Demography: Analysis of the NIDS Wave 1 Dataset

Discussion Paper No. 9

Tom Moultrie
Centre for Actuarial Research, University of Cape Town
tom.moultrie@uct.ac.za

Rob Dorrington
Centre for Actuarial Research, University of Cape Town
rob.dorrington@uct.ac.za

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1. Introduction

This report sets out the major findings from investigations into the demographic data collected as part of the National Income Dynamics Study (NIDS). The report concerns itself primarily with three distinct investigations: fertility; child mortality and adult mortality. Each of these will be presented in turn. We have not prepared a section on the basic demography (age and sex structure of the population), as we presume that this will be covered in the report on the realisation of the sample, and the derivation of weights used or on migration, which is the topic of a separate report. However, where our findings relate to that material, comment will be offered.

2. Fertility

The questions on fertility in the questionnaire closely followed the format of questions asked in Demographic and Health Surveys. Women aged 15 and older were first asked whether they had ever given birth, followed by a series of questions to elucidate the total number of children born and living with the respondent; the number of children born but living elsewhere; and the number of children born but who have since died. The respondent was then asked whether the combined total implied by responses to these three questions was equal to the number of children ever born.

For those women who reported at least one child born, a detailed maternity history was asked. Respondents were asked about each child born, in order from oldest to youngest. Information on the sex, date of birth, current vital status and residence of each child was sought.

2.1 Fertility Data

NIDS administered adult questionnaires to 9 355 women. 170 women (1.8 per cent) did not have a complete month or year of birth reported. This information is required to estimate accurately age and the exposure-to-risk of experiencing a particular event. Data on these women were excluded. The information lost is not material in the derivation of fertility estimates. Trivial deviations between derived age group of women and those provided with the data were noted. Again, these will not be material.

While the fertility questions were asked of all women older than 15, experience across the developed and developing world has shown that older women's recall of their fertility is prone to significant errors and omission. Further, since the standard measures of fertility are typically based on the reports of women aged 15-49, we will follow convention here, and present data only for women in this age range. The sample of women aged 15-49, with valid month and year of birth, covered by NIDS is 6 613. This is just over half the sample size of the 1998 Demographic and Health Survey. It follows that the estimates produced here will be subject to a significantly greater degree of variation than the results from that survey.

Just under one per cent of female respondents between the ages of 15 and 49 refused to disclose their population group, or had missing data; the responses of four women to the question of whether they had ever given birth was missing. Table 1 shows the proportion of remaining women (n = 6 559, but weighted using the survey weights provided) who had ever given birth, by age and population group.

Table 1: Proportion of women by age and population group who have ever given birth

	Africans	Coloured	Indian	White	All
15-19	15.1	21.6	0.0	3.7	14.8
20-24	59.0	48.4	55.2	38.2	57.1
25-29	82.1	83.5	87.5	70.2	81.5
30-34	90.7	80.8	91.6	78.8	89.1
35-39	95.4	97.3	100.0	95.7	95.4
40-44	97.7	95.8	98.9	96.0	97.2
45-49	97.3	99.0	100.0	93.9	97.2

Childbearing is almost universal in South Africa, with around 2.5 per cent of African women being childless by the age of 45. A slightly higher proportion (around 5 per cent) of White women remains childless by this age, but the numbers are subject to random error on account of the small sample size in this group.

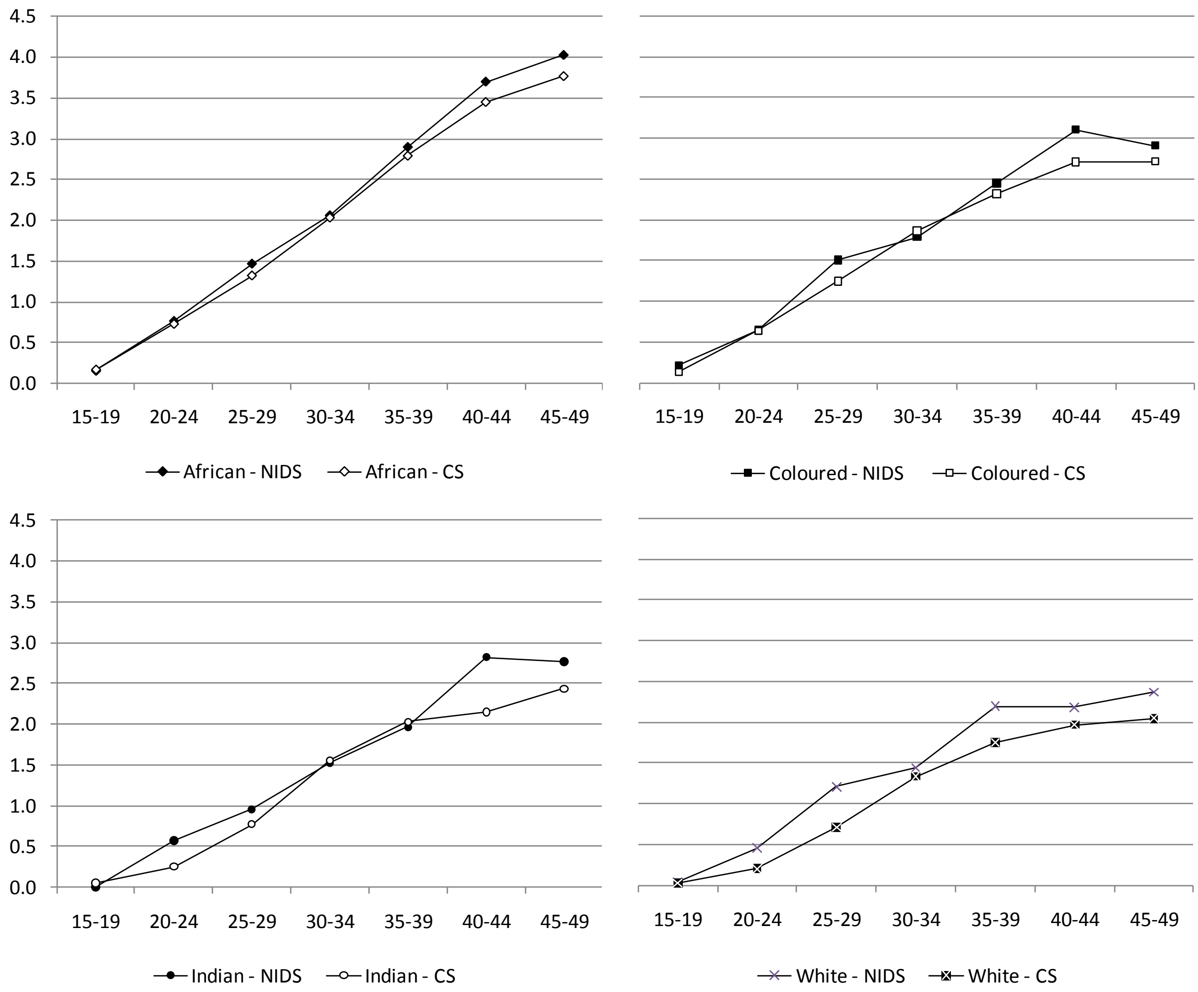
Despite these similarities, entry into motherhood occurs at very different rates. In these data, more than one in five Coloured teenagers have had a child and 15 per cent of African teenagers have already had a child. Teenage childbearing among Indian and White South Africans is exceedingly rare. Of women in their early twenties nearly 60 per cent of Africans, half of all Coloured women and 40 per cent of White women have had a child. Table 2 shows the average number of children born to women, by age and population group.

Table 2: Average numbers of children born to women by age and population group

	African	Coloured	Indian	White	Total
15-19	0.16	0.22	0.00	0.04	0.15
20-24	0.77	0.65	0.57	0.45	0.74
25-29	1.47	1.50	0.96	1.20	1.45
30-34	2.06	1.79	1.52	1.44	1.97
35-39	2.90	2.45	1.96	2.20	2.77
40-44	3.70	3.10	2.82	2.18	3.40
45-49	4.03	2.91	2.77	2.37	3.65

In general, the patterns are as expected, although the falling-off in average parity at age 45-49 among Coloured and Indian women is almost certainly not real. The data above can be compared with the results from the 2007 Community Survey (CS), a study conducted by Statistics South Africa as a census substitute exercise in early February 2007 (a year before NIDS). The CS interviewed over 300 000 women between the ages of 15 and 49, a sample almost 50 times that covered by NIDS. The average number of children born to women, by age and population group, indicated by the two studies is shown in Figure 1.

Figure 1: Average parities by age and population group, NIDS and 2007 CS



For African and Coloured women, the parity data collected in NIDS is substantially similar to that collected in the CS, although NIDS seemed to have found more high-parity women aged 40 and over than did the CS. Among Indian women (for whom the NIDS sample was very small), average parities indicated by the NIDS data are again higher than in the CS except for women between 30 and 40. Average parities for White women in the NIDS data are notably higher than those from the CS. Again, the small sample size in NIDS means that not too much store should be put by these figures.

2.2 Direct estimation of fertility

The data contained in the maternity histories allow the direct estimation of fertility rates from the data collected in NIDS. As with the DHS, the data collected are too sparse to estimate fertility rates for a single year, so rates are estimated for the three year period preceding the survey. Given the small sample size, an even longer period of investigation might be indicated, but the loss of precision in the estimation – given that fertility in South Africa has been falling for a long time – is not warranted. The age of the child's mother at the birth of each child can be calculated (to the nearest month), while the mother's exposure to risk of giving birth over the three years preceding the survey can be accurately apportioned to different ages.

The person-years of exposure, number of births and associated age-specific fertility rates by age and population group are shown in Table 3. The data collected in NIDS suggest that the total fertility rate in South Africa in the second half of 2006 was 2.80 children per woman. This is somewhat higher than the 2.54 children per woman indicated by the Community Survey for mid-2006. Total fertility rates estimated from the CS were 2.71 for Africans; 2.35 for Coloureds; 1.39 for Asians/Indians and 1.45 for Whites.

While the aggregate rates for African and Coloured South Africans derived from NIDS are reasonably close to those derived from the CS, the indicated fertility rates for White and Indian South Africans are implausibly high. Some clues as to reason why the fertility rates derived from the NIDS data are curious can be gained from a closer inspection of the exposure derived by age and population group. It can be seen, for example, that the exposure estimated for White women aged 20-24 is lower than that for the adjacent cohorts. At first, this would appear counterintuitive, since there are more women aged 20-24 than there are aged 25-29 in the NIDS data. However, closer examination of the data on the 35 women interviewed who were aged 20-24 shows that they were weighted up to be representative of 114 000 women. But, while 8 of the women (22.9 per cent) in the underlying data were aged 20, 20 year olds account for nearly 39 per cent of White women aged 20-24 in the weighted data, with 21 year olds accounting for a further 18.5 per cent of this age group. When working with exposure over a three year period, it must follow that the bulk of the exposure for 20 and 21 year olds will lie in the 15-19 age group. Thus, the weighting procedure (which was determined at a household, not an individual level; and which suggests a somewhat curious pattern of differential household enumeration) combined with a very small sample size causes material problems in the procedure used to estimate fertility rates.

In any event, the fertility rates for White and Indian South Africans are deemed to be too inconsistent and variable to be regarded as offering a reliable insight into the dynamics of South African fertility. In turn, this means that the national figure (of 2.80 children per woman) is also unreliable.

Table 3 a) Births and exposure, by age and population group

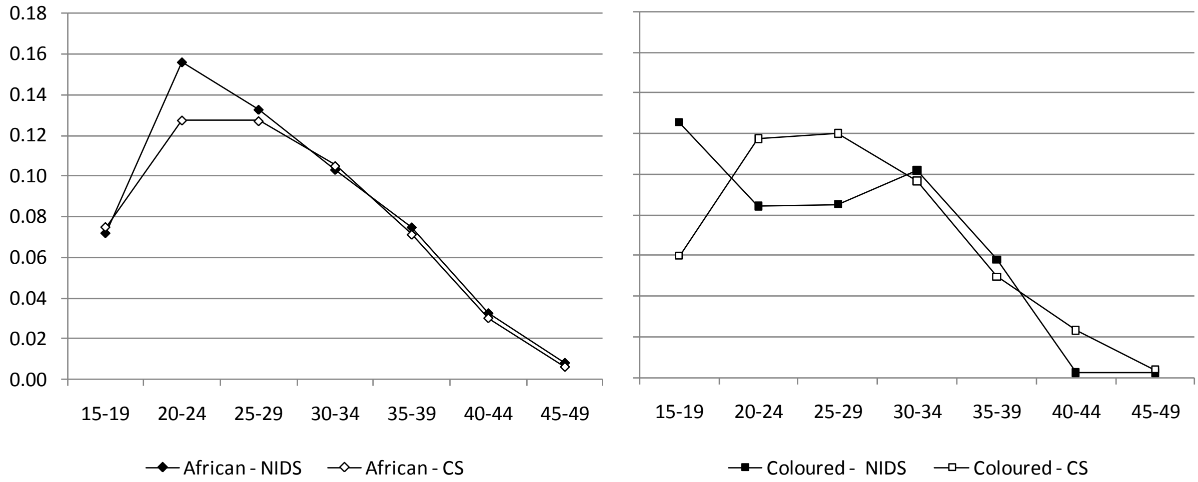
	African		Coloured		Indian		White		TOTAL	
	Births	Exposure	Births	Exposure	Births	Exposure	Births	Exposure	Births	Exposure
15-19	399933	5559437	51519	410901	11964	160368	9939	336061	473354	6466767
20-24	793926	5087146	35516	421281	3803	76571	43268	263807	876513	5848805
25-29	591186	4455157	37214	437675	27330	151072	54906	385700	710637	5429603
30-34	414483	4020975	54251	533156	6848	130685	55097	415404	530680	5100219
35-39	240130	3212046	24783	427603	236	130471	12588	309072	277737	4079192
40-44	82954	2553286	854	370042	0	84294	10549	520104	94357	3527726
45-49	18658	2318905	734	311093	0	126836	0	348920	19392	3105753
TOTAL	2541270	27206951	204872	2911752	50181	860297	186347	2579066	2982670	33558066

b) Age-specific and total fertility rates, by population grou;p

	African	Coloured	Indian	White	TOTAL
15-19	0.072	0.125	0.075	0.030	0.073
20-24	0.156	0.084	0.050	0.164	0.150
25-29	0.133	0.085	0.181	0.142	0.131
30-34	0.103	0.102	0.052	0.133	0.104
35-39	0.075	0.058	0.002	0.041	0.068
40-44	0.032	0.002	0.000	0.020	0.027
45-49	0.008	0.002	0.000	0.000	0.006
TFR	2.90	2.30	1.80	2.65	2.80

The age-specific fertility rates for African and Coloured South Africans, from both the NIDS data and the 2007 CS, are presented in Figure 2.

Figure 2: Age specific fertility rates, African and Coloured women, NIDS and 2007 CS



The data presented in Figure 2 shows a great degree of consistency in the age-specific fertility rates for Africans as indicated by the NIDS data and the 2007 CS. Only one data point (that for 20-24 year olds) is materially different, and this accounts for almost the entire difference in estimated total fertility between the two surveys. However, the flat shape of the fertility schedule for Africans in their 20s has been documented across a wide range of data sources (the 1996 and 2001 censuses; the 1998 DHS; and the 2007 CS; see for example Moultrie and Timæus (2002, 2003) and Moultrie and Dorrington (2004)) and one is inclined to prefer the CS estimates over those produced by NIDS on these grounds, as well as on the basis of the sample sizes involved. Users of the data on fertility for Africans should treat curious, surprising or significant results for 20-24 year olds with a high degree of circumspection.

By contrast, although the total of fertility for Coloured women surveyed in the NIDS data was close to that reported from the 2007 CS, the shapes of the fertility schedules are clearly different, and cannot be regarded as giving a true or reasonable depiction of fertility in this population group. The fertility schedules for the other two population groups are unreliable, largely as a result of very small sample sizes.

The flaws in the current fertility data for three of the four population groups also preclude using indirect techniques to estimate fertility (for example those suggested by Brass (United Nations Department of International Economic and Social Affairs 1983), Zaba (1981), or Feeney (1998)), as these techniques rely on the assumption that the shape of the fertility schedule (but not its level) is correct, and can be used to derive a revised fertility schedule using the average parities of younger women. Where the shape of the underlying fertility schedule cannot be relied upon, indirect techniques of fertility estimation are of limited use.

2.3 Trends and differentials in African fertility

The results presented above suggest that the fertility data for Africans (with a degree of caution attached to the fertility data for women in their early twenties) is of sufficient quality to be used to understand the causes and correlates of economic and social exclusion and deprivation. The data for African South Africans is explored in greater detail in the sections below.

2.3.1. Provincial differentials in African fertility

The data on births in the three years preceding the survey are too sparse to produce reliable estimates of fertility by province. Analyses of fertility by province should not be attempted; they indicate, for example, a TFR in Gauteng among African women of over 3 children per women (and suggesting that Gauteng's fertility rate is the fourth highest among all the provinces). The 2007 CS, on the other hand, ranked Gauteng's fertility as joint lowest (with the Western Cape) at a level of 2.2 children per woman.

2.3.2. Teenage childbearing

There has been much public concern about the level and trends in teenage fertility and some commentators have gone so far as to allege that the South African social welfare and grants system has led to rising levels of teenage fertility. While the academic literature has challenged this perception (Makiwane and Udjo 2006; Moultrie and McGrath 2007), the data from NIDS, in conjunction with other data sources, adds a further level of support to the contention that – in aggregate – teenage fertility in South Africa has not increased over the past decade.

From Table 4 it is apparent that, by the most important metrics, teenage fertility in South Africa is not rising. In absolute terms, the teenage fertility rate has fallen by 17.4 per cent since 1996, to 72 births per 1 000.

Table 4: Metrics of African teenage fertility, various surveys

	Census 1996	DHS 1998	Census 2001	CS 2007	NIDS
ASFR (15-19) – per 1000	86	81	71	75	72
Contribution to TFR (%)	12.3	13.0	11.6	13.8	12.4
Proportion of births that are to teenage mothers (%)	15.7	16.7	15.8	17.6	15.6

Likewise, the proportion of all births that are born to teenage mothers has remained approximately constant, at between 15.5 and 17.5 per cent over the last decade. In total, the evidence suggests that the concern directed at teenage pregnancy is, for the most part, misplaced.

2.3.3 Differentials in African fertility by rural-urban residence

The age-specific fertility rates by rural-urban residence are shown in

Table 5.

Table 5: Age-specific fertility rates for Africans, by age and place of residence

	Rural	Urban
15-19	0.084	0.061
20-24	0.147	0.163
25-29	0.141	0.127
30-34	0.126	0.086
35-39	0.077	0.073
40-44	0.025	0.040
45-49	0.013	0.004
TFR	3.07	2.76

Fertility rates in rural areas of South Africa are, unsurprisingly, higher than fertility rates in urban areas. Rural fertility is estimated in the NIDS data as 3.07 children per woman, while urban fertility is approximately ten per cent lower, at 2.76 children per woman. The shape of the urban fertility schedule has a more pronounced peak than the rural schedule (which is much flatter). The urban teenage fertility rate is approximately three quarters that of rural teenagers.

2.3.4. Differentials in African fertility by education of mother

There is a very steep differential in fertility by the level of mother's education. As with many other analyses, the data at the extremes are relatively sparse and subject to excessive error. To improve the robustness of the estimates, a three-way classification of women's education was adopted: primary or less (Grade 7 or less); senior (Grade 8- Grade 11); and Matric or higher (Grade 12 and higher education). The results are shown in Table 6.

Table 6: Age-specific and total fertility rates by mother's educational attainment

	Primary or less	Senior	Matric or higher
15-19	0.140	0.073	0.049
20-24	0.195	0.168	0.134
25-29	0.170	0.123	0.129
30-34	0.170	0.101	0.068
35-39	0.085	0.078	0.060
40-44	0.033	0.031	0.034
45-49	0.011	0.005	0.000
TFR	4.02	2.90	2.37

Several things are apparent from these data. First, that total fertility for women with a matric or higher education is close to replacement level; second, that the fertility of women with very limited education remains high; and third, interestingly, it would appear that by far the greatest risk of teenage pregnancy lies among those women who have never entered secondary school (and not those falling pregnant while in secondary school). However, it is equally unsurprising that the greatest number of births to teenage mothers is to those with an incomplete secondary school education. Therefore, the causality connecting teenage pregnancy and schooling outcomes remains unresolved. The longitudinal data collected in subsequent waves of NIDS might offer some insight into this aspect of fertility in South Africa.

3. Child mortality

There are two distinct approaches that can be used to measure the level and trend in child mortality from the data collected in NIDS. The first is direct measurement, using the detailed data collected on every woman's children in the maternity histories. These data, because they include each child's date of birth, vital status, and – if dead – the child's age at death, can be used to reconstruct patterns of child mortality. The alternative approach is to use so-called indirect techniques for estimating child mortality. This involves using the summary data on women's childbearing (specifically, the tabulations on average numbers of children ever born, and surviving by age of mother) to estimate indirectly survival probabilities and – hence – child mortality. Both approaches were applied to the NIDS data, and are described in the sections below. However, data on population groups other than Africans are too scanty to allow any type of estimation of child mortality. Not a single Indian female respondent under the age of 50 reported a child who had died. White women under the age of 50 reported a total of 7 dead sons and 3 dead daughters. Among all Coloured women under the age of 50, 48 dead sons and 36 dead daughters were recorded.

3.1 Direct measurement of child mortality

The detailed data collected in the maternity histories about each child born to each woman is used to measure the exposure to risk of death of each child, from date of birth to the date of interview, or death – if this occurs first. To get as exact estimates as possible, both events (i.e. deaths) and exposure are cross-classified by calendar time (to avoid distortions in the estimates arising from changing patterns of mortality over time) and age.

As mentioned earlier, the data collected in NIDS permits the assessment of child mortality using direct measurement. Information on each child's month and year of birth is captured; and information on the age at death of each dead child (measured in days, months, or years) is also collected.

3.1.1 Data manipulations

Information on 24 502 children of all population groups was collected from the 9 355 women interviewed in this round of NIDS. Just under two per cent of responses on child's month of birth were missing or refused. However, respondents reported that they did not know their child's month of birth in 23.5 per cent of cases. (Once weighted, the proportion of unknown month of birth falls to 17.0 per cent). With regards to children's year of birth, less than 1.5 per cent of mothers' responses were coded as "missing" or "refused". Again, though, information on year of child's birth was recorded as "Don't Know" for 16.8 per cent of actual reports (11.3 per cent once weighted).

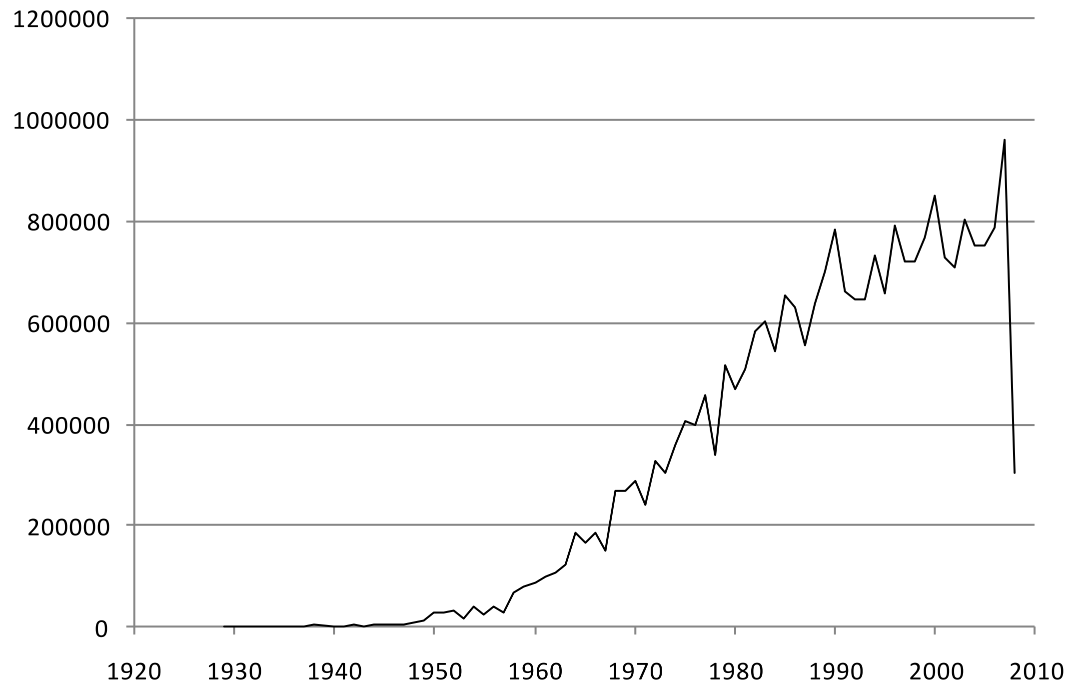
While it is hard (though not impossible) to attribute years of birth to children based on mother's age and other variables, if the year of birth is known but month of birth is not, it is a trivial matter to randomly allocate months of births to those children without unduly affecting the quality or integrity of the data. This allows an extra 1 784 children's records to be analysed. The overwhelming majority (weighted, 93.2 per cent) of these extra records relate to births more than a decade ago, and so will have a negligible impact on the estimates of mortality of children under the age of five derived from the data. However, there are additional issues with the reported year of birth data, as is discussed in the next section.

3.1.2 Data issues

When trying to derive the child mortality estimates directly from the data, problems with the collection of the data in the maternity histories were identified. The reported dates of child's birth appear to be reasonable if a little erratic. The steep fall-off in 2008 is due to the bulk of the fieldwork being completed in the early months of 2008.

The problem with the dates in the maternity history data arises from the reporting of dead children's year of birth, and their age at death. First, years of child's birth were recorded as "Don't Know" disproportionately in the records of dead children. Of the 4 111 children reported dead, a valid date of birth could not be derived for 2 032, leaving 2 079 records of dead children. Of these, ages at death could not be derived for a further 486 children, leaving a total of only 1 593 (38.75 per cent of the original sample) children with both valid dates of birth and dates of death. Second, the distribution of the years of birth and death of these 1 593 remaining children from whom one would estimate rates of child mortality are implausible (Figure 4). The births are concentrated in the 1970s and 1980s, while the deaths are reported almost exclusively as occurring in the very recent past.

Figure 3 Reported year of child's birth (African South Africans), weighted



If one further restricts this analysis to the 889 children who died before their fifth birthday (the subset of the data from which one would estimate child mortality), the pattern is no more sensible (Figure 5). There is an evident shortfall in the number of births in the 1990s that is not evident in the full data set on children (Figure 3 above), while nearly ten per cent of all deaths under the age of five are reported to have occurred between 2006 and 2008.

Odd as it may seem, it might be the case that – since the date of death was derived by adding the reported age at death (in months) to the reported date of birth – respondents inadvertently misunderstood the question to be asking "how old would this child be now, if he or she were still alive?".

Figure 4 Years of birth and death of all children reported dead who have valid dates of birth and death (weighted; original n = 1 593)

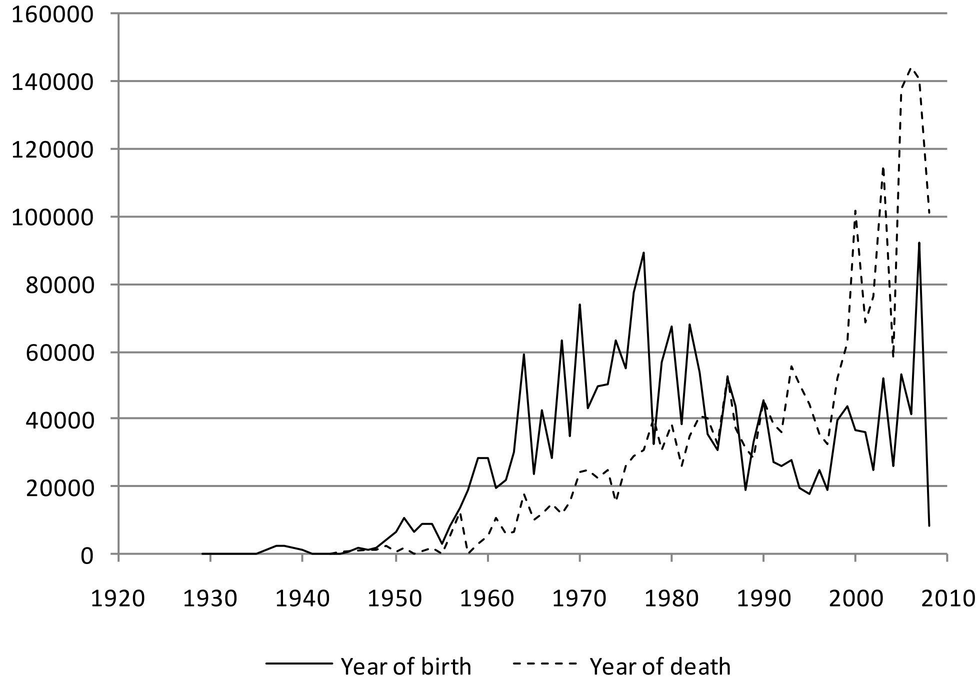
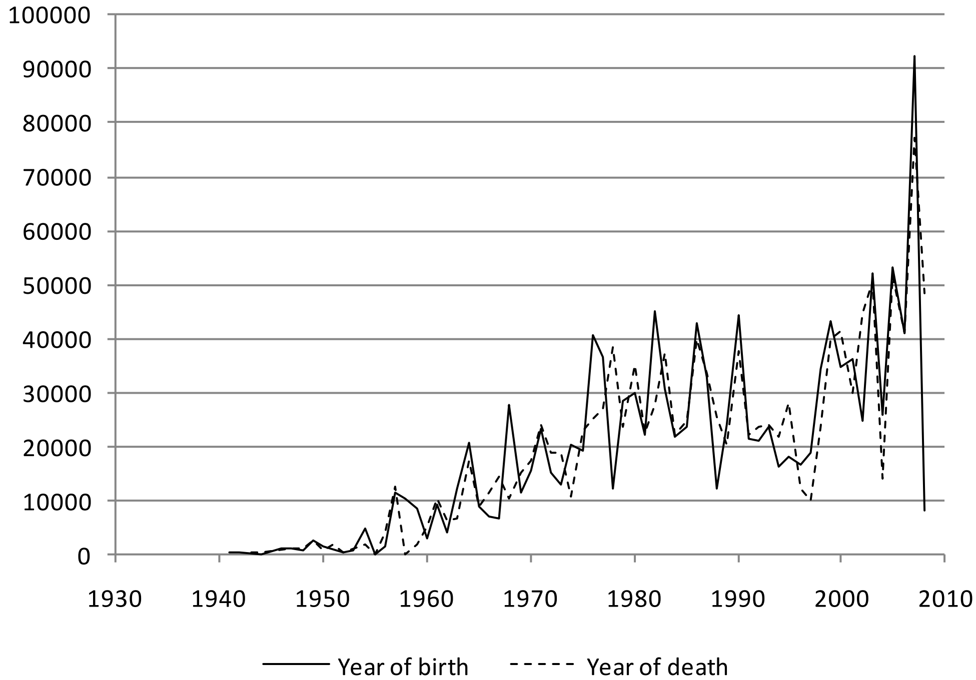


Figure 5: Years of birth and death of all children reported dying before the age of 5 who have valid dates of birth and death (weighted; original n = 889)



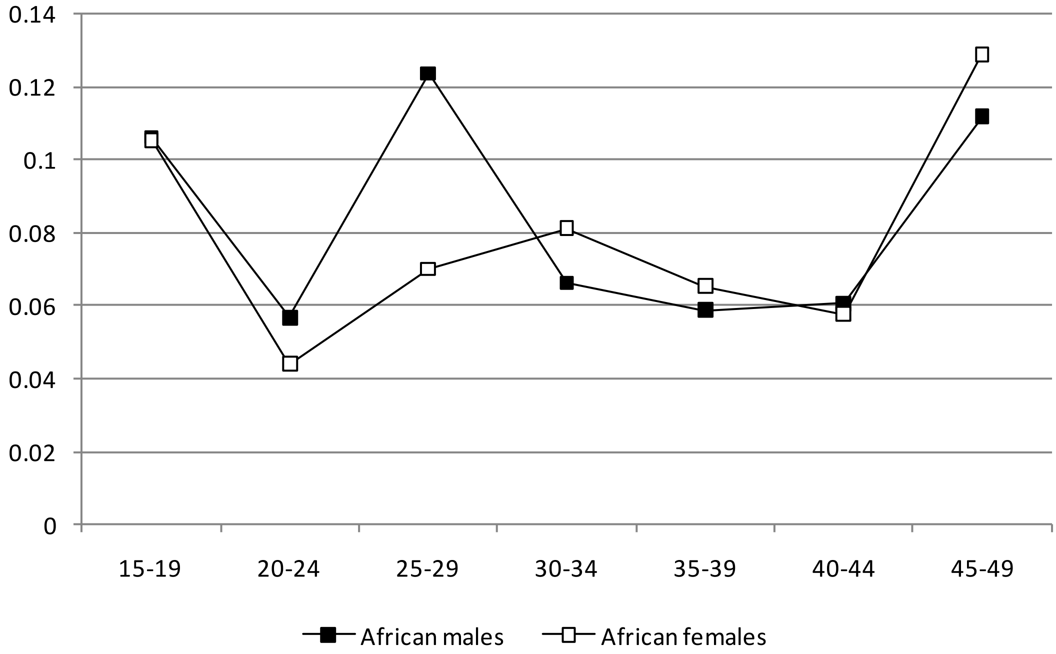
The implication of this analysis is that sensible estimates of either the trend in, or level of, child mortality from the NIDS data cannot be derived. *Inter alia*, the rates derived suggest that the probability of an African child dying before its first birthday increased by 116 per cent over the period from 2000-2004 to 2005-2008, while the probability of an African child dying before its fifth birthday over the same period might have increased by as much as 164 per cent.

3.2 Indirect measurement of child mortality

The alternative to direct estimation of child mortality is to use women's responses to the questions on the number of children ever born and the number of those surviving and applying the Brass method (Brass 1975; Brass, Coale, Demeny *et al.* 1968; United Nations 1983) to these data. The method uses the proportion of children who have died, by age of mother, to estimate the probability of a child surviving to specific ages: the proportion of children dead of mothers aged 20-24, for example, is used to estimate the probability of survival to age 2; the proportion of children dead of mothers aged 30-34 is used to estimate the probability of survival to age 5. With the possible exception of the data for very young women (15-19 years old), one would expect the proportion of children who have died to be greater for older women than younger women, as older women's children would have been born, on average, longer ago and hence been at risk of dying for a longer time.

Only for Africans was there enough data to even attempt the application of the method. Figure 6 shows the proportions surviving for each age group of women used as inputs to the method.

Figure 6: Proportion of children dead by age of mother and sex of child

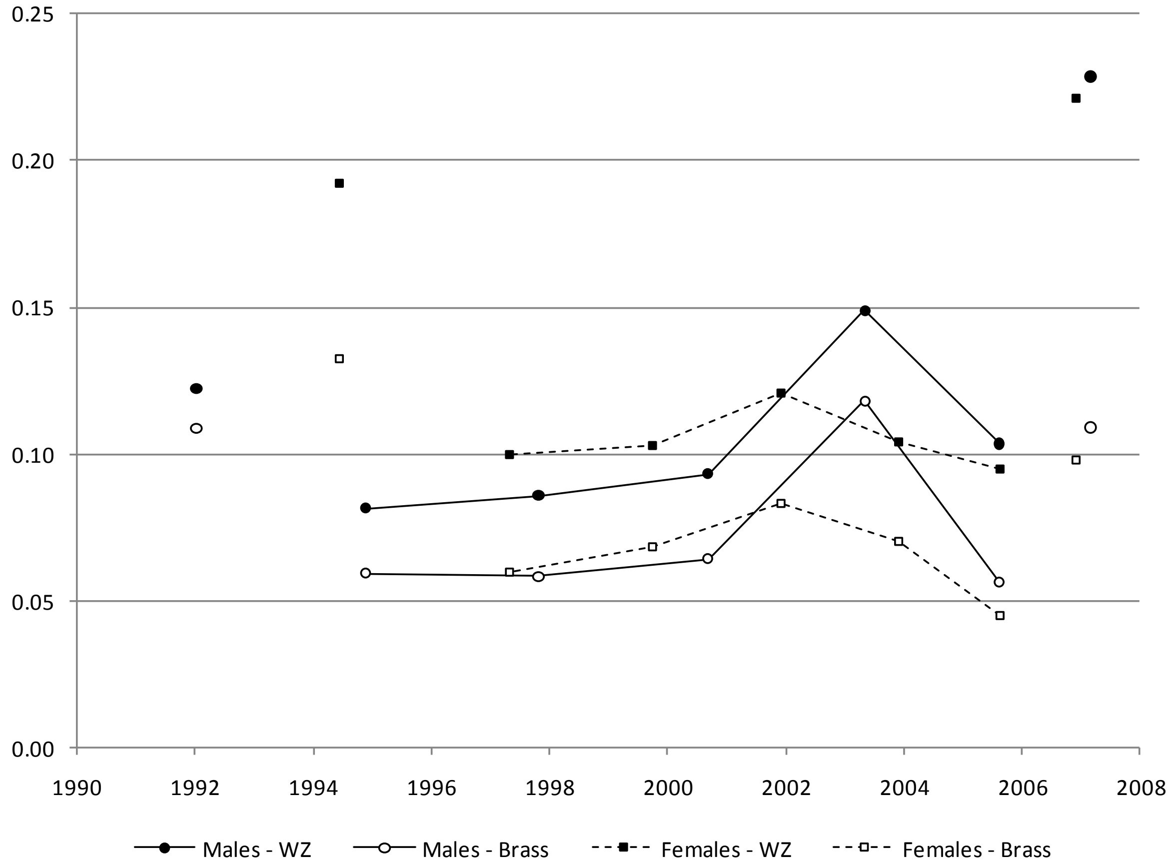


Several features of these two series give cause for concern. The proportion of daughters who have died is higher than the proportions of sons who have died in three of the mother's age groups. Male child mortality is typically significantly higher than female child mortality so one should not see this pattern. Second, there is a sharp discontinuity in the proportions of children dead among women aged 45-49 relative to women aged 40-44, suggesting, implausibly, proportionately twice as many dead children in the former age group as in the latter. Third, the proportion of dead sons reported by women in their late twenties is also unrealistically high.

Application of the Brass method suffers from a major handicap where HIV/AIDS is widespread. The method assumes that the mortality of mothers and their children is independent; a patently unreasonable assumption in this context. While far from ideal, and suffering from its own limitations (in particular the necessity of having to assume that the HIV/AIDS epidemic is stable), the best adjustment to the Brass method is that proposed by Ward and Zaba (2008).

Applying a modified version of the Ward-Zaba (WZ) approach (to accommodate the fact that the HIV/AIDS epidemic is not stable) to the data for African children produces estimates of the time trend in ${}_5q_0$ (the probability of a child dying before its fifth birthday) shown in Figure 7.

Figure 7: Estimates of 5q0 for Africans, by sex



The most recent and most distant estimates are shown on the figure, but are not connected to the other points. This is because the most recent estimates (for some time in 2007) are derived from the information from the youngest women, and this is known to be unreliable, not least because of the adverse impact of early childbearing on child health. The data furthest back in time are derived from the information from women aged 45-49, and – as can be seen from the data presented in Figure 6, these are also not reliable. Likewise, the effect of the spike in the proportion of male children dead derived from women aged 25-29 (shown in Figure 6) can be clearly seen in the estimates of male mortality in Figure 7.

While concerns must still be registered about the overall quality of the data on children – and in particular in the birth histories – the data presented above suggest an approximate level of under five mortality for Africans of 100 per 1 000 births in 2006, and ignoring the estimate for 2004, that the rate of child mortality hasn't changed much over the last 10 years.

3.3 Child mortality based on reported deaths in the household

A less traditional (probably because early experience found these data not to be too promising) method for estimating child mortality is to make use of the data on children's deaths reported by households. The data on deaths as reported by households is discussed in more detail in the next section, but for the purposes of estimating child mortality it is relevant to note that no age was reported for almost 20 per cent of reported deaths. If one distributes these deaths to age according to the proportion of deaths with a reported age at each age and divides the resultant numbers of deaths (weighted) under age 1 and under age 5 by the number of births estimated to have occurred in the two years prior to the survey, one can produce estimates of the infant mortality rate[1] (IMR) and the under five mortality rate[2] (U5MR). However, it might, quite reasonably, be expected that respondents would have known the ages of any children who had died in the past two years and thus that one should not make any adjustment to the data on the number of deaths under age five. Estimates on both these bases are presented for the country as a whole and for the African population group (there being only 3 deaths under age five in the sample for all non-African population groups together) in Table 7. It is very likely that these rates span the range of plausible estimates, with, according to ongoing work on estimates from the Community Survey data, the best estimate of IMR lying close to the minimum and the best estimate of the U5MR lying about mid-way between the upper and lower estimates in the table.

Table 7: Infant and under five mortality rates (per 1 000 live births)

	National		African	
	With apportionment	Without apportionment	With apportionment	Without apportionment
IMR	59	49	70	57
U5MR	81	68	97	79

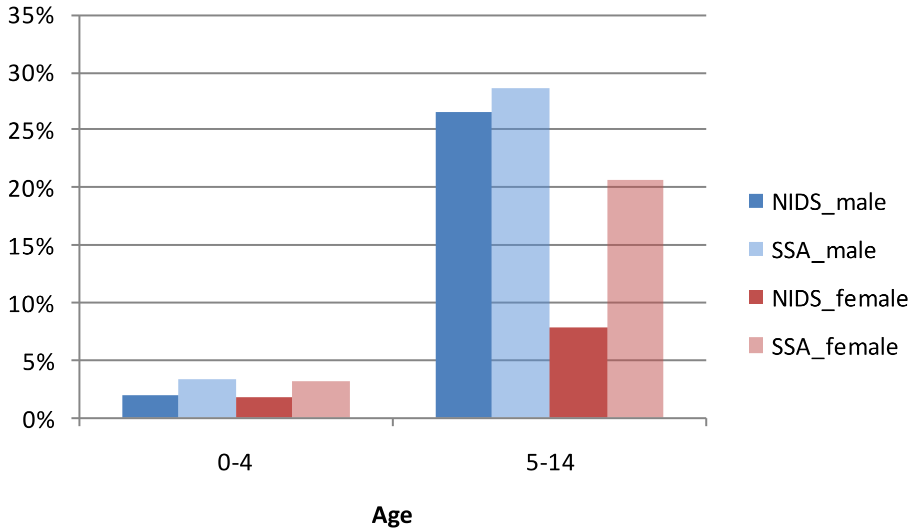
A comparison of the proportion of deaths of children under age five in the urban and rural areas with the numbers estimated to be living in these areas according to NIDS suggests that in broad terms the mortality of children living in rural areas may be some 60 per cent higher than that of children living in urban areas. The household survey also asked if the death was due to unnatural causes ("the result of an accident or violence"). The proportion of deaths due to unnatural causes for children under the age of 15 are compared in Figure 8 with the proportions

[1] Close to the probability of dying in the first year of life, $1000q_0$.

[2] Approximately the probability of dying in the first five years of life, $1000{}_5q_0$.

from the vital registration data for 2006 (Statistics South Africa 2008b). Given the small sample size (only 7 deaths of girls aged 5-14) the results do not look unreasonable.

Figure 8: Proportion of deaths due to unnatural causes



4. Adult Mortality

As with child mortality there are essentially two approaches to estimating adult mortality: the direct method, which makes use of the number of deaths reported as having occurred in the household in the 24 months immediately preceding the survey; and an indirect approach, which makes use of reported proportion of parents of the respondents in different ages groups that are alive at the time of the survey.

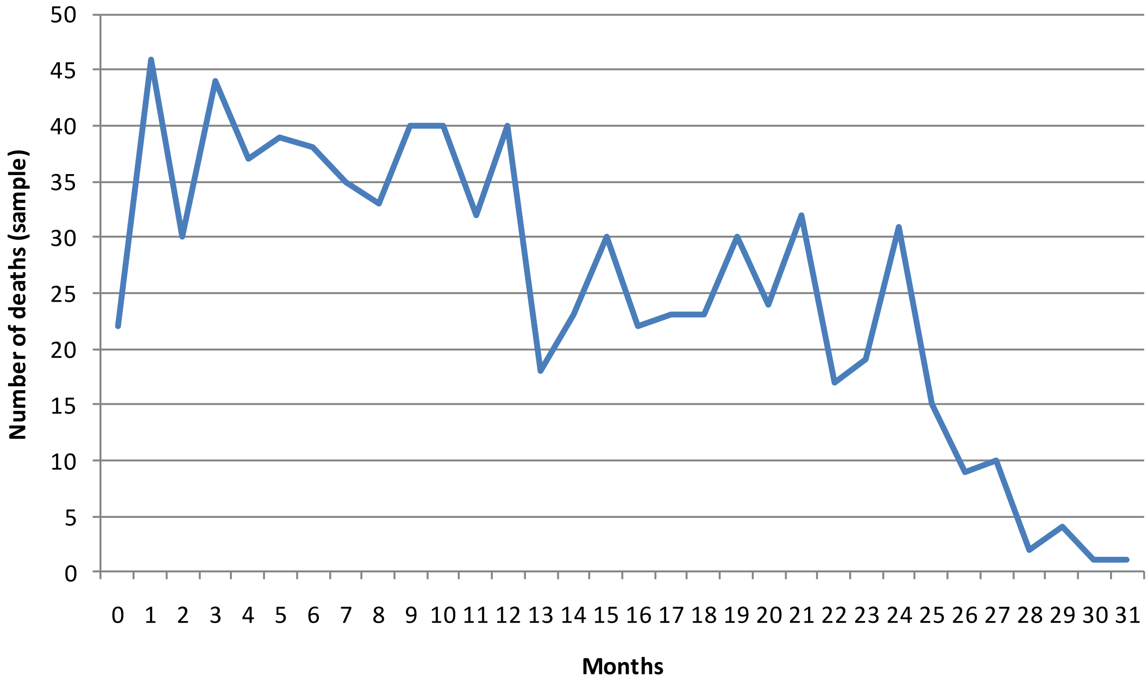
4.1 Deaths reported by households

Data on deaths in the household were collected using questions similar to those used in the national census with the exception that the reference period was 24 months rather than the 12 months of the census and no attempt was made to identify maternal deaths separately. However, in addition NIDS asked for the relationship of the deceased to the respondent.

Of the 7 305 households to which the household questionnaire was administered only 6 could be considered child-headed and no deaths were reported as having occurred in these households. There were 948 deaths reported by the remaining 7 299 households. Although this is very few from which to be deriving mortality rates by age, weighted up using the household weights, it gives an estimated total number of deaths nationally of nearly 700 000 deaths per annum which is not far off expectation.

Some 14 per cent (11 per cent when weighted) of the reported deaths were missing all or part of the date of death and of the remainder some 5 per cent had dates of death more than two years prior to the date of interview. In addition inspection of the distribution of the number of deaths by number of months prior to interview shows (Figure 9) a falling off in numbers the further back in time one goes, with almost two distinct levels with the numbers in the first 12 month period being about 50 per cent higher on average than those in the second 12 month period.

Figure 9: Number of reported deaths by month prior to interview



Perhaps of more concern than the uncertain quality of the date of death data is the fact that nearly 20 per cent of the deaths had no age at death recorded thus forcing the user to make some assumption about the distribution of ages of these deaths. As shown in the previous section, two reasonable alternative assumptions can produce significant differences in the estimates of child deaths. Although one can limit the range in which the age might fall for some of the deaths by making use of the information on household relationships, about a third of the deaths were sons or daughters of the respondent which would not help in most cases in deciding whether or not the deceased child had reached age 1 or age 5.

Figure 10 shows the ratio of the number of deaths derived from the NIDS data, after apportioning the deaths without age and weighting the data, to twice the number recorded by the vital registration system (Statistics South Africa 2008b)[3]. The average ratio for male deaths is 100 per cent while that for female deaths is around 120 per cent, however, the registered deaths are themselves not completely reported (they are probably about 10 per cent under reported). Thus it would appear that NIDS is under recording the male deaths by about 10 per cent and exaggerating the number of female deaths by about 10 per cent, with an excess in the 15-59 age range and a shortfall in numbers above that this range.

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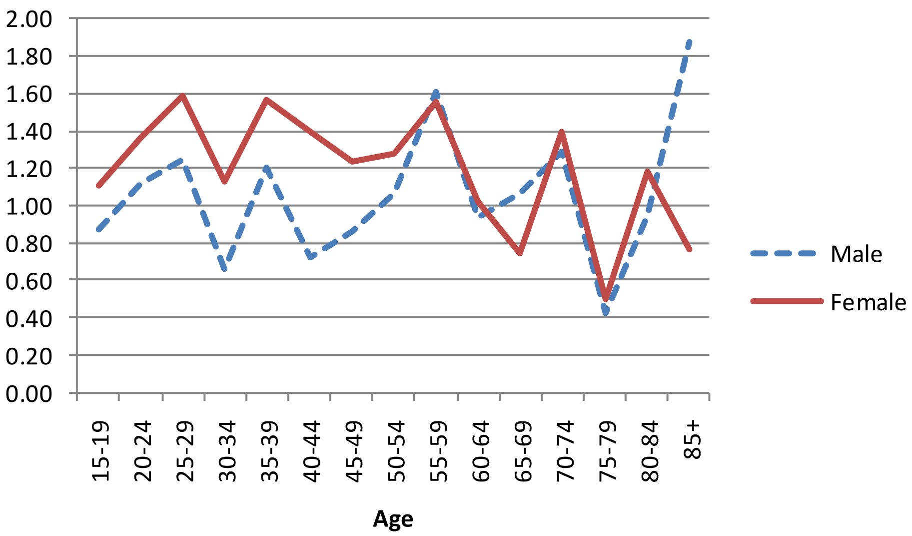
[3] The Stats SA data is not reported by population group, so all investigations using those data, or presented in comparison with them, are for all South Africans.

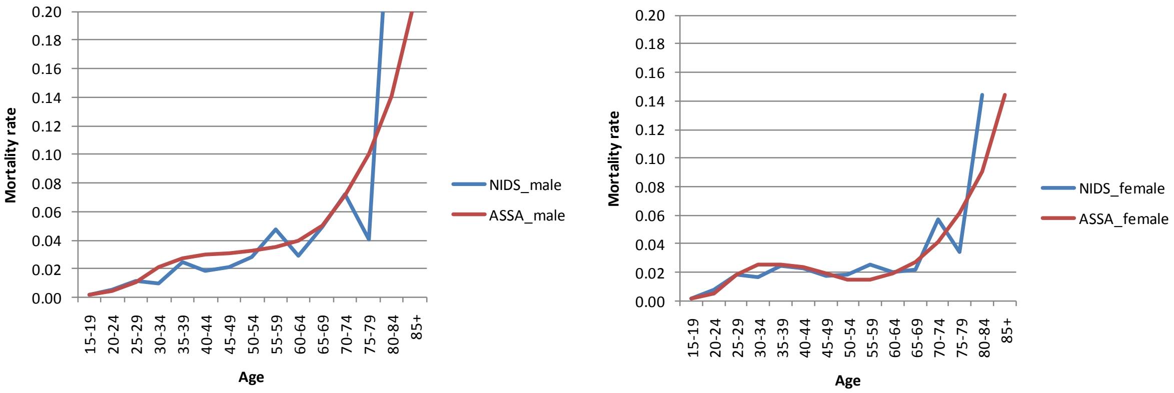
Figure 10: Ratio of NIDS deaths per annum (weighted) to 2006 registered deaths



4.2 Age specific mortality rates

Figure 11 compares the age specific mortality rates produced by dividing the weighted number of deaths, after apportioning those without age, by the mid-year population estimates for 2007 produced by Stats SA (Statistics South Africa 2008a) with the rates produced by the ASSA2003 AIDS and Demographic model (Dorrington, Bradshaw, Johnson *et al.* 2006; Johnson and Dorrington 2006) for the same period.

Figure 11: Age specific adult mortality



The correspondence is surprisingly good, although it should be noted that the ASSA model probably overestimates the mortality due to HIV slightly. A frequently used index of adult mortality is ${}_{45}q_{15}$, the probability of a 15 year old dying before reaching age 60. The ASSA model estimate this probability to be 62 per cent for men and 52 per cent for women, while NIDS estimates it to be 57 per cent and 54 per cent respectively.

What is a little worrying is that past experience with these data from the 2001 census and the Community Survey would have led one to expect a falling off in the estimates from NIDS at the older ages, particularly for women, as households disintegrate on the death of the head of household. That this is not apparent from the data suggests that there is probably a degree of age exaggeration which is compensating for this loss.

However, the life expectancies at birth produced using the method described above applied to the NIDS data are 51 years nationally and 48 years for Africans which compares extremely well with estimates from the ASSA model of 50.7 years and 47.4 years respectively .

4.3 Mortality by population group, province and area of residence

In order to investigate adult mortality by population group it is necessary to decide on the population group of the deceased as this is not given. For this exercise the deceased was given the population group of the head of household, or the next person in the household for whom population group is recorded, if there was no head of household identified (about 11% of households with adults) or the population group of the head of household was not recorded (about 4% of households with a head of household). A derived variable was created for this purpose.

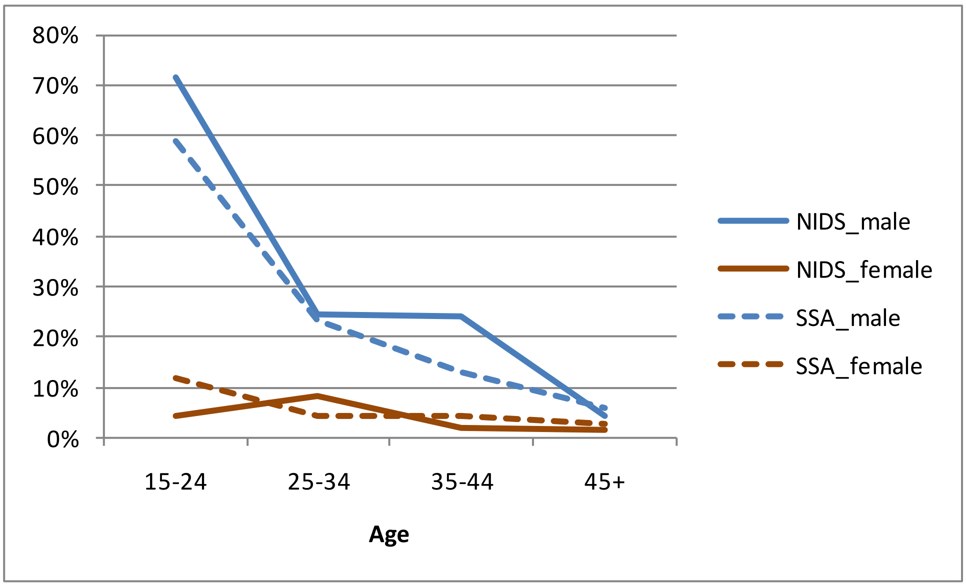
Unfortunately, as was the case for the child mortality, the sample was too small for us to be able to estimate age-specific mortality rates for the non-African population groups (a total of 105 deaths of which 66 were Coloured, 6 Indian and 23 White). As might be expected comparisons of estimates of mortality rates for Africans were as good as the estimates at the national level but with greater variation. The NIDS data produced estimates of ${}_{45}q_{15}$ of 67 per cent and 62 per cent for males and females respectively, compared with 69 per cent and 58 per cent from the ASSA model.

Needless to say the data are also too sparse to rely on any estimates at the provincial level. However, comparison of mortality by rural-urban residence suggests, perhaps not unsurprisingly, that the mortality of adults living in rural areas is around 35 per cent higher than the mortality of adults living in urban areas.

4.4 Deaths due to unnatural causes

Figure 12 compares the proportion of deaths (weighted) due to unnatural causes from NIDS with that from the 2006 vital registration (SSA). While there is broad consistency (given the uncertainty) there appears to be a tendency for NIDS to exaggerate these causes in men under 45.

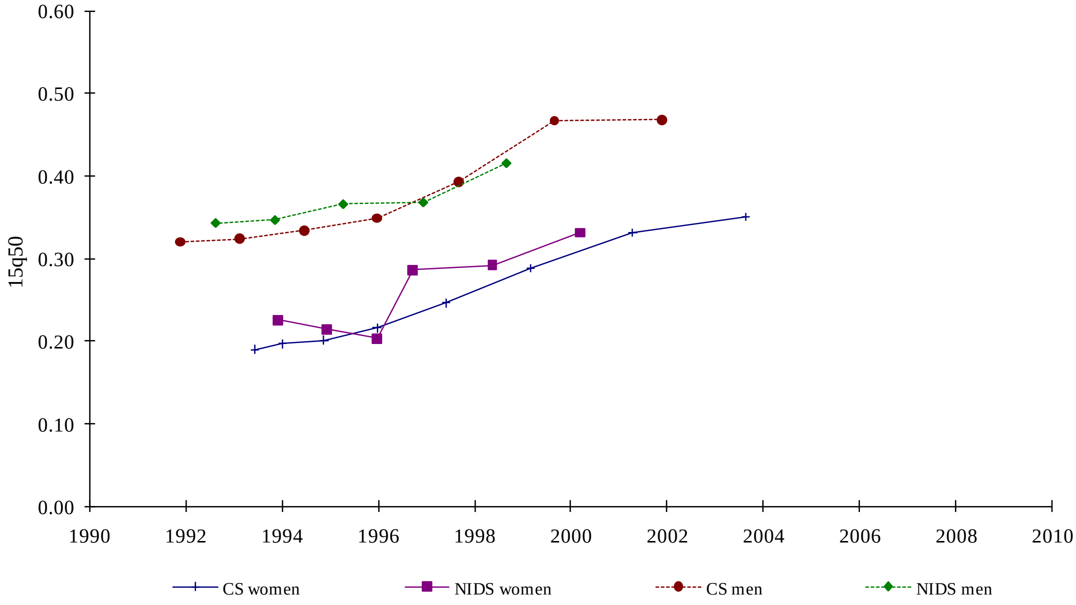
Figure 12: Proportion of deaths due to unnatural causes



4.5 Trend in mortality from data on the survival of parents

Finally, for completeness we consider, briefly the trend and level of mortality as estimated using the data on survival of parents. Respondents were asked whether their mother and whether their father was still alive at the time of the survey. These data can be used to produce broad estimates of mortality over the past 15 years (United Nations 1983, 2002). Figure 13 compares the estimates of ${}_{15}q_{50}$, the probability of someone aged fifty surviving for 15 years, from NIDS to those produced using data from the Community Survey (CS) about a year earlier. These results show a remarkable degree of consistency which reinforces the conclusion that mortality rates have been increasing over the past 15 years and, provided there has been a levelling of mortality in the recent past, these results correspond quite closely to the estimates from the household deaths of 41 per cent for males and 27 per cent for females. However, it must be noted that in the case of the Community Survey the proportions are based on the responses of male and female respondents combined (which is the typical practice unless the reporting by one group, usually females, is markedly better) while for the NIDS survey it was necessary to base the survival of women on proportions surviving as reported by male respondents alone. For some unknown reason female respondents in NIDS reported implausibly low proportions of their mothers surviving, which would have led to estimates of mortality closer to those of the men than the women if their responses had been included.

Figure 13: Trend in mortality of older adults by sex, all South Africans, NIDS and CS



Although techniques have been developed for deriving a point estimate of mortality at the mid-point between two surveys where there are two surveys that have asked the question on survival of parents (United Nations 1983, 2002) these did not work when combining the data from the Community Survey and NIDS. This points to an inconsistency in the reporting of proportions of parents surviving between the two surveys, with a lower than expected proportion being reported by NIDS.

5. Conclusions

Despite its relatively small sample size, it has been possible to derive reasonably plausible estimates of fertility, child mortality and adult mortality for the African population of South Africa from the data. The sample sizes, and reports of births and deaths, for other population groups are inadequate for the kind of demographic estimation pursued here.

The major findings, in respect of the demography of the African South African population are:

A level of fertility of approximately 2.9 children per woman in the second half of 2006. Age-specific levels of fertility indicated by the data are almost identical to estimates applicable to the same period derived from the 2007 Community Survey. Fertility rates from the NIDS data in the 20-24 age group, however, are too high relative to the CS data, and do not concur with the results from multiple census and surveys. Fertility levels by level of education, and by urban-rural residence, show the expected gradients. The data are too sparse to derive sensible fertility levels by province.

These data do not indicate a rising trend in teenage fertility rates among African South Africans. Suppositions in the popular press that great numbers of teenage girls are falling pregnant to access the Child Support Grant are most probably unfounded.

A plausible level of, or trend in, child mortality could not be determined from the maternity histories collected in the study, or from the reported proportions of children dead by age of mother. An implausibly high proportion of mothers were recorded as not knowing their own children's dates of birth or death. We suspect that this is more probably the consequence of inadequate fieldworker training and supervision, rather than an inherent failing of mothers.

Levels of child and infant mortality from deaths reported in households over the two years preceding the survey were in line with expectations, although the numbers of deaths reported were very small – implying a great degree of uncertainty surrounding the estimates derived.

The high proportion of reported deaths without age increases the uncertainty about the mortality rates, and an additional question to categorise the deceased into broad age groups where age isn't known, would have helped to improve the estimates.

Levels of adult mortality derived from the data on deaths reported in households, and from the data on survival of parents are – given the sample sizes – surprisingly consistent with expectations. So too is the trend in adult mortality derived from the reported survival of parents (with the exception of the reporting of survival of mothers by women, for some unknown reason).

While the findings above are mostly positive, and point to the utility of much of the data contained in the NIDS study, some aspects of the study, its design and analysis might benefit from additional attention. First, the relative incompleteness of reporting of dates in the maternity histories is a deficiency. Subsequent rounds of NIDS should seek to address this through additional fieldworker training and tighter fieldwork supervision. Second, given the high level of reported deaths in the household whose ages were recorded as not known, a follow-up question to at least give a possible age-range of decedents would be useful.

This report has merely sketched the essential delineations of fertility, child mortality and adult mortality among African South Africans as indicated by the NIDS data set. Other information that was collected in the study might well prove useful in adding to our understanding of these factors. Here we are thinking – in particular – of the information collected on the age of parents at death; on whether the parent was alive when the respondent was 5, and 15; and making greater use of the information on household relationships. These, and other investigations, pursued with care, might allow further corroboration of the findings set out here, as well as permitting new approaches to demographic estimation, and providing additional insight into the demography of the African South African population.

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