 summarize the estimates. The own-children, Palmore, and Rele estimates are all averages for the five years preceding the year data was collected except for 1991. For 1991, the own-children estimates are averages for the last three years for reasons that will be made clear later. The last live birth method, on the other hand, refers to the year preceding the data collection date. All of the tables and graphs in this report are labeled by the year the data was collected, but the fertility estimates themselves refer to the average rates for one, three, or five years before that date.

Table 1
ESTIMATED TOTAL FERTILITY RATES
BASED ON FOUR DIFFERENT ESTIMATION METHODS:
INDONESIA, 1971-1991

Estimation	Year Data Collected						
	1971	1976	1980	1985	1987	1990	1991
Last Live Birth Method	5.29	4.70	4.27	3.26	2.93	2.80	n.a.
Own-Children Method	5.60	5.20	4.68	4.06	3.35	3.33	3.22
Rele Method	5.35	4.66	4.54	3.89	3.39	3.38	3.25
Palmore Method	5.81	5.04	4.70	3.95	3.76	3.53	3.35

Note: n.a.= not available

Usually (the exception is for 1976), the last live birth method gives lower estimates than the other three methods. When fertility is declining, this is to be expected since the last live birth method estimates are for a more recent date. But the magnitudes of the differences between the last live birth estimates and the others exceed differences that can be explained by declining fertility. For the purposes of this analysis, in any case, the most important result is that each of the methods shows rapid fertility declines.

In terms of percentage declines, there is substantial agreement over long time periods: the own-children method estimates declined 42.5% between 1971 and 1991, the Rele method estimates 39.3%, and the Palmore method estimates 42.3%. Even the last live birth method is not too far out of line: a 47.1% decline. Most of the decline was in the last decade, with the estimates for the four series showing declines of between 24.9 and 34.4 percent from 1980 to 1990.

Figure 1
Estimated TFRs, Indonesia: 1971-1991
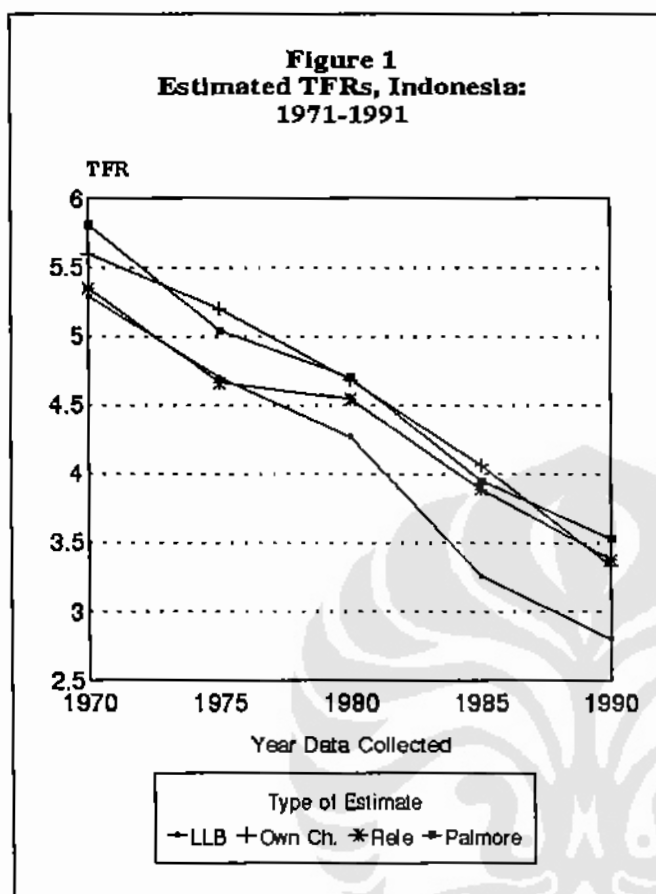
What the estimation techniques do not agree on is the fertility levels. The range in estimates is large partly because the last live birth method estimates are typically much lower than the other three estimates. If one discounts the "lower bound" last live birth estimates, the range is smaller: 20 or less except prior to 1980 and in 1987.

What accounts for the large range? For 1987, the explanation probably lies in the sampling design of the 1987 Survey. The sample size outside of Java and Bali was very small: only 3449 ever married women were interviewed in the provinces outside Java and Bali. While Java and Bali constitute a substantial

proportion of the total population of Indonesia, small sample sizes outside of Java and Bali can still distort the overall fertility level.

The 1987 total fertility rate was estimated to be in the range of 2.93 to 3.76 (Adioetomo et al. 1989, using yet another estimation technique, arrived at a total fertility rate of 3.37 for 1987). Clearly, the actual rate was somewhere in the middle of that range, probably close to 3.5, but the small sample size for areas outside Java and Bali precludes precision. Because of the unreliability of the 1987 estimates, all of the graphs in this paper omit the estimates for that date but the estimates are presented in the tables except for areas outside of Java and Bali.

A more general explanation for the ranges in the estimates comes from remembering that fertility estimates may be in error because of age misreporting, under-reporting of births (especially children born alive who later died), and temporal inaccuracy in the reporting of recent births. All of the indirect fertility estimation techniques used here rely, in different ways to be sure, on age data. Unfortunately, age data in Indonesia is known to be unreliable (see, for example, National Research Council 1987, pp. 15-28). The age data problem is the most likely explanation for the range in the fertility estimates reported here, but this and other possible reasons (mortality levels, sample sizes) are discussed in more detail later in this paper along with comments on possible solutions.

5. Fertility Estimates in Java and Bali

The national family planning program, which began in 1970, was phased so that efforts began in Java and Bali, later expanded to the provinces labeled "Outer Islands I," and finally included the last group of provinces in the "Outer Islands II" group (the provinces in each group are listed in Tables 7, 8, and 9 later in this report). Hence, it is instructive to look at estimates for Java and Bali, where the family planning program began, separately (see Table 2 and Figure 2).

For this discussion of the regional fertility estimates, the 1991 estimates are omitted for the time being. These results are discussed in a separate section later in the paper.

Fertility in Java and Bali fell very quickly between 1971 and 1990: by at least forty-two percent (using the Rele method estimates). Somewhat more than half of the decline occurred between 1980 and 1990. With the exception of the last live birth method, even the levels of the various estimates are quite similar from 1980 until the present, with the exception of 1987.

Table 2
ESTIMATED TOTAL FERTILITY RATES
BASED ON FOUR DIFFERENT ESTIMATION METHODS:
JAVA AND BALI, 1971-1991

Estimation Method	Year Data Collected					
	1971	1976	1980	1985	1987	1990
Last Live Birth Method	4.49	4.32	3.38	2.88	2.56	2.52
Own-Children	5.39	4.90	4.24	3.68	3.02	2.89
Rele Method	5.12	4.41	4.21	3.58	3.21	2.99
Palmore Method	5.44	4.64	4.24	3.64	3.56	3.12

Figure 2
Estimated TFRs, Java and Bali:
1971-1990
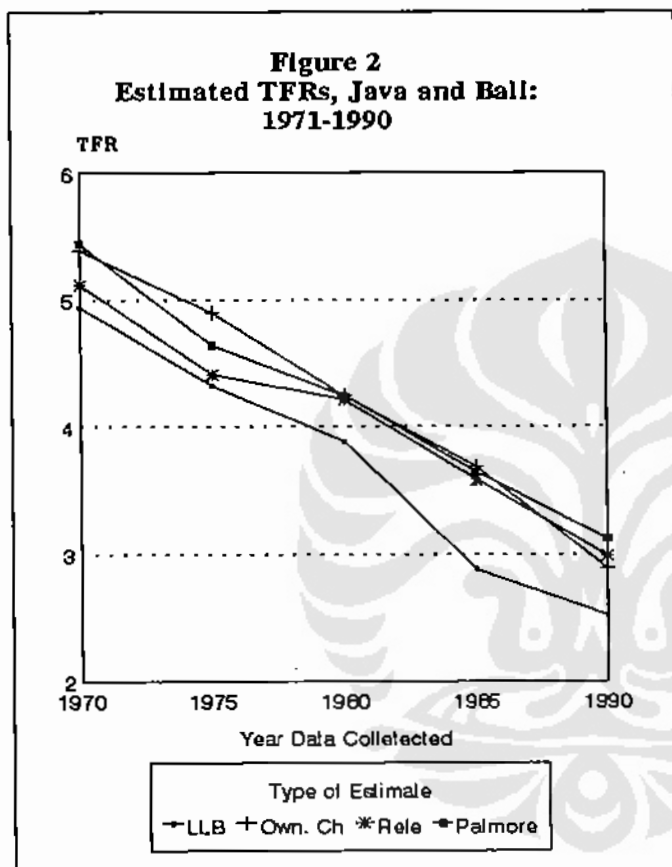
The 1987 estimates are again problematic. The estimated total fertility rate ranged between 2.56 (last live birth method) and 3.56 (Palmore method). Adioetomo *et al.* (1989) estimated a TFR of 2.92 for the same date, within the range of the estimates reported here. While the 1987 NICPS did have a larger

sample for Java and Bali (8435 ever married women) than for the outer island provinces, the sample size even for Java and Bali may be too small for fertility estimation purposes and is probably largely responsible for the lack of agreement between the various estimation methods for 1987.

Within Java and Bali, fertility has declined in all six provinces, but the patterns of decline are very different. Table 3 and Figure 3 summarize estimates based on the Rele method. Fortunately, estimates prepared by Poedjastoeti allow extending the comparison for provinces in Java back to 1961 (see United Nations Economic and Social Commission for Asia and the Pacific 1987, p. 26).

Table 3
ESTIMATED TOTAL FERTILITY RATES PROVINCES OF BASED ON THE RELE ESTIMATION METHOD: JAVA AND BALI, 1961-1990

Year Data Collected	Province					
	DKI Jakarta	West Java	Central Java	DI Yogyakarta	East Java	Bali
1961	5.39	6.26	6.03	5.53	5.13	n.a.
1971	5.33	5.74	5.13	4.48	4.59	5.77
1976	4.58	5.29	4.37	3.82	3.76	4.55
1980	4.21	5.07	4.23	3.17	3.56	3.94
1985	3.16	4.23	3.61	2.67	3.21	2.97
1990	2.37	3.59	3.16	2.07	2.57	2.35

Note: n.a. = not available

Two distinctive features emerge when looking at the pattern of decline in the provinces of Java and Bali. First, the decline began in the 1960s in all of these provinces except DKI Jakarta. In DKI Jakarta, the decline seems to have started in the early 1970s. Second, the rate of decline in two provinces, Bali and DKI Jakarta, was truly astounding. The TFR for Bali declined by 59.3% between 1971 and 1990. The TFR for DKI Jakarta declined by 55.5% during the same time period. In the 1980-1990 decade alone, the DKI Jakarta TFR decreased by 43.7% and the Bali TFR by 40.4%.

Table 4 and Figure 4 present own-children estimates for 1971 through 1990. These estimates also record exceptionally swift declines for Bali and DKI Jakarta. The percentage declines in the own-children method estimates are close to those for the Rele method estimates: the TFR in DKI Jakarta declined by 55.0% and the TFR in Bali declined by 61.9% between 1971 and 1990. Both provinces' TFRs declined by just over forty percent between 1980 and 1990.

By 1990, four of the provinces had TFRs close to replacement levels given current mortality conditions: DI Yogyakarta (2.08), Bali (2.27), DKI Jakarta (2.33), and East Java (2.46). A recent paper by Suyono and Palmore carefully evaluates the reasons for the low fertility in these provinces (Suyono

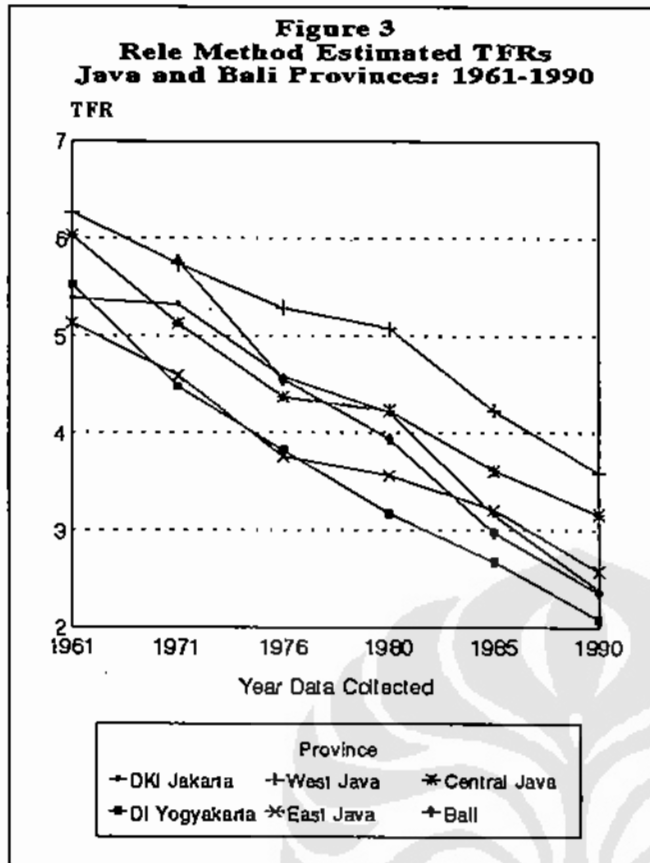and Palmore 1992). In Java, only Central Java and West Java still had TFRs above three.


Figure 3
Rele Method Estimated TFRs
Java and Bali Provinces: 1961-1990

Table 4
ESTIMATED TOTAL FERTILITY RATES, PROVINCES
OF BASED ON THE OWN-CHILDREN ESTIMATION METHOD:
JAVA AND BALI, 1971-1990

Year Data Collected	Province					
	DKI Jakarta	West Java	Central Java	DI Yogyakarta	East Java	Bali
1971	5.18	6.34	5.33	4.76	4.72	5.96
1976	4.78	5.64	4.92	4.47	4.32	5.23
1980	3.99	5.07	4.37	3.42	3.56	3.97
1985	3.25	4.30	3.82	2.93	3.20	3.09
1990	2.33	3.47	3.05	2.08	2.46	2.27

Figure 4
Own-Children Method Estimated TFRs
Java and Bali Provinces: 1971-1990
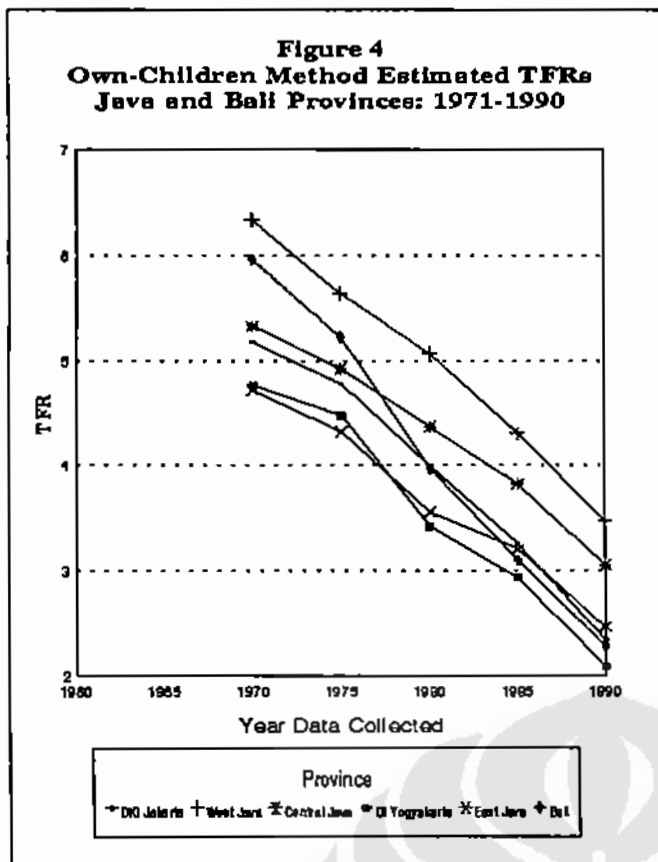
6. Fertility Estimates, Outer Islands I

For the outer island areas, where the family planning program started later, fertility also declined, although the percentage declines were not as big as in Java and Bali.

Clearly, estimates for these provinces are harder to trust as being reliable. Data collection is more difficult in many of these areas (*e.g.*, Irian Jaya or Kalimantan) and the sample size were often smaller in the sample surveys. Particularly in the 1987 survey, the samples sizes were small for areas outside Java and Bali. Consequently, the 1987 estimates are not presented for the outer island regions.

Estimates were calculated for the remaining six data sets, although the 1991 estimates are discussed later in this report. For three of the estimation methods, these estimates for Outer Islands 1 are quite consistent in the percentage declines since 1 971. The own-children, Rele, and Palmore method estimates

show a decline between 33.7% and 36.7% between 1971 and 1991. In these provinces, more of the decline was in the 1980-1990 decade than was the case in Java and Bali, with the three estimation methods showing a decline between 23.7% and 27.2% (see Table 5 and Figure 5).

Table 5
ESTIMATED TOTAL FERTILITY RATES
BASED ON FOUR DIFFERENT ESTIMATION METHODS:
OUTER ISLAND I, 1971-1990

Estimation Method	Year Data Collected				
	1971	1976	1980	1985	1990
Last Live Birth Method	5.93	5.10	4.52	3.94	3.22
Own-Children Method	6.36	5.94	5.52	4.71	4.02
Rele Method	5.92	5.16	5.27	4.53	3.92
Palmore Method	6.54	5.67	5.44	4.66	4.15

Figure 5
Estimated TFRs, Outer Islands I:
1971-1990
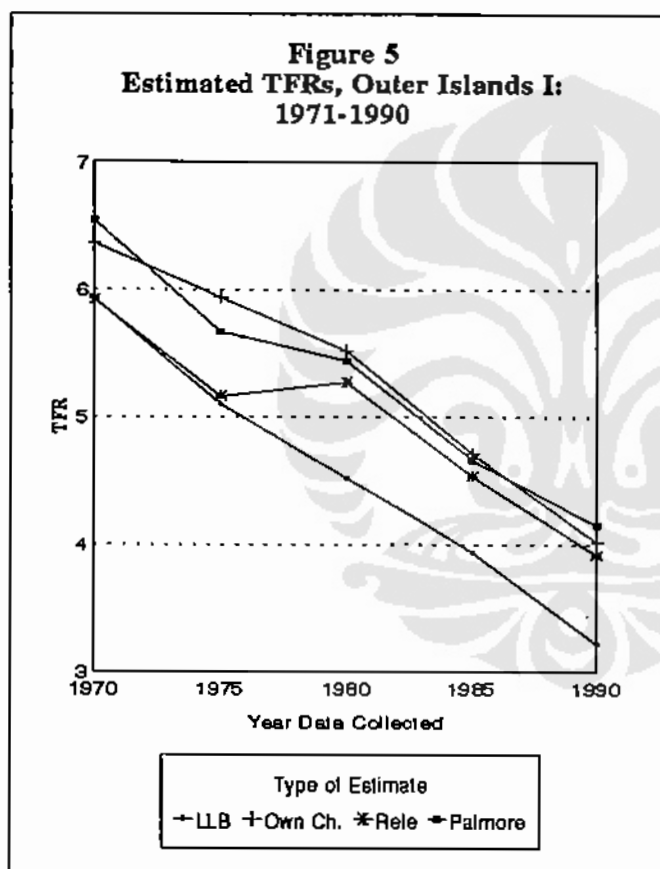
For all of the years, the variation in the estimated TFRs is large if the last live birth method is included, ranging from a high of 1.00 in 1980 to a low of .62 in 1971. Disregarding the last live birth method, however, the estimates are close to each other from 1980 to the present, varying by roughly one fifth of a child.

The percentage declines in the fertility of the Outer Islands I provinces was about ten percent less than in Java and Bali. Further, fertility in 1971 was higher in the Outer Islands I provinces than in most of the areas of Java and Bali. Hence, even though fertility decreased in these outer island provinces during the ensuing two decades, the 1990 TFR was still approximately four and, as shown later in this paper, only two provinces (North Sulawesi and possibly South Kalimantan) had TFRs under three. Six provinces had TFRs above four and one province still had a TFR above 4.5 (West Nusa Tenggara).

7. Fertility Estimates in Outer Islands II

A similar picture emerges for the provinces in Outer Islands II, the last provinces to be served by the national family planning program (see Table 6 and Figure 6). Fertility was high in 1971, has declined substantially in the last twenty years, but still remains higher than in Java and Bali.

Table 6
ESTIMATED TOTAL FERTILITY RATES BASED
ON FOUR DIFFERENT ESTIMATION METHODS:
OUTER ISLANDS II, 1971-1990

Estimation Method	Year Data Collected				
	1971	1976	1980	1985	1990
Last Live Birth Method	6.04	5.76	5.55	4.17	3.45
Own-Children Method	6.26	5.75	5.40	4.74	4.24
Rele Method	5.97	5.67	5.64	4.91	4.26
Palmore Method	6.64	6.08	5.80	5.02	4.43

The percentage declines in fertility in the Outer Islands II provinces were less than in the Outer Islands I provinces (just as the declines in the Outer Islands I provinces were less than those in the provinces of Java and Bali). Between 1971 and 1990, the total fertility rate for this region declined between 28.6% and 33.3% based on three of the estimation methods. The last live birth method records a larger decline of 42.9%, but this number is suspect because the TFR estimated by this method for 1990 is clearly far too low (3.45 as compared to a minimum of 4.24 for any of the other three estimation methods).

As one might expect given the later start of the family planning program in the Outer Islands II provinces, much of the fertility decline occurred in the past decade. Hence, by 1990 the total fertility rate for the Outer Islands II provinces was still above four. Further, as shown later in this report, not even one province in this region had a 1990 total fertility rate less than three and five provinces had TFRs above four and a half. At the extreme, East Timor had a TFR between 5.5 and 5.7.

Figure 6
**Estimated TFRs, Outer Islands II**
1971-1990
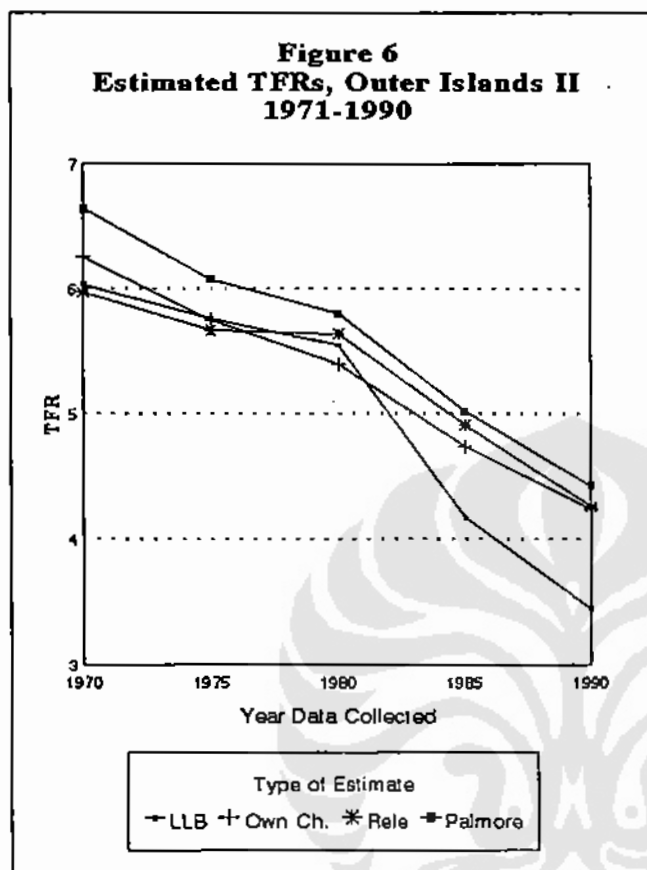
8. Regional Variations in the Pace of Fertility Decline

Fertility has been declining in every region of Indonesia, although the percentage declines have been higher in Java and Bali than in the provinces of the outer islands. This finding is, however, only one way of thinking about the changes since the percentage decline calculations depend on the starting level of fertility.

Suppose, for example, that the TFR is 5.00 at the beginning of a time period and 4.00 at the end. Then the percentage decline would be 20.0% for that time period. If the starting level for the TFR was 7.00 and it declined to 6.00, then the percentage decline would be 14.3% for the same time period. In this hypothetical case, the percentage decline is substantially less for the decline from seven to six than it is for the decline from five to four, yet both TFRs declined by exactly one. The declines in Indonesia are much like this hypothetical case.

In terms of percentage declines, the numbers are higher for Java and Bali. The declines in the TFRs for the outer islands, however, are roughly equal in absolute terms, declining by about the same number of children born in each decade. For this reason, a graph of the TFRs for the three regions (Figure 7) shows three lines (one for each region) that are roughly parallel. The absolute amount that the TFR in each region has been declining is about the same for all the regions but fertility was higher in the outer islands provinces at the start of the two decades under review.

Figure 7
Estimated TFRs by Region: 1971-1990
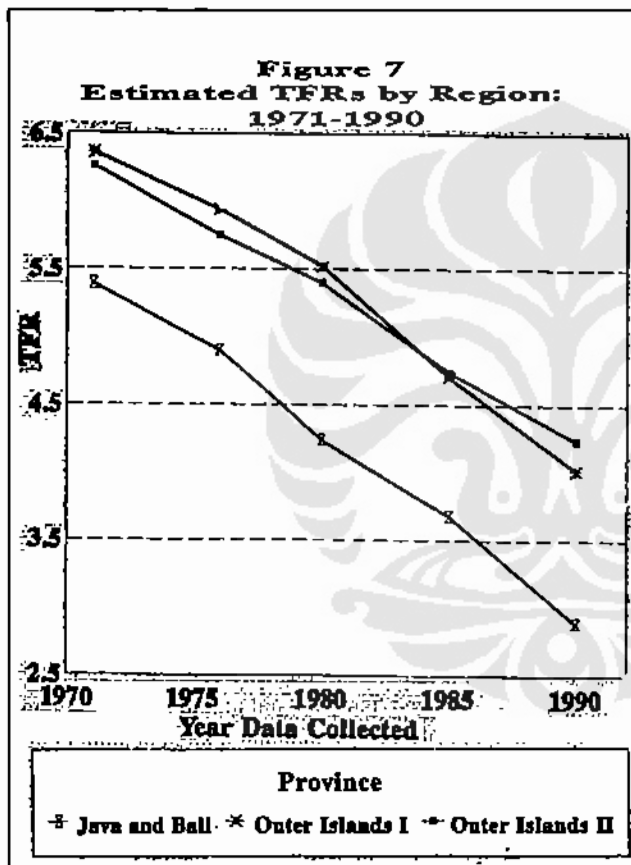
9. Provincial Fertility Levels in 1990

Tables 7, 8, and 9 summarize provincial fertility estimates for 1990 and 1991. For 1990, estimates using each of the four estimation methods are given for all of the provinces. For 1991, only own-children and "direct" method estimates are provided and these estimates are provided only for the provinces of Java and Bali and Outer Islands I due to small sample sizes in the Outer Islands II provinces (4853 ever married women were interviewed in those provinces). For 1991, the own-children estimates are averages for three years to make them easy to compare with the "direct" method estimates which are also averages for the three years prior to the survey.

Table 7
ESTIMATED TOTAL FERTILITY RATES BY PROVINCE:
JAVA AND BALI, 1990 CENSUS AND 1991 IDHS

Province	Estimation Method					
	1990 Census				1991 IDHS	
	LLB	OWN Ch.	Rele	Palmore	"Direct"	Own Ch.
DKI Jakarta	2.07	2.33	2.37	2.17	2.14	2.18
West Java	3.04	3.47	3.59	3.83	3.37	3.40
Central Java	2.70	3.05	3.16	3.26	2.85	2.97
DI Yogyakarta	1.29	2.08	2.07	2.14	2.04	1.96
East Java	2.08	2.46	2.57	2.62	2.13	2.59
Bali	2.02	2.27	2.35	2.37	2.22	2.29

Table 8
ESTIMATED TOTAL FERTILITY RATES BY PROVINCE:
OUTER ISLAND I, 1990 CENSUS AND 1991 IDHS

Province	Estimation Method					
	1990 Census				1991 IDHS	
	LLB	Own Ch.	Rele	Palmore	"Direct"	Own Ch.
DI Aceh	3.21	4.37	4.14	4.23	3.76	4.28
North Sumatra	3.45	4.29	4.18	4.39	4.17	4.23
West Sumatra	3.37	3.89	3.78	4.10	3.60	3.77
South Sumatra	3.20	4.22	4.25	4.46	3.43	3.75
Lampung	3.26	4.05	4.07	4.18	3.20	3.59
West Kalimantan	3.13	4.44	4.30	4.55	3.94	3.57
South Kalimantan	2.68	3.24	3.31	3.56	2.70	2.14
North Sulawesi	2.67	2.69	2.81	2.92	2.52	2.25
South Sulawesi	2.91	3.54	3.32	3.52	3.01	3.47
West Nusa Tenggara	3.96	4.98	4.60	5.25	3.82	4.36

Two methodological comments are appropriate. First, the last live birth estimates for 1990 are uniformly lower for every province than the estimates for the other three methods. In the authors' opinion, they are not valid indicators of the "true" level of fertility. For some provinces, the last live birth method estimates are close to one child lower than the other estimates, a difference that cannot be explained by the slightly different reference periods for the four estimation methods.

Second, the "direct" method estimates, when compared to the own-children estimates for 1991, also appear to be too low for many provinces. For the sixteen provinces where both estimates are available, the "direct" method estimate is lower in twelve cases, equal in one, and higher for only three provinces. Again, the authors' opinion is that these "direct" method estimates are probably not valid. Possible reasons for this judgment are given later in this report.

Table 9
ESTIMATED TOTAL FERTILITY RATES BY PROVINCE:
OUTER ISLAND II, 1990 CENSUS

Province	Estimation Method			
	LLB	Own Ch.	Rele	Palmore
Riau	3.29	4.09	4.17	4.30
Jambi	2.79	3.76	3.91	4.00
Bengkulu	3.30	3.97	4.18	4.28
East Nusa Tenggara	4.05	4.61	4.38	4.68
East Timor	4.66	5.73	5.52	5.66
Central Kalimantan	3.14	4.03	4.10	4.10
East Kalimantan	2.72	3.28	3.51	3.52
Central Sulawesi	3.43	3.85	3.98	4.33
Southeast Sulawesi	4.14	4.91	4.83	5.03
Maluku	4.01	4.59	4.53	4.81
Irian Jaya	3.00	4.70	4.73	4.82

Substantively, the most interesting finding is the wide variation in fertility levels found within each region and across the country. In Java and Bali, own-children estimates of the 1991 TFRs range from 1.96 (DI Yogyakarta) to 3.40 (West Java). In the Outer Islands I provinces, TFRs in the same year had an even wider range: from 2.14 (South Kalimantan) and 2.25 (North Sulawesi) to 4.23 (North Sumatra) and 4.28 (DI Aceh) and 4.36 (West Nusa Tenggara). The estimate using the own-children method may be too low for South Kalimantan given the fact that the "direct" method estimate is higher and that the 1990 Census fertility estimates for the Rele, Palmore, and own-children estimates are all substantially higher, but it seems clear that fertility in that province has declined to a low level relative to other provinces in the Outer Islands I region.

For the provinces in the Outer Islands II region, TFRs can be compared only for 1990. Here, again, the range is large. Using the own-children estimates, one finds a TFR of 3.28 for East Kalimantan as compared to TFRs above 4.5 for Maluku (4.59), East Nusa Tenggara (4.61), Irian Jaya (4.70), Southeast Sulawesi (4.91), and East Timor (5.73).

As the careful reader will have noticed, the estimates for the various estimation methods differ more for the provincial level estimates than for broad regions. This is to be expected, since all of these estimation techniques work better the larger the population. Nevertheless, the agreement between the methods other than the last live birth and "direct" methods is sufficiently similar to allow rough comparisons between provinces and regions. For the whole country, then, the TFRs around 1990 or 1991 ranged from just less than two to almost six -- very large differences.

10. Discussion and Conclusions

Applying the different estimation techniques to seven different Indonesian data sets has been instructive. There can be little doubt that fertility in Indonesia has been declining rapidly, particularly in the last decade, and that this decline is happening in all three major regions of the country.

The fertility estimation methods, even those other than the last live birth and "direct" methods, do not agree very well on fertility levels prior to 1980 but appear to be converging in recent years. For the earlier years, it seems clear that no one estimation technique uniformly yields "correct" estimates for Indonesia and its regions. The level of fertility in Indonesia before 1980, hence, must be considered to be a range, rather than choosing any single number to summarize the nation's fertility. Even more cautious statements should be made about fertility levels for subnational areas.

11. Adjusted Age Distributions

The large discrepancies for dates prior to 1980 between the results using the various estimation techniques requires explanation. One possible reason is the quality of Indonesia's data on age.

For many years, there have been questions about the quality of age data in Indonesia (see, for example, Utomo 1979 and United Nations Economic and Social Commission for Asia and the Pacific 1987, pp. 5-11). To illustrate the difficulties, the complete enumeration for the 1971 Census only asked for information on broad age group, sex, and citizenship. More precise age informa-

tion was collected for only a 3.8 percent sample. While there have been constant efforts to obtain better age data, the problem remains a difficult one to solve.

The authors attempted several ways of overcoming these problems. As reported in Mamas et al. (1991), the authors' first attempt involved using adjusted age distributions to reestimate for the earlier years using the Palmore and Rele methods. The adjusted age distributions were those used in the last population projections prepared by the Central Bureau of Statistics before the 1990 Census was taken and, in effect, "corrected" age distributions for time periods prior to 1980 based on assumptions about reverse survival ratios. Unfortunately, using these adjusted age distributions results in higher estimates before 1980 for both of the two fertility estimation techniques. These results, hence, suggested even more rapid declines in fertility in Indonesia than reported in the present paper. Similar results were found for Java and Bali, Outer Islands I, and Outer Islands II.

The authors view this attempt to re-estimate fertility levels as unsuccessful. The critical difficulty is deciding which age distribution to start with as "correct" for then "correcting" other age distributions. After adjustment, it is true that the Rele and Palmore estimates were closer, but both were then substantially higher than either the own-children or last live birth method estimates.

12. Averages and Moving Averages

A second way to deal with problems in the age distribution at any one time is averaging over a series of years or using moving averages. This is most easily accomplished with the own-children method because the requisite tabulations are produced routinely as part of the data needed for that method (see the Appendix). In fact, the own-children estimates presented in this paper are averages for either three years (1991 estimates) or five years (all of the other years). The "direct" method, as implemented in the Indonesian DHS surveys, also applies the averaging idea since the estimates provided are an average for the last three years instead of a rate for just the last year.

The problem with using the averaging approach is that one is reporting fertility levels farther in the past. In addition, errors introduced by under-reporting young children will not be solved by using either averages or moving averages. Also, the averaging approach is not easily used with the three estimation techniques other than the own-children method unless one has annual surveys--which is not the case with the data sets used here. SUSENAS, a survey now conducted annually by the Central Bureau of Statistics, might be used to construct moving averages for the other techniques. To date, however, this has not been attempted.

13. Time Referent for Each Estimation Technique

One might suspect that part of the difference in the estimates could originate from different time referents for the various estimation techniques. The own-children (when presented as an average of the five preceding years), Palmore, and Rele methods are, however, supposed to estimate the average rate for the five years preceding the date the data were collected. In this paper, the own-children estimates that are given in the tables are for the five years before the data was collected with the exception of the estimates for 1991 which use a three year time period so that they can be easily compared with the "direct" method estimates for that year. In theory, then, the estimates from three of the four methods should generally be in close agreement if the time referent is the issue. For the last live birth method, the time referent is different, but the size of the differences between the last live birth method estimates and the other estimates is too big to be accounted for by the more recent reference period for the last live birth method.

14. Input Data

Another possible source for the differences between the estimates is the input data. This is probably one of the reasons that both the last live birth and "direct" method estimates are generally low. In the DHS surveys, for example, the interviewers are aware that they must ask many additional questions if the respondent has had children in the recent past. Under such circumstances, it is likely that a few interviewers will neglect reporting those children in the birth history. These children may, however, still appear in records about the household, hence allowing the own-children, Palmore, and Rele methods to provide more accurate estimates of fertility.

In the censuses, observations of the field work suggest that the question about "last birth" used in the last live birth method are often misunderstood by either the enumerator or the respondent or both. Sometimes, "last birth" is interpreted to mean the birth after which no more births are anticipated and the answer may be something like: "My last birth will be next year when I have two children." Because of this type of problem in the field, the "last births" are often under-reported.

Another comment on the input data is related to the fact that all of the methods, except the last live birth and "direct" methods, make adjustments for mortality. The mortality data used, however, are not the same for each method. For the own-children method, mortality adjustments are made for both mothers and their own-children. For the Rele method, life expectancy at birth for both sexes is used. For the Palmore method, the infant mortality rate is used.

For Indonesia, all of the mortality rates are estimates. If the various mortality measures are not consistent with one another (e.g., the infant mortality rate is not consistent in mortality level with what one would expect given the level of life expectancy at birth), this factor could lead to artificial differences in the fertility levels estimated by the various fertility estimation techniques employed here. The farther back in time one goes, the more likely that the mortality estimates for Indonesia are questionable and perhaps inconsistent across measures. This possible explanation for differences in the fertility rates for the early years deserves more careful scrutiny.

15. Sample Sizes

Clearly, the basis for the wide variation in fertility estimates does not lie in the sample sizes for the various data sources with the exceptions of the 1987 and 1991 survey data. The three censuses were, of course, nearly complete counts and the 1976 and 1985 Intercensal surveys were both very large samples. Instead, age mis-statement and age-specific under -or over-counting are the most likely causes for the lack of agreement between the estimates using different estimation techniques.

From the authors' work, it has become very clear that using the 1987 NICPS and 1991 IDHS for fertility estimation is risky for areas smaller than regions. Comparison of the estimates from different estimation methods for provinces indicates that fertility estimates from such surveys should be interpreted with extreme caution and a range used instead of any specific method's estimated TFR.

Two additional guidelines for the future emerge as a result of this estimation work. The first is an obvious recommendation for increased efforts to collect good age data. The second is the recommendation that consistent estimation methods for fertility be used as indicators of fertility change rather than combining the estimates from several different methods.

Irrespective of the wide variation in estimates prior to 1980, however, it is abundantly clear that fertility in Indonesia has been declining very rapidly and that the international recognition of their successful national family planning program is not misplaced.

16. Acknowledgements

References

Adioetomo, Sri Moertiningsih, Ayke S. Kitting, and Salman Taufik. 1989. *Fertility ·Transition in Indonesia: Trends in Proximate Determinants of Fertility.* Jakarta: Demographic Institute, Faculty of Economics, University of Indonesia, and the Population Council.

Central Bureau of Statistics. 1988. *Fertility and Mortality Estimates Based on the 1985 Intercensal Population Survey.* Jakarta.

———. 1990. *Tren Fertilitas di Indonesia, 1971 -1987.* Jakarta. (In Bahasa Indonesia).

Central Bureau of Statistics, National Family Planning Coordinating Board, and Demographic and Health Surveys, Institute for Resource Development, Westinghouse. 1989. *Indonesia: National Contraceptive Prevalence Survey 1987.* Jakarta and Columbia, Maryland.

Central Bureau of Statistics, National Family Planning Coordinating Board, Ministry of Health, and Macro International Inc. 1992. *Indonesia Demographic and Health Survey 1991.* Jakarta and Columbia, Maryland.

Cho, Lee-Jay, Robert D. Retherford, and Minja Kim Choe. 1986. *The Own-children Method of Fertility Estimation.* Honolulu: University of Hawaii Press and East-West Center.

Cho, Lee-Jay, Sam Suharto, Geoffrey McNiccol, and Si Gde Made Mamas. 1976. *Estimates of Fertility and Mortality in Indonesia.* Jakarta: Central Bureau of Statistics.

Dasvarma, Gouranga L., and Terence H. Hull. 1984. "Estimation of Fertility in Indonesia 1980 from Last Live Birth Data." *Indonesian Journal of Demography,* 11 (22): 33-47.

Hanenberg, Robert. 1983. " Estimates of the Total Fertility Rate Based on the Child-Woman Ratio." *Asian and Pacific Census Forum,* 10 (2): 5 - 11.

Hull, Terence H., and Gouranga Lal Dasvanna. 1987. "The 1985 Intercensal Survey of Indonesia: Evidence of Continuing Fertility Decline." *Research Notes.* Canberra: Department of Demography, Australian National University.

Mamas, Si Gde Made. 1983. "Tren dan Variasi Angka Kelahiran Indonesia Menurut Propinsi." Jakarta: Central Bureau of Statistics. (Mimeographed). (In Bahasa Indonesia).

Mamas, Si Gde Made. 1989. *Regional Fertility Differentials and Trends in Indonesia: A Multi-Level Analysis.* Honolulu: Department of Sociology, University of Hawaii. (Ph.D. dissertation).

Mamas, Si Gde Made, James A. Palmore, and Yohandarwati Arifiyatno. 1991. "Recent Fertility Trends in Indonesia, 1971 - 1987." *Working Papers of the East-West Population Institute.* No. 63. Honolulu: East-West Center.

National Research Council. 1987. *Recent Trends in Fertility and Mortality in Indonesia.* Papers of the East-West Population Institute. No.105. Also, Report No. 29, Committee on Population and Demography, National Research Council. Honolulu: East-West Center.

Palmore, James A. 1978. *Regression Estimates of Changes in Fertility 1955-60 to 1965-75, for Most Major Nations and Territories.* Papers of the East-West Population Institute. No.58. Honolulu: East-West Center.

Rao, N. Rama, J.R. Rele, and James A. Palmore. 1987. *Regression Estimates of Fertility for India, 1971 and 1981.* Occasional Paper No. 3 of 1987. Delhi: Office of the Registrar General and Census Commissioner.

Rele, J.R. 1967. *Fertility Analysis Through Extension of Stable Population Concepts.* Berkeley: Institute of International Studies, University of California. (Ph.D. dissertation).

———. 1987. "Fertility Levels and Trends in India, 1951-1981." *Population and Development Review,* 13 (3): 513 - 530.

Suyono, Haryono, and James A. Palmore. 1992. "Indonesian Fertility, the Proximate Determinants, and Unmet Need for Family Planning." Jakarta: National Family Planning Coordinating Board. (Harvard Graphics Presentation).

Swamy, V. S., et al. 1993 (forthcoming). *Evaluating the Sample Registration System Using Indirect Estimates of Fertility and Mortality.* Occasional Papers of 1993. Delhi: Office of the Registrar General and Census Commissioner.

United Nations Economic and Social Commission for Asia and the Pacific. 1987. *Levels and Trends of Fertility in Indonesia Based on the 1971 and 1980 Population Censuses: A Study of Regional Differentials.* Asian Population Studies Series. No. 62-E. New York: United Nations.

———. 1988. The *Geography of Fertility in the ESCAP Region.* Asian Population Studies Series. No. 62-K. New York: United Nations.

Utomo, Budi. 1979. *A Study of Indonesian Age Data 1971 and 1976.* Jakarta: Population Institute, Faculty of Economics, University of Indonesia.