ZIMBABWE
Working Papers

Based on further analysis of
Zimbabwe Demographic and Health Surveys

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Elizabeth Gonese
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Vinod Mishra

February 2010 • No. 1

The *Zimbabwe Working Papers* series is a prepublication series of papers reporting on work in progress. The papers are based on further analysis of data collected in the Zimbabwe Demographic and Health Surveys. The development of these working papers was funded by the United States Agency for International Development (USAID) through the MEASURE DHS project at ICF Macro, Calverton, Maryland, USA, and by the U.K. Department for International Development (DFID) through Population Services International (PSI), Zimbabwe and Centres for Disease Control and Prevention (CDC), Zimbabwe. ICF Macro, Calverton, Maryland, USA, provided technical assistance for the analysis and preparation of the papers.

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Elizabeth Gonese[1]

Janet Dzangare[1]

Nicholas Jonga[2]

Owen Mugurungi[1]

Simon Gregson[3]

Ruth Walkup[4]

James Mudzori[5]

Vinod Mishra[6]

February 2010

Corresponding author: Elizabeth Gonese, AIDS and TB Unit, Ministry of Health and Child Welfare, Box CY 1122, Causeway, Harare, Zimbabwe; Phone: +263-11-616-815; Email: gonesee@zw.cdc.gov.

1. AIDS and TB Unit, Ministry of Health and Child Welfare, Harare, Zimbabwe
2. Central Statistics Office, Harare, Zimbabwe
3. Biomedical Research and Training Institute, Harare, Zimbabwe and Imperial College London, UK
4. Centers for Disease Control and Prevention, Harare, Zimbabwe
5. National Microbiology Reference Laboratory, Zimbabwe
6. ICF Macro, Calverton, Maryland, USA

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the technical support provided by ICF Macro and in particular the analytic support provided by Sarah E.K. Bradley. Authors also thank Shanxiao Wang for research assistance, Bryant Robey for editing, and Yuan Gu for document production.

Suggested Citation:

Gonese, Elizabeth, Janet Dzangare, Nicholas Jonga, Owen Mugurungi, Simon Gregson, Ruth Walkup, James Mudzori, and Vinod Mishra. 2010. Comparison of HIV Prevalence Estimates for Zimbabwe from National Antenatal Clinic Surveillance (2006) and the 2005-06 Zimbabwe Demographic and Health Survey. *Zimbabwe Working Papers, No.1.* Calverton, Maryland, USA: ICF Macro.

ABSTRACT

Background: In generalized epidemics, national HIV prevalence estimates are derived indirectly from surveillance of pregnant women attending selected antenatal care (ANC) clinics. The main advantages of using ANC data include low cost of data collection and accessibility of populations. However, ANC data may not represent HIV prevalence in the general population.

Objectives: The purpose of this study is to compare HIV prevalence estimates obtained from the 2006 ANC surveillance survey with estimates obtained from the 2005-06 population-based Zimbabwe Demographic and Health Survey (ZDHS), and to assess the use of three residential classifications— rural, urban, and other—in deriving HIV estimates**.**

Methods: Geographic Information Systems were used to match ANC surveillance sites with ZDHS clusters. HIV prevalence estimates from the ANC surveillance sites were compared with estimates from the corresponding ZDHS clusters for all men and women and for women residing within 30km of the ANC sites. Comparisons were also made stratified by current pregnancy status, experience of recent child birth, and receiving ANC for the last birth.

Results: Women in the 2006 ANC survey were more likely to live in urban areas, had fewer children, and were more educated, more likely to be unemployed, and younger than women in the ZDHS sample. The ANC HIV prevalence estimate (17.9%, 95% CI 17.0%–18.8%) was similar to the ZDHS estimates for all men and women age 15-49 years (18.1%, 16.9%–18.8%), for pregnant women (17.5%, 13.9%–21.9%), and for ANC attendees living within 30km of the ANC surveillance sites (19.9%, 17.1%–22.8%). However, the ANC surveillance estimate (17.9%) was significantly lower than the ZDHS estimates for all women (21.1%,

19.7%–22.6%) and for women living within 30km catchment areas of ANC surveillance sites (20.9%, 19.4%–22.3%). HIV prevalence in the ANC sites classified as urban and rural was significantly lower than in sites classified as “other”.

Conclusions: ANC surveillance provides reliable estimates of HIV prevalence among pregnant women attending ANC clinics and is a useful source of data for monitoring the HIV epidemic in Zimbabwe. Data from periodic population-based surveys complement ANC surveillance data by providing nationally representative estimates of HIV prevalence, as well as linked information on the characteristics and behaviors of people. A much higher HIV prevalence among the ANC sites classified as “other” suggests that Zimbabwe should continue to generate HIV estimates using the three classifications: rural, urban, and other.

Key Words: *HIV, prevalence, antenatal, surveillance, survey, DHS, Zimbabwe*

INTRODUCTION

Accurate HIV prevalence data are critical for countries in southern Africa faced with very high HIV-related disease burdens and limited resources. These data are required for monitoring the progress of the HIV epidemic, planning for HIV prevention and care and treatment programs, and assessing the impacts of interventions. The main source of HIV prevalence data is antenatal clinic (ANC) surveillance among pregnant women attending for antenatal care in selected health facilities. These data have been used to provide information on HIV prevalence levels and trends, including estimates for the general population derived using mathematical models [1-3].

The advantages and shortcomings of ANC data in representing the general population have been documented [4, 5]. The main advantages include the accessibility of populations and the low cost of data collection. However, lack of universal coverage of ANC services in developing countries and exclusion of men and non-pregnant women tend to make these data less representative of the general population. To obtain up-to-date and accurate data on HIV prevalence, countries have begun implementing HIV testing in population-based Demographic and Health Surveys (DHS) and AIDS Indicator Surveys (AIS). These surveys provide nationally representative estimates of HIV prevalence in the general population and have the advantage of linking socio-demographic and behavioral data to the HIV serostatus of individuals [6]. However, estimates derived from these surveys can be affected by bias, due to non-response and exclusion of non-household-based populations, and the surveys are too expensive to conduct on an annual or biannual basis.

A comparison of HIV prevalence estimates from population-based surveys to those from ANC surveillance in five Sub-Saharan African countries—Ethiopia, Kenya, Malawi, Tanzania, and Uganda—showed that population survey estimates were lower than ANC estimates in four of the five countries [7, 8]. In Uganda, where the HIV epidemic has

stabilised, the estimates were similar from both sources. In the multi-country analysis, younger women (age 15-24) sampled in the ANC surveillance catchment areas in the population-based surveys had a lower HIV prevalence than those in the ANC surveillance surveys. The opposite trend was observed for older women (age 25-49). A similar pattern has been observed in local studies in Zimbabwe [9]. Variations in HIV prevalence were also noted for the different residential classifications (urban and rural).

These comparisons provide insight into the potential biases of the different data sources. Researchers concluded that the two data sources (population-based surveys and ANC surveillance surveys) are complementary and that caution needs to be exercised in interpreting HIV prevalence data [7].

Zimbabwe has conducted ANC surveys biannually in 19 consistent sites since 2000. The 2006 round coincided with the 2005-06 Zimbabwe Demographic and Health Survey (ZDHS—the first national population-based survey that included HIV testing. The 19 ANC sentinel sites were purposively chosen to track the HIV epidemic in different geographic regions. Three sites in major cities were over-sampled in order to give a larger sample size in the 15-24 age group in urban areas, which could be used as a proxy for incidence [10].

The extent to which HIV prevalence data from the ANC surveillance surveys reflect prevalence in the general population has not previously been assessed at the national level in Zimbabwe. Therefore, this study compares HIV prevalence estimates from the 2006 ANC surveillance survey with estimates from the 2005-06 ZDHS for women living in the sampled clusters within the catchment areas of the ANC surveillance sites.

The 2005-06 ZDHS data have been used previously to calibrate the 2007 HIV national estimates in Zimbabwe. The HIV estimation process for Zimbabwe has been unique in that, in addition to the usual two residential classifications—urban and rural—a third classification of “other”, derived from the classifications employed in the national census, is

used. ANC sentinel sites classified as “other” are characterized by high labor and circulatory migration and include growth points, commercial farming areas, mining areas, and border towns. It is believed that the epidemiology of HIV in these communities is different than that in either urban or rural settings [9]. A scientific audit to determine the value of the “other” residential classification at the national level has not been conducted. This analysis will therefore also explore the differences in HIV prevalence by the three different classifications (rural, urban, and other) in ANC surveillance data compared with the ZDHS clusters within a 30km catchment area of each ANC surveillance site.

METHODS

The 2006 ANC surveillance survey

A total of 19 sentinel sites contributed to the 2006 ANC surveillance survey. Pregnant women presenting for the first time with their current pregnancy at the participating ANC sites during the survey period were enrolled in the study. A total of 7,249 ANC attendees were tested in an anonymous unlinked HIV sero-survey. A minimum data set extracted from antenatal clinic booking cards was used to fill in the 2006 ANC survey form. More details about the ANC survey are available in the main survey report [11].

The 2005-06 ZDHS

In the 2005-06 ZDHS the sample was selected in two stages, with enumeration areas (EAs) as the first-stage and households as the second-stage sampling units. In total, 1,200 enumeration areas were selected with probability proportional to size (PPS), the size being the number of households enumerated in the 2002 Census. The list of households obtained was used as the frame for the second-stage systematic probability selection of households. The listing excluded people living in institutions (army barracks, hospitals, police camps, boarding schools, etc.) and the homeless.

All women age 15-49 and men age 15-54 who were either permanent residents of the sampled households or visitors present in the household on the night before the survey were eligible to be interviewed and to give consent for blood draw for anemia and HIV testing.

Geographic Information Systems (GIS) method

A GIS-based method was used to identify the ZDHS clusters that were located within a 30km radius of the nearest ANC sentinel site. Although Zimbabwe endeavours to provide primary health care services within a 10km radius, a wider radius was used since ANC sentinel sites

often have a wider geographic coverage, because there is a good road network and people tend to seek care at higher-level health institutions. Additionally, primary health care facilities do not offer all mother and child health services, and differences in user fees can widen the geographic catchment areas for some sites.

Each of the 19 ANC sentinel sites was matched to the nearest ZDHS enumeration area using geo-reference codes in ArcView 9.1 [12]. In each case, a ZDHS enumeration area was found within 30km of the ANC.

Of 6,947 women interviewed and tested for HIV in the 2005-06 ZDHS, 2,943 (42%) lived in clusters located within 30km of one of the 19 ANC sites. We compared the ANC surveillance survey estimates of HIV prevalence with the estimates for all men and women (combined and separately) included in the ZDHS, women living in 30km ANC catchment areas, and women living in 30km ANC catchment areas who attended ANC for their last birth. In the initial analyses (Tables 1 and 3), ZDHS clusters and ANC sites were distinguished as urban and rural using the ZDHS classification. In Table 4, ZDHS clusters that were within the 30km radius of ANC surveillance sites classified as “other” were recoded as “other” to allow comparisons of HIV prevalence estimates for each of the three residential strata.

Statistical analysis

The comparisons in HIV prevalence estimates were made by selected demographic and socioeconomic characteristics of women available in both the ANC surveillance survey and the ZDHS. These included broad age groups, educational status, work status, marital status, number of living children, and urban/rural residence. ZDHS estimates were also tabulated for women by current pregnancy status, experience of birth in past three years, and whether attended ANC for last birth in past three years.

There were no reliable estimates of population size in the ANC catchment areas or information on the representativeness of the ANC surveillance sites. Therefore, we did not have appropriate weighting factors for the estimates based on the 2006 ANC surveillance survey or for women in the 2005-06 ZDHS living in the ANC catchment areas, and comparisons are made using unweighted estimates. However, the estimates for all women in the ZDHS are appropriately weighted to provide comparisons with nationally-representative estimates.

STATA SE10.1 statistical software [13] was used to recode variables and generate HIV prevalence estimates and 95% confidence intervals (CI) for both the 2006 ANC surveillance survey and the 2005-06 ZDHS datasets.

RESULTS

In total, 7,494 women (76% of those eligible) and 5,555 men (63% of those eligible) had a valid HIV test result in the 2005-06 ZDHS. Of the women participating in the ZDHS, 2,943 lived within 30km of an ANC surveillance site. Of these women, 777 had attended ANC for their last birth in the previous three years. A total of 7,202 pregnant women participated in the anonymous unlinked sero-survey conducted in the 19 ANC sentinel sites in 2006.

A comparison of women included in the 2006 ANC surveillance survey and those in the 2005-06 ZDHS reveals major differences in their characteristics. Women in the ANC survey were younger, had fewer children, were more educated and were more likely to be unemployed, married, and living in urban areas (Table 1). The characteristics of the women in the ANC survey were more similar to those of women interviewed in the ZDHS who lived in the 30km catchment areas of the ANC surveillance sites—particularly so when the sample was further restricted to include only women who attended ANC for their last birth in the past three years.

Table 1. Sample distributions of women (age 15-49) included in the 2006 ANC surveillance survey and the 2005-06 ZDHS, by selected characteristics

	ANC[1]		ZDHS					
	All women (15-49)		All women (15-49) interviewed and tested for HIV[2]		Women in 30 km ANC catchment areas[3]		Women in 30 km ANC catchment areas who attended ANC for last birth[4]	
	%	N	%	N	%	N	%	N
Total	**100.0**	**7,202**	**100.0**	**6,947**	**100.0**	**2,943**	**100.0**	**777**
Age group								
15-24	58.7	4,236	46.1	3,200	48.2	1,417	44.9	349
25-34	35.3	2,547	30.3	2,105	29.2	860	45.3	352
35-49	6.0	435	23.6	1,642	22.6	666	9.8	76
Residence								
Urban	52.4	3,768	38.4	2,670	71.8	2,113	65.1	506
Rural	47.7	3,430	61.6	4,277	28.2	830	34.9	271
Education								
None	0.9	66	4.3	301	2.1	61	1.4	11
Primary	21.3	1,531	32.6	2,263	21.2	623	19.7	153
Secondary or higher	77.8	5,596	63.1	4,383	76.8	2,259	78.9	613
Work status								
Not working	85.5	6,158	63.4	4,406	63.4	1,866	67.3	523
Working	14.5	1,048	36.6	2,541	36.6	1,077	32.7	254
Marital status								
Never married	5.0	354	26.6	1,846	32.5	957	5.7	44
Married	94.0	6,699	58.0	4,027	51.9	1,527	83.5	649
Divorced/separated/ widowed	1.0	71	15.5	1,074	15.6	459	10.8	84
Number of living children[5]								
0	47.5	3,414	30.0	2,086	35.3	1,040	40.0	311
1-2	41.2	2,960	37.3	2,590	38.2	1,123	44.1	343
3-4	9.6	688	20.2	1,401	18.2	536	11.7	91
5+	1.8	130	12.5	871	8.3	244	4.1	32

[1] Ns for individual categories may not add to total due to missing information.

[2] Numbers for all women in the ZDHS are weighted.

[3] Women age 15-49 interviewed and tested by the ZDHS who live in a community within 30km from the nearest ANC site.

[4] Women age 15-49 interviewed and tested by the ZDHS who live in a community within 30km from the nearest ANC site and who received ANC for their last birth in the previous 3 years.

[5] Number of living children for women in the ZDHS sample who live within an ANC catchment area and attended ANC for the last birth has been adjusted to show parity at time of last ANC attendance (excluding the most recent birth).

However, women in the ZDHS who lived in the 30km ANC catchment areas, had had a birth in the last three years and reported attending for ANC for their most recent birth were somewhat older than those in the ANC survey and were more likely to be working, to be divorced, separated or widowed, and to live in urban areas (Table 2) (perhaps due to the over-sampling of urban clinics in the ANC survey).

Table 2. Comparison of HIV prevalence among women age 15-49 from ANC sentinel surveillance and among men and women age 15-49 interviewed by the ZDHS, by women's pregnancy status, recent birth experience, and receiving antenatal care for last birth, 2005-06

	ANC			ZDHS					
	All women (15-49)			All women (15-49)[1]			Women in 30 km ANC catchment areas[2]		
	%	95%CI	N	%	95%CI	N	%	95%CI	N
Total	**18.0**	**17.0-18.8**	**7,202**	**21.1**	**19.7-22.6**	**6,947**	**20.9**	**19.4-22.3**	**2,943**
Currently pregnant									
No		---	---	21.4	19.9-23.0	6,473	21.3	19.8-22.8	2,789
Yes		---	---	17.5	13.9-21.9	474	13.0	7.6-18.4	154
Gave birth in past 3 years									
No		---	---	21.5	20.1-23.0	4,602	21.0	19.3-22.7	2,136
Yes		---	---	20.3	18.2-22.7	2,345	20.4	17.7-23.2	807
Attended ANC for last birth (among women who gave birth in past 3 years)									
No		---	---	26.0	17.8-36.2	97	(33.3)	15.4-51.2	30
Yes		---	---	20.1	17.9-22.5	2,248	19.9	17.1-22.8	777

[1] Numbers for all women in the ZDHS are weighted; ZDHS HIV prevalence estimate for all men age 15-49 is 14.5% (95%CI 13.2-15.9), and for all adults (men and women combined) age 15-49 is 18.1% (95%CI 16.9-18.8).

[2] Women age 15-49 interviewed and tested by the ZDHS who live in a community within 30km from the nearest ANC site.

( ): 25-49 unweighted cases.

The ANC sentinel surveillance HIV prevalence estimate for women (17.9%, CI 17.0%–18.8%) is similar to that for all men and women age 15-49 (18.1%, 16.9%–18.8%) in the ZDHS. The ANC estimate is significantly lower than the ZDHS estimates for all women (21.1%, 19.7%–22.6%) and women living in the 30km ANC catchment areas (20.9%, 19.4%–22.3%), and higher than that for men age 15-49 (14.5%, 13.2%–15.9%). It is also lower than the ZDHS estimate for women who reported a birth in the last three years and attended ANC for their most recent birth (19.9%, 17.1%-22.8%). However, the difference is not statistically significant and is reduced after controlling for the older ages of the women in the ZDHS sample. The latter could be due to the inclusion of women who gave birth up to three years previously and would be expected to raise HIV prevalence but also to increase the proportion of women who are at the more advanced stages of infection where HIV-associated sub-fertility is generally most severe [14].

HIV prevalence in the ANC survey was higher among younger women (age 15-24) and lower among older women (age 25-49) than in the corresponding age-groups of women in the ZDHS (Table 3). HIV prevalence among women tested in the ANC survey was lower than in women tested in the ZDHS for all socio-economic sub-groups except those who had never been married and those with no living children. However, these differences disappeared when the comparison was restricted to women in the ZDHS who lived in the 30km ANC catchment areas, had had a birth in the last three years, and who reported attending for ANC for their most recent birth.

Table 3. Comparison of HIV prevalence among women age 15-49 from ANC sentinel surveillance and ZDHS, by selected background characteristics, 2005-06

	ANC			ZDHS								
	All women (15-49)			All women (15-49)[1]			Women in 30 km ANC catchment areas[2]			Women in 30 km ANC catchment areas who attended ANC for last birth[3]		
	%	95%CI	N	%	95%CI	N	%	95%CI	N	%	95%CI	N
Total	**17.9**	**17.0-18.8**	**7,202**	**21.1**	**19.7-22.6**	**6,947**	**20.9**	**19.4-22.3**	**2,943**	**19.9**	**17.1-22.8**	**777**
Age group												
15-24	13.3	12.2-14.3	4,224	11.0	9.8-12.3	3,200	10.7	9.0-12.3	1,417	14.0	10.4-17.7	349
25-34	25.0	23.3-26.6	2,545	31.8	29.0-34.8	2,105	31.6	28.5-34.7	860	26.7	22.1-31.3	352
35-49	21.7	17.8-25.6	433	27.1	24.6-29.7	1,642	28.7	25.2-32.1	666	15.8	7.4-24.2	76
Residence												
Urban	18.6	17.3-20.0	3,422	21.6	19.8-23.6	2,670	20.9	19.1-22.6	2,113	20.9	17.4-24.5	506
Rural	17.2	16.0-18.4	3,760	20.8	18.8-23.0	4,277	20.8	18.1-23.6	830	18.1	13.5-22.7	271
Education												
None	16.7	7.4-25.9	66	20.0	14.4 - 27.0	301	26.2	14.9-37.6	61	*	*	11
Primary	18.9	17.0-20.9	1,526	22.4	19.8 - 25.3	2,263	24.6	21.2-27.9	623	17.0	11.0-23.0	153
Secondary or higher	17.6	16.6-18.6	5,585	20.5	19.0 - 22.2	4,383	19.7	18.1-21.3	2,259	21.0	17.8-24.3	613
Work status												
Not working	17.4	16.4-18.3	6,143	19.3	17.8 - 21.0	4,406	19.3	17.6-21.1	1,866	20.1	16.6-23.5	523
Working	20.8	18.4-23.3	1,047	24.2	22.1 - 26.4	2,541	23.5	21.0-26.0	1,077	19.7	14.8-24.6	254
Marital status												
Never married	21.2	17.0-25.5	353	8.4	7.2 - 9.8	1,846	9.3	7.5-11.1	957	(25.0)	11.7-38.3	44
Married	17.5	16.6-18.4	6,684	20.2	18.7 - 21.9	4,027	21.2	19.2-23.3	1,527	18.2	15.2-21.2	649
Divorced/separated/ widowed	42.3	30.5-54.0	71	46.3	42.1 - 50.5	1,074	43.8	39.2-48.3	459	31.0	20.9-41.0	84

(Cont'd)

Table 3 – cont'd

	ANC			ZDHS								
	All women (15-49)			All women (15-49)[1]			Women in 30 km ANC catchment areas[2]			Women in 30 km ANC catchment areas who attended ANC for last birth[3]		
	%	95%CI	N	%	95%CI	N	%	95%CI	N	%	95%CI	N
Number of living children[4]												
0	13.0	11.9-14.1	3,405	10.0	8.6 - 11.7	2,086	10.3	8.4-12.1	1,040	17.4	13.1-21.6	311
1-2	22.4	20.9-23.9	2,956	26.8	24.7 - 29.1	2,590	26.2	23.6-28.8	1,123	21.3	16.9-25.6	343
3-4	23.0	19.9-26.2	686	28.5	25.7 - 31.4	1,401	30.4	26.5-34.3	536	25.3	16.2-34.4	91
5+	15.5	9.2-21.8	129	18.9	15.7 - 22.6	871	20.5	15.4-25.6	244	(15.6)	2.3-28.9	32

[1] Numbers for all women in the ZDHS are weighted.

[2] Women age 15-49 interviewed and tested by the ZDHS who live in a community within 30km from the nearest ANC site.

[3] Women age 15-49 interviewed and tested by the ZDHS who live in a community within 30km from the nearest ANC site and who received ANC for their last birth in the previous 3 years.

[4] Number of living children for women in the ZDHS sample who live within an ANC catchment area and attended ANC for the last birth has been adjusted to show parity at time of last ANC attendance (excluding the most recent birth).

*: 0-24 unweighted case; (): 25-49 unweighted cases.

By residential classifications, HIV prevalence in the ANC survey was lowest in the rural areas (15.1%, CI 17.0%–18.8%), higher in the urban areas (17.8%, 16.5%–19.1%), and highest in the areas classified as “other” (23.3%, 21.1%–25.6%) (Table 4). When the ZDHS women in the 30km catchment areas for the ANC sites were grouped according to the ANC site classification, the ANC survey estimates remained lower than the ZDHS estimates for the urban and rural classifications. In the “other” classification, HIV prevalence in the 2006 ANC surveillance survey was higher than in the ZDHS. However, the ZDHS sample for “other” sites was small and dominated by one site that had relatively low prevalence even in the ANC survey, and the difference was not statistically significant.

Table 4. Comparison of HIV prevalence among women age 15-49 from ANC sentinel surveillance and ZDHS, by ANC surveillance site and site classification, 2005-06

		ANC			ZDHS		
		All women (15-49)			Women in 30 km ANC catchment areas[1]		
Province / ANC site	**ANC site classification**	**%**	**95%CI**	**N**	**%**	**95%CI**	**N**
Total		**17.9**	**17.0-18.8**	**7,202**	**20.9**	**19.4-22.3**	**2,943**
Rural		**15.1**	**13.7-16.5**	**2,472**	**21.6**	**17.5-25.7**	**394**
Binga District Hospital	Rural	7.6	4.8-10.4	344	*	*	17
Gutu Mission Hospital	Rural	17.3	13.5-21.1	387	*	*	16
Karanda Hospital	Rural	10.0	6.8-13.2	339	22.6	13.9-31.2	93
Murambinda Hospital	Rural	16.4	12.4-20.4	356	22.9	12.8-32.9	70
Musume Mission Hospital	Rural (Growth Point)	18.5	14.5-22.6	356	20.8	9.5-32.0	53
Mutoko District Hospital	Rural (Growth Point)	17.5	13.3-21.6	326	16.9	8.0-25.8	71
Sadza District Hospital	Rural	17.6	13.9-21.4	391	25.7	15.5-35.9	74
Urban		**17.8**	**16.5-19.1**	**3,388**	**20.7**	**19.0-22.3**	**2,283**
Bindura Chipadze Clinic	Urban	13.5	9.9-17.1	348	16.8	9.4-24.3	101
Chinotimba Clinic	Urban (Border Post)	25.5	20.8-30.2	337	18.0	7.0-29.0	50
Gwanda Provincial Hospital	Urban (Municipality)	24.7	20.0-29.4	328	25.9	14.2-37.5	58
Gweru Provincial Hospital	Urban (Municipality)	18.0	13.9-22.2	333	25.3	16.4-34.2	95
Kuwadzana Clinic	Urban (Municipality)	15.8	12.8-18.9	550	19.7	16.8-22.6	725
Nkulumane Clinic	Urban (Municipality)	18.0	14.9-21.1	590	19.9	16.9-23.0	672
Sakubva Clinic	Urban (Municipality)	14.5	10.7-18.3	331	18.9	12.2-25.7	132
St Mary's Clinic	Urban (Municipality)	15.4	12.4-18.4	571	23.3	19.4-27.3	450

(Cont'd)

Table 4 – cont'd

		ANC			ZDHS		
		All women (15-49)			Women in 30 km ANC catchment areas[1]		
Province / ANC site	**ANC site classification**	**%**	**95%CI**	**N**	**%**	**95%CI**	**N**
Other		**23.3**	**21.1-25.6**	**1,342**	**21.4**	**16.5-26.4**	**266**
Banket District Hospital	Other (Commercial farming)	24.9	20.2-29.6	329	29.2	17.9-40.6	65
Beitbridge District Hospital	Other (Border Post)	25.5	20.7-30.2	330	(23.7)	9.5-37.8	38
Chiredzi District Hospital	Other (Commercial farming)	20.3	16.0-24.6	345	19.0	12.5-25.5	142
Kadoma District Hospital	Other (Mining)	22.8	18.3-27.3	338	*	*	21

[1] Women age 15-49 interviewed and tested by the ZDHS who live in a community within 30km from the nearest ANC site.

Note: Urban, rural, and other designation is based on the classification of the ANC surveillance site attended (for ANC columns) or the nearest ANC surveillance site (for ZDHS columns).

*: 0-24 unweighted case; (): 25-49 unweighted cases.

DISCUSSION

The 2006 ANC surveillance estimate (17.9%, 95% CI 17.0%-18.8%) provides a good approximation to HIV prevalence among men and women in the general population measured in the 2005-06 ZDHS (18.1%, 16.9%-18.8%). This finding is consistent with findings from similar national comparisons in five sub-Saharan African countries [7] and from a number of earlier community studies [9, 15, 16], and supports UNAIDS recommendations that routine ANC surveillance data can be used to provide reliable national estimates of HIV prevalence in adults [17].

The ANC estimate understated HIV prevalence in women in the general population but overstated HIV prevalence in men. These results are also consistent with findings from the earlier studies [7-9]. In general, estimates based on pregnant women tend to overstate HIV prevalence among all women at young ages, due to selection for early sexual activity, and overstate prevalence at older ages, due to infertility and/or higher levels of contraceptive use among infected women [18]. The latter effect is typically stronger and results in net underestimates for women in the general population, as we observed in the current study. ANC surveys typically overestimate HIV prevalence in men because HIV prevalence is generally lower in men than in women age 15-49, due to their older average ages at infection [19].

HIV prevalence in the ANC survey was slightly lower than in the ZDHS among women who attended for ANC for their last birth. However, this difference was not statistically significant and arose because the ZDHS sample of women living in a 30km ANC catchment area who attended for ANC at last birth tend to be older and are more likely to live in an urban area than those in the corresponding ANC sample. Thus the study results indicate that, in countries where access to ANC services is nearly universal, it is possible to get a reliable estimate of HIV prevalence among pregnant women using ANC sero-surveys.

In most countries HIV prevalence is higher in urban areas than in rural areas [20, 21]. In the ANC survey in Zimbabwe, HIV prevalence was slightly higher in the urban areas (17.8%) than in the rural areas (15.1%) but was higher still in the areas classified as other (23.2%) which are characterised by high levels of circulatory labour migration. When the ZDHS data for all women living in the 30km ANC site catchment areas were grouped according to the urban/rural/other ANC site classification, HIV prevalence was found to be similar in all three types of area. HIV prevalence was higher among pregnant women tested in the ANC survey in the rural and urban areas but not in the other areas. This finding may be because the ZDHS estimate for the "other" classification was based on a relatively small and unrepresentative sample.

There are some limitations in this study that should be kept in mind when interpreting its findings. The 30km radius around the ANC surveillance sites used in identifying matching ZDHS clusters may not reflect the true catchment areas for the individual ANC sites. The GPS coordinates of the ZDHS clusters were displaced to protect confidentiality of survey participants. However, this displacement was random and the results from individual ANC catchment areas were aggregated up to the national level, so any effect of such bias is expected to be small. The ZDHS sample may also be biased due to differential non-response in the survey and/or exclusion of population groups that do not live in households. An analysis of the effects of non-response and exclusion of non-household-based populations on national HIV prevalence estimates derived from household surveys in several countries found that this bias was generally small [22]. Finally, the small numbers of women in the ZDHS sample who lived in the catchment areas of the ANC surveillance sites and attended ANC for their last birth makes it difficult to interpret the differentials in prevalence for these women observed by urban, rural, and other site classification.

In conclusion, our comparison of HIV estimates finds that the ANC surveillance estimate compares well with the overall HIV prevalence estimate from the ZDHS population survey for all adults (men and women). This is despite important differences in the characteristics of the women who participated in the two surveys. The findings suggest that ANC surveillance provides reliable estimates of HIV prevalence among pregnant women attending ANC clinics and is a useful source of data for monitoring the HIV epidemic in Zimbabwe. At the same time, periodic sero-behavioral surveys, such as the ZDHS, that provide HIV prevalence data for representative samples of adults in the general population, can be helpful in validating ANC-based HIV estimates and in understanding the biases in ANC data.

In addition, they provide linked information on the characteristics and risk-taking and healthcare-seeking behaviors of infected and uninfected adults, which can aid the design of effective HIV programs. Finally, the much higher HIV prevalence seen at ANC sites classified as “other” suggests that Zimbabwe should continue to generate HIV estimates using the three classifications: rural, urban, and other.

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