

# PMTCT Service Uptake Among Adolescents and Adult Women Attending Antenatal Care in Selected Health Facilities in Zimbabwe

Reuben Musarandega, MSc,\* Rhoderick Machekano, PhD, MPH,† Memory Chideme, MSc,\* Cephass Muchuchuti, BSc,\* Angela Mushavi, MD, MMED,‡ Agnes Mahomva, MD, MPH,\* and Laura Guay, MD†§

**Background:** Age-disaggregated analyses of prevention of mother-to-child transmission (PMTCT) program data to assess the uptake of HIV services by pregnant adolescent women are limited but are critical to understanding the unique needs of this vulnerable high-risk population.

**Methods:** We conducted a retrospective analysis of patient-level PMTCT data collected from 2011 to 2013 in 36 health facilities in 5 districts of Zimbabwe using an electronic database. We compared uptake proportions for PMTCT services between adolescent ( $\leq 19$  years) and adult ( $> 19$  years) women. Multivariable binomial regression analysis was used to estimate the association of the women's age group with each PMTCT service indicator.

**Results:** The study analyzed data from 22,215 women aged 12–50 years (22.5% adolescents). Adolescents were more likely to present to antenatal care (ANC) before 14 weeks of gestational age compared with older women [adjusted relative risk (aRR) = 1.34; 95% confidence interval: 1.22 to 1.47] with equally low rates of completion of 4 ANC visits. Adolescents were less likely to present with known HIV status (aRR = 0.34; 95% confidence interval: 0.29 to 0.41) but equally likely to be HIV tested in ANC. HIV prevalence was 5.5% in adolescents vs 20.1% in adults. While  $> 84\%$  of both HIV-positive groups received antiretroviral drugs for PMTCT, 44% of eligible

adolescents were initiated on antiretroviral therapy vs 51.3% of eligible adults, though not statistically significant.

**Conclusions:** Pregnant adolescents must be a priority for primary HIV prevention services and expanded HIV treatment services among pregnant women to achieve an AIDS-free generation in Zimbabwe and similar high HIV burden countries.

**Key Words:** adolescents, antenatal care, antiretroviral therapy, elimination, pregnant women, prevention of mother-to-child transmission of HIV

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## INTRODUCTION

HIV infections remain high among women of childbearing age.<sup>1,2</sup> In Sub-Saharan Africa, young women, in particular, are at the epicenter of the HIV epidemic as they contribute approximately 30% of all new HIV infections in the region.<sup>3–5</sup> Young women face multiple legal, economic, and social vulnerabilities that interact to affect their sexual behaviors, decisions, and circumstances, making them more susceptible to acquiring new HIV infections.<sup>3,5</sup> A number of studies have found that young people are less likely to take an HIV test and that those who are HIV infected have poorer HIV treatment uptake, retention, and outcomes than adults.<sup>6–14</sup> Less is known about adolescent uptake of prevention of mother-to-child transmission (PMTCT) of HIV services, where new HIV infections, low HIV testing uptake, and poor initiation of and retention on treatment are significant barriers to elimination of HIV infection in children.<sup>2,9–14</sup>

Zimbabwe is one of the 21 sub-Saharan Africa countries that continue to experience a high HIV burden in the adult population and high HIV transmission risk in adolescent women. HIV prevalence among the adult population aged 15–49 years was estimated through the Spectrum model to be 14.7% in 2015 and prevalence among women attending antenatal care (ANC) to be 16.1% while the mother-to-child transmission rate was estimated at 6.7% in 2014.<sup>15–17</sup> The Zimbabwe Demographic and Health Survey of 2010–2011 showed that adolescent women faced high HIV acquisition risks as HIV prevalence among women 15–19 years was 4.2% but increased to 10.6% in the 20–24 years age group and to 20.0% in the 25–30 years age group.<sup>18</sup>

Higher HIV risk factors among adolescent women have important implications for the goal of eliminating new pediatric

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From the \*Elizabeth Glaser Pediatric AIDS Foundation, Harare, Zimbabwe; †Research Department, Elizabeth Glaser Pediatric AIDS Foundation, Washington, DC; ‡AIDS and TB Unit, Zimbabwe Ministry of Health and Child Care, Harare, Zimbabwe; and §Department of Epidemiology and Biostatistics, Milken Institute School of Public Health, George Washington University, Washington, DC.

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Correspondence to: Reuben Musarandega, MSc, 107 King George, Avondale, Harare, Zimbabwe (e-mail: rmusarandega@pedaids.org).

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HIV infections in any country. Given the challenges that adolescent women face in controlling sexual decisions, accessing reproductive health services and protecting themselves against infection with HIV, understanding differences in service uptake among adolescent and adult women is critical for strengthening PMTCT programs. This study compared PMTCT service uptake among adolescent and adult women in selected ANC clinics in Zimbabwe to identify possible gaps in service uptake by adolescent women. The findings will inform the scale-up of the current PMTCT guidelines, which aim to provide antiretroviral therapy (ART) to all HIV-infected pregnant and breastfeeding women to minimize the risk of HIV transmission to children and to improve the health of the mothers.

### METHODS

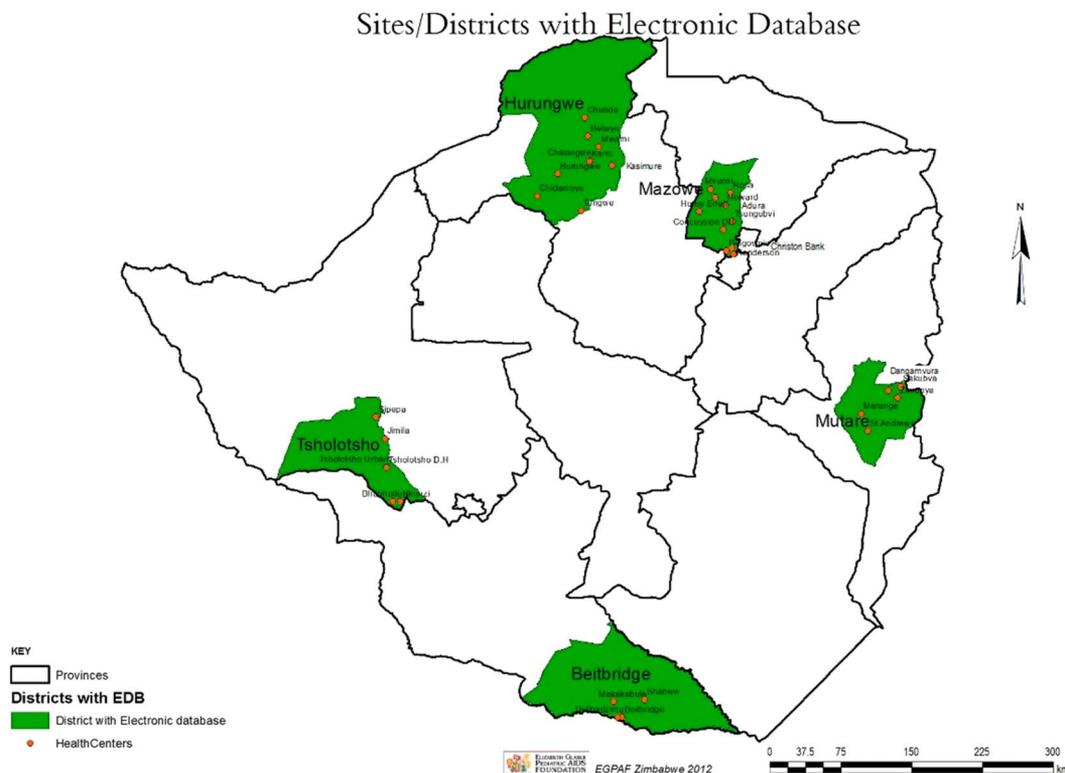
We conducted a retrospective analysis on patient-level data from pregnant women accessing ANC services collected using an electronic database in 36 of 145 primary health centers and hospitals from 5 districts of Zimbabwe between September 2011 and December 2013. The 5 districts where the database was implemented were purposively selected to represent the major ethnic and geographical characteristics of the female population of Zimbabwe from the Manicaland, Mashonaland, and Matabeleland provinces, including urban, rural, and highly mobile border populations. Health facilities serving at least 40 HIV-positive pregnant women per year were selected and the selected health facilities served approximately 3 in every 4 of the estimated HIV-positive

women in the districts. Figure 1 displays the location of the districts and study health facilities. All the health facilities were operated by government or faith-based organizations.

Zimbabwe implemented the World Health Organization (WHO) 2010 "Option A" PMTCT guidelines during this period, with all pregnant women being encouraged to attend first ANC visit by 14 weeks of gestational age so that HIV-infected women would be identified and would start taking antiretroviral drugs (ARVs) for PMTCT early.<sup>19</sup> HIV-infected women underwent WHO clinical staging and/or CD4 cell count assessment to determine eligibility for lifelong ART (WHO stage 3 or 4 or CD4 count  $\leq 350$  cells/ $\mu$ L). Women who were not clinically eligible for ART (WHO stage 1 or 2) took Zidovudine (AZT) prophylaxis while awaiting results of their CD4 cell count. Women who were eligible for ART by CD4 cell count switched to lifelong ART while women who were not eligible (CD4 cell count  $>350$  cells/ $\mu$ L) continued to take AZT prophylaxis throughout pregnancy and a single dose of Nevirapine at the onset of labor. Their infants received daily Nevirapine throughout breastfeeding.

### Study Population

The study population consisted of pregnant women who attended ANC at the selected health facilities during the study period. Women who attended their first ANC visit at a nonstudy facility for the current pregnancy were excluded because of missing first ANC visit information.



**FIGURE 1.** Map of Zimbabwe showing the districts and health facilities where the electronic database was implemented and the study data were collected.

## Data Collection

The Elizabeth Glaser Pediatric AIDS Foundation (EGPAF) supported the Zimbabwe Ministry of Health and Child Care (MoHCC) to implement an electronic patient-level database (EDB) in the selected districts and health facilities using the International Quality Care electronic medical record system developed by the Futures Group.<sup>20</sup> Clinic nurses routinely completed patient registers as they provided PMTCT services to the women. The registers recorded patient demographic data such as age, parity, gravida, gestational age, and expected date of delivery and PMTCT service data including HIV testing, WHO staging, CD4 count, and ARV uptake. Data entry clerks entered all patient data from the registers into the EDB. The data entry clerks verified all data at entry and followed up missing and inaccurate information with the nurses, assisted by inbuilt EDB data validation functionalities. Additional data included in the analysis were type of health facility (hospital or health center) and location (rural, urban).

## Data Analysis

We categorized the study population into adolescents—defined as women  $\leq 19$  years of age and adults—women  $>19$  years of age. We summarized the demographic characteristics of the study population using proportions and means or medians for each group—adolescent and

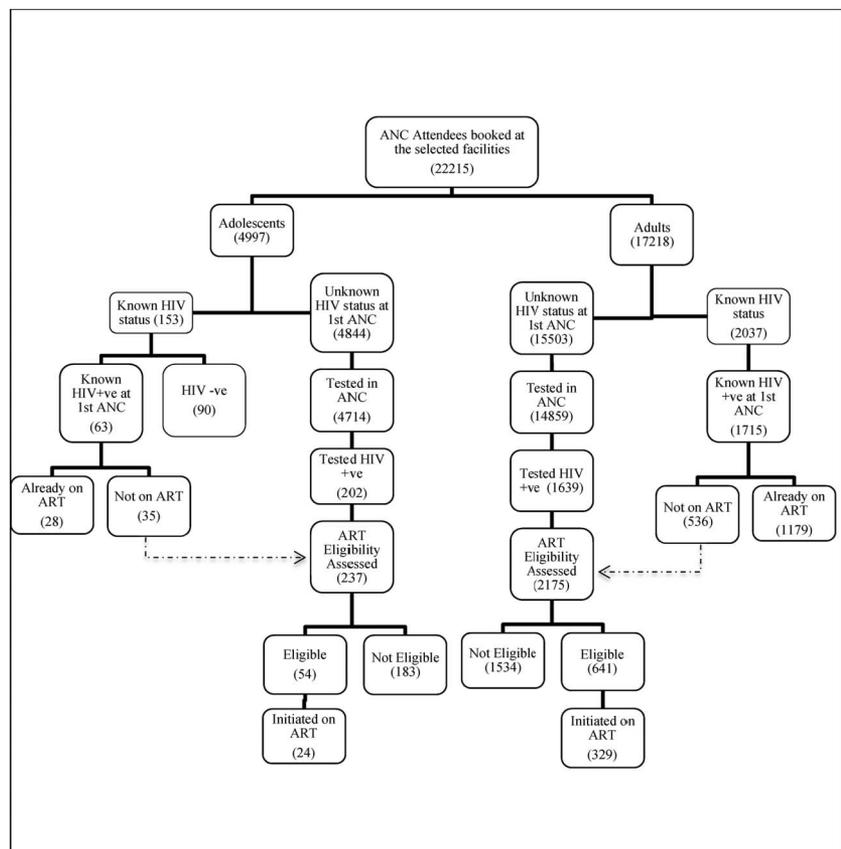
adult women. We calculated uptake proportions for various PMTCT service outcomes (HIV status before ANC, testing in ANC, ART eligibility, and ARV uptake) and compared them between the adolescent and adult women. We used multivariable binomial regression analysis to estimate relative risk (RR) for each PMTCT service outcome, comparing adolescent women with adult women. We performed exploratory analyses, comparing younger adolescents ( $\leq 16$  years) and older adolescents (17–19 years), to assess if younger adolescents were driving the observed differences between adolescents and adults. Risks ratios for ANC attendance and ANC visit outcomes were adjusted for facility type, gravidity, gestational age, HIV status before ANC, and being on ART before ANC while risk ratios for knowledge of and HIV status, ART eligibility, and ARV uptake were adjusted for facility type and gravidity. All analyses were performed using Stata version 12.0.<sup>21</sup>

The Medical Research Council of Zimbabwe gave ethical approval for analysis of the data and dissemination of results from the EDB.

## RESULTS

### Study Facilities

The study facilities included 5 district hospitals, 7 rural hospitals, 6 urban health centers, and 18 rural health centers.



**FIGURE 2.** Flow diagram for pregnant women accessing PMTCT services from September 2011 to December 2013 in 36 ANC clinics in Zimbabwe and those included in the study analysis. EDB, electronic patient-level database.

**TABLE 1.** Characteristics of Study Women Attending ANC in 36 Health Facilities Implementing the PMTCT EDB in Zimbabwe, September 2011–December 2013

Demographic Characteristics	Adolescent Women (≤19 yrs) (N = 4997), n (%)	Adult Women (>19 yrs) (N = 17,218), n (%)
Facility type		
District hospitals	767 (15.3)	2622 (15.2)
Rural hospitals	1853 (37.1)	6723 (39.0)
Urban health centers	1024 (20.5)	3587 (20.8)
Rural health centers	1353 (27.1)	4286 (24.9)
Age, yrs		
Median (min–max)	18.0 (12.0–19.0)	26.0 (20.0–50.0)
Gravida		
1–2	4867 (97.4)	7532 (43.7)
>2	130 (2.6)	9686 (56.3)
Parity		
0	4134 (82.7)	2696 (15.7)
1+	863 (17.3)	14,522 (84.3)
Timing of 1st ANC attendance		
1st Trimester	476 (9.9)	1187 (7.2)
2nd Trimester	2888 (60.0)	8784 (53.1)
3rd Trimester	1449 (30.1)	6581 (39.7)
Missing	184	666

### Characteristics of the Study Population

We extracted data from the records of 22,215 women attending ANC at the study sites, 22.5% (n = 4997) of whom were adolescents and 77.5% (n = 17218) were adults (Fig. 2). The age range for adolescent women was 12–19 years (median = 18 years), and the age range for adult women was 20–50 years (median = 26 years) (Table 1). Of the 22,215 women, 64% presented at rural health facilities, 20.8% at urban health facilities, and

15.3% at the district hospital with no differences between adolescents and adults. Among adolescent women, 82.7% had not given birth before compared with 15.7% of adult women.

### ANC Attendance

Among adolescent women, 9.9% had their first ANC visit in the first trimester, 60.0% in the second trimester, and 30.1% in the third trimester (Table 1). Among adult women, 7.2% had their first ANC visit in the first trimester, 53.1% in the second trimester, and 39.7% in the third trimester. Sixteen percent (16.2%) of adolescent women compared with 12.5% of adult women attended their first ANC visit by 14 weeks of gestational age (Table 2). Adjusting for gravidity, health facility type, and knowledge of HIV status before first ANC visit, adolescent women were 34% more likely to attend first ANC by 14 weeks gestational age compared with adult women [adjusted relative risk (aRR) = 1.34; 95% confidence interval (CI): 1.22 to 1.47]. However, adolescent (38.9%) and adult (36.7%) women were equally likely to attend at least 4 ANC visits (aRR = 0.98; 95% CI: 0.94 to 1.03).

### HIV Testing

Only 3.1% of adolescent women knew their HIV status before their first ANC visit in contrast to 11.8% of adult women. Adjusting for parity, gravida, and facility type, adolescents were 66% less likely to know their HIV status before ANC (aRR = 0.34; 95% CI: 0.29 to 0.41). Acceptance of HIV testing in ANC was equally high in both adolescent (95.5%) and adult (95.8%) women. Overall HIV prevalence among all the women attending ANC was 16.3%. HIV prevalence was significantly lower in adolescent women (5.4%) compared with adult women (20.1%). Adjusting for gravidity, adolescents were 68% less likely to be HIV infected than adult women (aRR = 0.32; 95% CI: 0.28 to 0.36).

**TABLE 2.** ANC Attendance and HIV Service Utilization Among Adolescent and Adult Pregnant Women Booking for ANC in the 36 Health Facilities Implementing the PMTCT EDB in Zimbabwe, September 2011–December 2013

	Adolescents (≤19 yrs)		Adult Women (>19 yrs)		Relative Risk	Adjusted Relative Risk
	n (%)	Total	n (%)	Total	RR (95% CI)	aRR (95% CI)
ANC attendance						
1st ANC visit by 14 weeks GA	779 (16.2)	4813	2065 (12.5)	16,552	1.30 (1.20 to 1.40)	1.34 (1.22 to 1.47)
Attended ≥4 ANC visits	1940 (38.9)	4993	6303 (36.7)	17,191	1.06 (1.02 to 1.10)	0.98 (0.94 to 1.03)
HIV status						
Known status before ANC	153 (3.1)	4997	2037 (11.8)	17,218	0.26 (0.22 to 0.30)	0.34 (0.29 to 0.41)
Positive before 1st ANC	63 (1.3)	4997	1715 (10.0)	17,218	0.13 (0.10 to 0.16)	0.19 (0.15 to 0.25)
Tested in ANC	4714 (95.5)	4934	14,859 (95.8)	15,503	1.00 (0.99 to 1.00)	0.99 (0.99 to 1.00)
Tested positive in ANC	202 (4.3)	4714	1639 (11.0)	14,859	0.39 (0.34 to 0.45)	0.38 (0.32 to 0.44)
Tested positive before or during ANC	265 (5.4)	4867	3354 (20.1)	16,690	0.28 (0.24 to 0.31)	0.32 (0.28 to 0.36)
ARV uptake						
On ART before first ANC visit	28 (44.4)	63	1179 (68.7)	1715	0.65 (0.49 to 0.85)	0.66 (0.50 to 0.87)
Eligible for ART	54 (22.8)	237	641 (29.5)	2175	0.77 (0.61 to 0.99)	0.79 (0.61 to 1.03)
Initiated ART	24 (44.4)	54	329 (51.3)	641	0.87 (0.64 to 1.18)	0.86 (0.63 to 1.18)
Started on AZT prophylaxis in ANC	196 (82.7)	237	1,714 (78.8)	2175	1.05 (0.99 to 1.12)	1.06 (0.99 to 1.14)

## ARV Uptake

Approximately 44.4% of HIV-infected adolescent women who knew their status before first ANC visit were already on ART compared with 68.7% of HIV-infected adult women who knew their status (Fig. 2 and Table 2). Among the HIV-infected women who were not already on ART at first ANC visit, 82.7% of the adolescents and 78.8% of the adult women were initially started on AZT prophylaxis. Among HIV-positive women not on ART and assessed for ART eligibility, 22.8% of adolescent women compared with 29.5% of adult women were eligible for ART. After adjusting for gravidity, gestational age at first ANC, and health facility type, adolescent women were less likely to be eligible for ART compared with adult women, although this did not reach statistical significance (aRR = 0.79; 95% CI: 0.61 to 1.03). Among those eligible for ART initiation in ANC, 44.4% of the adolescent women and 51.3% of the adult women were initiated on ART, similarly this was not significantly different.

## Comparison of Younger and Older Adolescents

There were no statistically significant differences between younger and older adolescents in all PMTCT service outcomes except in HIV prevalence (Table 3). Older adolescents were 64% more likely to be HIV positive than younger adolescents (aRR = 1.64; 95% CI: 1.14 to 2.36).

## DISCUSSION

In this study with more than 20,000 antenatal attendees in Zimbabwe, nearly one-quarter (4997) were adolescents, highlighting the importance of understanding ANC and HIV health-seeking behaviors in this group, as preventing new HIV infections in children depends on early and optimal uptake of PMTCT services. This study found that adolescents

were more likely than adult women to attend ANC early but both groups had very low rates of completion of the WHO recommended 4 antenatal visits. By contrast, compared with adult women, adolescents were less likely to know their HIV status or to be on ART at the time of their first ANC visit. Although not significant, there were trends toward fewer adolescents being eligible for ART in ANC and lower ART initiation during ANC among eligible adolescent women compared with adult women.

The finding of early ANC attendance by adolescents is consistent with studies in Ethiopia where pregnant women aged  $\leq 25$  years were nearly twice as likely to commence ANC at the recommended time as women older than 25.<sup>22,23</sup> By contrast, a cross-sectional survey of postnatal MCH attendees in Kenya found no difference in timing of first ANC between adolescents and adult women but higher rates of attending 4 ANC visits among adult women.<sup>24</sup> This may be due to the smaller sample size and the difference in study population between all ANC attendees in this study and those attending postnatal services in the Kenya study. The absence of complications in previous pregnancies has been associated with older women's confidence in delaying ANC attendance.<sup>25–28</sup> On the contrary, adolescents may have a higher pregnancy risk perception and start seeking ANC services early. The overall proportion of women attending at least 4 ANC visits was low in this study in part because of the initiation of ANC late in the third trimester by about one-third of attendees. The low rates of early ANC attendance overall indicate the need to focus efforts on improving early ANC attendance among pregnant women of all ages.

Several studies in South Africa also found that adolescent women were less likely to know their HIV status before their first ANC visit compared with adult women.<sup>11,29,30</sup> In a sentinel surveillance cohort study of women attending ANC in the Eastern Cape, Fatti et al found that 75.3% of adolescent women were unaware of their HIV status compared with 44.7% of older women.<sup>30</sup> Similarly,

**TABLE 3.** ANC Attendance and HIV Service Utilization Among Younger (<17 Years) and Older (17–19 Years) Adolescent Pregnant Women Booking for ANC in the 36 Health Facilities Implementing the PMTCT EDB in Zimbabwe, September 2011–December 2013

	Younger Adolescents (<17 yrs)		Older Adolescents (17–19 yrs)		Adjusted Relative Risk aRR (95% CI)
	n (%)	Total	n (%)	Total	
ANC attendance					
1st ANC visit by 14 weeks GA	172 (17.9)	961	607 (15.8)	3852	0.89 (0.76 to 1.04)
Attended $\geq 4$ ANC visits	395 (39.7)	995	1545 (38.6)	3998	1.05 (0.96 to 1.15)
HIV status					
Known status before ANC	19 (1.9)	996	134 (3.3)	4001	1.63 (0.99 to 2.66)
Positive before 1st ANC	6 (0.6)	996	57 (1.4)	4001	2.2 (0.95 to 5.09)
Tested in ANC	945 (95.5)	990	3769 (95.6)	3944	1.00 (0.99 to 1.02)
Tested positive in ANC	29 (3.1)	945	173 (4.6)	3769	1.62 (1.08 to 2.43)
Tested positive before or during ANC	35 (3.7)	956	230 (6.0)	3847	1.64 (1.14 to 2.36)
ARV uptake					
On ART before first ANC visit	2 (33.3)	6	26 (45.6)	57	1.29 (0.45 to 3.70)
Eligible for ART	8 (24.2)	33	46 (22.5)	204	0.92 (0.48 to 1.77)
Initiated ART	3 (37.5)	8	21 (45.7)	46	1.51 (0.67 to 3.38)
Started on AZT prophylaxis in ANC	25 (75.8)	33	171 (83.8)	204	1.12 (0.91 to 1.38)

Woldesenbet and others found that adolescent women were twice as likely as adult women to be unaware of their HIV status.<sup>11</sup> Older women had more of a chance to be tested for HIV during previous pregnancies compared with adolescents who were more likely to be presenting with their first pregnancy.<sup>22</sup> In addition, adolescent women may have less access to voluntary HIV counseling and testing services because of barriers such as need for parental consent, unfriendly HIV testing environments in health facilities, lack of knowledge of where and how to get an HIV test, fear of the test itself, and fear of discovering their HIV status.<sup>2-4,26,28,31,32</sup> Failure to know their HIV status before pregnancy is a missed opportunity to adolescents for pregnancy planning, initiation of ART before pregnancy, and active choices about how to reduce the risk of HIV transmission to the unborn baby. This further supports efforts to improve access to HIV testing for adolescents.

The acceptance of HIV testing for both adolescent and adult women was equally high in this (>95%) and the South Africa and Kenya studies, surpassing the UNAIDS target of 90% of people living with HIV knowing their status.<sup>24,29,30,33,34</sup> This confirms that PMTCT programs are now achieving high HIV testing rates in ANC, enabling the identification of nearly all HIV-infected pregnant women who attend ANC and providing them the opportunity to receive ARVs for their own health and prevention of HIV transmission to their unborn babies. If more pregnant women were to attend ANC early and regularly, the UNAIDS goal of putting more than 90% of HIV-infected people on ART would be achieved for pregnant women.<sup>33,34</sup> This would make possible the achievement of eliminating new HIV infections in children.

Although adolescents are less likely to be tested in the general population than adults, this and the similar studies identified demonstrate that adolescents are as likely to accept HIV testing as adults when the testing is offered to them in appropriate, supportive environments.<sup>24,29,30,35</sup> ANC remains a significant entry point for HIV testing for adolescent women and provides an opportunity for expanded adolescent-focused HIV prevention and treatment services. The significant differences in the HIV sero-prevalence among women  $\leq 19$  years compared with women  $> 19$  years (5.4% vs 20.1%) in this study demonstrates the critical need for interventions (such as PrEP) to decrease the incidence of new HIV infections in the vulnerable and high-risk group of pregnant adolescents while they are in contact with the health system.

The proportion of known HIV-positive adolescents who came for first ANC visit already on ART was significantly lower than that of adult women in this study (44.4% vs 68.7%). A greater differential rate between adolescents and adults was seen in the Ronen study in Kenya (4.8% vs 43.1%) but with a much lower proportion of those on ART in both groups in Kenya compared with Zimbabwe.<sup>24</sup> Our results should be interpreted with caution as we did not know the proportion of adolescents and adults who were eligible for ART at the time of HIV diagnosis. Hence, the difference could be due to fewer adolescents being eligible for ART during the time of the study when eligibility was determined by clinical or immunologic

disease status through testing of CD4 cell count or WHO staging. In contrast to other studies, we did not find a significant difference in the proportions of HIV-infected adolescent and adult women who were eligible for ART in ANC possibly because of lack of power because of the small number of HIV-infected adolescents.<sup>24,29</sup> We would expect fewer eligible adolescents as the duration of HIV infection in these young women was likely to be significantly shorter than older adult women. This difference will not be relevant with the change of guidelines to include initiation of ART in all HIV-positive individuals (Option B+ for pregnant women, test and start for general population).<sup>36,37</sup>

Overall, there was very high uptake of ARVs for PMTCT among both adolescents and adult women in this study (>84%) compared with the 33% of adolescents in the Kenya study who did not receive any ARV for PMTCT.<sup>24</sup> However, some of the difference is related to the postnatal study population in Kenya in which some of the adolescents may not have been diagnosed until after delivery. We found that adolescent women were as equally likely to receive AZT prophylaxis for PMTCT as adult women. However, there was a trend toward lower ART initiation among eligible adolescent women in ANC compared with adult women. While not statistically significant in our study, similar results have been reported in other studies from the Southern Africa region. In both the Horwood and the Fatti studies, lower rates of ART initiation were found in adolescent women in ANC compared with adult women.<sup>29,30</sup> Fitzgerald and colleagues found that the women who had not received ARVs for PMTCT were significantly younger than those who were started on ART.<sup>12</sup> It is possible that AZT prophylaxis is more acceptable to adolescent women who are naive to lifelong ART. Adolescent women are likely to face more challenges with adherence to lifelong ART including difficulties with the disclosure of their HIV status to their partners and families that could result in adolescent women being less likely to be initiated on ART yet equally likely to accept AZT prophylaxis as adult women. At the time that our data were collected, all HIV-infected women were initiated on AZT prophylaxis on diagnosis while they were being assessed for ART eligibility and initiated on ART if eligible. Women who were not offered or did not accept ART continued on AZT, thereby offering some protection to their unborn babies.

We suspected that the observed differences in PMTCT service uptake between adolescent and adult women could be driven by the more vulnerable younger adolescents (<16). However, our exploratory analyses did not find any significant differences between younger and older adolescents in all PMTCT outcomes analyzed except HIV prevalence where older adolescents were 64% more likely to be HIV positive than younger adolescents.

The findings of this study are strengthened by the large number of adolescents in the study population included from a diverse set of health facilities fairly distributed across the country. However, there are limitations to the interpretation of the study results. The electronic patient database was not able to track women across health facilities and record PMTCT services that women might have received at other health facilities which could lead to underreporting of services

received. The absence of data on adolescent and adult women who did not seek ANC services and the use of program data that included few demographic characteristics limit the ability to determine true associations with health-seeking behaviors for pregnant women.

This study highlights the importance of identifying and addressing the unique HIV testing, prevention, and treatment needs of adolescent women in all 4 prongs of the WHO PMTCT strategy to achieve elimination of pediatric AIDS.<sup>2</sup> This includes improved access to HIV testing and family planning services for adolescent women before pregnancy, targeted community awareness-raising on adolescent vulnerabilities and unique health needs particularly for those who are HIV positive, and critical primary HIV prevention services for pregnant/postpartum adolescents.

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