KENYA'S FERTILITY TRANSITION: HOW LOW WILL IT GO?

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DATA SOURCES

The principal sources of information on the rapid fall in fertility in Kenya since 1980 are, first, the birth histories compiled in the Kenya Fertility Survey (KFS) of 1977-78 and the three Demographic and Health Surveys (KDHS) of 1989, 1993 and 1998, and, second, the data on children ever born and on births in the last twelve months obtained in the population censuses of 1969, 1979, 1989 and 1999.

Birth histories enable us to reconstruct estimates of fertility rates by age and time periods up to twenty years prior to the surveys. The surveys, however, were restricted to women under the age of 50. Thus as the estimates are taken further back in time, the fertility rates become increasing truncated age-wise, and they have to be extrapolated up to the end of childbearing by "borrowing" the rates for the older age groups from the nearest subsequent time periods. When fertility is falling rapidly, this procedure introduces a progressive downward bias in the estimates. Furthermore the estimates are vulnerable to errors in the dating of the births in the birth histories. There is a widespread tendency for recent births to be pushed back in time, thus depleting the numbers recorded for the last five years and inflating those for the periods 5-9 and 10-14 years prior to the survey, thus simulating a spurious decline in fertility. In the DHSs this feature may have been aggravated by the large amounts of additional information (including heights and weights) required of children born in the last three, or in some cases five, years before the survey. There may also be a tendency for births which had occurred more than fifteen years ago to be brought nearer to the survey date. Thus this double "concertina" effect reinforces the inflation of the fertility rates for the period between 5 and 15 years before the survey. Methods of detecting and correcting these errors have been devised and will be discussed below.

The census data on lifetime and current births can be used in a variety of ways to examine fertility trends. Probably the simplest, and in some ways the most satisfactory, procedure, is the construction of "hypothetical cohorts" for the inter-censal periods from the differences in the average parities for the same cohorts of women in consecutive censuses (United Nations, 1983, pp. 59-64). The method uses only the average parities recorded in the censuses, and makes no assumptions about the nature or patterns of the possible errors in the data. However the census data on children ever born were not subject to the same detailed probing as in the birth history surveys, and errors, both of omission and faulty inclusions, undoubtedly occurred. There was generally a category of women who were "not stated" as to the numbers of children they had borne. Most of these women were probably childless, but some may have borne children who, for a variety of reasons, were not recorded. The El Badry correction for non-response (El Badry, 1961; United Nations, 1983, pp. 230-235) provides a possible method of handling this problem, and the average parities used for the construction of the hypothetical cohorts shown below were first adjusted by the El Badry method. The estimates have also been refined by fitting fertility models to the average parities of the hypothetical cohorts, thus smoothing irregularities and reducing the vulnerability of the estimates to errors in the reports for older women. Brass's relational Gompertz fertility model (Brass, 1981) was used for this purpose.

The relational Gompertz model may also be used to derive fertility estimates from census data on births reported as occurring during the twelve months preceding the census, together with the average parities of

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younger women, in a variation of the "P/F ratio" technique devised by Brass in the 1960s (Brass and others, 1968; Brass, 1975).

RESULTS

Table 1 shows the estimates of the total fertility rate in Kenya derived from the sources described above, which have also been plotted graphically in figure 1. The coherence of the estimates can be readily assessed from the discrepancies between the estimates for the same time periods from the different surveys and censuses.

The birth history data have clearly been distorted by the "concertina" effect described above. All four surveys show lower fertility rates for the period 15-19 years before the survey than for that 10-14 years before, and the rates for the latter were above the estimates derived for the same period from other sources. We have therefore attempted to re-distribute the births across the time periods, using the procedure devised by Brass (Brass, 1981; Brass and Jolly, 1993) which involved the fitting of relational Gompertz fertility models to the back-dated average parities. Brass himself made these adjustments to the 1977-78 KFS and the 1989 KDHS; the writer has applied them both to the 1993 KDHS (Macrae, Bauni and Blacker, 2001) and to that of 1998. The main problem in the application of this procedure lies in the selection of the "best" models. If the models fit the observed data closely they will simply reproduce the original biases. The principal criterion which I have adopted is to ensure improved agreement between the average parities back-dated to the times of preceding surveys and the average parities recorded in those surveys. Thus the 1998 KDHS was back dated by five years and compared with those from the 1993 KDHS, and then by 20 years for comparison with the KFS. The parameters of the models used for the back dating were manipulated, more or less by trial and error, so as to minimise the sums of the squared differences between the back dated and the observed values. The results are shown in table 2 and figure 2.

It may be argued that in this exercise the data have been over-corrected. The adjusted rates from the 1993 and 1998 surveys for periods more than 5 years before the survey dates appear now to fall below the estimates from other sources. But the general coherence of the different estimates has undoubtedly been improved. In particular those from the birth history surveys have been brought into better agreement with those based on the censuses.

The models may also be used to project the completed family sizes for the different cohorts of women in the surveys who were still of childbearing age. Although such projection is clearly unjustifiable where the younger women are concerned, the results may nevertheless provide a wet finger in the wind as to where Kenya's fertility is heading. They are shown in table 3. For what they are worth, they suggest that none of the cohorts will end up with less than 3 births per woman.

CONCLUSION ON FERTILITY TRENDS UP TO THE LATE 1990S

In the late 1970s, total fertility in Kenya was of the order of 8 births per women. There is an abundance of data to that effect: the 1977-78 KFS showed an average parity for women aged 45-49 of 7.88 and a total fertility rate of 8.065 for the three years prior to the survey; the changes in average parities between the 1969 and 1979 censuses implied a TFR of 7.79 for the inter-censal period; the National Demographic Survey of 1977 gave a Gompertz-adjusted TFR of 8.10 for the year before the survey; the Contraceptive Prevalence Survey (KCPS) of 1984 showed an average parity for women aged 45-49 of 8.15.

Prior to the 1970s fertility had been rising steadily. The evidence for this, which is based on a study of cohort parity progression ratios, is conclusive and has been presented elsewhere (Brass and Jolly, 1993; Central Bureau of Statistics, 1996a; Macrae, Bauni and Blacker, 2001), so that it need not be repeated here.

Then at some time in the late 1970s or early 1980s - it cannot be pinpointed precisely - there was an abrupt and dramatic change and fertility began to fall with unforeseen rapidity. The first evidence of this decline at national level came from the 1989 KDHS, and was confirmed by the census done in the same year; the KDHS gave a total fertility of 6.7 births per women for the 5-year period before the survey, which Brass, after a rigorous examination, saw no reason to amend (Brass and Jolly, 1983). The next DHS in 1993 gave a TFR of 5.4 for the last 3 years, and that of 1998 gave 4.7, also for a 3-year period. These figures, taken at their face value, therefore suggest that the rate of fertility decline had been slowing up: reductions of 0.34 births per annum between 1989 and 1993, and 0.14 births per annum between 1993 and 1998.

PROXIMATE DETERMINANTS OF FERTILITY

Most of this fertility decline can be attributed to increased *contraceptive use*. The proportion of currently married women aged 15 to 49 currently using a modern method of contraception increased from 9.7 per cent as shown by the 1984 Contraceptive Prevalence Survey to 17.9 per cent in the 1989 KDHS, 27.3 per cent in the 1993 KDHS, and 33.7 per cent in the 1998 KDHS. On the basis of these figures, the rate of uptake appears to have slowed up: it increased by 9.4 percentage points in the 4 years between 1989 and 1993, and by only 6.4 percentage points in the 5 years between 1993 and 1998.

Age at first marriage among women in Kenya rose during the last half of the 20th century, but this rise was not accompanied by a commensurate one in age at first birth. The simplest way of calculating age at marriage is Hajnal's "singulate mean age at marriage" (SMAM) using the proportions of never-married women in each age group and assuming that they represent a cohort of women going through life. Exactly the same procedure can be used to calculate the mean age at first birth (MAFB), using proportions childless in place of proportions never married. Table 4 shows the indices derived from the censuses and surveys in Kenya in the last 40 years. It will be seen that according to the 1962 and 1969 censuses age at marriage was slightly lower than age at first birth (although pre-marital conceptions would appear to have been the norm); but between 1969 and 1979 there was a crossover with first births preceding marriage. The surveys show the same thing with age at first birth being consistently lower than age at marriage, and with the gap widening in the recent surveys. Although age at marriage may continue to rise in Kenya, we can clearly expect little further impact on fertility.

Proportions *widowed and divorced* showed little change in the 1990s - if anything small declines. But in this respect some impact on fertility may be expected as widowhood rates increase in the wake of the AIDS epidemic.

Postpartum infecundability, although an important proximate determinant, has not contributed materially to the overall fertility decline. The median durations of postpartum amenorrhoea and abstinence fluctuated in an anomalous fashion across the surveys (Brass and Jolly, 1993; Macrae, Bauni and Blacker, 2001). Between the 1993 and 1998 KDHS's the median duration of postpartum insusceptibility fell from 12.9 months to 11.1 months. Clearly no further fertility reductions can be expected on this score.

Information on *abortion* in Kenya is virtually non-existent. Although it may have made a material contribution to the fertility decline, we have no means of measuring it, and are not in a position to speculate as to the roll it might play in the future.

Kenya has never been a country with a high prevalence of *pathological sterility*, with the possible exception of some coastal areas in the 1950s[1]. The 1987-88 KFS showed only 3 per cent of women over 30 years of age to be childless, and the 1998 KDHS still showed similar figures in these age groups.

In summary therefore, further reductions in fertility will be achieved principally as a result of further uptake of contraceptive use, and, as we have seen, this uptake has been slowing up. But the other proximate determinants may also be affected by the progress of the AIDS epidemic. It is well known that the fertility of HIV-positive women is lower than that of HIV-negative for a variety of reasons, both biological and behavioural: they are more likely to be widowed or divorced, and are less likely to get re-married; among those who are still married coital frequency is reduced, foetal mortality and menstrual disorders are increased, and, if their partners are also HIV-positive, there is a decreased production of spermatozoa. Zaba and Gregson (1998) have estimated that for every 10 per cent of the population which is HIV-positive, the national level of fertility is reduced by 4 per cent. On this basis the effect on the fertility rates in the late 1990s, when HIV prevalence was of the order of 10 percent, will have been trivial. But if prevalence increases to 20 per cent, or even 40 per cent (as in Botswana), it will no longer be negligible. The epidemic is also likely to affect the fertility of the HIV-negative in so far as it reduces extra-marital sexual activity, promotes condom use, and gives an added incentive to married couples to have fewer children when their families have already been enlarged by the adoption of orphans.

DIFFERENTIALS BY RESIDENCE, PROVINCE AND EDUCATION

All the Demographic and Health Surveys showed substantial differentials in fertility, both geographically and by educational categories of the women, all clearly associated with socio-economic development. They are shown in table 5. The total fertility rates, which are for the 3 years before each survey, are sometimes based on uncomfortably small numbers, so sampling errors, particularly in respect of the changes, will be high.

Except for Nairobi, which is a case apart, none of the categories showed TFRs of less than 3 births per woman in 1998. Central Province, which in terms of under-5 mortality, nutrition, education, housing amenities, or any other index of socio-economic development which one might care to name, is well in advance of the other five provinces (Nairobi again excluded), showed a substantial fall in fertility between 1989 and 1993, but a relatively small one between 1993 and 1998. It is tempting to infer that the fertility decline there is levelling out. The same can be said of women with secondary or higher education.

As fertility continues to fall in Kenya, these differentials can be expected to narrow. But they are unlikely to disappear. The improvements in living standards which characterised the first quarter of a century after Independence, and were reflected in such indices as infant and child mortality, school enrolment ratios, or GDP per capita, were clearly petering out in the 1990's. Poverty, so far from being eliminated, is likely to increase, aggravated by the horrendous effects of the AIDS epidemic. Thus unless the poorer, less educated sections of the community can be persuaded to espouse family planning on the same scale as their more affluent fellow countrymen, they will continue to have relatively large families.

IDEAL FAMILY SIZE

This somewhat nebulous concept has been claimed to reflect changing attitudes towards fertility. In Kenya it has indeed fallen in parallel with fertility: 5.8 in the 1984 KCPS, 4.4 in the 1989 KDHS, and 3.7 in the 1993 KDHS. But then it levelled out and the 1998 KDHS gave a figure of 3.8. Furthermore the breakdowns by age group enable us to examine the consistency of the answers given at different times for the same age cohorts of women (15-19 in 1993 and 20-24 in 1998; 20-24 in 1993 and 25-29 in 1998...etc.), shown in table 6. Except for the youngest cohort (15-19 in 1993), they show small but systematic increases in ideal family size as the women aged, and such consistent changes are unlikely to have been the result of sampling errors. In part the

increases may reflect the real increases in family size experienced by the women, but it is noticeable that the biggest changes in ideal family size were in the older cohorts where the increments in the numbers of children actually born will have been smallest.

The breakdown of the 1998 figures by numbers of living children, by residence (urban/rural), province and education reveal few categories whose ideal family size was less than 3. Only the younger women in Nairobi and Central Province, and those with secondary or higher education aged under 25, showed figures of under 3, and even in these categories none went as low as 2.5. For those who believe that ideal family size may be taken as an indicator of future levels of fertility, these data lend weight to the belief that total fertility in Kenya is unlikely to fall below 3 births per woman.

CONCLUSIONS

This paper concludes that total fertility in Kenya is unlikely to level out at less than 3 births per woman. This conclusion is based on a variety of somewhat tenuous evidence: projected completed family sizes for cohorts of women still of childbearing age in the 1998 KDHS; the slackening in the rise of contraceptive use; the trend in total fertility rates in Central Province and for women with secondary education; the downward trend and then stabilisation of the ideal family sizes. But much may also depend on the future trend of the HIV/AIDS epidemic and its possible impact on fertility.

On the basis of this conclusion, I have fitted a second-degree curve to the estimates from the late 1970s to the late 1990's shown in table 2 and extrapolated it into the future with a logistic curve with a lower asymptote of 3. These curves, together with the estimates for the period of rising fertility prior to 1970 reconstructed from the parity progression ratios (CBS 1996a), are shown in figure 3.

Would a TFR of 3 be above or below replacement level? This of course depends on the level of mortality, which in turn will be determined by the future course of the AIDS epidemic. Stable population models suggest that a TFR of 3 would be about enough to ensure replacement if life expectancy at birth does not fall below 45 years. After the 1989 census we made a new set of projections for Kenya which assumed rising mortality from AIDS, such that the overall life expectancy for both sexes after the turn of the century was just under 45 years (Central Bureau of Statistics 1996b). But the models used for the construction of the projections rested on some unhappy assumptions. In particular it had been assumed that HIV prevalence would level out at 9 per cent. It has done no such thing; and reached 13.5 per cent in 2000, though there are indications that it may be approaching a plateau. A new set of projections is being constructed, but as yet we have no conclusions we can put before this meeting. But it is difficult to avoid the conclusion that a TFR of 3 may not be enough to ensure replacement, at least until the AIDS epidemic comes under control.

In suggesting that total fertility in Kenya will level out at about 3 births per woman, I am considering only the relatively short-term future – say the next 20 or 30 years. This conclusion is supported by the fact that in other countries in the intermediate fertility category, including Bangladesh[2] and Malaysia, fertility declines have apparently stalled at about this level. How long it will remain so in Kenya, and what will happen thereafter, is a subject on which I am not prepared to speculate.

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TABLE 1. RECORDED AND EXTRAPOLATED ESTIMATES OF TOTAL FERTILITY IN KENYA

KFS 1977-78		*KDHS 1989*		*KDHS 1993*		*KDHS 1998*		*Census Based Estimates*	
1958-62	8.41	1969-73	8.00	1973-77	7.88	1978-82	6.87	1969-79	7.79
1963-67	9.01	1974-78	8.19	1978-82	8.02	1983-87	6.89	1979-89	6.58
1968-72	8.70	l979-83	7.64	1983-87	7.35	1988-92	5.71	1989-99	5.00
1973-77	8.26	1984-88	6.70	1988-92	5.53	1993-97	4.65		

TABLE 2. ADJUSTED AND EXTRAPOLATED ESTIMATES OF TOTAL FERTILITY IN KENYA

KFS 1977-78		*KDHS 1989*		*KDHS 1993*		*KDHS 1998*		*Census Based Estimates*	
1958-62	7.84	1969-73	7.89	1973-77	7.24	1978-82	6.62	1969-79	7.79
1963-67	8.12	1974-78	7.72	1978-82	6.89	1983-87	6.15	1979-89	6.58
1968-72	8.05	l979-83	7.27	1983-87	6.45	1988-92	5.54	1989-99	5.00
1973-77	7.91	1984-88	6.71	1988-92	5.79	1993-97	4.89		

TABLE 3. PROJECTED COMPLETED FAMILY SIZES FOR 1998 KDHS COHORTS

Age Group in 1998	*Average Parity in 1998*	*Projected Completed Family Size*
15-19	0.21	3.58
20-24	1.28	3.85
25-29	2.70	4.44
30-34	4.03	5.02
35-39	5.32	5.75
40-44	6.38	6.47
45-49	6.93	6.93

TABLE 4. SINGULATE MEAN AGES AT MARRIAGE AND MEAN AGES AT FIRST BIRTH

	SMAM	*MAFB*
1962 Census	18.5	19.8
1969 Census	19.2	19.8
1979 Census	20.3	20.0
1989 Census	21.9	20.9
1977-78 KFS	20.0	19.5
1984 KCPS	20.1	19.7
1989 KDHS	21.1	20.0
1993 KDHS	21.3	21.1
1998 KDHS	21.7	20.7

TABLE 5. TOTAL FERTILITY RATES BY RESIDENCE, PROVINCE AND EDUCATION

	1989	*1993*	*1998*
Urban	4.5	3.4	3.1
Rural	7.1	5.8	5.2
Nairobi	4.2	3.4	2.6
Central	6.0	3.9	3.7
Coast	5.4	5.3	5.0
Eastern	7.2	5.9	4.7
Nyanza	6.9	5.8	5.0
Rift Valley	7.0	5.7	5.3
Western	8.1	6.4	5.6
No schooling	7.5	6.0	5.8
Incomplete Primary	7.5	6.2	5.2
Completed Primary	6.4	5.0	4.8
Secondary & Higher	4.8	4.0	3.5

TABLE 6. REPORTED MEAN IDEAL FAMILY SIZES 1993 AND 1998

KDHS 1993		*KDHS 1998*	
15-19	3.5	15-19	3.5
20-24	3.4	20-24	3.4
25-29	3.6	25-29	3.6
30-34	4.0	30-34	3.9
35-39	4.1	35-39	4.4
40-44	4.1	40-44	4.8
45-49	4.5	45-49	4.9

Figure 1. Observed trends in total fertility

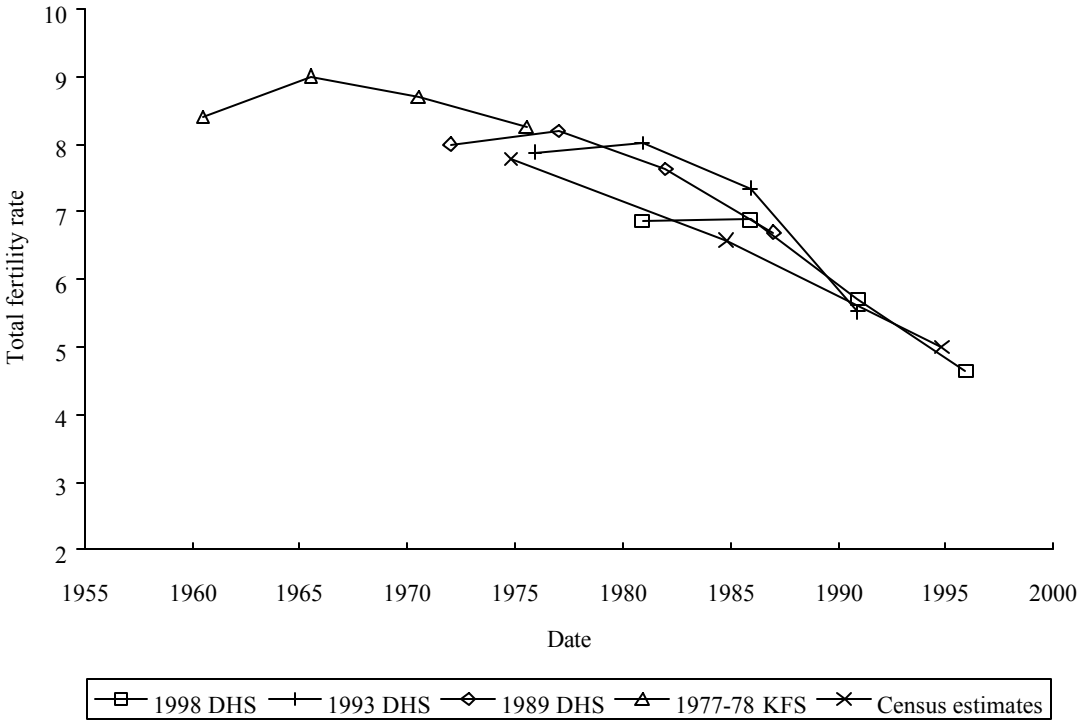


Figure 2. Adjusted estimates of total fertility

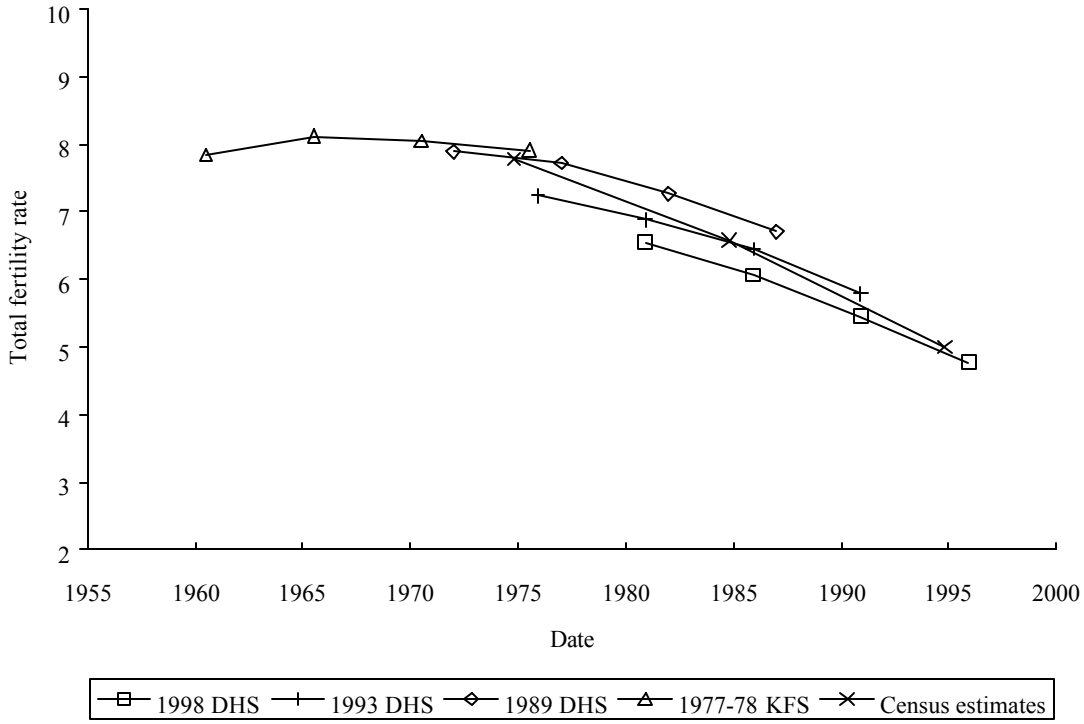
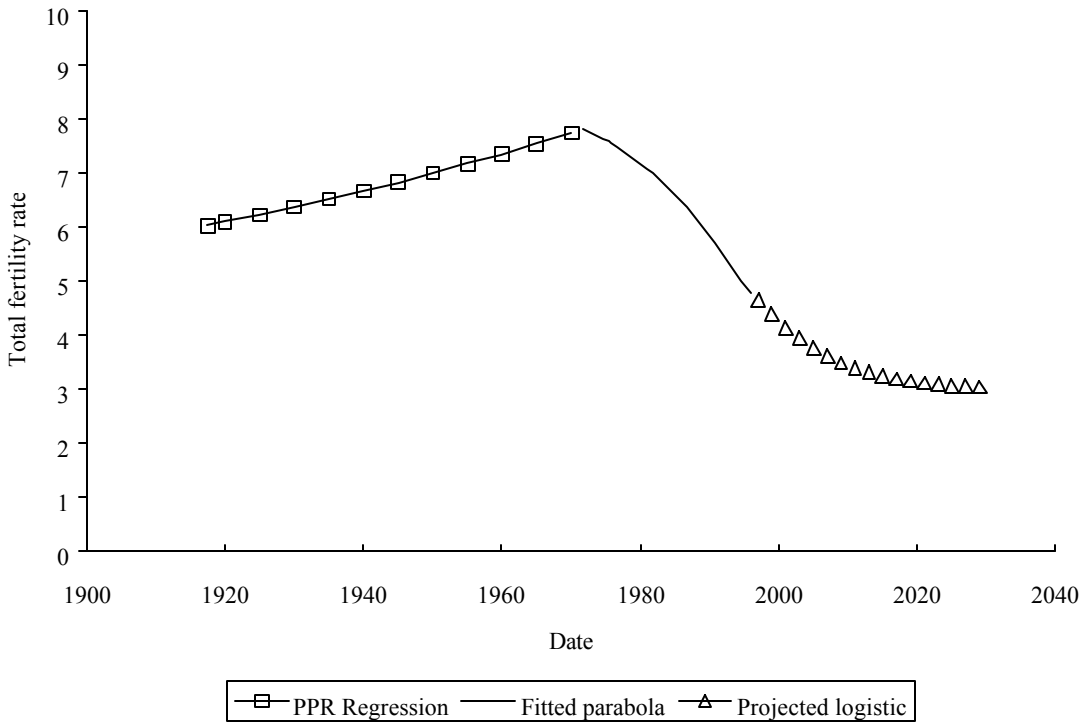


Figure 3. Long-term trend in Kenya TFR



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NOTES

[1] The East African Medical Survey, conducted in the early 1950s, showed that in Msambweni, on the Indian Ocean coast, some 10 per cent of women aged 35 and over were childless (Brass 1958).

[2] In the MCH-FP or treatment area of the Matlab Study Area in Bangladesh, where domiciliary visits by female health workers have achieved a contraceptive prevalence rate of between 65 and 70 per cent, total fertility has been fluctuating round 3 births per woman for about a decade (ICDDR,B 2000).