Perceptions of HIV Preexposure Prophylaxis Among Young Pregnant Women from Rural KwaZulu-Natal, South Africa

Laia Vazquez, MD,¹ Anthony P. Moll, MBChB,² Alexa Kacin, BS,³
Ntombi Euginia Ndlovu,⁴ and Sheela V. Shenoi, MD, MPH⁵

Abstract

Young sub-Saharan women are at particularly high risk of HIV acquisition during pregnancy and the postpartum period and would potentially benefit from preexposure prophylaxis (PrEP). From June to August 2016, we interviewed 187 HIV negative pregnant women 18–24 years old in Tugela Ferry, Kwazulu-Natal province, a rural and among the poorest subdistricts in South Africa. Demographic data, HIV and PrEP knowledge, HIV risk, and readiness for oral tenofovir-based PrEP were collected using an information-motivation-behavior model-formatted instrument. Mean age was 20.3 years, 179 (95.7%) were unemployed, and 137 (73.3%) reported sex with one partner in the last month. Most were concerned that their sexual partner (95.2%) potentially had HIV or had other sexual partners in the last month (36.4%). Despite this, only 7 (3.7%) women reported that condoms had been used consistently during sex; most (97.3%) felt powerless to negotiate condom use with their partner. There was widespread interest in taking PrEP (97.3%), and most women (>97%) reported possessing the skills to take pills regularly, would commit to monthly visits, and were motivated to remain HIV negative to take care of their families. Young pregnant rural South African women are cognizant of their HIV risk and interested in prevention. Impending motherhood may portend increased interest in HIV prevention. We identified three potential obstacles to successful PrEP rollout among young pregnant women: hesitation about PrEP effectiveness (46%), perceived HIV stigma (53.5%), and risk compensation through decreased condom use (9.6%). Comparative studies of motivations, skills, and rates of initiation and adherence among pregnant and nonpregnant women are needed to inform optimal implementation efforts.

Keywords: preexposure prophylaxis, HIV, pregnancy, primary prevention, South Africa, condom

Introduction

ORAL PREEXPOSURE PROPHYLAXIS, composed of 300 mg of tenofovir disoproxil fumarate (TDF), alone or in combination with 200 mg of emtricitabine (TDF-FTC), has been shown to be highly effective in preventing HIV infection among different populations when taken regularly. Based on the existing evidence, WHO released a technical brief in 2015 recommending preexposure prophylaxis (PrEP) to all persons at substantial risk of HIV infection (groups with an HIV incidence of about 3 per 100 person-years or higher).¹ Unfortunately, young pregnant and lactating women from sub-Saharan Africa, who have one of the highest HIV infection rates globally, with an estimated HIV incidence of 3.8 per 100 woman-years,² were excluded. This alarming rate,

along with the associated risk of mother-to-child transmission, represents a public health emergency that needs immediate attention.² Moreover, pregnancy and breastfeeding are associated with increased biological susceptibility to HIV-1 infection.³ Approval of PrEP for this population has been delayed due to safety concerns. The scarce data available on PrEP during pregnancy and breastfeeding suggest no significant differences in maternal and infant outcomes between women receiving PrEP or placebo at the time of conception,^{4–6} as well as minimal excretion of TDF into human breast milk.⁷ Data on pregnant and breastfeeding HIV-positive women show similar maternal, infant, and growth outcomes between antiretroviral therapy (ART) exposure (TDF and non-TDF containing regimens) and no ART; however, more information is needed regarding long-term

¹Bridgeport Hospital Internal Medicine, Bridgeport, Connecticut.

²Church of Scotland Hospital, Tugela Ferry, South Africa.

³Northeastern University, Boston, Massachusetts.

⁴Philanjalo NGO, Tugela Ferry, South Africa.

⁵AIDS Program, Department of Medicine, Yale University School of Medicine, New Haven, Connecticut.

safety.^{8–10} In light of this information, WHO now recommends initiation and continuation of PrEP in pregnant and lactating women at substantial risk of HIV infection, as part of a comprehensive program for prevention of mother-to-child transmission.⁸ Implementation science research is needed to understand the knowledge, perceptions, and beliefs about HIV infection and preventive strategies in this population.¹¹ In this study we report on the perceptions about PrEP among young pregnant women from rural South Africa.

Methods

Tugela Ferry, KwaZulu-Natal province, South Africa, is characterized by extremely high HIV seroprevalence (>30% among women receiving prenatal care) rates. Tugela Ferry is the center of a rural impoverished subdistrict of 2000 square kilometers that is home to 180,000 traditional Zulu speaking people and is the third poorest subdistrict in South Africa.¹² The topography is harsh: semiarid, rocky, and mountainous, with the population widely dispersed in isolated family compounds. The unemployment rate is 55%, with 40% dependent on meager social welfare grants, with low levels of access to piped water (1%) and electricity (25%); 25% have no formal education.¹² Truvada was approved for PrEP in South Africa in December 2015 and is available in selected locations for men who have sex with men (MSM) and sex workers. Other key populations, including adolescent girls and young women 15–24 years old and individuals in serodiscordant relationships, are prioritized but do not yet have approval. South Africa has not yet approved PrEP for use in pregnant or lactating women.

From June to August 2016, local nurses at primary care clinics or the hospital maternity clinic identified young pregnant women 18–24 years old with documented negative HIV status, as eligible for the study. Trained research nurses confirmed eligibility and requested verbal consent to participate. An anonymous quantitative survey was administered by trained Zulu speaking research staff to young women in a private confidential location at the clinic. After the initial component of the survey, PrEP was described as a single antiretroviral pill, which if taken daily would successfully prevent them from acquiring HIV for as long as they took the medication, requiring initial clinical evaluation and blood work to establish eligibility. Information was collected on demographics, HIV knowledge and risk perceptions, and interest and readiness for oral TDF-based PrEP. Data were analyzed using Stata/IC, version 14.2.

Results

Among 187 young pregnant women interviewed, the mean age was 20.3 years (SD1.97), 93 (49.7%) had completed secondary school, and the vast majority (95.7%) was unemployed (Table 1). Most women (83.7%) had a partner, and 73% reported one sexual partner in the last month. None of the women reported use of alcohol before sex or having ever been paid for sex.

While 185 (98%) knew that HIV can be transmitted through sex and 184 (95%) knew that condoms can reduce the risk, only 117 (62.5%) knew that a woman can transmit HIV to her child and only 95 (51%) knew that HIV can be transmitted through breast milk (Table 2). A total of 178 (95.2%) participants reported that at least one of their sexual partners may have HIV, and 68 (36.4%) believed that their

TABLE 1. CHARACTERISTICS OF YOUNG PREGNANT WOMEN IN RURAL SOUTH AFRICA (N=187)

Age (mean ± SD)	20.27 ± 1.9, n (%)
Site of interview	
Hospital	84 (44.9)
Primary Care Clinic	103 (55.1)
Marital status	
Married/partner	160 (84.1)
Single	26 (13.7)
Unemployed	179 (95.7)
Years of school attendance	
0–6	11 (3.1)
7–11	88 (47.6)
≥12	93 (49.7)
Has had previous lifetime HIV testing	185 (98.9)
Has had sex with 1 partner in the past month	137 (73.3)

current sexual partner had been sexually active with other people in the last month. Despite this, 70 (37.4%) women reported that condoms were never used by their male partners during sex, and 78 (41.7%) reported that their partners used condoms less than half of the time. Only 7 (3.7%) women reported that condoms were always used during sex. The vast majority (182, 97.3%) of women felt powerless to negotiate

TABLE 2. HIV KNOWLEDGE AND RISK AMONG YOUNG PREGNANT SOUTH AFRICAN WOMEN (N=187)

	Yes (%)
Do you believe that HIV can be acquired through unprotected sex with a person who has HIV?	184 (98.4)
Do you believe that HIV can be acquired through unprotected sex with a person who has HIV but who is on treatment?	183 (97.9)
Do you believe HIV can be transmitted through breast milk?	95 (50.8)
Do you believe an HIV positive mother can give her child HIV?	117 (62.6)
Do you believe condom use can reduce risk of HIV spread?	185 (98.9)
Do you worry about getting sick with HIV?	184 (96.8)
Do you believe any of your sexual partners has HIV?	178 (95.19)
If your sex partner does not want to use condoms, there is little you can do about it	182 (97.3)
Frequency of condom use	
Never	70 (37.4)
Less than ½ time	78 (41.7)
More than ½ time	36 (19.2)
It is easy to reject sexual advances from people who do not want to use condoms?	62 (33.2)
In the heat of passion, you have a difficult time using a condom	62 (33.2)
Do you believe any of your sexual partners could have HIV?	178 (95.2)
Do you believe any of your sexual partners have had sex with other people in the past month?	68 (36.4)

condom use with their partner, and 62 (33.3%) admitted having difficulty using condoms in the heat of the moment.

None in the study population knew about PrEP before the interview, but after a short introduction, 97.3% of women reported interest in taking oral PrEP (Table 3). Similarly, 97% declared having the necessary skills to take pills, would start PrEP if a doctor recommended it, would take PrEP daily for as long as needed, and would commit to monthly visits to the primary care clinic to continue treatment. Overwhelmingly, respondents wanted to remain HIV negative to take care of their families (99.5%) and were motivated to be a role model for others (94.6%). The vast majority (97.3%) believed that their families would support them if they decided to take PrEP. Some women (9.3%) believed that by taking PrEP their partner may no longer need to use condoms. A small proportion (5.9%) believed that by taking PrEP they may no longer need HIV screening, and 39 (20.9%) were uncertain. We identified two other obstacles to PrEP implementation among young pregnant women: hesitation to take a medication that does not protect 100% from HIV infection (86, 46%), and concern about being mistaken

TABLE 3. READINESS FOR PREEXPOSURE PROPHYLAXIS AMONG YOUNG PREGNANT RURAL SOUTH AFRICAN WOMEN (N=187)

	Yes (%)
Have you ever heard of PrEP?	0 (0)
Are you interested in taking PrEP?	182 (97.3)
If someone takes PrEP...	
Their partner does not need to use a condom	18 (9.6)
You would no longer need to get screened for HIV	11 (5.88)
If you were taking PrEP...	
Others would think less of you	21 (11.3)
Others would think you have HIV	100 (53.5)
You would feel comfortable telling others	90 (48.4)
Perceived benefits and barriers	
Would you take PrEP even if it did not protect you 100% from getting HIV?	86 (46.0)
You prefer to avoid getting HIV by taking PrEP now	185 (98.9)
You would set a good example if you took meds to prevent HIV infection	177 (94.6)
Would you take PrEP, if you had to take it daily for it to work?	182 (97.3)
Would you take PrEP for as long as needed to prevent getting HIV?	186 (99.5)
Fear of side effects prevents you from being interested in taking PrEP	6 (3.2)
Life is so busy, you do not have time for medicine to prevent HIV	1 (0.5)
Queues in clinic are too long	117 (62.6)
Taking medications continuously is too expensive	4 (2.1)
You would take PrEP if a doctor recommends it to you	184 (98.4)
You do not take any other medicines, so you do not want to start PrEP	3 (1.6)
My family would support me taking PrEP	182 (97.3)
You want to remain HIV negative to take care of my family	186 (99.5)

PrEP, preexposure prophylaxis.

TABLE 4. FACTORS ASSOCIATED WITH YOUNG PREGNANT SOUTH AFRICAN WOMEN'S CONCERNS ABOUT BEING MISTAKEN AS HIV POSITIVE BY TAKING PREEXPOSURE PROPHYLAXIS (N=187)

	Yes (%)	p
Being single	26 (13.7)	0.02
Access to tap water	120 (64.2)	<0.001
Lack of electricity at home	91 (48.7)	0.005
Attending school	185 (98.9)	1.0
Knowing someone who has been sick with HIV	134 (71.7)	<0.001
Difficulty using a condom in the heat of the passion	62 (33.3)	<0.001
Sex in the last month	138 (73.8)	0.72
Sexual partner has had sex with other people in the past month	68 (36.4)	<0.001
Inconsistent condom use	180 (96.3)	0.07
Others will think less of you if you take PrEP	21 (11.2)	0.005
Others will avoid you if you take PrEP	23 (12.3)	0.001
Not comfortable telling others about PrEP	95 (50.8)	<0.001
Not willing to share information with others about PrEP	14 (7.5)	0.04
Family support for taking PrEP	182 (97.3)	0.89
Queues in clinic are too long	117 (62.6)	<0.001
Refusal to take PrEP if it does not protect a 100% from HIV infection	100 (53.5)	<0.001

PrEP, preexposure prophylaxis.

as HIV positive (53.5%). Concerns about side effects (3.2%) and costs (5.9%) were present but less common.

Women concerned about being mistaken as HIV positive if taking PrEP (Table 4) were more likely to be single ($p=0.02$), lack access to tap water ($p<0.001$) and electricity ($p=0.005$), believe that their partner had been sexually active with other people in the last month ($p<0.001$), and believe that queues in the clinic are too long ($p<0.001$). In addition, they were more likely to believe that others will avoid them ($p<0.001$) or think less of them ($p<0.001$). Women who knew someone who had been sick or died from HIV, relative or not, were more likely to be concerned about being mistaken as HIV positive ($p<0.001$).

Women were more likely to disclose reasons for PrEP intake (Table 5) if they had been sexually active in the past month ($p=0.03$) and if they believed that any of their sexual partners had HIV ($p=0.02$). They were also more likely to

TABLE 5. CORRELATES OF DISCLOSING PREEXPOSURE PROPHYLAXIS USE AMONG YOUNG PREGNANT WOMEN

	Yes (%)	p
Sex in the past month	131 (70)	0.03
Concern that a sexual partner has HIV	167 (89.3)	0.02
People would not think less of me if I took PrEP	21 (11.2)	0.004
People would not avoid me if I took PrEP	5 (2.7)	0.04
People would not mistake me as HIV positive if I took PrEP	11 (5.9)	0.03

PrEP, preexposure prophylaxis.

talk about their reasons to take PrEP if they believed that people would not think less of them ($p=0.004$), would not avoid them ($p=0.04$), or would not mistake them as HIV positive ($p=0.03$).

Discussion

We present one of the first reports on understanding, interest, and concerns about PrEP among young pregnant women outside of known serodiscordant relationships in sub-Saharan Africa. Overall, the results of this study suggest that young pregnant women are cognizant of their HIV risk, express interest in protecting themselves and experience an inability to do so using traditional methods, and are potentially interested and willing to take oral TDF-based PrEP. A potentially major obstacle was perceived HIV stigma.

In our population of predominantly young, unmarried, and unemployed women, living in a rural impoverished region, widespread knowledge of sexual HIV transmission and preventive role of condoms did not translate into high levels of reported condom use. This happened despite concern of women about HIV infection and recognition of their risk of HIV acquisition from current sexual partners. Part of this paradox may be explained by the common practice of transactional sex¹³ and age-discordant relationships¹⁴ in South Africa. Both phenomena amplify power imbalances and intimate partner violence already present in heterosexual relationships, limiting women's agency to negotiate safe sex and increasing their risk of HIV acquisition.¹⁵ Women may also desire childbearing, which can elevate women's social recognition.¹⁶

As seen in other studies carried out in the United States¹⁷ and Kenya,^{18,19} we identified great interest in PrEP among young HIV-negative pregnant women receiving antenatal care. Pregnant women in known serodiscordant relationships taking PrEP were enthusiastic although concerned with side effects that may impact their fetus.²⁰ In our study, respondent characteristics that favor PrEP initiation include positive clinic experiences, appreciation for doctors' advice, high levels of motivation, family support, and self-reported ability to take daily oral TDF-based PrEP. Particularly encouraging are women's awareness of HIV risk and seeming ability to value future benefits of PrEP above immediate costs, which may differ from nonpregnant young women.^{21–23} Young pregnant women in our study were quite interested in taking PrEP and overwhelmingly motivated by remaining healthy and HIV negative to take care of their families, whereas a minority seemed concerned with PrEP side effects, adherence, and clinic visits. We speculate that impending motherhood could confer increased interest in future health outcomes, resulting in a potential lack of "present-bias."^{23,24} This potential interest in long-term health may lend itself to greater interest in PrEP initiation and adherence.^{18,22,23} The differences between young women who are pregnant and those who are not with regard to motivation for PrEP need to be investigated in future studies.

We identified three main obstacles to PrEP acceptance: perceived stigma, hesitation about PrEP effectiveness, and potential for risk compensation. Perceived HIV stigma and external stigma are strong inhibitors to HIV care and may be particularly relevant barriers to PrEP implementation.^{25,26} Fear that PrEP would be misconstrued as HIV treatment and

imply HIV positive status was a major concern among respondents and reinforces this finding in other studies as a potential barrier to PrEP implementation among pregnant women and women who are planning to have children.^{19,25,27} Fear of being perceived as HIV positive is concerning due to high levels of stigmatization in the community and personal relationships. Stigma was associated with having had contact with people affected by HIV, indicators of lower socioeconomic status, being single, and believing that their partner had been sexually active with others, suggesting that stigma may be experienced at greater levels by those in unstable relationships. Stigma was also accentuated in those who considered that clinic queues were too long, speculatively connoting decreased likelihood of engaging in existing health care services, as HIV stigma is prevalent among health care workers.^{26,28}

Further, we detected the potential for risk compensation,^{22,23} including cessation of condom use and HIV screening if taking PrEP, undermining the benefit of PrEP as part of a combination prevention package. Although multiple randomized controlled trials and observational studies in different populations have failed to confirm risk compensation behaviors, increased numbers of partners, decreased condom use, and increased sexually transmitted infections (STIs) have been recently noted in other high risk populations with increasing concern.^{29–31} In addition, those who were willing to discuss PrEP use were sexually active women who acknowledge that at least one of their partners could have HIV. Fear of being stigmatized could prevent women from sharing information about PrEP intake. PrEP implementation among pregnant women will need to consider incorporating strategies to address stigma, support adherence to optimize effectiveness, and prevent risk compensation.

The study also revealed deficient knowledge of vertical and breastfeeding HIV transmission risk, suggesting the need to revise prenatal health education as part of a comprehensive package of interventions to prevent mother-to-child transmission.

More information is needed to understand the needs and beliefs of young at-risk pregnant women in sub-Saharan Africa to ensure optimal HIV prevention, including potential use of and adherence to PrEP. Young nonpregnant women's perspectives on PrEP use are well delineated with respect to the mutuality framework of distrust, to uncertainty, alignment, and mutuality.³² Our results suggest that young pregnant women may have different attitudes toward PrEP, speculatively may feel greater trust in the product, less uncertainty about the benefit of PrEP in their lives, and more alignment and persistence compared to nonpregnant young women.^{32–34} However, while it is possible that pregnant women may experience a high degree of ownership over the use of PrEP, the substantive stigma noted in our study may detract from their overt support for PrEP. Comparative studies of pregnant and nonpregnant women are needed to determine how the potential fit with the mutuality framework informs potential strategies for optimal implementation in both populations. Risk assessment tools may be helpful to predict maternal HIV acquisition and, thus, identify pregnant and postpartum women who would benefit the most from PrEP.³⁵ In addition, HIV stigma associated with oral PrEP formulations may be mitigated by alternative forms of PrEP delivery, such as vaginal rings³⁶ and injectables.³⁷

Our findings must be interpreted considering certain limitations. This is a quantitative dataset obtained from a cross-sectional study and did not incorporate qualitative methods which likely could have provided additional insight.^{19,20,27} Next, we did not assess for physical or intimate partner violence or other potential consequences from their male partners as a result of PrEP use. In addition, these results may not be generalizable to other high-risk groups, including sex workers or nonpregnant adolescent girls and young women, but focus solely on young pregnant women not known to be in serodiscordant relationships. Further, as this study was done before approval of Truvada for prevention in South Africa, most women had not previously heard of PrEP and so the information gleaned during these interviews was first impressions. As South Africa proceeds with implementation and public education about PrEP increases, stigma may decrease. In addition, self-reporting does not necessarily predict actual initiation and adherence to PrEP,⁴ and therefore, we cannot predict whether these women who expressed interest would actually start and take PrEP daily if offered. Finally, we acknowledge that some women could have provided us with the most socially desirable response¹⁶ instead of their true opinions.

In summary, young pregnant women in a rural impoverished region of South Africa are cognizant of their HIV risk, report lack of agency around condom use, and are interested in protecting themselves using oral TDF-based PrEP. Respondents were overwhelmingly future oriented, possibly due to impending motherhood. HIV stigma, concern about PrEP effectiveness, and potential for risk compensation were identified as possible barriers to successful rollout in this group. Attention is needed to identify the optimal approaches toward PrEP implementation among pregnant and postpartum women in resource-limited settings.

Acknowledgments

Funding for the study came from NIAID (SS, #K23AI089260), Gilead Foundation (SS, #RO8290), and Doris Duke Fund to Retain Clinical Scientists/YCCI (SS, #2015216). The authors acknowledge the diligent health care workers at Church of Scotland Hospital and Philanjalo NGO who strive to provide quality care for the Msingalo community.

Author Disclosure Statement

The authors declare that they have no competing interests. SS's spouse performs part-time contract work for Amgen Pharmaceuticals. There is no conflict of interest regarding this article but it is included for full disclosure.

References

1. WHO Guidelines Approved by the Guidelines Review Committee. Guideline on When to Start Antiretroviral Therapy and on Pre-Exposure Prophylaxis for HIV. Geneva: World Health Organization Copyright[©], 2015.
2. Mofenson LM. Tenofovir pre-exposure prophylaxis for pregnant and breastfeeding women at risk of HIV infection: The Time is Now. *PLoS Med* 2016;13:e1002133.
3. Thomson KA, Hughes J, Baeten JM, et al. Increased risk of HIV acquisition among women throughout pregnancy and during the postpartum period: A prospective per-coital-act analysis among women with HIV-1 infected partners. *J Infect Dis* 2018;218:16–25.
4. Marrazzo JM, Ramjee G, Richardson BA, et al. Tenofovir-based preexposure prophylaxis for HIV infection among African women. *N Engl J Med* 2015;372:509–518.
5. Van Damme L, Corneli A, Ahmed K, et al. Preexposure prophylaxis for HIV infection among African women. *N Engl J Med* 2012;367:411–422.
6. Mugno NR, Hong T, Celum C, et al. Pregnancy incidence and outcomes among women receiving preexposure prophylaxis for HIV prevention: A randomized clinical trial. *JAMA* 2014;312:362–371.
7. Mugwanya KK, Hendrix CW, Mugno NR, et al. Pre-exposure prophylaxis use by breastfeeding HIV-uninfected women: A prospective short-term study of antiretroviral excretion in breast milk and infant absorption. *PLoS Med* 2016;13:e1002132.
8. WHO Technical Brief: Preventing HIV During Pregnancy and Breastfeeding in the Context of PrEP. Licence: CC BY-NC-SA 3.0 IGO. Geneva: World Health Organization Copyright[©], 2017.
9. Gibb DM, Kizito H, Russell EC, et al. Pregnancy and infant outcomes among HIV-infected women taking long-term ART with and without tenofovir in the DART trial. *PLoS Med* 2012;9:e1001217.
10. Nachega JB, Uthman OA, Mofenson LM, et al. Safety of tenofovir disoproxil fumarate-based antiretroviral therapy regimens in pregnancy for HIV-infected women and their infants: A systematic review and meta-analysis. *J Acquir Immune Defic Syndr* 2017;76:1–12.
11. Seidman DL, Weber S, Cohan D. Offering pre-exposure prophylaxis for HIV prevention to pregnant and postpartum women: A clinical approach. *J Int AIDS Soc* 2017; 20(Suppl 1):21295.
12. Massyn NDC, Barron P, Haynes R, English R, Padarath A (ed). District Health Barometer 2011/12. Durban: Health Systems Trust, 2013.
13. Ranganathan M, MacPhail C, Pettifor A, et al. Young women's perceptions of transactional sex and sexual agency: A qualitative study in the context of rural South Africa. *BMC Public Health* 2017;17:666.
14. Maughan-Brown B, Evans M, George G. Sexual behaviour of men and women within age-disparate partnerships in South Africa: Implications for young women's HIV Risk. *PLoS One* 2016;11:e0159162.
15. Jewkes RK, Dunkle K, Nduna M, Shai N. Intimate partner violence, relationship power inequity, and incidence of HIV infection in young women in South Africa: A cohort study. *Lancet* 2010;376:41–48.
16. Todd CS, Stibich MA, Laher F, et al. Influence of culture on contraceptive utilization among HIV-positive women in Brazil, Kenya, and South Africa. *AIDS Behav* 2011;15: 454–468.
17. Seidman DL, Weber S, Timoney MT, et al. Use of HIV pre-exposure prophylaxis during the preconception, antepartum and postpartum periods at two United States medical centers. *Am J Obstet Gynecol* 2016;215:632.e1–632.e7.
18. Kinuthia J PJ, Mugwanya K, et al. High PrEP uptake among Kenyan pregnant women offered PrEP during antenatal care. Conference on Retroviruses and Opportunistic Infections: Kenyatta National Hospital, 2018.
19. Pintye J, Beima-Sofie KM, Makabong'O PA, et al. HIV-uninfected Kenyan adolescent and young women share

- perspectives on using pre-exposure prophylaxis during pregnancy. *AIDS Patient Care STDS* 2018;32:538–544.
20. Pintye J, Beima-Sofie KM, Kimemia G, et al. “I did not want to give birth to a child who has HIV”: Experiences using PrEP during pregnancy among HIV-uninfected Kenyan Women in HIV-serodiscordant couples. *J Acquir Immune Defic Syndr* 2017;76:259–265.
 21. Price JT, Rosenberg NE, Vansia D, et al. Predictors of HIV, HIV risk perception, and HIV worry among adolescent girls and young women in Lilongwe, Malawi. *J Acquir Immune Defic Syndr* 2018;77:53–63.
 22. Celum CL, Delany-Moretlwe S, McConnell M, et al. Rethinking HIV prevention to prepare for oral PrEP implementation for young African women. *J Int AIDS Soc* 2015;18(4 Suppl 3):20227.
 23. Linnemayr S, Stecher C. Behavioral economics matters for HIV research: The impact of behavioral biases on Adherence to Antiretrovirals (ARVs). *AIDS Behav* 2015;19:2069–2075.
 24. Linnemayr S. HIV prevention through the lens of behavioral economics. *J Acquir Immune Defic Syndr* 2015;68:e61–e63.
 25. Calabrese SK, Dovidio JF, Tekeste M, et al. HIV pre-exposure prophylaxis stigma as a multidimensional barrier to uptake among women who attend planned parenthood. *J Acquir Immune Defic Syndr* 2018;79:46–53.
 26. Calabrese SK, Earnshaw VA, Underhill K, et al. Prevention paradox: Medical students are less inclined to prescribe HIV pre-exposure prophylaxis for patients in highest need. *J Int AIDS Soc* 2018;21:e25147.
 27. Bazzi AR, Leech AA, Biancarelli DL, Sullivan M, Drainoni ML. Experiences using pre-exposure prophylaxis for safer conception among HIV serodiscordant heterosexual couples in the United States. *AIDS Patient Care STDS* 2017;31:348–355.
 28. Aggarwal S, Lee DH, Minter WB, et al. Another generation of stigma? Assessing healthcare student perceptions of HIV-positive patients in Mwanza, Tanzania. *AIDS Patient Care STDS* 2017;31:87–95.
 29. Fonner VA, Dalglish SL, Kennedy CE, et al. Effectiveness and safety of oral HIV preexposure prophylaxis for all populations. *AIDS* 2016;30:1973–1983.
 30. Traeger MW, Schroeder S, Wright EJ, et al. Effects of pre-exposure prophylaxis for the prevention of human immunodeficiency virus infection on sexual risk behavior in men who have sex with men: A systematic review and meta-analysis. *Clin Infect Dis* 2018;67:676–686.
 31. Newcomb ME MK, Feinstein BA, Forscher E, Mustanski B. Pre-exposure prophylaxis (PrEP) use and condomless anal sex: Evidence of risk compensation in a cohort of young men who have sex with men. *JAIDS* 2018;77:358–364.
 32. Amico KR, Wallace M, Bekker LG, et al. Experiences with HPTN 067/ADAPT study-provided open-label PrEP among women in Cape Town: Facilitators and barriers within a mutuality framework. *AIDS Behav* 2017;21:1361–1375.
 33. Gill MM, Umutoni A, Hoffman HJ, et al. Understanding antiretroviral treatment adherence among HIV-positive women at four postpartum time intervals: Qualitative results from the Kabehe Study in Rwanda. *AIDS Patient Care STDS* 2017;31:153–166.
 34. Nattey C, Jinga N, Mongwenyana C, et al. Understanding predictors of early antenatal care initiation in relationship to timing of HIV diagnosis in South Africa. *AIDS Patient Care STDS* 2018;32:251–256.
 35. Pintye J, Drake AL, Kinuthia J, et al. A risk assessment tool for identifying pregnant and postpartum women who may benefit from preexposure prophylaxis. *Clin Infect Dis* 2017;64:751–758.
 36. Smith JM, Moss JA, Srinivasan P, et al. Novel multipurpose pod-intravaginal ring for the prevention of HIV, HSV, and unintended pregnancy: Pharmacokinetic evaluation in a macaque model. *PLoS One* 2017;12:e0185946.
 37. Biello KB, Mimiaga MJ, Santostefano CM, Novak DS, Mayer KH. MSM at highest risk for HIV acquisition express greatest interest and preference for injectable antiretroviral PrEP compared to daily, oral medication. *AIDS Behav* 2018;22:1158–1164.

Address correspondence to:
Sheela V. Shenoi, MD, MPH
Yale University School of Medicine
135 College Street, Suite 323
New Haven, CT 06510

E-mail: sheela.shenoi@yale.edu