COMMENTARY

Has HIV prevalence peaked in South Africa? – Can the report on the latest antenatal survey be trusted to answer this question?

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On the weekend of Friday 29 August, the National Department of Health placed their report on the results of the 2007 national antenatal survey, carried out a little over 10 months ago, on their website.[1] The Department uses these results (showing an overall HIV prevalence of 28%) to reinforce those of the previous survey[2] and argue that 'South Africa may be making some real progress in its response to the HIV epidemic' and that the 'South African HIV epidemic is on a downward trend'. While this may or may not be true, in order for one to infer a trend in indicators from a sequence of surveys they need to be comparable, year on year, with one another. Unfortunately this is not the case with the antenatal surveys of the past 2 years.

In 2006 the survey sample was doubled in size and the sentinel sites chosen on the probability proportional to size (PPS) basis designed, as pointed out in the most recent report,[1] to provide (for the first time) prevalence estimates for each district in the country on a self-weighting sample. Compared with the national prevalence of 30.2% reported for 2005, it was argued that the 29.1% in 2006 suggested that 'for the first time that the South African epidemic may be beginning a downward trend'.[2] However, as the 2006 survey sample was so different from that used previously, one cannot be sure of the extent to which the decrease is due simply to the larger, more representative survey measuring prevalence more accurately. Although there is mounting evidence of a fall in prevalence among young pregnant women, one cannot interpret the overall trend without a thorough analysis of the data, which unfortunately are not in the public domain.

In 2007, the survey sample design was the same as that in 2006 and one might have expected to be able at least to use the 2006 and 2007 results to give an indication of whether the overall national prevalence had fallen. Unfortunately, although not clearly described in the methodology of the report, the Department appears to have reweighted the data in a way that is not only radically different from the method used in 2006, but is also manifestly *wrong*. In 2006, as intended, the districts were treated as self-weighting and the estimates of provincial prevalence rates were therefore simply the total of the results from the districts within the province. The national estimate was then derived, as in previous surveys, by taking a weighted average of the provincial results using the number of women aged 15 - 49 years in each province according to Statistics South Africa (Stats SA) mid-year population estimates[3] as weights. In 2007 the Department appears to have introduced age weighting. Instead of treating the district data as self-weighting according to the survey design, the provincial estimates appear to have been derived by weighting each age group according to number of women in each age group in the province according to Stats SA mid-year population estimates.[4]

It is clearly problematic to use the age distribution of the population of all women to weight data representing women attending public antenatal clinics by age to produce an estimate of the prevalence of women attending public antenatal clinics. By definition women attending antenatal clinics are pregnant, and have therefore been exposed to unprotected sex, and since fertility rates have a very distinctive pattern with respect to age (low for the 15 - 19 age group, peaking in the 20 - 24 age group and falling steadily to very low levels beyond age 35), the age distribution of women attending antenatal clinics is very different from that of the female population, which is highest in the 15 - 19 age group and decreases gradually with increasing age. Since the prevalence of HIV also has a distinct age pattern and prevalence is lower in the youngest and oldest age groups, using the population of all women to reweight the data will inevitably *underestimate* the prevalence of women attending public antenatal clinics in that year.

That most of the decline in overall prevalence between 2006 and 2007 is simply an artefact of the inappropriate reweighting

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of the data can be seen by considering the results in more detail. For example, the age-specific data presented indicate that the prevalence fell in two age groups only and by less than 1% in each case, yet supposedly the prevalence for all ages 15 - 49 fell by over 1%. An estimate of national prevalence produced by a weighted average of the provincial prevalence using the method applied to the 2006 data (updated to use the 2007 mid-year population estimates) gives an estimated national prevalence of 29.4%, which suggests, given the overall uncertainty in the estimates, that overall prevalence probably has not declined from 2006 to 2007.

The new weighting gives rise to some absurd results. For example, the prevalence in the Western Cape, which previously had the most rapidly growing epidemic, albeit from a low base, apparently fell from 15.1% in 2006 to 12.6% in 2007. This while, apparently, prevalence fell in only two districts, and in both cases by less than 1%, and in the presence of a significant roll-out of life-preserving treatment which would, other things being equal, lead to an *increase* in the numbers of infected women in the province. Closer inspection shows that using the aggregate of the district data for this province (or alternatively a weighted average of the district prevalence rates using the expected number of births in the districts as weights) gives a prevalence in 2007 of about 15.3% – much more in line with expectation. Similarly, the estimates based on the aggregate of the districts in 2007 are 31.7% for the Free State, 38.7% for KwaZulu-Natal and 20.4% for Limpopo, all suggesting minimal change from the previous year, while that for Mpumalanga is 34.6%, reversing a drop in prevalence shown last year. Finally, either as a consequence of the underestimate of antenatal prevalence in 2007 or for some other reason (the report is short of details about how the estimate was derived), the Department estimates the total number of people infected to be lower in 2007 than in 2006 and some 5 - 10% lower than 5.5 - 5.7 million estimated by others[5,6] (but possibly in line with the estimate of 5.35 million for 2008 provided by Stats SA for which no method was provided[7]).

The adoption of a national strategic plan has increased the necessity to monitor trends in the HIV epidemic. However, interpretation of the trend in the antenatal survey data is becoming increasingly difficult as one has not only to allow for possible bias at the young ages (sexually active young women who have had unprotected sex do not represent all young women) but also for the impact of treatment on prevalence levels (on which the report is surprisingly silent). On the face of it, analysis of these data appears to be becoming increasingly beyond the skills of the Department of Health and it would serve all if these data were made available to the broader scientific community to analyse and interpret more thoroughly.

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