Prenatal Alcohol Exposure in the Republic of the Congo: Prevalence and Screening Strategies

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ABSTRACT: OBJECTIVE: To determine prevalence of prenatal alcohol use in Brazzaville, Congo and to evaluate a prenatal screening tool for use in this population. **METHODS:** A prospective population screening program of 3099 women at 10 prenatal care clinics in Brazzaville, Congo using the 1-Question screen. To validate the 1-Question screen in this population we screened 764 of these women again using the T-ACE as a gold standard for comparison study. The study outcomes were as follows: prevalence of self-reported prenatal alcohol use in Brazzaville using the 1-Question screen, estimation of number of drinking days, drinks per drinking day, most drinks on any one occasion. We also estimated the epidemiologic performance criteria for the 1-Question screen. **RESULTS:** The 3099 women screened were classified as follows: no risk 77% ($n = 2{,}384$); at risk 3.7% ($n = 115$); and as high risk 19.3% ($n = 600$). Of the women reporting drinking during pregnancy, 87.4% reported drinking 4 or more drinks on any occasion. The agreement for detection of alcohol use during pregnancy by the 1-Question Screen and a positive T-ACE score was 94.7%. **CONCLUSIONS:** 23.3% of women attending prenatal care in Brazzaville reported alcohol use during pregnancy and 83% of them continued to drink after recognition of pregnancy. Prenatal alcohol exposure should be the focus of efforts to improve identification of alcohol use prior to and during pregnancy to improve maternal and child health. *Birth Defects Research (Part A) 97:489–496, 2013.* © 2013 Wiley Periodicals, Inc.

Key words: women; prenatal; alcohol; screening; fetal alcohol spectrum disorder; Congo

INTRODUCTION

Alcohol use is a major contributor to global burden of disease accounting for 4% of total world-wide mortality and between 4 and 5% of all disability adjusted life years (Lim et al., 2012). Among women, 1.1% of total mortality and 1.4% of disability-adjusted life years was attributable to alcohol use in 2009 (Rehm et al., 2009). Alcohol use may now account for a larger proportion of disability-adjusted life years than tobacco use world-wide (Parry, 2000). However, it is possible that this represents an underestimate of the impact of alcohol use in the developing world, especially Africa since the data from this region is often incomplete (Rehm et al., 2009).

In Uganda, 36% of women are current drinkers and 10.7% report that they meet criteria for problem drinkers (Room and Selin, 2005). In Nigeria, 14% are current drinkers and 8.9% are problem drinkers (Room and Selin, 2005). Most of these women are of child bearing age. Thus, improved data collection on alcohol use is an important public health priority for countries in the developing world (Parry, 2000). The 167 million babies born each year in Sub-Saharan Africa are exposed to multiple risk factors including poverty, poor nutrition, lack of clean water, poor sanitation, and inadequate access to medical care, which contributes to high rates of prematurity, maternal and infant mortality in the region (United Nations Department of Economic and Social Affairs, 2011).

In many countries prenatal alcohol exposure (PAE) has also been found to be a risk marker for increased maternal mortality, fetal mortality, infant and child mortality, preterm birth, and morbidity (Abel, 1977; Kesmodel et al., 2002; Burd and Wilson, 2004; Burd et al., 2008; Li et al., 2011; Cornman-Homonoff et al., 2012). South Africa—which has the highest reported rates of PAE and binge drinking in Africa—also has some of the world's highest rates of fetal alcohol spectrum disorders

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Table 1
Summary of the Published Research from Sub-Saharan Africa on PAE

		Number/ percent reporting drinking		Number/ percent reporting bingeing			
	Total	N	%	N	%	Population studied	Screening tool
Namagembe et al., 2010	610	180	29.5	56[a]	**9**	Urban; National referral hospital	Clinic interview; CAGE
Tandu-Umba et al., 2011	240	78	32.5	61[b]	25.4	Urban; Antenatal Clinics	Clinic interview
Medhin et al., 2010	1065	54	5.1			Urban/Rural Mix; Data Surveillance Site	Interview
Chaibva et al., 2011	80	39	48.8				
Croxford and Viljoen, 1999	636	272	42.8	150[c]	23.7	Urban/Rural Mix; Prenatal Clinics	Clinic interview

[a]31% of the 180 drinkers in Uganda.
[b]78% of the 78 drinkers in D.R. Congo.
[c]55% of the 272 drinkers in South Africa.

(Croxford and Viljoen, 1999; May et al., 2009). Research on PAE and fetal alcohol spectrum disorders in other Sub-Saharan Africa countries has been limited. Table 1 provides a summary of published studies of PAE and binge drinking from Sub-Saharan Africa. Available data from Africa on PAE varies eightfold from 5.1% in Ethiopia to over 40% in Zimbabwe (Medhin et al., 2010; Chaibva et al., 2011). Both Uganda and the Democratic Republic of Congo have PAE rates near 30% (Namagembe et al., 2010; Tandu-Umba et al., 2011; World Health Organization, 2011; U.S. Department of State, 2012). Rates of binge drinking during pregnancy were 9% for Uganda and 24.5% in the Democratic Republic of Congo (Namagembe et al., 2010; Tandu-Umba et al., 2011; World Health Organization, 2011; U.S. Department of State, 2012).

The Republic of the Congo has a per capita income of $3732 with an annual per capita health expenditure of only $108, which ranks 145th worldwide for per capita health expenditures (World Health Organization, 2011; U.S. Department of State, 2012). Due to unevenly distributed income and a concentration of wealth; a majority of individuals and families have limited incomes and are unlikely to afford even this level of expenditures for healthcare (UNHCO, 2012). In Congo, one in six infants (16.7%) are born prematurely, which is the second highest rate in the world and the maternal mortality ratio is the 19th highest rate in the world at 580 per 100,000 (World Health Organization, 2010; Partnership for Maternal, Newborn & Child Health, 2012). The infant mortality rate is 74.2/1000 live births, which is the 17th highest in the world (CIA, 2012). These factors have resulted in a suboptimal environment for pregnant women, mothers, infants, and children in the Congo. Identification and quantification of preventable risk factors could provide an opportunity to improve the health status of women and children in the Congo.

Prior to this project, there had been no known published reports of population based screening for PAE in the Congo. The medical community expressed concerns to us about rates of PAE especially in Brazzaville, but had not carried out formal research. This study is a collaborative response to concerns expressed by the prenatal care providers and community members from the Congo. The community goal is to determine prevalence rates of PAE and to identify effective screening strategies to improve identification of women who drink during pregnancy.

METHODS

Prospective data collection was completed at 10 prenatal care sites in Brazzaville by local prenatal care staff. Congo has a high birth rate (36 births/1000 people), and the city of Brazzaville has 50,000 live births annually (Population Reference Bureau, 2012). The 10 prenatal care sites in Brazzaville were selected based on patient numbers, available clinic space, and location within the city and were thought to be approximately representative of women attending prenatal care in the city. These sites are financed in part by agencies in the Congo to increase access and to reduce the cost of care. We did not sample women from rural areas of the Congo in this study.

We obtained approval for the study from the University of North Dakota Institutional Review Board, and the Ministry of Health in Brazzaville. This project is a cooperative effort between the Congolese Association for Research and Prevention of Fetal Alcohol Spectrum Disorders (SAF Congo) and the University of North Dakota Fetal Alcohol Syndrome Center. The consent forms were in French and each consenting woman received a copy of the form.

Training and screening materials were developed collaboratively by the North Dakota and Brazzaville teams and translated into French. The SAF Congo staff then utilized these materials for project training prior to data collection. Ongoing consultation via a phone-based training was provided during training and the data collection period. Each pregnant woman was interviewed in French or a local language. At the most recent prenatal care visit

data was collected for the variables: estimated week of gestation at the time of the visit, maternal weight, maternal age, exposure status ("When was your last drink?"), frequency (drinking days per week), quantity (usual drinks per drinking day and maximum number of drinks on any one occasion during this pregnancy), and cigarettes smoked per day.

We used a 1-Question screen (When was your last drink?) to collect exposure data in the most efficient manner possible. The sites screened 3099 urban women with the 1-Question screening (Burd et al., 2003, 2006). For a comparison study to validate the 1-Question screen, we used the T-ACE as the gold standard tool for detection of alcohol use in this population. The T-ACE has been widely used and has demonstrated useful validity for detection of PAE (Chiodo et al., 2010). In addition, a positive T-ACE score is associated with increased risk for neurodevelopmental impairments in childhood (Chiodo et al., 2010). Out of the first 1600 women screened, every other woman ($n = 800$) was offered T-ACE screening, 36 declined the T-ACE screening for various reasons, including lack of time, and refusal to further discuss their alcohol use. When reporting on alcohol use participants were asked to report on the period from the beginning of pregnancy to the day of the T-ACE administration. The T-ACE was administered to 764 women (95.5%), all of whom had a matching 1-Question screen.

The screening was conducted from December 2011 to March 2012. The data for each subject were reviewed for errors. Any out of range values were then reconciled by email or phone with the prenatal care chart. Each pregnant woman was provided a SAF Congo promotional bracelet for participation.

Data Analysis

Several risk stratification strategies are available for PAE (Abel, 1998; Burd et al., 2006; May et al., 2009). These include binge drinking and continuing to drink after recognition of pregnancy, which increases the duration of exposure and the cumulative exposure across pregnancy (Abel, 1998; Burd et al., 2006; May et al., 2009). We used the 1-Question screen to classify women into three exposure groups: (1) no risk (women who did not report any alcohol use during pregnancy); (2) at risk (women who drank but reported quitting at recognition of pregnancy); and (3) high risk (women continued to drink after recognition of pregnancy). We used four exposure variables: (1) drinks per drinking day; (2) number of binge days (four or more drinks on an occasion); (3) drinking days per week; (4) maximum number of drinks on any one day.

To estimate the epidemiologic performance of the 1-Question screen we used the recommended scoring for the T-ACE of 0–5 with a score above 2 or more to detect alcohol use during pregnancy. The T-ACE consists of four variables: (1) Tolerance: how many drinks does it take to feel high? (2) Annoyance: do people annoy you when they criticize your drinking? (3) Cut Down: have you ever felt you should cut down on your drinking? (4) Eye Opener: have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover?

The number of drinks was calculated based on self-reported drinks (usually bottled beer). In Brazzaville, the screeners who are local residents indicated that the typical drink is beer usually 50–70 cl (16–24 ounces) with an alcohol content of about 5%. Each beer has between 18 and 28 g of alcohol or an average of 23 g of alcohol per drink. Thus, a typical drink in the Congo is equivalent to ~1.6 standard drinks if 14 g of alcohol comprise a standard drink (NIAAA, 2007). We did not collect data to allow for calculation of standard drinks using a specified number of grams of alcohol as the unit of delineation.

Nineteen women proportionately distributed across the two risk groups reported their last drink was during pregnancy, but reported 0 as the number of drinks per drinking day. Some of these are likely women who drink less than one beer or other drink when they do drink. We assigned these women a value of 1 drink per drinking day for the analysis since they do have exposure but at low levels.

Statistical Analysis

Analysis of variance (ANOVA) was used to examine the differences in means of continuous dependent variables (average drinks per drinking day, average binge episodes in pregnancy, most drinks at once in pregnancy, cigarettes smoked per day, drinking days for week, age and weight, etc.) and the three independent categorical measures risk factors (e.g., no risk, at risk, and high risk). A chi-square procedure was used to examine the strength of the relationship between two categorical variables (e.g., risk level and dichotomized binge drinking). Statistical significance (alpha level) was set at 0.05 for all analyses.

The receiver operating characteristic (ROC) curve analysis was used to evaluate the efficacy of the 1-Question screen with respect to the gold standard (T-ACE). The ROC curves plot the number of true positives on the y-axis against the number of false positives on the x-axis. The resulting graph helps to identify the cutoff values with the best possible combination of specificity and sensitivity for a given instrument. In this study, the area under the curve represents the probability, (given "drinking" and "nondrinking" persons are drawn at random from the population) that "drinking"' persons can be identified using the 1-Question screen.

RESULTS

From 10 prenatal care sites in Brazzaville, 3099 women completed the screening and had complete data. Data from the 1-Question screen was used to categorize women into three risk categories: No risk $n = 2384$ (77%); at risk $n = 115$ (3.7%); and high risk $n = 600$ (19.3%). The mean age of the "no risk" group was 27.3 years (sd =5.7); in the "at risk" group 26.5 years (sd = 5.3); and in the "high risk" 27.2 years (sd = 5.7; Table 2). The gestational week at the current visit (26 weeks) did not differ across the three groups $p = 0.86$. The current mean maternal weight of pregnant women by group was significantly different $p < 0.04$ between groups but the difference was very modest averaging about 1 kg (Table 2).

The exposure data by risk group are presented in Table 3. In Brazzaville, 20.2% ($n = 627$) of women reported one or more binge episodes during pregnancy. Thus, 87% of all women drinking at any point during pregnancy engaged in binge drinking. For this pregnancy, the comparison of the "At Risk" group with

Table 2
Summary Data on Maternal Weight, Gestational Age at Screening, and Maternal Age

	No risk $N = 2384$		At risk $N = 115$		High risk $N = 600$		Total $N = 3099$
Factor	M	SD	M	SD	M	SD	P
Weight (Kilo)	57.21	4.87	56.06	4.01	57.08	4.79	0.04[a]
Week of pregnancy	26.05	6.71	25.85	6.98	26.18	6.58	0.86[a]
Age	27.26	5.65	26.53	5.30	27.19	5.68	0.40[a]

[a]The probability value is the overall difference by ANOVA.

the "High Risk" group by drinks per drinking day is portrayed in Table 3. Drinking decreased modestly (7.8%) but significantly for the "High Risk" group from 4.13 drinks (sd = 1.78) to 3.81 drinks per drinking day for the "At Risk "group. The "At Risk" group averaged 2.8 (sd = 1.26) drinking days per week, which is slightly more than the 2.6 (sd = 1.21) days per week for the "High Risk" group (Table 3). The average number of binge episodes were similar, as the "At Risk" group averaged 3.57 (sd = 3.35) binges per pregnancy and the "High Risk" group averaged 3.59 (sd = 3.37) binges per pregnancy (Table 3). This suggests that some women reduce drinking during pregnancy by a modest amount. For the variable most drinks at any one time in pregnancy, the "At Risk" group averaged 7.1 (sd = 2.53) drinks and ranged up to 12 drinks on any one occasion. The "High Risk" group averaged 6.8 (sd = 2.46) drinks and ranged up to 13 drinks on anyone occasion. (Table 3).

Validation of the 1-Question Screen

Another study objective was to validate the 1-Question screening tool for use in Congo. We selected the T-ACE as a "gold standard tool" for comparison with the One-Question screen. Of the first 1600 women receiving the 1-Question screen, 764 also were screened using the T-ACE. The T-ACE is scored on a range of 0–5, with 2 or higher considered as a positive score. Table 4 shows the frequency of final T-ACE scores and the *n* for each score of 0–5 for this population. Of the 764 women, screened with the T-ACE, 296 (38.7%) had a positive T-ACE score. Each woman was asked to report the number of drinks it takes to feel high. For the 296 women with a positive T-ACE score, the mean was 8.5 drinks (sd = 2.4) with a range of 2–14 drinks.

Table 4
A Summary of the T-ACE Data from 764 Women Attending Prenatal Care in Brazzaville

	N	%
T: Tolerance	294	38.5
A: Annoyed	94	13.3
C: Cut Down	179	23.4
E: Eye Opener	94	12.3
Positive Screens (Total Score = 2 or more)	296	38.7
Distribution of T-ACE Scores		
0	466	61
1	2	0.3
2	42	5.5
3	163	21.3
4	75	9.8
5	16	2.1
Total	764	100.0

We then calculated the epidemiologic performance criteria for the 1-Question screen. Figure 1 presents the 2 × 2 box and the performance criterion comparing the T-ACE (positive with a score of 2 or more) and the 1-Question screen. The sensitivity in our study was 96.6% and the specificity was 98.5%. Figure 2 shows the ROCs and the area under the curve of 0.976.

DISCUSSION

In this study of 3099 pregnant women in Brazzaville, Congo, we found that 23% of women drank during pregnancy, of whom 87.4% reported binge drinking. Only one-in-six women (16.7%) quit drinking after recognition of pregnancy. Continued drinking after recognition of pregnancy indicates that PAE likely occurs over all three trimesters of pregnancy for nearly 1 in every 5 pregnancies in Congo. May et al. have suggested that the definition of a binge episode should be changed to three drinks on an occasion (May et al., 2004). There is no known

Table 3
Summary Data on the Four Exposure Variables from 3099 Women Attending Prenatal Care in Brazzaville

	No risk		At risk		High risk		Total
	$N = 2384$		$N = 115$		$N = 600$		$N = 3099$
Factor	M	SD	M	SD	M	SD	*P*
Average drinks per drinking day	0.01	0.22	4.13	1.78	3.81	1.61	< 0.001[a] < 0.001[b]
Average binge episodes in pregnancy	0.01	0.15	3.57	3.35	3.57	3.37	< 0.001[a] $= 0.99$[b]
Most drinks at once in pregnancy	0.02	0.37	7.10	2.53	6.80	2.46	< 0.001[a] $= 0.307$[b]
Drinking days per week	0.01	0.13	2.80	1.26	2.60	1.21	< 0.001[a] $= 0.003$[b]

[a]Probability value is the overall difference.
[b]Probability value is the difference between at risk and high risk.
Statistical procedure = ANOVA.

		T-ACE (Gold Standard)	
		Positive (+)	**Negative (-)**
1-Question Screen	**Positive (+)**	286 (a)	7(c)
	Negative (-)	10 (b)	461 (d)

Epidemiologic Performance Values and Definitions:

Population Prevalence of Prenatal Alcohol Exposure = 38.7%

Accuracy = Percent correctly classified 97.4 %

Sensitivity = Pr(T-ACE +/One Question +) = a/(a+b) = 96.6%

False Positive Fraction (FPF) = Pr(T-ACE +/One Question -) = c/(c+d) = 1.5%

False Negative Fraction (FNF) = Pr(T-ACE -/One Question +) = b/(a+b) = 3.4%

Specificity = Pr(T-ACE -/One question -) = d/(c+d) = 98.5%

Positive Predictive Value= Percent with positive one question screen with alcohol use = 97.61%

Negative Predictive Value = Percent with negative one question screen without alcohol use = 97.88%

Figure 1. The epidemiologic performance characteristics of the One Question Screen.

threshold of PAE that causes fetal alcohol spectrum disorders, but the high rates of exposure and the persistent pattern of binging across all trimesters of pregnancy suggest that fetal alcohol spectrum disorders could be an important public health concern in Congo. Increased efforts to improve detection of fetal alcohol spectrum disorders would be important since both exposure and the resulting adverse outcomes are potentially preventable.

We found that the "At Risk/Quit" and the "High Risk" groups in this study have very few differences between them (Tables 2 and 3). While these women are similar on all study variables the "At Risk" group did quit using alcohol on recognition of pregnancy. We did not collect data that would inform us of which factors differentiate the two groups but this is likely important information. Since there has been little to no education regarding PAE in Brazzaville, there is an opportunity to develop interventions in this population. This intervention would need to be low cost and culturally appropriate.

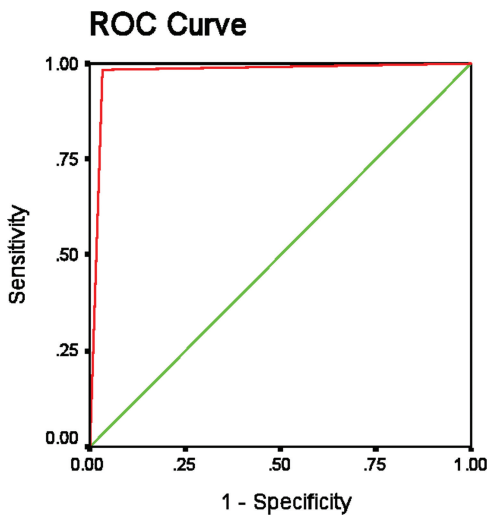

Figure 2. The ROCs and area under the curve (97.6 %) for the T-ACE vs One Question Screen comparison.

When examining the data we found inconsistencies with the number of self-reported binges. The 715 women who drank during pregnancy averaged 2.63 (sd = 1.22) drinking days per week, and averaged 3.86 (sd = 1.64) drinks per drinking day; however, the average number of binge episodes during pregnancy were only 3.57 (sd = 3.36) episodes (Table 3). To examine this, we devised an equation to estimate cumulative binge episodes for this population. We considered four drinks per drinking day as a binge and identified all women who reported four or more drinks per drinking day ($n = 423$). Since they averaged four or more drinks per drinking day, we considered each drinking day as a binge for these women. For each identified woman, we multiplied the number of drinking days per week by their gestational weeks to determine the cumulative binge episodes per pregnancy. Figure 3a plots the calculated number of binges for each woman drinking four or more drinks per drinking day to her screening date. Since May et al. have recommended reducing the number of drinks for a binge to three drinks per drinking day for some populations [29], we calculated the derived number of binges for each woman drinking three or more drinks per drinking day to her screening date ($n = 482$; Fig. 3b).

The estimates of binge drinking suggest that the definition of binge drinking may need to be revised. One reason for considering the three-drink binge definition is that adverse effects from prenatal alcohol use have been observed at sporadic and low-level use of alcohol in pregnancy [29]. The three drink definition may also be important for women of widely varying body mass. Using the revised definition of binge drinking may also enhance understanding of the role of PAE and adverse birth outcomes.

Using either the 4-drink binge or 3-drink binge formulas to estimate the number of binge episodes identifies underreporting of binge episodes in this population. The underreporting could be due to recall bias, women underreporting their binge episodes, or the lack of dose based definition of a binge episode in this study.

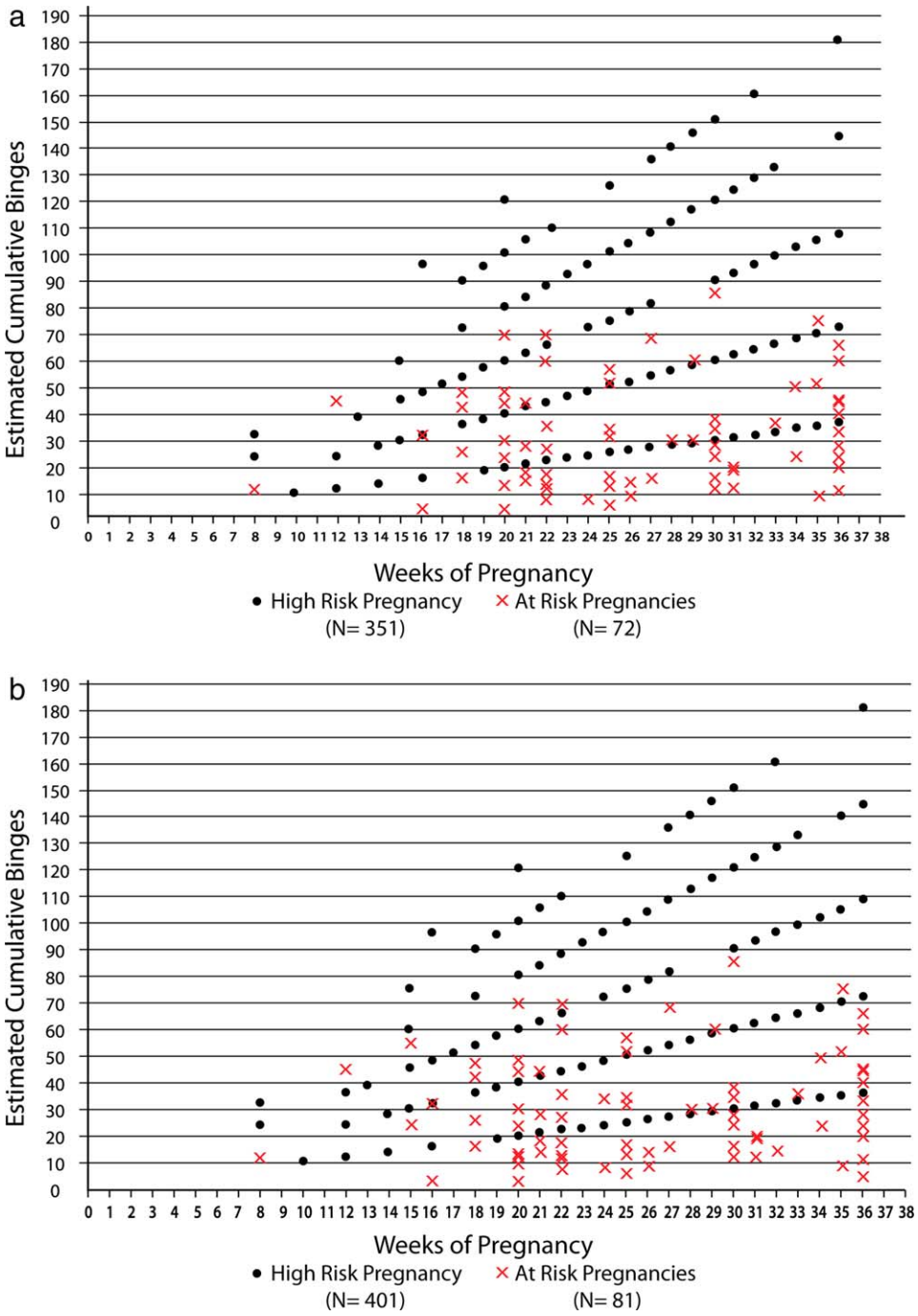

Figure 3. (a) Scatter plot of estimated cumulative binge episodes for women averaging four drinks for more per drinking day. (b) Scatter plot of estimated cumulative binge episodes for women averaging three drinks for more per drinking day. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

Improved detection of a binge drinking may prove to be useful in risk stratification of women who drink during pregnancy and would likely improve the linkage between dosimetry and outcomes in exposed pregnancies. Further research will be needed to understand how to improve dosimetry estimates in routine screening during pregnancy.

This study examined the performance characteristics of the 1-Question screen and compared the validity of this screen against the T-ACE, a widely used alcohol-screening tool. The "1-Question" had excellent performance in identifying women who were using alcohol in their pregnancy with 96.6% sensitivity, 98.5% specificity with an area under the ROC curve of .976 (Figs. 1 and 2).

Compared to the T-ACE screening, the "1-Question" screen appears to be an efficient way for health care professionals to identify PAE in Congo. To screen with the T-ACE, all women must complete the entire screening, regardless of their alcohol use. With the 1-Question screen, women who are not using alcohol during pregnancy are finished with the screening after the first question. In this study, 79.6% of women did not need to spend the additional time to answer the remaining questions. This has important implications for countries where health care resources are severely limited. As an example, if 80% of the women attending prenatal care do not need to answer more than one question to complete prenatal alcohol screening the reduced burden would be about 4 min per woman to complete the screening and record the responses. In a population of 50,000 women, 40,000 could stop after one question for a time savings of 160,000 minutes (about 2600 hours), or the equivalent of one full time staff person. The 1-Question screen also provides an easy entry point to gather information on dosimetry of exposure including frequency (number of drinking days per week or month) and quantity (number of drinks, frequency of drinks, binge episodes and most drinks in a day). The additional dosimetry data allows for easy estimation of cumulative exposure during pregnancy, which may be useful for researchers and clinicians to determine the risk-status of a pregnancy. This data can then be included in medical records and would be useful in future diagnostic evaluations of FASD.

LIMITATIONS

The sampling frame for this study collected data on ~15–20% of women attending prenatal care in Brazzaville during the study year. Due to financial limitations, we did not collect social or economic data on how these women may differ from women who did not attend prenatal care, women who attended other prenatal clinics who were not sampled and women from rural areas of the Congo.

In future studies, the performance of the 1-Question Screen should be further examined to see if the performance values change as women in the Congo become more informed about the consequences of drinking during pregnancy, which may affect their reporting of alcohol use during pregnancy. In a future study, variance from an ordering effect should be considered by asking the T-ACE questions first to see if this modifies the response rates for either the T-ACE or the 1-Question Screen. Inclusion of women from rural areas of the Congo would be important in future studies. Additional data on participant social and economic factors should be collected to refine estimates of who is included in the sample and how these women differ from those not included in the sample.

CONCLUSION

This study had several limitations. One main limitation that arose during data collection was the idea of what "one drink" is in Brazzaville. In the United States, one standard drink is defined as 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of liquor or 14 g of alcohol (NIAAA, 2007). In Brazzaville many people consider drinking one bottle of beer to be "one drink," but bottles of beer vary in size and alcohol content. In subsequent studies, gathering specific dosimetry data information on what type of alcohol is being consumed, the volume of the drink, and the alcohol content of specific drinks will add precision for the estimation of exposure by grams of alcohol.

An important factor in reducing PAE is helping women become aware of the risk before pregnancy and again during pregnancy. At the time of the screening, the average woman in this group was entering her third trimester, suggesting high levels of cumulative exposure to alcohol and increased number of binge episodes during a pregnancy. This is a priority population for risk reduction strategies. Encouraging early prenatal care and screening would provide an opportunity for many more women to receive advice about risk and to have an exposure free second and third trimester. It is also important to recognize that effective screening during prenatal care and in-office advice about the risk may decrease exposure in subsequent pregnancies. This may provide an effective population based strategy to improve heath and developmental outcomes for many women and children in Congo.

PAE increases risk for maternal mortality, preterm birth, stillbirth, neonatal, and infant mortality. These outcomes are public health concerns in Congo and decreasing PAE may be an efficient strategy to reduce risk for these outcomes. While we have demonstrated an efficient strategy for detection of PAE in the Congo, future studies will be needed to identify effective and affordable strategies to reduce exposure to alcohol during pregnancy.

REFERENCES

Abel EL. 1977. Maternal alcohol consumption and spontaneous abortion. Alcohol Alcohol 32:211–219.
Abel EL. 1998. Fetal Alcohol Abuse Syndrome. New York: Plenum Press.
Burd L, Cotsonas-Hassler TM, Martsolf JT, et al. 2003. Recognition and management of fetal alcohol syndrome. Neurotoxicol Teratol 25:681–688.
Burd L, Klug MG, Bueling R, et al. 2008. Mortality rates in subjects with fetal alcohol spectrum disorders and their siblings. Birth Defects Res A: Clin Mol Teratol 82:217–223.
Burd L, Klug MG, Martsolf J, et al. 2006. A staged screening strategy for prenatal alcohol exposure and maternal risk stratification. J R Soc Promot Health 126:86–94.
Burd L, Wilson H. 2004. Fetal, infant, and child mortality in a context of alcohol use. Am J Med Genet C Semin Med Genet 127C:51–58.
Central Intelligence Agency [Internet]. The world factbook 2012: country comparison: infant mortality rate. Washington, DC: CIA; 2012. Available at: https://www.cia.gov/library/publications/the-world-factbook/rankorder/2091rank.html. Accessed June 18, 2012.
Chaibva CN, Ehlers VJ, Roos JH. 2011. Audits of adolescent prenatal care rendered in Bulawayo, Zimbabwe. Midwifery 27:e201–207.
Chiodo LM, Sokol RJ, Delaney-Black V, et al. 2010. Validity of the T-ACE in pregnancy in predicting child outcome and risk drinking. Alcohol 44:595–603.
Cornman-Homonoff J, Kuehn D, Aros S, et al. 2012. Heavy prenatal alcohol exposure and risk of stillbirth and preterm delivery. J Matern Fetal Neonatal Med 25:860–863.
Croxford J,Viljoen D. 1999. Alcohol Consumption by pregnant women in the Western Cape. S Afr Med J 89:962–965.
Kesmodel U, Wisborg K, Olsen SF, et al. 2002. Moderate alcohol intake during pregnancy and the risk of stillbirth and death in the first year of life. Am J Epidemiol 155:305–312.
Li Q, Fisher WW, Peng CZ, et al. 2012. Fetal alcohol spectrum disorders: a population based study of premature mortality rates in the mothers. Matern Child Health J 16:1332–1337.
Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, et al. 2012. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 380:2224–2260.

May PA, Gossage, JP, Kalberg WO, et al. 2009. Prevalence and epidemiologic characteristics of FASD from various research methods with an emphasis on recent in-school studies. Dev Disabil Res Rev 15:176–192.

May PA, Gossage JP, White-Country M, et al. 2004. Alcohol consumption and other maternal risk factors for fetal alcohol syndrome among three distinct samples of women before, during, and after pregnancy: the risk is relative. Am J Med Genet C Semin Med Genet 127C:10–20.

Medhin G, Hanlon C, Dewy M, et al. 2010. Prevalence and predictors of undernutrition among infants aged six and twelve months in Butajira, Ethiopia: The P-MaMiE Birth Cohort. BMC Public Health 10:27.

Namagembe I, Jackson LW, Zullo MD. 2010. Consumption of alcoholic beverages among pregnant urban Ugandan women. Matern Child Health J 14:492–500.

National Institute on Alcohol Abuse and Alcoholism. What's a standard drink? 2007. Available at: http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/standard-drink. Accessed March 15, 2013.

Parry, CDH. 2000. Alcohol problems in developing countries: challenges for the new millennium. Suchtmed 2:216–220.

Partnership for Maternal, Newborn & Child Health. Born too soon: the global action report on preterm birth. Available at: http://www.who.int/pmnch/media/news/2012 /preterm_birth_report/en/index4.html. Accessed May 22, 2012.

Population Reference Bureau [Internet]. Washington, DC: PRB; c2012. Birth Rate (annual number of births per 1,000 total population). Available at: http://www.prb.org/DataFinder/Topic/Rankings.aspx?ind=3. Accessed June 6, 2012.

Rehm J, Mathers C, Popova S, et al. 2009. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. Lancet 373:2223–2233.

Room R, Selin KH. 2005. Problems from women's and men's drinking in eight developing countries. In: Obot IS, Room R, editors. Alcohol, gender and drinking problems: perspectives from low and middle income countries. Geneva: World Health Organization. pp. 209–220.

Tandu-Umba B, Mbangama MA, Mbungu MR. 2011. Effect of maternal alcohol consumption on gestational diabetes detection and mother-infant's outcomes in Kinshasa, DR Congo. OJOG 1:208–212.

UNHCO [Internet]. New York: UNHCO; c2003-12. Country Profile Congo. Available at: www.unhco.org/county-profile-congo. Accessed June 7, 2012.

United Nations Department of Economic and Social Affairs/Population Division. World Population Prospects: The 2010, Volume II: Demographic Profiles [Internet]. New York: United Nations; 2011. Available at: http://esa.un.org/wpp/Documentation/pdf/WPP2010_Volume-II_Demographic-Profiles.pdf. Accessed March 19, 2013.

U.S. Department of State [Internet]. Washington, DC: U.S. Dept. of State; 2012. Background Note: Republic of the Congo. Available at: http://www.state.gov/r/pa/ei/bgn/2825.htm. Accessed June 4, 2012.

World Health Organization. 2010. Trends in Maternal Mortality 1990–2008. Geneva: World Health Organization.

World Health Organization. World Health Statistics 2011 [Internet]. Geneva: WHO Press; 2011. Available at: http://www.who.int/whosis/whostat/EN_WHS2011_Full.pdf. Accessed June 4, 2012.