



Predictors of alcohol use prior to pregnancy recognition among township women in Cape Town, South Africa

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ABSTRACT

South Africa has the highest prevalence of Fetal Alcohol Spectrum Disorders (FASDs) in the world. The purpose of this study was to identify high risk factors associated with drinking alcohol prior to pregnancy recognition in 24 neighborhoods in the Cape Flats outside Cape Town, South Africa. An interviewer assessed risk among 619 pregnant Black/African women between the ages of 18 and 41 years. Logistic regression analyses explored factors associated with drinking alcohol post conception but prior to pregnancy recognition. Forced multiple logistic regression analysis revealed that drinking prior to pregnancy recognition was associated with being younger, single, having better living conditions, smoking, having a longer gestation prior to pregnancy recognition, having a greater number of sexual partners, and a higher incidence of intimate partner violence. Depressive symptoms tended to be higher among alcohol users. These risk factors were consistent with other research on the characteristics of South African women having children with a diagnosis of Fetal Alcohol Spectrum Disorders and/or of non pregnant women at high risk for an alcohol-exposed pregnancy. These findings highlight the need for women of child-bearing age to be routinely screened for alcohol use and its associated risk factors. Intervention efforts could be integrated into health initiatives already present in South Africa including the prevention and treatment of HIV/AIDS, tuberculosis, and malnutrition. Preconception care is particularly important since pregnancy recognition often occurs several weeks to months following conception and could be implemented by South African community health workers. These endeavors should facilitate national goals of healthier pregnancies and the elimination of FASDs in South Africa.

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Introduction

It is well known that prenatal alcohol exposure produces a range of developmental deficits, collectively referred to as Fetal Alcohol Spectrum Disorders (FASDs) (Warren & Hewitt, 2009). The most severely affected children on the spectrum show a characteristic pattern of anomalies termed Fetal Alcohol Syndrome (FAS) which consists of prenatal and/or postnatal growth retardation, a unique cluster of facial malformations, and neuro developmental disabilities (Jones & Smith, 1973; Kodituwakku, 2009). Additionally, a substantial body of research has documented significant neurocognitive difficulties among individuals on the spectrum who do not meet full

criteria for the syndrome but who fall along a continuum of disability and who are described as having Partial FAS (PFAS), Alcohol Related Neurodevelopmental Disorder (ARND), or Alcohol Related Birth Defects (ARBD) according to the diagnostic schema proposed by the Institute of Medicine (Hoyme et al., 2005; Stratton, Howe, & Battaglia, 1996). The entire continuum of effects is estimated to represent at least 20 to 50 per 1000 live births in certain urban areas of the United States and some Western European countries (May et al., 2009).

Although recent data indicating that FASDs are more common in some populations throughout the world than previously thought, certain regions of South Africa are reported to have the highest measured prevalence rates of the disorder in the world (May et al., 2009; May et al., 2008). South Africa is a middle income country; however, it is also characterized by high levels of poverty and inequality. As a result of its apartheid past, conditions of adversity disproportionately affect the mixed race ('Coloured') and 'Black/'

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African' (e.g., Xhosa) populations. Associated with adversity in these populations are high rates of infant mortality, HIV/AIDS, tuberculosis, and poor nutrition.

The most extensive and comprehensive series of studies of the effects of prenatal alcohol exposure on children in South Africa have been carried out in the Western Cape Province. These in-school studies of first grade primarily mixed race children living in rural and small town settings, reveal rates of Fetal Alcohol Syndrome as high as 41 to 74 per 1000 children (May et al., 2009). The addition of children diagnosed with Partial FAS reveals rates between 68 and 89 per 1000 in this population. Similarly high rates have been noted in two cities in the Northern Cape Province of South Africa reaching levels as high as 67/1000 for FAS and 100/1000 with the addition of the diagnosis of Partial FAS (Urban et al., 2008). These extraordinarily high rates demonstrate that alcohol exposure during pregnancy is a serious public health problem in South Africa.

Given the high prevalence rates of alcohol-exposed pregnancies in South Africa, studies have been designed to investigate various risk factors for having a child with a Fetal Alcohol Spectrum Disorder. The most comprehensive studies have been conducted in the Western and Northern Cape provinces (May et al., 2005; May et al., 2008; Urban et al., 2008) using retrospective recall of alcohol use during pregnancy. Using this methodology, mothers of children with the disorder were found to be older, were more likely to live in rural impoverished areas, had lower educational attainment, were less likely to be married, had higher parity, smoked tobacco, and suffered from poor nutrition with a lower body mass index (BMI). Other findings included higher levels of depression and living with a partner who had a drinking problem (May et al., 2008; Urban et al., 2008).

A recent population based study, examining risk factors for an alcohol-exposed pregnancy (AEP) in non pregnant women, revealed higher risk associated with living in a rural, as opposed to, an urban community (Morojele et al., 2010). One in nine women in the urban area (Gauteng) of South Africa and one in five in the rural area (Cederberg, Bergrivier, Swartland) were at risk of having an alcohol-exposed pregnancy by virtue of being current alcohol users, fertile, not pregnant, and not using effective contraception. For the rural women, risk factors included early onset of alcohol use, lower education level, being younger, lower parity, lifetime use of cannabis, smoking, and having a partner with a drinking problem. For urban women, predictors of risk included early onset of alcohol use, lifetime cannabis use, access to recreational facilities (that may include bars, taverns or shebeens), and smoking.

In order to guide appropriate social interventions, the aim of this study was to identify risk characteristics of pregnant Black/African women living in a peri-urban settlement area outside Cape Town. Many of these settlements are referred to as "townships." In South Africa, the term "township" usually refers to the urban living areas that, under apartheid, were reserved for non-whites.

The theoretical framework for the study was based on Social Action Theory (Ewart, 1991). This model has been used to guide interventions to redress health problems that disproportionately affect certain communities such as substance and alcohol misuse among individuals in low income neighborhoods with high levels of health risks. A social action view emphasizes social interdependence in personal control of health-endangering behaviors. It further emphasizes that environmental, psychological, and problem solving activities are important to effect sustained behavioral change. Based upon this theoretical construct, and empirical findings from women with FASDs and women at risk for an alcohol-exposed pregnancy, we predicted that certain demographic, interpersonal, psychological, and living condition factors would be associated with reports of drinking

alcohol prior to pregnancy recognition. Specifically, we posited that women who report drinking alcohol would more likely be smokers, younger, single, and to be less educated. Furthermore, they would report a higher number of symptoms of depression, would be more likely to have more sexual lifetime partners, to have a sexually transmitted disease, and to be exposed to higher levels of intimate partner violence.

The study was part of the initial phase of a randomized controlled screening and brief intervention program designed to provide a home-based model in which peer counselors (mentor mothers) provided psycho-educational interventions and ongoing social support to pregnant women who reported using alcohol during pregnancy. A larger aim of the research was to provide interventions to reduce the consequences of hazardous alcohol use, HIV/AIDS, and poor nutrition in order to improve child and maternal outcomes. This study is unique in that it was designed to assess women who were currently pregnant and consuming alcohol prior to pregnancy recognition. As such, data reported here include only an assessment of those factors associated with post conception alcohol use prior to pregnancy recognition.

Methods

Prior to participant recruitment, the research was approved by the Health Research Ethics Committee of Stellenbosch University (N08-08-218) located in Stellenbosch, South Africa and the Social Behavioral Institutional Review Board at the University of California at Los Angeles (G07-02-033) in the United States.

Study site

The study site was located in 24 neighborhoods in the Cape Flats outside Cape Town, South Africa. Our research partner in South Africa is the Philani Nutrition and Development Project which has been implementing a child health and nutritional program for poor women and children over the past 30 years, the last 10 years using a community based model of in-home individual peer (mentor mothers) counseling and support. A key aspect of Philani is its ongoing community support, which is promoted through a consensus decision-making model and local leadership. The Philani group works in several major peri-urban settlements with formal houses, sub-economic formal housing, and vast areas of informal housing. Some sites are provided with paved roads, mast lighting, water, and water-borne sewage service, and some have access to electricity and telephones. Other informal houses are found in transit areas for people awaiting relocation to serviced sites. In these areas, services are limited to shared water outlets and bucket toilets. Unemployment is high in the area and is estimated to be between 25% and 50%. The racial/ethnic make up of the area is 3% 'Coloured' and 97% 'Black/African' (e.g., Xhosa). The primary language is Xhosa (93%). The female population is young ($M = 23.4$ years). Most women live within 5 km of a prenatal clinic and women have fertility rates of 2–3 children each (above data from the *Census, 2001*: Statistics South Africa, 2003).

Sample selection

Philani operates in 10 sites across 100 neighborhoods: Site B, Site C, Mayabuye, Brown's Farm, Town II, KTC, Nyanga, Delft, Mfuleni, and Crossroads. In these areas, we identified 40 neighborhoods that were not currently receiving Philani services. These were the sites that we targeted for expansion of Philani services. We sub-grouped the 40 neighborhoods into 10 community clusters of 4 neighborhoods each. The selection of neighborhood recruitment sites was made using aerial mapping, conducting street-intercept

Table 1
Baseline characteristics of sample women.

	Total (N = 619)	
Demographics		
Age (M,SD)	26.2	5.5
Highest education level (M,SD)	10.2	1.9
Marital status (n, %)		
Single	274	44.3
Married/living together	345	55.7
Language (n, %)		
Xhosa	583	94.2
Other	36	5.8
Employed (n, %)		
Employed	108	17.4
Household income (n, %) (n = 594)		
Less than 2001 Rand	354	59.6
2001 Rand or greater	240	40.4
Living conditions		
Lives in formal housing (n, %)		
SUM water, electricity, flush toilet (0–3) (M, SD)	2	1.1
0 (n, %)	62	10.0
1 (n, %)	208	33.6
2 (n, %)	24	3.9
3 (n, %)	325	52.5
Reproductive health		
Previous pregnancy (M, SD)	1.1	1.2
Previous live births (M,SD)	1.0	1.0
Previous low-birth weight babies (n, %) (n = 408)	71	17.4
Previous treatment for an STI (n, %)	181	29.2
Weeks pregnant at pregnancy recognition (M, SD)	7.9	5.8
Weeks pregnant at assessment (M, SD)	25.8	8.3
Mental health		
EPDS (M,SD) ^a	13.5	5.3
Sig. depression (13 or more) (n, %)	371	59.9
Substance Use		
Tobacco (n, %)	28	4.5
Cannabis (n, %)	1	0.2
HIV testing		
Ever tested for HIV (n, %)	559	90.3
Mother is HIV+ (n, %) (n = 555)	144	25.8
Sexual behavior and partner violence		
Lifetime partners (M, range)	3.6	1–28
Partners past year (M, range)	1.2	0–5
Any violence from partner(s) past year (n, %)	269	43.5

^a EPDS: Edinburgh Postnatal Depression Scale.

surveys, and walking and driving through the neighborhoods during the day and at sunset. We counted structures in each potential site from the aerial maps. Multiple reviewers, both persons familiar and those not familiar with the sites, drove around the neighborhoods to identify comparable sites. Local Xhosa-speaking women also conducted 20 interviews in each neighborhood in order to ensure that the mothers were from similar areas in Cape Town and had similar lengths of residence in their neighborhoods. The interviews also covered housing and living characteristics. A data collector walked every street of each neighborhood counting the number of informal and formal houses, as well as the number of structures such as bottle stores, bars, taverns, shebeens, and clinics. Data were analyzed using frequencies and cross-tabulations to make sure neighborhoods were evenly distributed. Descriptive data such as housing type, water supply, and other infrastructure proved primarily consistent with expectations derived from census data (2001 Census: Statistics South Africa) and 2007 satellite photography. A list of 24 noncontiguous neighborhoods (at least 1 km apart) was identified as final recruitment sites. Neighborhoods were defined by neighborhood size – between 450 and 600 households; distance from a health clinic within 5 km;

number of bottle stores/bars/taverns/shebeens; and access/no access to water on living premises.

Participants

Participant characteristics are presented in Table 1. Participants had an average age of 26.2 years (SD = 5.47). Ninety percent of women had completed grades 7 through 12 with an average education level of 10.2 (SD = 1.94). The majority of women were married or living with a partner (55.7%). Ninety four percent of the women indicated Xhosa as their primary language. Only 17.4% were employed with the majority of women having a household income of less than 2001 Rand (\$258) per month. A third of the women lived in formal housing with 52.5% having indoor running water, electricity, and flush toilets. Sample women averaged 1.0 (SD = 1.0) live births. Twenty nine percent of women had received treatment for a sexually transmitted disease. Almost all of the women had been tested for HIV/AIDS (90.3%) and 25.8% were HIV positive. Women averaged 3.6 lifetime sexual partners and 43.5% had experienced partner violence in the past year. On average, women were at 7.9 weeks (SD = 5.8) gestation when they learned they were pregnant and were interviewed at 25.8 weeks (SD = 8.3) gestation.

Assessment interviewer training

Assessment interviewers were township women who did not live in the study neighborhoods and who were not known to the Philani peer counselors. Interviewers had to be able to speak, read, and write in Xhosa and English and to have good social skills. Assessment interviewers received training from a South African co-investigator familiar with the participants' culture and values. Training began with IRB certification and human subjects training. Next the trainer provided a question-by-question review of the assessment questionnaire, interviewing techniques, strategies for approaching participants in a non judgmental manner, strategies to increase the probability of collecting honest answers, and live demonstrations of the interview. All interviewers participated in mock interviews during training and were observed by the trainer administering 8–10 assessments in the field before collecting data on actual participants.

All data collection was accomplished using a mobile phone so that training for data collection consisted of a general orientation to using a mobile phone and its data collection software, accessing the assessment questions on the phone, and standard care of the phone device. The training also included information on how to deal with technical difficulties that might arise with the mobile phones.

Measures

We developed a structured assessment questionnaire for this study that included items that have been used among similar populations in South Africa (Kalichman et al., 2006). The 194-item questionnaire included sections measuring participant demographics (age, education level, marital status, language, ethnicity, employment status, and income), housing demographics (formal/informal housing, indoor water supply, electricity, and toilet facilities), reproductive health (HIV/AIDS and STIs), mental health of the mother, substance use post conception prior to pregnancy recognition, HIV/AIDS disclosure, sexual behavior, and partner violence. The interview was translated into Xhosa and then back translated following standard principles (Brislin, 1986). The interview was also available in English. To establish rapport, non-threatening questions were asked first followed by more personal questions.

Table 2
Frequency of alcohol use and binge episodes of post conception drinkers prior to pregnancy recognition.

Derived AUDIT-C Items	N	%
How often did you use alcohol?		
Never = 0 ^a	452	73.0
Less than once a month = 1	16	2.6
Once a month = 2	58	9.4
2–3 times a month = 2	47	7.6
Once a week = 2	12	1.9
2 times a week = 3	22	3.6
3–4 times a week = 3	11	1.8
Nearly every day = 4	0	0.0
Every day = 4	1	0.2
Drinks per day (n = 166)		
1 or 2 = 0	87	52.4
3 or 4 = 1	42	25.3
5 or 6 = 2	20	12.0
7,8 or 9 = 3	5	3.0
10 or more = 4	12	7.2
Frequency of four or more drinks in one day (N = 165)		
Never = 0	64	38.8
Less than once a month = 1	6	3.6
Once a month = 2	29	17.6
2–3 times a month = 2	20	12.1
Once a week = 2	12	7.3
2 times a week = 3	15	9.1
3–4 times a week = 3	18	10.9
Nearly every day = 4	0	0.0
Every day = 4	1	0.6
Frequency of three or more drinks in one day (N = 165)		
Never = 0	51	30.9
Less than once a month = 1	14	8.5
Once a month = 2	29	17.6
2–3 times a month = 2	25	15.2
Once a week = 2	12	7.3
2 times a week = 3	13	7.9
3–4 times a week = 3	18	10.9
Nearly every day = 4	2	1.2
Every day = 4	1	0.6

^a Score per item.

To estimate alcohol use post conception and prior to pregnancy recognition, women were interviewed with the Derived Alcohol Use Disorder Identification Test from the National Epidemiologic Survey on Alcohol and Related Conditions (Derived AUDIT-C; Dawson, Grant, & Stinson, 2005). The Derived AUDIT-C is a three-item questionnaire based upon the original 10-item AUDIT (Saunders et al., 1993), which has been used extensively to assess alcohol use in both men and women in the Cape Town region of South Africa (Kalichman, Simbaya, Kaufman, Cain, & Jooste, 2007; Kalichman et al., 2008). The Derived AUDIT-C is highly correlated with the original AUDIT (Dawson et al., 2005) but includes modifications to the first three questions and is based solely on items reflecting alcohol consumption. The tool was developed to meet the challenge of brevity and ease of administration in busy clinics. The Derived AUDIT-C demonstrates good sensitivity and specificity for identifying risk drinking in pregnant women and performs well across different racial and ethnic groups in the United States (Dawson et al., 2005). The three questions on the screen include: 1) days of any alcohol use; 2) usual number of drinks per day; and 3) binge episodes of five or more drinks in a single day. For this study, question 3 was modified to define a binge episode as heavy episodic drinking of four or more drinks in a single day. An additional question was added to assess episodes of three or more drinks a day to conform to the definition of risky drinking used in the South African Department of Health 2002 (Parry, 2001) and the current National Institute on Alcohol Abuse and Alcoholism definition of

hazardous drinking in women (NIAAA, 2005). For the current study, women were asked about their drinking levels during the time period “before you found out you were pregnant.” The scoring for the Derived AUDIT-C is presented in Table 2. An acknowledgment of any alcohol use post conception prior to pregnancy recognition classified the woman as drinking during pregnancy.

The Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987) was used to assess depressive symptoms in sample women. The EPDS has been validated in many international settings against several specific depression scoring systems including the Diagnostic and Statistical Manual-IV (DSM-IV) published by the American Psychiatric Association (Chibanda et al., 2009). The measure carries a significant level of sensitivity and specificity in identifying African women at risk of or potentially suffering from either prenatal or postpartum depression (Chibanda et al., 2009; Lawrie, Hofmeyr, de Jager, & Berk, 1998; Rochat et al., 2006). The EPDS consists of 10 items, each response rated 0–3 based on severity, and summed to yield a total score (0–30). The scale has items related to depressive symptoms of anhedonia, anxiety, tearfulness, helplessness and low motivation. A cut point of 13 or more has been found to characterize minor to major depression in antenatal South African women (Rochat et al., 2006; Rochat, Tomlinson, Newell, & Stein, 2009).

Recruitment and data collection

Recruitment took place between May 2009 and January 2010. Inclusion criteria for participants included any pregnant woman who lived in a study neighborhood who was willing to give voluntary informed consent. In each selected neighborhood there was a study recruiter, a woman living in the neighborhood who was familiar with the residents. The recruiter went from house-to-house on a monthly basis to identify pregnant women, to obtain consent to contact, and to refer women to the assessment team. Refusal rates and reasons for refusal to participate were monitored and recorded on an ongoing basis at the household level, neighborhood level, and with information about potential risk status. Following a standardized script, the recruiters informed mothers about the study. The mothers were assured that decision to participate would not affect services at any local clinic site. If a mother agreed to participate, the recruiter obtained a signed informed consent and scheduled a baseline assessment interview. To assure that participants were being recruited in selected neighborhoods on a timely basis, we monitored the daily progress of recruiters using a GPS locator.

For the baseline assessment, all women were interviewed in a research base location near their homes. A driver took the potential participants to the assessment location. Assessment interviews were conducted in Xhosa or English, depending on the participant's primary language preference. Interviews lasted on average between 33 and 181 min, with a mean of 60 min (SD = 13.00).

All data were collected using standard mobile phones. The only hardware requirement was that the mobile phones had to be enabled for the Java programming language. We established a web-based system, which allowed electronic questionnaires to be designed on a word processor, sent wirelessly to standard entry level mobile phones that were used to enter data while conducting participant interviews. Assessment completion took place offline requiring no network coverage. Once completed, assessments were automatically uploaded to the host computer using mobile network coverage. If there was no mobile network coverage, completed assessments were stored securely until a signal could be found at which time completed assessments were uploaded. All data were encrypted, thus maintaining the confidentiality of responses.

Table 3

Comparison of characteristics of post conception prior to pregnancy recognition non-drinkers and drinkers.

	Non-Drinkers (N = 452)		Drinkers (N = 167)	
Demographics				
Age (M, SD)	26.8	5.5	24.6	5.1**
Highest education level (M, SD)	10.3	1.9	10.1	1.9
Marital status (n, %)				
Single	173	38.3	101	60.5**
Married/living together	279	61.7	66	39.5
Language (n, %)				
Xhosa	423	93.6	160	95.8
Other	29	6.4	7	4.2
Employed (n, %)				
Employed	85	18.8	23	13.8
Household income (n, %) (N = 594)				
Less than 2001 Rand	257	58.7	97	62.2
2001 Rand or greater	181	41.3	59	37.8
Living Conditions				
Lives in formal housing (n, %)	138	30.5	63	37.7
SUM water, electricity, flush toilet (0–3) (M, SD)	1.9	1.2	2.2	1.0**
0 (n, %)	56	12.4	6	3.6
1 (n, %)	156	34.5	52	31.1
2 (n, %)	16	3.5	8	4.8
3 (n, %)	224	49.6	101	60.5
Reproductive Health				
Previous pregnancy (M, SD)	1.2	1.2	1	1.1
Previous live births (M, SD)	1	1	0.9	1
Previous low-birth weight babies (n, %) (n = 408)	53	17.0	18	18.6
Previous treatment for an STI (n, %)	117	25.9	64	38.3**
Weeks pregnant at pregnancy recognition (M, SD)	7.6	5.7	8.9	5.7**
Weeks pregnant at assessment (M, SD)	25.9	8.2	25.5	8.7
EPDS (M, SD)	13.2	5.2	14.3	5.3**
Sig. depression (13 or more) (n, %)	258	57.1	113	67.7*
Substance Use				
Tobacco (n, %)	10	2.2	18	10.8**
Cannabis (n, %)	0	0	1	0.6
HIV Testing				
Ever tested for HIV (n, %)	408	90.3	151	90.4
Mother is HIV+(n, %) (n = 555)	100	24.8	43	28.5
Sexual Behavior and Partner Violence				
Lifetime partners (M, range)	3.4	1–28	4.3	1–20**
Partners past year (M, range)	1.1	1–4	1.3	0–5**
Any violence from partner(s) past year (n, %)	164	36.3	105	62.9**

* $p < .05$; ** $p < .01$.

Communication between the browser and the server was encrypted using 128-bit SSL.

Data analysis

Descriptive data on the total sample were first examined. Next, women were classified as drinking or not drinking alcohol prior to pregnancy recognition based upon a score greater than 0 on the Derived AUDIT-C. Data analysis was conducted using SAS software version 9.2 (SAS Institute Inc., Cary, NC, USA) to compare groups. Comparison of groups was performed using

independent sample *t* tests and chi-square analyses. Data were then subjected to simple logistic regression analysis to determine whether there were statistically significant ($p < .05$) bivariate associations between each predictor and the outcome drinking variable. This analysis was followed by a forced multiple logistic regression analysis entering into the model all those independent variables that had a statistically significant pair wise relationship with the outcome variable in the bivariate analysis while controlling for all other variables. Given that multiple questions were asked in the assessment interview and that women were allowed to refuse to answer questions, not all data analyses

Table 4

Multivariate analysis: Variables predicting risk for post conception prior to pregnancy recognition drinking.

Variable	Odds Ratio	95% Confidence Interval		<i>p</i> -value	At risk
		Lower	Upper		
Mother's age	0.94	0.90	0.97	0.001	Younger
Single vs. married/living together	1.54	1.01	2.36	0.043	Single
Sum: water, electricity, flush toilet	1.32	1.09	1.57	0.004	More facilities
Use Tobacco	4.96	2.01	12.27	<0.001	More likely to smoke
Number of lifetime partners	1.15	1.06	1.25	0.001	Greater number of partners
Partner violence	2.68	1.79	4.00	<0.001	Higher level of partner violence
Weeks pregnant at pregnancy recognition	1.04	1.00	1.07	0.039	More weeks to pregnancy recognition

included all sample women. In that instance, missing data are indicated by the number of responses per variable examined in the results section.

Results

Alcohol and other substance use post conception

Of the 620 women invited to participate in the study, only 1 refused to participate resulting in a total sample size of 619. Of the total sample of 619 women, 27.0% (167/619) of women reported drinking post conception prior to pregnancy recognition on the Derived AUDIT-C (Table 2). Of that number, 72.5% (121/169) of women drank infrequently (<once a week) but when asked about heavy episodic drinking behavior, 61.2% (101/165) of women reported drinking four or more drinks per drinking day and 69.1% (114/165) admitted to drinking three or more drinks per drinking day. Eleven percent (18/167) of women who drank also smoked tobacco in comparison to 2.2% (10/452) of women who reported not drinking. Less than 1% (1/167) of drinking women and 0% of non drinking women reported cannabis use (Table 3).

Comparison of post conception drinkers to non drinkers on demographic and sample characteristics

Table 3 presents the comparison of post conception drinkers to non-drinkers. Results revealed that drinkers did not differ statistically from non-drinkers on variables of education level, language, employment status, household income, number of previous pregnancies and live births, previous low birth weight babies, number of weeks gestation at assessment, or HIV/AIDS status. Drinkers did differ from non-drinkers on age, marital status, living conditions (running water, electricity, flush toilet), history of a previous treatment for a sexually transmitted disease (STI), weeks pregnant at pregnancy recognition, number of depressive symptoms, smoking, number of lifetime sexual partners and sexual partners in the past year, and intimate partner violence.

Predictors of post conception alcohol use

Bivariate logistic regression analyses revealed that drinkers were more likely to be younger, to be single, to have better living conditions (water, electricity, toilet onsite), to have a history of a previous treatment for sexually transmitted infections (STIs), to discover that they were pregnant later in gestation, to endorse more depressive symptoms, to smoke tobacco, to have a higher number of lifetime sexual partners, and to have experienced intimate partner violence. After entering all variables that were statistically significantly associated with the dependent drinking variable into a forced multivariate logistic regression model (see Table 4), maternal age, marital status, living conditions, smoking number of lifetime sexual partners, partner violence, and weeks pregnant at pregnancy recognition remained significant. The number of depressive symptoms approached significance.

Discussion

Alcohol misuse continues to remain a problem in South Africa despite its prioritization by the Department of Welfare (1999). It is clear from the present study that over 1 in 4 women reported drinking alcohol post conception before pregnancy recognition. At pregnancy recognition, 71.1% of women reported that they had stopped drinking; however, of special concern is the fact that many women in the sample were unaware of their pregnancy status and were drinking well into the first trimester of pregnancy. In fact,

pregnancy recognition in the women who reported drinking alcohol did not occur until almost the 9th week of gestation, suggesting a relatively long period of fetal exposure and the need for early preventive care.

In order to provide preventive care, it is helpful to identify the women at highest risk for using alcohol during pregnancy. To our knowledge, this is the first study to identify risk factors in South African women who were currently pregnant and who reported drinking alcohol post conception prior to pregnancy recognition. However, our results are consistent with studies of maternal risk for an alcohol-exposed pregnancy in women who are of child bearing age but not pregnant, who are drinking alcohol, and not using effective contraception (Morojele et al., 2010), and the risk factors found in studies of retrospective reports of alcohol use in women who have been identified as having a child with a FASD (May et al., 2008). These include being single, smoking tobacco, having a higher number of lifetime sexual partners, and having experienced intimate partner violence.

Contrary to some reports of higher prevalence of FASDs in the children of poorer women (May et al., 2009), women in this study who drank post conception prior to pregnancy recognition had somewhat better living conditions (including onsite water, electricity, and flush toilets) than those who reported no drinking. However, in the current sample, all women were poor and there was no difference in average household income suggesting that income alone may not be a sufficient measure of economic resources and that women who were drinking during pregnancy may have been slightly better off economically than their non drinking peers.

Regarding drinking patterns prior to pregnancy recognition, approximately 27% of sample women reported drinking post conception. Although sample women reported drinking at relatively low frequencies, when they did drink, they drank heavily with over 69% drinking three or more drinks per drinking occasion, a rate that has been established as hazardous and consequently dangerous for the developing fetus (NIAAA, 2005). These rates are higher than those identified in the general population of South African women which reveal that one third of current drinkers report risky drinking (Parry, 2005; Parry et al., 2005). Findings are consistent with the research that shows that although South African men drink more frequently than women; women who report alcohol use are drinking large quantities of alcohol per drinking occasion (Kalichman et al., 2007).

Heavy consumption also places women at high risk for STIs and HIV/AIDS (Kalichman et al., 2007). Indeed, the frequency of drinking occasions appears to be less important in predicting sexual risks in women than does the quantity of alcohol consumed (Department of Health, 2002). Number of STIs and HIV/AIDS status were not discriminating risk factors in the final model in this study; however, a quarter of sample women screened positive for HIV/AIDS demonstrating the incredibly high neonatal risk of infection for 1 in 4 unborn babies and the need for intensive perinatal treatment for mother and infant. On a positive note, almost 90% of sampled pregnant women had been screened for HIV/AIDS revealing that the national initiative to screen is highly effective (at least in peri-urban regions of Cape Town). Unfortunately, most screening of pregnant women does not occur until many weeks into pregnancy suggesting that HIV/AIDS screening and education about alcohol use during pregnancy should be provided prior to conception. Furthermore, given busy overworked providers in health clinics, developing ways to deliver integrated interventions at the level of the family in the community are crucial.

Alcohol consumption has also been associated with having a greater number of sexual partners (Kapiga, Lyamuya, Lwihula, & Hunter, 1998) and having more lifetime partners was a risk factor found to predict post conception drinking in the present sample.

Having multiple sexual partners has also been identified in the literature from the United States as a powerful predictor of risk of having an AEP (Project Choices, 2002). These findings also highlight the significant need for preconception counseling and intervention with women of child bearing age in order to prevent an AEP.

The association between drinking and intimate partner violence is well established in the literature (Flynn, Walton, Chermack, Cunningham, & Marcus, 2007; World Health Organization, 2009). Moreover, evidence suggests that alcohol use increases the occurrence and severity of domestic violence (Campbell, Glass, Sharps, Laughon, & Bloom, 2007). Data reveal that in South Africa, 65% of women experiencing spousal abuse reported that their partner used alcohol before the assault (Weinsheimer, Schermer, Malcoe, Balduf, & Bloomfield, 2005). It has also been postulated that women may be using substances to cope with abuse and depression, and that substance misuse and depression increase vulnerability to subsequent violence (Testa, Livingston, & Leonard, 2003). The combination of these factors found to predict alcohol use post conception in this sample of women living in South Africa suggests that domestic violence is a significant variable to assess when counseling women about having a healthy pregnancy. This risk variable was one of the most powerful predictors in this study and has been demonstrated to be predictive of high risk pregnancies in other populations of women in the United States (Project Choices, 2002).

Smoking was the strongest predictor of post conception drinking behavior in the current sample. Consensus among most investigators, in many studies conducted throughout the world, is that smoking is highly associated with alcohol consumption in both men and women. Clinical intervention studies have found that as many as 70%–90% of women who report heavy alcohol use are also smokers (Floyd et al., 2007; McKee, Krishan-Sarin, Shi, Mase, & O'Malley, 2006). Studies also reveal that women who smoke are much more likely to engage in episodes of heavy drinking (Tsai, Floyd, Green, & Boyle, 2007). Significantly, this variable consistently appears in studies of women with children with FASDs (May et al., 2009; Urban et al., 2008) and in studies of women who are not pregnant but at risk for an alcohol-exposed pregnancy (Morojele et al., 2010; Project Choices, 2002). Furthermore, the combination of smoking and drinking has a synergistic effect producing an increased risk for preterm labor, low birth weight, and growth restriction (Odendaal, Steyn, Elliott, & Burd, 2009) suggesting that all counseling on alcohol use should include information about smoking cessation.

Although not a statistically significant predictor of post conception alcohol use after taking into account other risk factors in the model, depressive symptoms were prevalent in sampled women. Sixty percent of the total sample of women received a score of 13 or more on the EPDS, a cut point that suggests the need for counseling of pregnant South African women at high risk for depression (Rochat et al., 2006, 2009). Of significant concern was the finding that 68% of women who reported drinking during pregnancy also reported high levels of depressive symptoms, in contrast to 57% of women who were not drinking. It is well established that psychological distress is a significant contributing factor to high-risk drinking in non pregnant women (Project Choices, 2002; Tsai, Floyd, O'Connor, & Velasquez, 2009) and in pregnant women (O'Connor & Whaley, 2006). Furthermore, women with higher levels of depression often continue to use alcohol despite knowing they are pregnant and clinician advice against such use (O'Connor & Whaley, 2006). Importantly, comorbid alcohol use and mental disorders have been shown to have negative consequences on infant outcomes in addition to FASDs (Kelly et al., 2002). For example, a retrospective report of over 500,000 women in California found that those women diagnosed with co-morbid substance use disorders and psychiatric disorders were more likely to deliver low birth weight and preterm infants

than those with either of these conditions alone (Kelly et al., 2002). These findings support the idea that effective treatment of co-occurring conditions should involve the integration of mental health and substance abuse treatment services in a cohesive and unitary system of care (Tsai et al., 2009).

Limitations

The findings in this study are limited by sampling constraints. This study has the advantage over other studies relying on small convenience samples in that appropriate sampling techniques were applied. Nevertheless, the sample consisted of individuals from a fairly restricted geographic and culture specific group. However, it is encouraging that the results are consistent with other studies of individuals at risk for an alcohol-exposed pregnancy both in South Africa and the United States (Morojele et al., 2010; Project Choices, 2002) suggesting that, with a few exceptions, findings may be universal.

Another limitation of the study is its cross-sectional design which precludes conclusions about the directionality or causality of effects. Although we can identify risk variables, the role of each in longitudinal outcome for the infant and child has yet to be established. However, it is reasonable to assume that such longitudinal studies will be confirmatory, in that school-based prevalence studies of FASDs in a population of South African children, using retrospective reports of alcohol use and factors of risk during pregnancy for predicting a diagnosis of a FASD, found very similar associations to ours (May et al., 2005; Urban et al., 2008).

Finally, the use of self-report measures to assess alcohol consumption and other behaviors may have resulted in under-reporting. Nevertheless, the use of interviewers of the same cultural/ethnic backgrounds and the confidentiality of participant responses suggest to us that women were truthful in their answers. Indeed, the high rate of consent suggests that women were interested in talking about their practices during pregnancy.

Conclusion

Alcohol exposure during pregnancy is a major public health problem in South Africa. As this study has demonstrated, there is a need for location-specific targeted intervention approaches identifying specific characteristics of women who could most benefit from prevention and intervention programs. Many of the risk factors identified in this study are interrelated and amenable to change through education and prevention efforts. Innovative and creative approaches are necessary along with improved socioeconomic circumstances. The findings also point to the need for all women of child-bearing age to be routinely screened for alcohol use and its associated risk factors. A useful universal approach to reduce alcohol-exposed pregnancies would include integrating alcohol education and screening with other health initiatives already present in South Africa including the prevention and treatment of HIV/AIDS, tuberculosis, and malnutrition. Preconception screening is particularly important since pregnancy recognition and first contact with antenatal services often occur several weeks to months following conception.

Although interventions aimed at reducing psychological distress and depression during pregnancy may be difficult to provide on a large-scale basis, given the high association between distress and drinking during pregnancy, counseling and social support should be an important goal. Additionally, the consistent finding of a strong association between smoking and risk of an AEP, as well as having a child with a FASD, means that screening for smoking and smoking cessation treatment should be provided to women on a routine basis. Domestic violence is a significant problem for both

pregnant and non pregnant women throughout the world (World Health Organization, 2009). Women experiencing violence around the time of pregnancy represent an important group to target for screening and intervention efforts because such violence will most certainly negatively impact health and functioning of the women and their infants.

The results of this study support the need for an integrated approach to screening and treatment consistent with a social action theory of positive health promotion that can serve to improve pregnancy outcomes in South Africa. Ongoing education of health providers regarding cultural and personal factors influencing access to treatment for alcohol misuse/abuse during pregnancy should be instituted in an effort to reach national goals of healthier pregnancies and the elimination of FASDs in South Africa.

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Appendix. Supplementary material

Supplementary material for this article may be found, in the online version, at doi:10.1016/j.socscimed.2010.09.049.

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