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Factors associated with alcohol use prior to and during pregnancy among HIV-infected pregnant women in Cape Town, South Africa

Kirsty Brittain^{a,b}, Robert H. Remien^c, Tamsin Phillips^{a,b}, Allison Zerbe^d, Elaine J. Abrams^{d,e}, Landon Myer^{a,b}, and Claude A. Mellins^c

^aDivision of Epidemiology & Biostatistics, School of Public Health & Family Medicine, University of Cape Town, South Africa

^bCentre for Infectious Disease Epidemiology & Research, School of Public Health & Family Medicine, University of Cape Town, South Africa

^cHIV Center for Clinical and Behavioral Studies, New York State Psychiatric Institute, Columbia University, New York, NY, USA

^dICAP, Columbia University, Mailman School of Public Health, New York, NY, USA

^eCollege of Physicians & Surgeons, Columbia University, New York, NY, USA

Abstract

Introduction—Alcohol use during pregnancy is prevalent in South Africa, but there are few prospectively-collected data exploring patterns of consumption among HIV-infected women, which may be important to improve maternal and child health outcomes. We examined patterns of and factors associated with alcohol use prior to and during pregnancy among HIV-infected pregnant women in Cape Town, South Africa.

Methods—Participants were enrolled when entering antenatal care at a large primary care clinic, and alcohol use was assessed using the AUDIT (Alcohol Use Disorders Identification Test). In analysis, the AUDIT-C scoring was used as a measure of hazardous drinking, and we examined factors associated with patterns of alcohol use in logistic regression models.

Results—Among 580 women (median age: 28.1 years), 40% reported alcohol use during the 12 months prior to pregnancy, with alcohol use characterised by binge drinking and associated with single relationship status, experience of intimate partner violence (IPV), and lower levels of HIV-

Correspondence Kirsty Brittain, Division of Epidemiology & Biostatistics, School of Public Health & Family Medicine, Falmouth Building, University of Cape Town Faculty of Health Sciences, Anzio Road, Observatory, Cape Town, South Africa, 7925; Tel: +27 21 406 6540; kirsty.brittain@uct.ac.za.

Contributors KB conducted the analysis, led data interpretation and drafted the manuscript. TP and AZ directed data collection and assisted with data interpretation. CAM, EJA and LM conceptualised the study and assisted with data interpretation. RHR contributed to study design and assisted with data interpretation. All authors read and approved the final manuscript.

Conflict of Interest No conflicts declared.

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related stigma. Of this group, 65% had AUDIT-C scores suggesting hazardous alcohol use, with hazardous alcohol users more likely to report having experienced IPV and having higher levels of education. Among hazardous alcohol users, 70% subsequently reported reduced levels of consumption during pregnancy. Factors independently associated with reduced consumption included earlier gestation when entering antenatal care and report of a better patient-healthcare provider relationship.

Conclusions—These unique data provide important insights into alcohol use trajectories in this context, and highlight the urgent need for an increased focus on screening and intervention at primary care level.

Keywords

Alcohol; HIV; pregnancy; South Africa

1. Introduction

Alcohol use during pregnancy is prevalent in South Africa, with rates of fetal alcohol syndrome in the Western Cape Province being among the highest in the world (May et al., 2000, Viljoen et al., 2005, May et al., 2007, May et al., 2013). Numerous studies have documented hazardous levels of drinking among pregnant women accessing antenatal care (Petersen Williams et al., 2014, Tomlinson et al., 2014), and alcohol use in the country is generally characterised by heavy episodic or binge drinking (Desmond et al., 2012, Russell et al., 2013). Although terminology is inconsistent across the literature, ‘hazardous alcohol use’ is generally defined as a pattern of alcohol consumption that increases the risk of harmful consequences (Babor et al., 1994); while ‘binge drinking’, sometimes referred to as ‘heavy episodic drinking’ or ‘heavy drinking’, is used to describe a single drinking session leading to intoxication, and is typically measured as having consumed more than a certain number of drinks on one drinking occasion (Herring et al., 2008). In the current article, ‘hazardous alcohol use’ and ‘binge drinking’ will be defined as such.

Although it is widely documented that alcohol use is prevalent during pregnancy in South Africa, it is unclear to what extent women who use alcohol prior to pregnancy reduce their consumption during pregnancy. Alcohol use cessation rates during pregnancy of 87% and 92% have been reported in the Netherlands and United States, respectively (Beijers et al., 2014, Kitsantas et al., 2014), although much lower rates of cessation have been reported among Inuit women in Canada (Fortin et al., 2016). Notably, there are few prospectively-collected data exploring patterns of alcohol use prior to and during pregnancy in South Africa and other low- and middle-income country (LMIC) contexts. Risk factors for hazardous alcohol use are well-documented in these contexts, and include intimate partner violence [IPV; (O'Connor et al., 2011, Eaton et al., 2012, Pitpitan et al., 2012, Choi et al., 2014)] and single relationship status (Desmond et al., 2012, O'Connor et al., 2011, Petersen Williams et al., 2014). As stated above, however, few studies have quantified reductions in consumption during pregnancy in these settings, or explored factors associated with reduced consumption.

Although alcohol use is prevalent in general populations, HIV-infected women may be a particularly vulnerable group, with high rates of hazardous alcohol use observed among HIV-infected women in the United States (Cook et al., 2009). Notably, alcohol use is a well-documented risk factor for non-adherence to antiretroviral therapy (ART) among non-pregnant females (Wandera et al., 2015) and during pregnancy and the postpartum period (Mellins et al., 2008, Nachega et al., 2012). Examining factors associated with hazardous alcohol use among HIV-infected pregnant women in South Africa and in other contexts where HIV is prevalent may be critical to improving adherence and HIV treatment outcomes and, consequently, both maternal and child health.

Given the high prevalence of alcohol use during pregnancy and the fact that screening tools and interventions are not routinely available at the primary care level (Baron et al., 2016), research exploring patterns and predictors of alcohol use prior to and during pregnancy are urgently needed in this context in order to guide the development of much-needed interventions. In particular, a better understanding of the protective factors that increase the likelihood of harm reduction during pregnancy is needed in order to target intervention efforts, given the limited resources that exist in primary care. Finally, more research into alcohol use among HIV-infected women is needed, as they may represent a particularly vulnerable group. We thus examined patterns of alcohol use prior to and during pregnancy among HIV-infected pregnant women who were initiating ART in Cape Town, South Africa; and explored factors associated with any and hazardous alcohol use prior to pregnancy, respectively, and with reduced consumption during pregnancy.

2. Methods

2.1 Study design

This analysis draws on longitudinal data from the MCH-ART study, a multi-phase implementation science study evaluating strategies for delivering HIV care and treatment services during pregnancy and the postpartum period (Myer et al., 2016; <https://clinicaltrials.gov/ct2/show/NCT01933477>). The broader study recruited consecutive eligible women entering antenatal care at a large primary care clinic in the former township of Gugulethu, Cape Town, where an antenatal HIV prevalence of 29% has been documented (Kaplan et al., 2014).

2.2 Participants

Eligible participants were HIV-infected pregnant women who were 18 years or older, were entering prevention of mother-to-child transmission (PMTCT) services, and were eligible to initiate lifelong ART based on current local guidelines. Prior to July 2013, ART eligibility was determined based on CD4 cell count or clinical disease staging; from July 2013 onward, all HIV-infected pregnant women were eligible to initiate lifelong ART under Option B+ guidelines (Western Cape Government, 2013). All women provided written informed consent prior to enrolment, and the study was approved by the Faculty of Health Sciences Human Research Ethics Committee of the University of Cape Town and by the Institutional Review Board of the Columbia University Medical Center.

2.3 Study procedures and measures

Participants were recruited and enrolled when entering PMTCT services, and attended a maximum of three antenatal and one early postpartum study visit, all of which were conducted separately from routine care. At each study visit, demographic and psychosocial questionnaires were administered. All questionnaires were translated into isiXhosa, the predominant local language, and were administered by trained isiXhosa-speaking interviewers, given concerns about literacy levels in this population. All measures were also back-translated to ensure accuracy (World Health Organization, 2013), and were piloted in a sample of women recruited from the same population prior to the study. Gestation was estimated based on an antenatal ultrasound or, where not available, using symphysis-fundal height or date of last menstrual period.

At participant's first study visit, which coincided with their first routine antenatal visit, basic demographic characteristics were assessed. These included age, marital status and gravidity, and a composite poverty score was calculated to categorise participants based on their relative level of disadvantage (Brittain et al., 2016). At their second and third antenatal study visits, participants completed a battery of psychosocial measures. These included a 12-item measure to assess the perceived availability of social support (Barrera, 1980, Arnsten et al., 2007), and a 7-item measure to assess HIV-related stigma (Fife and Wright, 2000). The Edinburgh Postnatal Depression Scale (Cox et al., 1987) was used to measure recent depressive symptoms; and the World Health Organization Violence Against Women questionnaire (Garcia-Moreno et al., 2005) was used to assess experience of past-year IPV. The development and scoring of these measures has been previously described (Brittain et al., 2016). In addition, a 19-item Patient-Healthcare Provider Relationship Scale, developed and validated in the context of antenatal care in South Africa (Barry et al., 2012), was administered at participants' third antenatal study visit. Items were assessed on a scale ranging from 1 to 4, and the mean response across items was calculated such that higher scores indicate a better patient-healthcare provider relationship.

The 10-item Alcohol Use Disorders Identification Test [AUDIT; (Saunders et al., 1993)] was administered at participants' second and third antenatal study visits in order to assess alcohol use during the 12 months prior to pregnancy recognition (assessed at the second antenatal visit) and between pregnancy recognition and the late third trimester (assessed at the third antenatal visit), respectively. The AUDIT is a screening tool for excessive drinking, and was developed as part of a World Health Organization collaborative study at primary care facilities in six countries. The tool has been validated for use during pregnancy (Burns et al., 2010) and in a sample of HIV-infected individuals in South Africa specifically (Myer et al., 2008). For the purposes of this research, the prevalence of risky drinking (AUDIT score >6) and alcohol dependence (AUDIT score >20) were described using the scoring system from the original development of the full AUDIT scale (Saunders et al., 1993) and cut-off scores previously used in South Africa (Vythilingum et al., 2012).

For analytic purposes, the AUDIT-C (AUDIT-Consumption) scoring system was used as a measure of hazardous drinking, given its focus on the frequency and quantity of consumption, as well as the frequency of binge drinking. As above, we defined 'hazardous drinking' as a pattern of alcohol consumption that increases the risk of harmful

consequences, with the AUDIT-C used here as a screening tool for this pattern; and defined 'binge drinking' as a single drinking session typically leading to intoxication. Here, we used the third question of the AUDIT tool (which assesses the frequency of having six or more drinks on one occasion) as a marker of the frequency of binge drinking. Following standardized guidelines, the first three items of the scale, each scored between 0 and 4, were summed for a maximum possible score of 12, and a score of ≥ 3 was used as indicative of hazardous drinking (Bush et al., 1998, Bradley et al., 2003). In South Africa, a standard drink contains approximately 12 grams of alcohol, and in this context typically includes one beer or glass of wine.

2.4 Data analysis

Data were analysed using Stata 12 (StataCorp Inc, College Station, Texas, USA). For the purpose of this analysis, we were interested in report of two patterns of alcohol use: any alcohol use (versus no use) and hazardous alcohol use (versus non-hazardous use). Further, three categories of alcohol use were explored: (i.) report of any versus no alcohol use in the 12 months prior to pregnancy; (ii.) among women reporting any alcohol use in the 12 months prior to pregnancy, hazardous (AUDIT-C score ≥ 3) versus non-hazardous (AUDIT-C score <3) alcohol use; and (iii.) among women reporting hazardous alcohol use in the 12 months prior to pregnancy, continued hazardous use (AUDIT-C score ≥ 3) versus reduced consumption (AUDIT-C score <3) between pregnancy recognition and late third trimester. Demographic and clinical characteristics were compared across these groups, using χ^2 or Fisher exact tests for categorical variables and Wilcoxon rank sum tests (Mann-Whitney tests) for non-normally distributed continuous variables. Variables independently associated with each of these patterns of alcohol use were then examined in logistic regression models.

3. Results

3.1 Demographic, clinical and psychosocial characteristics

A total of 580 women [median age: 28.1 years; inter-quartile range (IQR): 24.7–32.4], enrolled between March 2013 and April 2014, completed psychosocial measures and were included in analysis. Detailed demographic, clinical and psychosocial characteristics of this sample are presented in Table 1. Most participants reported that they were not married or cohabiting, and most of the current pregnancies were unintended. Participants entered antenatal care at a median gestation of 20 weeks (IQR: 16–26), and just over half (55%) were diagnosed with HIV during the index pregnancy. At the start of antenatal care, participants had a median HIV $\log_{10}$ viral load of 4.0 copies/mL (IQR: 3.4–4.6), and a median CD4 cell count of 344 cells/ μ L (IQR: 236–516). At their second antenatal visit, the women included reported high median levels of the perceived availability of social support (median: 4.7; maximum: 5), and relatively low stigma (median: 2.3; maximum: 5) and depressive symptom scores (median: 4.0; maximum: 30). IPV during the preceding 12 months was reported by 21% of participants. At the third antenatal visit, high patient-healthcare provider relationship scores (median: 3.8; maximum: 4) were observed.

3.2 Patterns of any and hazardous alcohol use prior to and during pregnancy

Alcohol use was assessed at the second and third antenatal study visit. Changing patterns of any alcohol use prior to and during pregnancy were explored and are presented in Figure 1a. Of the 580 women included in this analysis, 60% reported no alcohol use in the 12 months prior to pregnancy, while 40% reported some level of alcohol consumption during that period. Of the 234 women who reported some level of alcohol consumption prior to pregnancy, 62% subsequently reported no alcohol use during pregnancy, while 38% reported some level of continued use. Of the total sample, 16% reported any alcohol use during pregnancy. Figure 1b presents patterns of hazardous alcohol use prior to and during pregnancy. Among participants reporting any alcohol use in the 12 months prior to pregnancy ($n=234$), 65% scored above threshold for hazardous alcohol use during that period on the AUDIT-C. Of these women ($n=152$), 70% subsequently scored below threshold for alcohol use during pregnancy, although 30% reported continued hazardous alcohol use. In the total sample of women reporting both any or no alcohol use, hazardous alcohol use prior to pregnancy was reported on the AUDIT-C by 26% of participants, and 10% reported hazardous alcohol use during pregnancy. Using the full AUDIT questionnaire, 15% and 0.7% of participants in the total sample reported risky drinking and alcohol dependence prior to pregnancy, respectively; these proportions were 5% and 0.5% for alcohol use during pregnancy (Table 1).

3.3 Reported frequency and quantity of alcohol consumption, and frequency of binge drinking

Among the 40% of participants ($n=234$) who reported any alcohol use in the 12 months prior to pregnancy, most (59%) reported only using alcohol once per month or less (Table 2). Notably, 82% of participants reporting alcohol use prior to pregnancy reported consuming 3 or more drinks per day when drinking, and 9% reported consuming 6 or more standard drinks at one time at least weekly (binge drinking). Among participants who scored above threshold for hazardous alcohol use prior to pregnancy and reported continued hazardous use during pregnancy, 70% reported drinking 2–4 times per month or more, with 98% of participants consuming 3 or more drinks per day when drinking and 13% reporting binge drinking at least weekly.

3.4 Factors associated with any and hazardous alcohol use prior to pregnancy

Variables associated with any and hazardous alcohol use prior to pregnancy and with reduced consumption during pregnancy were explored. For each of these comparisons, factors independently associated with each pattern of alcohol use were then explored in logistic regression models. Compared to women reporting no alcohol use, women who reported any alcohol use in the 12 months prior to pregnancy were more likely to be of younger age and single relationship status (Table 3). Other factors associated with any alcohol use in the 12 months prior to pregnancy in unadjusted analysis included lower levels of HIV-related stigma, experience of IPV during the 12 months prior to pregnancy, and an unintended pregnancy. These associations persisted when adjusted for age and poverty level (Table 4). Specifically, any alcohol consumption in the 12 months prior to pregnancy was significantly associated with single relationship status [adjusted odds ratio (aOR): 3.14; 95%

confidence interval (CI): 2.12–4.65] and experience of past-year IPV (aOR: 2.84; 95% CI: 1.83–4.40), while higher HIV-related stigma scores were associated with a reduced odds of reporting any alcohol use (aOR: 0.69; 95% CI: 0.55–0.86).

Among women reporting any alcohol use prior to pregnancy, few differences were observed across categories of hazardous alcohol use, although women reporting hazardous alcohol use had higher education levels and were more likely to have experienced past-year IPV compared to women scoring below threshold. After adjustment for age and poverty, hazardous alcohol use in the 12 months prior to pregnancy remained significantly associated with experience of past-year IPV (aOR: 2.84; 95% CI: 1.45–5.57), while having attained lower levels of education was associated with a reduced odds of hazardous alcohol use (aOR: 0.38; 95% CI: 0.18–0.78).

3.5 Factors associated with reduced consumption during pregnancy

Among the women who scored above threshold for hazardous alcohol use prior to pregnancy, participants who subsequently reduced their consumption during pregnancy had entered antenatal care at earlier gestation and reported a better patient-healthcare provider relationship compared to women who reported continued hazardous use. In adjusted analyses, reducing alcohol consumption during pregnancy remained significantly associated with a better patient-healthcare provider relationship score (aOR: 2.99; 95% CI: 1.01–8.87). In addition, later gestation when entering antenatal care remained significantly associated with a reduced odds of reducing alcohol consumption during pregnancy (aOR: 0.93; 95% CI: 0.88–0.98). Notably, women who entered antenatal care at earlier gestation reported a significantly better patient-healthcare provider relationship ($p=0.006$).

4. Discussion

This research explored alcohol use patterns prior to and during pregnancy in a sample of HIV-infected women in South Africa; and explored factors associated with these patterns. Hazardous alcohol use was prevalent prior to pregnancy, and although the majority of participants reported reduced consumption during pregnancy, almost 1 in 3 women who scored above threshold for hazardous alcohol use prior to pregnancy did not report reducing their consumption to below-threshold levels during pregnancy. Notably, only 62% of participants reporting any alcohol use prior to pregnancy reported complete cessation of alcohol use during pregnancy. During both time periods, alcohol use was characterised by binge drinking. Single relationship status was strongly associated with report of any alcohol use prior to pregnancy, and experience of IPV was associated with report of both any alcohol use and of hazardous alcohol use. Among women reporting hazardous alcohol use prior to pregnancy, reduction in consumption was associated with earlier gestation when entering antenatal care and with a better reported patient-healthcare provider relationship.

The prevalence of hazardous alcohol use in the 12 months prior to pregnancy observed here is notable, with 1 in 4 women in the total sample scoring above threshold on the AUDIT-C. While 60% of participants reported no alcohol consumption prior to pregnancy, 40% of women reported some level of alcohol use, and the prevalence of hazardous alcohol use (65%) among these women is thus worryingly high. Although the proportion of women who

scored above threshold for alcohol dependence on the full AUDIT questionnaire was low, the notable prevalence of hazardous drinking reported on the AUDIT-C is of concern, given the impact of hazardous levels of consumption on both maternal and child health outcomes. The pattern of alcohol use reported here is characterised by binge drinking, similar to the patterns described by others conducting research among women in South Africa (Desmond et al., 2012, Russell et al., 2013).

Consistent with the findings of many previous studies, experience of IPV was here observed as a risk factor for both any alcohol use and for hazardous alcohol use (O'Connor et al., 2011, Eaton et al., 2012, Pitpitan et al., 2012, Choi et al., 2014), further highlighting the urgent need to concurrently address both gender-based violence and the alcohol epidemic in this context. Higher levels of HIV-related stigma were here associated with a reduction in the odds of any alcohol use prior to pregnancy. This may be explained by women experiencing higher levels of stigma avoiding alcohol-serving venues, where HIV-related stigma may be prevalent (Velloza et al., 2015), although more than half of the women in this sample were only diagnosed with HIV when they entered antenatal care, after the reference period for pre-pregnancy alcohol use, and this particular finding should thus be interpreted with caution. In a systematic review of the predictors of alcohol use during pregnancy it was noted that while many studies have explored the impact of educational attainment on alcohol use, findings are inconsistent (Skagerström et al., 2011; Kitsantas et al., 2014). Here, we observed a significant association between lower levels of educational attainment and a reduced odds of hazardous alcohol use prior to pregnancy among women reporting any alcohol use during that period, but found no associations between education and any versus no alcohol use prior to pregnancy, or reduced consumption versus consistently high consumption during pregnancy.

In the current study, 16% of the total sample reported some level of alcohol use during pregnancy. This prevalence of alcohol use is consistent with that reported among HIV-infected pregnant women in KwaZulu-Natal (18%; Desmond et al., 2012), and has major implications for child health and development in this setting. Among women reporting any alcohol use prior to pregnancy, rates of alcohol use cessation observed here are much lower than those reported in most high-income countries (Beijers et al., 2014, Kitsantas et al., 2014). The association between later gestation when entering antenatal care and a reduced odds of decreased consumption may be due to poorer health-seeking behaviours, or to the reduced time during which to change behaviours. As study visits were conducted separately to routine clinical visits in the present study, conclusions cannot be drawn with regard to the association between a better patient-healthcare provider relationship and the increased odds of reduced consumption. However, it is plausible that the perception of higher quality care as well as support received from healthcare providers may motivate women to practice improved health-related behaviours during pregnancy. Notably, women who entered antenatal care at earlier gestation reported a significantly better patient-healthcare provider relationship, suggesting that this group may represent a patient population characterised by improved health-seeking behaviours as well as improved satisfaction with care. There are few formal programmes for substance use screening and intervention at primary care level in South Africa, with healthcare provider responses to antenatal alcohol use generally consisting only of informal advice and support (Petersen Williams et al., 2015, Sorsdahl et

al., 2015). These results suggest that an increased focus on screening and intervention, healthcare worker training, and improved referral systems are urgently needed.

A strength of the present study is the longitudinal assessment of alcohol use, given that most previous research has assessed alcohol use at only one point in time during pregnancy; although inferences regarding causality cannot be made in terms of reported alcohol use prior to pregnancy. In addition, the inclusion of a large, representative sample of HIV-infected women attending primary care increases the generalizability of these results to other communities in the region. A limitation of this analysis is the use of self-report to measure alcohol use, given the potential impact of recall and social desirability bias on these data. However, the AUDIT has been validated for use during pregnancy (Burns et al., 2010) and in South Africa specifically (Myer et al., 2008). The time period of assessment used in this research is a further limitation of the measure, as the 12 months prior to pregnancy recognition may have included the peri-conception period and early gestation, thus limiting our ability to draw conclusions about pre-pregnancy alcohol use specifically. Finally, although only HIV-infected women were included in this analysis, Gugulethu is characterized by a generalized HIV epidemic, with approximately 1 in 3 women accessing antenatal care being HIV-infected (Kaplan et al., 2014), and the results observed in the present analysis are likely to be generalizable more broadly.

5. Conclusions

Despite some limitations, these results are notable. Although the high prevalence of alcohol use during pregnancy in South Africa is widely documented, there are few prospectively-collected data exploring alcohol use trajectories prior to and during pregnancy in LMIC contexts. These unique data provide important insights into these trajectories and changing behaviours in a context with a very high prevalence of hazardous alcohol use. In addition, these data suggest that risk factors for alcohol use observed in other populations are similarly associated with alcohol use here; but also that earlier gestation when entering antenatal care and a better patient-healthcare provider relationship may be protective against continued hazardous use among women reporting hazardous alcohol consumption prior to pregnancy. Given the lack of interventions for alcohol use at the primary care level (Baron et al., 2016), these data suggest a possible area of intervention in this high-risk population, and indicate that screening tools need to be developed and routinely implemented in primary care antenatal services in this region. Finally, these results suggest that a notably high proportion of infants born to HIV-infected mothers in this setting are exposed to alcohol *in utero*, which may further compound health risks in this already vulnerable group, and further study of the impact of alcohol use on both maternal and child health outcomes is needed in this growing population of women.

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Highlights

- Hazardous alcohol use prior to pregnancy is prevalent among HIV-infected women.
- Alcohol use is characterised by binge drinking.
- Almost 1 in 3 women report continued hazardous consumption during pregnancy.
- Reduced consumption is more likely among women entering antenatal care earlier.
- A better healthcare provider relationship is associated with reduced consumption.

Figure 1.

Figure 1a Patterns of any alcohol use prior to and during pregnancy

Figure 1b Patterns of hazardous alcohol use prior to and during pregnancy, among participants reporting any alcohol use prior to pregnancy ($n=234$)

Table 1

Demographic, clinical and psychosocial characteristics and hazardous alcohol use

Variable	n (%)
Number of mothers	580
<i>Demographic and clinical characteristics at first antenatal visit</i>	
Median age in years [IQR]	28.1 [24.7, 32.4]
Ethnicity – Black/African	578 (99.7)
Educational attainment	
Primary/some secondary	419 (72)
Completed secondary/any tertiary	161 (28)
Currently employed	222 (38)
Poverty level (assets + employment)	
Least disadvantaged	183 (32)
Moderate disadvantage	193 (33)
Most disadvantaged	204 (35)
Single relationship status	344 (59)
Unintended pregnancy	411 (71)
Time of HIV diagnosis	
Before this pregnancy	263 (45)
During this pregnancy	317 (55)
Primigravida	102 (18)
Median gestation in weeks [IQR]	20 [16, 26]
Median log ₁₀ HIV viral load [IQR; copies/mL]	4.0 [3.4, 4.6]
Median CD4 cell count [IQR; cells/ μ L; n=566]	344 [236, 516]
<i>Psychosocial characteristics reported at subsequent antenatal visits</i>	
Median perceived availability of support score [IQR; max=5]	4.7 [3.7, 5.0]
Median HIV-related stigma score [IQR; max=5]	2.3 [1.6, 2.9]
Median antenatal depressive symptoms score [IQR; max=30]	4.0 [1.0, 8.0]
Median patient-healthcare provider relationship score [IQR; max=4]	3.8 [3.4, 4.0]
Intimate partner violence experienced in preceding 12 months	119 (21)
<i>Alcohol use prior to pregnancy</i>	

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Variable	n (%)
Report of alcohol use on AUDIT	487 (84)
Below threshold	89 (15)
Risky drinking (AUDIT score >6)	4 (0.7)
Alcohol dependence (AUDIT score >20)	
Report of alcohol use on AUDIT-C	
Below threshold	428 (74)
Hazardous alcohol use	152 (26)
<i>Alcohol use during pregnancy</i>	
Report of alcohol use on AUDIT	
Below threshold	546 (94)
Risky drinking (AUDIT score >6)	31 (5)
Alcohol dependence (AUDIT score >20)	3 (0.5)
Report of alcohol use on AUDIT-C	
Below threshold	524 (90)
Hazardous alcohol use	56 (10)

Table 2

Reported alcohol use prior to and during pregnancy

Variable	Any alcohol use prior to pregnancy	Non-hazardous use prior to pregnancy	Hazardous use prior to pregnancy	Reduced consumption during pregnancy	Consistently high consumption during pregnancy
Number of mothers	234	82 (35)	152 (65)	106 (70)	46 (30)
<i>Alcohol frequency</i>					
How often do you have a drink containing alcohol?					
Never	0 (0)	0 (0)	0 (0)	89 (84)	0 (0)
Once per month or less	138 (59)	75 (91)	63 (41)	17 (16)	14 (30)
2–4 times per month	83 (35)	7 (9)	76 (50)	0 (0)	25 (54)
2–3 times per week	12 (5)	0 (0)	12 (8)	0 (0)	5 (11)
4 times or more per week	1 (0.4)	0 (0)	1 (0.7)	0 (0)	2 (4)
<i>Alcohol quantity</i>					
How many standard drinks containing alcohol do you have on a typical day when drinking?					
1 or 2	42 (18)	38 (46)	4 (3)	7 (7)	1 (2)
3 or 4	89 (38)	44 (54)	45 (30)	10 (9)	13 (28)
5 or 6	77 (33)	0 (0)	77 (51)	0 (0)	24 (52)
7 to 9	12 (5)	0 (0)	12 (8)	0 (0)	2 (4)
10 or more	14 (6)	0 (0)	14 (9)	0 (0)	6 (13)
<i>Binge drinking</i>					
How many times do you have six standard drinks or more at a time?					
Never	128 (55)	81 (99)	47 (31)	104 (98)	15 (33)
Less than monthly	61 (26)	1 (1)	60 (39)	2 (2)	16 (35)
Monthly	24 (10)	0 (0)	24 (16)	0 (0)	9 (20)
Weekly	16 (7)	0 (0)	16 (11)	0 (0)	6 (13)
Daily or almost daily	5 (2)	0 (0)	5 (3)	0 (0)	0 (0)

Table 3

Factors associated with alcohol use patterns prior to and during pregnancy

Variable	Total sample (n=580)			Any alcohol use prior (n=234)			Hazardous use prior (n=152)		
	Total sample	No alcohol use prior	Any alcohol use prior	P-value	Non-hazardous use prior	Hazardous use prior	P-value	Reduced consumption during	Consistently high consumption
Number of mothers	580	346	234		82	152		106	46
Age – mean (SD)	28.8 (5.4)	29.1 (5.4)	28.2 (5.5)	0.040	28.2 (5.5)	28.2 (5.5)	0.962	28.1 (5.5)	28.5 (5.6)
Gestation in weeks at enrolment–mean (SD)	20.8 (7.5)	20.8 (7.7)	20.6 (7.3)	0.869	20.6 (7.5)	20.6 (7.1)	0.963	19.5 (6.7)	23.2 (7.4)
Educational attainment									
Completed secondary/any tertiary	161 (28)	102 (29)	59 (25)		12 (15)	47 (31)		34 (32)	13 (28)
Primary/some secondary	419 (72)	244 (71)	175 (75)	0.260	70 (85)	105 (69)	0.006	72 (68)	33 (72)
Poverty level									
Least disadvantaged	183 (32)	100 (29)	83 (35)		29 (35)	54 (36)		39 (37)	15 (33)
Moderate disadvantage	193 (33)	115 (33)	78 (33)		26 (32)	52 (34)		34 (32)	18 (39)
Most disadvantaged	204 (35)	131 (38)	73 (31)	0.159	27 (33)	46 (30)	0.895	33 (31)	13 (28)
Relationship status									
Married/cohabiting	236 (41)	177 (51)	59 (25)		24 (29)	35 (23)		26 (25)	9 (20)
Single	344 (59)	169 (49)	175 (75)	<0.001	58 (71)	117 (77)	0.294	80 (75)	37 (80)
Pregnancy intention									
Intended	169 (29)	115 (33)	54 (23)		20 (24)	34 (22)		24 (23)	10 (22)
Unintended	411 (71)	231 (67)	180 (77)	0.008	62 (76)	118 (78)	0.726	82 (77)	36 (78)
Time of HIV diagnosis									
Before this pregnancy	263 (45)	156 (45)	107 (46)		37 (45)	70 (46)		46 (43)	24 (52)
During this pregnancy	317 (55)	190 (55)	127 (54)	0.879	45 (55)	82 (54)	0.892	60 (57)	22 (48)
Perceived availability of support score – mean (SD; max=5)	4.3 (0.8)	4.2 (0.9)	4.3 (0.8)	0.084	4.4 (0.8)	4.3 (0.8)	0.459	4.4 (0.8)	4.2 (0.9)
HIV-related stigma score mean (SD; max=5)	2.2 (0.8)	2.3 (0.8)	2.1 (0.8)	0.005	2.0 (0.8)	2.1 (0.9)	0.346	2.1 (0.9)	2.1 (0.9)
Patient-healthcare provider relationship score – mean (SD; max=4)	3.7 (0.3)	3.7 (0.3)	3.7 (0.3)	0.948	3.7 (0.4)	3.7 (0.3)	0.880	3.7 (0.3)	3.6 (0.4)
Antenatal depressive symptoms score – mean (SD; max=30)	5.3 (5.3)	5.1 (5.1)	5.6 (5.6)	0.378	5.3 (5.9)	5.8 (5.4)	0.313	5.4 (5.4)	6.7 (5.4)
Intimate partner violence									
No violence	461 (79)	297 (86)	164 (70)		68 (83)	96 (63)		68 (64)	28 (61)

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Variable	Total sample (n=580)		Any alcohol use prior (n=234)		Hazardous use prior (n=152)		P-value	Consistently high consumption	P-value
	Total sample	No alcohol use prior	Any alcohol use prior	P-value	Non-hazardous use prior	Hazardous use prior	P-value	Reduced consumption during	
Any violence	119 (21)	49 (14)	70 (30)	<0.001	14 (17)	56 (37)	0.002	38 (36)	18 (39)
									0.700

Table 4
Factors independently associated with alcohol use patterns prior to and during pregnancy

Variable	Any alcohol use vs no alcohol use prior to pregnancy	Hazardous use vs non-hazardous use prior to pregnancy	Reduced consumption vs consistently high consumption during pregnancy
	Adjusted odds ratio [95% CI]	Adjusted odds ratio [95% CI]	Adjusted odds ratio [95% CI]
Age	1.00 [0.96, 1.03]	1.00 [0.95, 1.06]	0.99 [0.93, 1.06]
Gestation in weeks at enrolment			
Educational attainment			
Completed secondary/any tertiary		Reference	
Primary/some secondary		0.38 [0.18, 0.78]	0.93 [0.88, 0.98]
Poverty level			
Least disadvantaged	Reference	Reference	Reference
Moderate disadvantaged	0.85 [0.55, 1.32]	1.10 [0.56, 2.18]	0.62 [0.26, 1.50]
Most disadvantaged	0.93 [0.59, 1.45]	1.05 [0.52, 2.10]	0.91 [0.36, 2.30]
Relationship status			
Married/cohabiting	Reference		
Single	3.14 [2.12, 4.65]		
HIV-related stigma score	0.69 [0.55, 0.86]		
Patient-healthcare provider relationship score			
Intimate partner violence			
No violence	Reference	Reference	
Any violence	2.84 [1.83, 4.40]	2.84 [1.45, 5.57]	2.99 [1.01, 8.87]
			0.048