Web-Based Assessment and Brief Intervention for Alcohol Use in Women of Childbearing Potential: A Report of the Primary Findings

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Background: There is a need for more effective assessment and primary prevention programs aimed at accurately measuring and reducing alcohol consumption among women before conception in underserved, high-risk populations. Health information technology may serve this purpose; however, the effectiveness of such tools within this population is not known.

Methods: We conducted a small-scale randomized controlled trial to test the effectiveness of an adapted web-based alcohol assessment and intervention tool among low-income, nonpregnant women of reproductive age who were receiving Women Infant and Children (WIC) services in San Diego County and who reported currently drinking at a moderate risk level. A total of 150 risky drinking participants completed a web-based assessment and were randomly assigned to either receive a personalized feedback intervention or general health information about alcohol consumption and fetal alcohol syndrome. Follow-up assessments on reported alcohol consumption were conducted via telephone at 1- and 2-months postbaseline. Participants ranged in age from 18 to 44 and were predominately Hispanic/Latina (44%).

Results: At baseline, all respondents reported consuming ≥3 standard drinks on ≥1 occasion in the previous month. Outcome data were available for 131 participants. The main outcome measure was reduction in the number of risky drinking occasions, which did not differ significantly between treatment conditions (odds ratio 1.200, 95% CI 0.567 to 2.539, $p = 0.634$). Over 70% of the participants, however, reported a reduction in risky drinking occasions regardless of treatment condition (control 43/63, 68%; experimental 49/68, 72%).

Conclusions: The results of this study demonstrate that web-based assessment of alcohol consumption among low-income women of reproductive age, as represented by WIC clients, is feasible and acceptable. The findings also suggest that detailed and interactive assessments of alcohol consumption may be sufficient for the reduction of risky drinking within this population without personalized feedback.

Key Words: Web-Based, Alcohol Brief Intervention, Fetal Alcohol Spectrum Disorders, Alcohol Use in Women, Prevention.

FETAL ALCOHOL SPECTRUM disorders (FASD) represent a range of physical, developmental, cognitive, and behavioral abnormalities in children exposed to alcohol in the womb, and are estimated to occur as frequently as one in 100 births or in approximately 1% of the general U.S. population (May and Gossage, 2001; Sampson et al., 1997). These rates likely underestimate the prevalence of FASD in low-income populations, who may have a higher frequency of risky drinking in pregnancy and additional risk factors, such as peers with drinking problems, low education levels, younger or older maternal age, and reduced access to prenatal education and health care (Abel, 1998).

FASD are completely preventable if pregnant women avoid alcohol consumption. Despite general awareness of the health risks associated with alcohol use during pregnancy, many women continue to drink through part or all of gestation (May and Gossage, 2001). Results from the 2005 National Survey on Drug Use and Health indicate that among pregnant women, an estimated 12.1% report current alcohol use and 3.9% report binge drinking (SAMHSA, 2006). Rates of the most risky patterns of alcohol consumption during pregnancy have not declined in recent years, and remain higher than the 2010 Healthy People objectives (SAMHSA, 2000). It is important to note that the prevalence estimates for pregnant women are based on survey respondents who knew they

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were pregnant. As many women do not recognize a pregnancy until the sixth week of gestation and more than 50% of pregnancies in the United States are unplanned; prevalence rates for women of childbearing potential probably represent more accurate estimates of actual alcohol consumption in the first 4 to 8 weeks of pregnancy (Floyd et al., 1999). Therefore, of most concern are sexually active women of childbearing potential who do not plan to become pregnant, but who do so and continue to consume alcohol during the early stages of pregnancy (CDC, 2002). There is a need for more effective primary prevention and intervention programs aimed to reduce preconception and, therefore, prenatal alcohol use—especially risky drinking.

Brief interventions (also referred to as SBIRT [screening, brief intervention, referral to treatment] or SBI [screening and brief intervention] programs) incorporating feedback mechanisms have been demonstrated to be the most effective treatment for alcohol abuse and misuse in the general population (Miller et al., 1995). With respect to the subset of women with the potential to become pregnant, Project TrEAT (Trial for Early Alcohol Treatment), a study evaluating the efficacy of 2 physician-delivered brief interventions in primary care settings administered 1 month apart, found that women of childbearing potential in the intervention group had significantly sustained reduction in alcohol use in the previous week ($p = 0.0039$) and number of episodes of binge drinking ($p = 0.0021$), and that this reduction was sustained over 4 years of follow-up (Manwell et al., 2000). Similarly, Project CHOICES, a randomized trial testing a time and labor-intensive face-to-face motivational interviewing intervention to reduce alcohol consumption and/or increase appropriate contraceptive methods in a sample of women at increased risk of a future alcohol-exposed pregnancy found that women in the intervention group were approximately twice as likely to be at a reduced risk for an alcohol-exposed pregnancy at all follow-up periods when compared with the control group (3 months, odds ratio [OR] 2.31 [confidence interval (CI) = 1.69 to 3.20]; 6 months, OR 2.15 [CI = 1.52 to 3.06]; 9 months, OR 2.11 [CI = 1.47 to 3.03]) (Floyd et al., 2007).

However, there are barriers to the applicability of these measures in primary care and community settings due to the extensive personnel time, training, and other cost factors involved. One alternative is to develop more cost effective, efficient programs using health information technology (HIT) (Kwankam, 2004). To date, this eHealth approach has demonstrated success in the general population. For example, in a study conducted by Hester and colleagues (2005), 61 male and female problem drinkers were randomly assigned to either immediate treatment with a computer-based brief motivational intervention or a 4-week wait-list control group. The authors found that compared to the wait-list control group participants who immediately received the active intervention had a significantly greater reduction in drinking at 4 weeks postintervention as measured by the Brief Drinker's Profile ($p = 0.005$).

To our knowledge the web-based approach has yet to be systematically evaluated for the prevention of risky drinking in women of childbearing potential to prevent alcohol exposure in a future pregnancy. An intervention in this particular special population would be fundamentally different in design from the Hester and colleagues trial from 2 perspectives. First, the focus on women who might become pregnant requires modifying drinking behaviors that are not necessarily "risky" for the individual woman in her current nonpregnant state, but would be construed as risky to her fetus if she continued drinking at current levels into an unplanned pregnancy. Second, the nature of the intervention by definition ties the woman's motivation to change behavior to the health of a future baby. To fill this void, we conducted a randomized trial to test the efficacy of a brief web-based screening and intervention protocol in reducing risky drinking among low-income women who had the potential to become pregnant.

MATERIALS AND METHODS

Study Design

A double blinded, 2-group randomized controlled design was used. Participants were nonpregnant risky drinking women who were recruited from 3 separate Women Infant and Children (WIC) Special Supplemental Nutrition Clinics in San Diego County and randomized to receiving a web-based screening with or without a personalized feedback intervention. Randomization occurred at the individual level (i.e., across clinics). Follow-up consisted of telephone-based assessment of current drinking at 1 and 2 months postbaseline assessment and intervention. The institutional review boards from the University of California, San Diego and San Diego State University approved the study.

Study Sample

Participants in the trial consisted of 150 nonpregnant women recruited from 3 WIC clinics in San Diego County who were either WIC clients themselves (breastfeeding, postpartum), or had children or dependents enrolled in the WIC program. Eligibility criteria for recruitment included: (i) a minimum age of 18 years, (ii) the woman being nonpregnant, (iii) the woman being capable of future pregnancy, (iv) being proficient in the English language, (v) being able to read, and (vi) being comfortable using a computer. The third criterion of capability of a future pregnancy was defined as currently sexually active and not permanently sterilized. In addition, only women who met criteria for current risky alcohol consumption (should they inadvertently become pregnant) were included. For this study, we defined "risky" alcohol consumption as ≥3 drinks on at least 1 occasion in the previous month. This cutoff was selected based on the data linking 3 or more drinks per occasion in pregnancy to adverse infant outcomes, and based on the National Institutes of Alcoholism and Alcohol Abuse estimates of quantity of alcohol resulting in binge and risky drinking blood alcohol levels among adult females (May et al., 2008; NIAAA, 2004; Saitz, 2005).

A trained research assistant screened potential participants at each WIC site for alcohol consumption in the previous month. Individuals who met criteria for frequent or heavy drinking (defined as the consumption of >20 drinks in a typical drinking week in the past month) were screened out of potential participation due to ethical concerns about possible randomization to the web-based control condition, and referred to appropriate resources. Similarly, women currently in the treatment for substance abuse were excluded. Those women who met criteria and agreed to participate were consented to participation in a "study to learn more about the effectiveness of using a computer to provide health education about the use of alcohol in women of childbearing age."

Adaptation of eCHECKUP TO GO (e-CHUG) to WIC eCHECKUP

The original version of the e-CHUG combines a brief assessment with motivational feedback tailored to college students (Van Sickle and Sokolow, 2006). Multiple controlled trials evaluating the efficacy of the e-CHUG program have demonstrated its effectiveness in reducing alcohol consumption in college student populations (Henry et al., 2004; Steiner et al., 2005; Walters et al., 2005, 2007). The adapted WIC eCHECKUP version of the e-CHUG was tailored to an appropriate reading and comprehension level for WIC clients and the visual graphics were modified to appeal to women in this population. Working with the developers of the original web-based program as well as using data from multiple β tests, we adapted and modified the assessment questions and intervention content to ensure appropriateness for the target population and target health behavior. Relevant changes to the measurement components of the program incorporated established and validated methods of assessing for alcohol use in women of childbearing potential and the feedback was tailored to include either general information about fetal alcohol syndrome or personalized information about the participant's alcohol use, associated health risks, and health risks associated with alcohol use during pregnancy.

Web-Based Screening and Intervention Protocol

The WIC clinics participating in the study provided a private space for a computer and printer in the clinic for participant use to access the WIC eCHECKUP website during the study period. Following informed consent, each participant accessed the WIC eCHECKUP website and logged into her own personal account with a 1-click option in the program. The participant was then assigned a unique study identification number by the computer program. Using a random number table generated by computer software, the WIC eCHECKUP program then randomized the participant to one of 2 study groups. Those in the experimental group received personalized feedback in electronic format during the session, and also in printed format before they could log out of the system. Women in the control group received generic information about risks associated with alcohol use in general and during pregnancy in electronic format and in printed form before they could log out of the system. Each participant was given a study folder consisting of a reminder calendar noting the dates of her follow-up assessments; in which, they could place the summary report printout.

Study participants were provided a gift card for a local store for completion of the assessment and follow-up interviews.

Study Measures

Baseline Measures for All Participants. Demographic and health behavior characteristics were assessed for all participants. Variables included age, race/ethnicity, education level, marital status, other drug use, contraceptive use and method, illicit drug use, tobacco use, family history of alcohol use disorders, age of first alcohol use, number of living children, and number of pregnancies. Contraceptive method was categorized according to WHO (2007) established levels of effectiveness.

Alcohol consumption at baseline was measured for all participants in several ways. Each participant was asked to report the number of days in the past month on which they consumed ≥3 drinks containing alcohol. In addition, a modified version of the Timeline Follow-Back procedure was used to assess specific amounts and types of alcohol consumed by day over the previous 2-week period (Sobell and Sobell, 1992; Sobell et al., 1979). To aid in recall and estimation of standard drink size, participants were presented with a series of pictures depicting several options for alcohol beverage sizes and types. The participant was asked to choose the picture that best represented the type and size of beverage that she consumed. Standard drink size measures as defined by the NIAAA (2010) were used to calculate the number of standard drinks in each vessel. Conversion calculations for number of standard drinks were programmed into the WIC eCHECKUP tool, which automatically converted the picture chosen into the respective number of standard drinks.

The T-ACE (Tolerance, Annoyed, Cut Down, Eye-Opener) screening instrument was used to assess the level of risky drinking behavior in the past year for all participants, with T-ACE positive defined as a score of 2 points or greater (Sokol et al., 1989). Finally, a series of true/false questions were used to assess all participants' knowledge and perceptions about alcohol-associated risk to herself, risk to an unborn child, and common drinking behaviors among peers of the same age and ethnic group. Each participant also completed a satisfaction questionnaire after she completed the study activities on the computer.

Follow-Up Assessments for All Participants. Due to inconsistencies in access to the web-based tool at the standard postintervention assessment time points, all follow-up measures were collected via telephone interview. Each participant at each follow-up assessment was asked about her current marital status, whether she had become pregnant since the last assessment, current contraceptive method, and about her alcohol consumption quantity and frequency since the last assessment using the same measures as described for the baseline measures. All follow-up assessments were completed between 28 and 33 days postprevious assessment. The 1- and 2-month follow-up time points were chosen to allow for the assessment of change in risky drinking behavior over a comparable time period as assessed in the screening and initial assessment, and to measure persistence of change.

Study Intervention Procedures and Content

Experimental Group Feedback Intervention. Participants in the intervention group received feedback on their alcohol consumption, health risks associated with risky alcohol use, and social norms information. Participants were presented with statements indicating the number of alcohol units (number of drinks reported) they consumed in the previous 2 weeks, and the associated financial cost. In addition, statements highlighting the number of risky use occasions per week and the number of standard alcoholic drinks per occasion were provided along with equivalent caloric intake. Women in the intervention group received personalized statements that indicated the percentage of women in the general population who report drinking less than the amount reported by the study participant. The percentages were standardized according to the race/ethnicity of the participant and were calculated from the Behavioral Risk Factor Surveillance System. Statements summarizing the participant's responses to questions assessing knowledge about alcohol-associated risks, their perception of common drinking behaviors among the general population, and their perceived susceptibility to associated health risks and the severity of the consequences of risky alcohol consumption were presented. In addition, actual susceptibility and severity was provided through individual and family risk levels. Finally, the general health risks and negative consequences of alcohol use for women of childbearing potential and during pregnancy were presented. Tips for sensible drinking and contact information for local support services were provided.

General Information for Control Group. Participants in the control group received general (nonpersonalized) information about alcohol consumption, the U.S. Surgeon General recommendations about alcohol use for women of childbearing potential, generic information about fetal alcohol syndrome, and a listing of local alcohol and other health behavior resources. This information was provided in the form of a printout consisting of approximately 2 pages at the end of the assessment session.

Study Outcome Variables

The primary outcome variables of interest were: (i) a reduction in the number of risky drinking occasions (RDO) in the previous month at 1-month follow-up (Follow-Up I) when compared with baseline, (ii) a reduction in the mean drinks per occasion (MDPO) in the previous 2-week period at 1-month follow-up compared with baseline, and (iii) a sustained reduction in the number of RDO at 2-month follow-up (Follow-Up II) in the subgroup of participants reporting a reduction in RDO at 1-month follow-up.

Statistical Analysis

Prior to conducting analyses, the possibility of nesting within data due to recruitment from 3 geographically separate WIC clinics was evaluated; hierarchical linear modeling analysis indicated no evidence of nesting within clinic. The effectiveness of randomization was assessed by comparing baseline characteristics of the experimental group to the control group. *t*-Tests (for continuous variables), chi-squared tests (for dichotomous variables), Fisher's exact tests (for dichotomous variables of small cell sizes), and nonparametric analyses (for non normal distributions) were used to test for equivalence between groups. Plots and examination of skewness and kurtosis were used to identify evidence of non normality for continuous variables. Where sparseness existed in categorical variables (i.e., race, marital status, and age group), data categories were collapsed to produce sufficient cell sizes. Although non normal distributions are a typical characteristic of this type of data, the analytical methods used were considered robust enough and the data followed all assumptions necessary for all analyses conducted (Draper and Smith, 1981). Therefore, the final analyses were conducted using the original (raw scores) data. To test the hypothesis that the intervention was effective at reducing the number of RDO from baseline to the 1-month assessment, logistic regression was used to compute OR and 95% CI. A one-way analysis of covariance was used to test the hypothesis that the intervention was effective by comparing treatment groups on MDPO at the 1-month assessment (Vickers and Altman, 2001), controlling for MDPO at baseline. In the subgroup of women who showed a reduction in RDO at 1-month postbaseline, a chi-squared test was conducted to evaluate differences in the sustainability of study effects between participants in the experimental and control groups at 2 months postbaseline, where the sustained reduction was defined as sustained or further reduced the number of RDO. The number of missing observations was compared between treatment arms for the study. Logistic regression models were used to determine if the "missingness" violated the assumption of missing completely at random (MCAR) (Ridout, 1991). Multiple models yielded a Little's test range of $\chi^2 = 0.245$, df = 2, $p = 0.885$ to $\chi^2 = 8.793$, df = 4, $p = 0.066$. Furthermore, analyses looking at the 15 participants who were lost to follow-up and the additional 3 that had incomplete data yielded no significant differences between treatment arms or baseline characteristics for these subgroups compared with the participants who completed Follow-Up I and/or had complete data. Therefore, there was no evidence that the missing data threatened the validity of the study, MCAR was not rejected, imputation was not needed, and cases with missing main outcomes were dropped from the final analyses. Multivariate analyses revealed a total of 4 multivariate outliers (Probability Mahalanobis $D^2 < 0.001$). The outliers did not significantly impact the analyses; therefore, final outcome analyses were conducted with and presented for data from study completers (completed both baseline and Follow-Up I activities); the 4 identified outliers were excluded from analysis (Tabachnick and Fidell, 2007). Statistical analyses were conducted with the Statistical Package for the Social Sciences (SPSS) for Windows version 16.0 (SPSS for Windows, 2007).

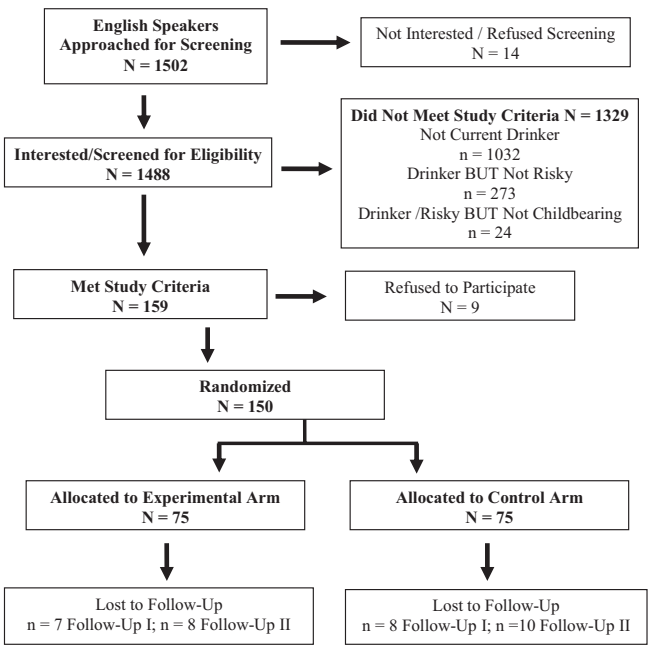

Fig. 1. Recruitment and randomization of study participants.

RESULTS

A total of 1,502 English speaking, nonpregnant women were approached to be screened for the study; 1,488 women (99%) were interested and agreed to be screened. Of the total number of women screened, 159 (11%) met inclusion criteria for study participation; however, nine women (6%) refused to participate after being informed about the study requirements. Thus 150 women met eligibility criteria, were enrolled, and completed baseline study activities, with 75 allocated to the experimental group and 75 to control group. Fifteen participants were lost to follow-up at Follow-Up I (control $n = 8$, experimental $n = 7$). Figure 1 illustrates the CONSORT diagram, which provides a summary of study flow.

Baseline characteristics of the sample are shown in Tables 1 and 2 for the 150 women enrolled in the study from 3 WIC Clinics in San Diego County (Clinic 1, $n = 52$; Clinic 2, $n = 44$; Clinic 3, $n = 54$) between June 2009 and October 2009. A comparison of baseline characteristics between the 2 treatment groups yielded no significant differences across sociodemographic characteristics or alcohol consumption patterns. Study participants were predominantly Latina (44%) with a mean age of 26.33 years (SD 5.30, range 18 to 44). Nearly half of the participants reported education beyond the high school level (48%). Most were not current smokers (61%), with 50% having more than 1 living child at home. Approximately 67% reported using some type of contraceptive at the time of baseline assessment with 57% using either an effective or a very effective method. More than half (65%) scored positive on the T-ACE.

All of the participants reported that they were comfortable using the program and found the program easy to use, while nearly all (96%) of the participants reported that the program was both useful and interesting (data not shown). In addition,

Table 1. Demographic Characteristics of Participants by Treatment Condition ($N = 150$)

Variable	Control	Experimental	*p*-Value
Age (years), mean (±SD)	25.75 (5.228)	26.91 (5.335)	0.181
Age category (years), *n* (%)			0.330
18–20	7 (9)	6 (8)	
21–30	58 (77)	52 (69)	
31–45	10 (13)	17 (23)	
Race/Ethnicity, *n* (%)			0.271
Caucasian/White	27 (36)	24 (32)	
Hispanic/Latina	36 (48)	30 (40)	
African American/Black	3 (4)	9 (12)	
Multi-Racial	4 (5)	8 (11)	
Other	5 (7)	4 (5)	
Years of education, mean (±SD)	12.85 (1.865)	12.84 (2.181)	0.980
Education category, *n* (%)			1.000
Less than high school	13 (17)	13 (17)	
High school	26 (35)	26 (35)	
Above high school	36 (48)	36 (48)	
Marital status, *n* (%)			0.259
Single/not living with partner	27 (36)	16 (21)	
In a relationship/not living with partner	9 (12)	9 (12)	
Single or in a relationship/living with partner	18 (24)	18 (24)	
Married	16 (21)	26 (35)	
Married but separated or divorced	5 (7)	6 (8)	
Number of living children, *n* (%)			0.690
0	7 (9)	7 (9)	
1	33 (44)	28 (37)	
>1	35 (47)	40 (53)	
Currently using contraceptives [Yes], *n* (%)	50 (67)	51 (68)	0.862
Contraceptive effectiveness, *n* (%)			0.141
Not effective (not using)	15 (20)	14 (19)	
Somewhat effective (condoms)	19 (25)	17 (23)	
Effective (shot, pill, ring, patch)	32 (43)	24 (32)	
Very effective (IUD, implant)	9 (12)	20 (27)	
Cell phone use [Yes], *n* (%)	67 (89)	65 (87)	0.615
SMS text messaging use [Yes], *n* (%)	60 (80)	62 (83)	0.802

p-Values for differences between treatment groups were calculated using chi-squared analyses for dichotomous data, independent *t*-tests for continuous data, and nonparametric analyses (Mann–Whitney *U*-test) for non normally distributed data.

SMS, short message service.

Table 2. Baseline Substance Use Characteristics of Participants by Treatment Condition ($N = 150$)[a]

Variable	Control	Experimental	*p*-Value
Tobacco use [Yes], *n* (%)	30 (40)	29 (39)	0.867
Illicit Drug use [Yes], *n* (%)	6 (8)	5 (7)	0.790
Age first started drinking (years), *n* (%)			0.765
21+	11 (15)	14 (19)	
17–20	27 (36)	24 (32)	
<16	37 (49)	37 (49)	
Family member with alcohol problem [Yes], *n* (%)	54 (74)	53 (72)	0.749
T-ACE score, mean (±SD)	1.72 (1.298)	1.79 (1.312)	0.797
T-ACE positive [Yes], *n* (%)	49 (66)	49 (67)	0.907
Knowledge questions correct [out of 7], mean (±SD)	5.41 (0.737)	5.20 (1.053)	0.153
Overall perceived threat [Low], *n* (%)	0 (N/A)	4 (5)	0.120
Health and alcohol perceived threat [Low], *n* (%)	69 (92)	68 (91)	0.772
Pregnancy and alcohol perceived threat [Low], *n* (%)	1 (1)	5 (7)	0.209
No. RDO in last month, mean (±SD)	4.43 (4.300)	4.59 (4.081)	0.620
Total no. drinks in past 2 weeks, mean (±SD)	12.07 (10.726)	11.31 (10.571)	0.584
MDPO in past 2 weeks, mean (±SD)	3.27 (1.887)	2.87 (1.334)	0.134
No. RDO in past 2 weeks, mean (±SD)	2.05 (2.160)	1.81 (1.914)	0.464
Most no. drinks in past 2 weeks, mean (±SD)	4.44 (2.539)	3.96 (2.017)	0.207
Mean standard DPO in past 2 weeks, mean (±SD)	6.82 (6.791)	6.07 (4.917)	0.898

p-Values for differences between treatment groups were calculated using chi-squared analyses or Fisher's exact test for dichotomous data, independent *t*-tests for continuous data, and nonparametric analyses (Mann–Whitney *U*-test) for non normally distributed data.

[a]Variations in *N* (decline to answer option) control, experimental: illicit drug use: 74, 72; family member alcohol problem: 73, 74; T-ACE score and positive: 74, 73; all variables for past 2 weeks: 73, 74.

DPO, drinks per occasion; MDPO, mean drinks per occasion; RDO, risky drinking occasions; T-ACE, Tolerance, Annoyed, Cut Down, Eye-Opener screening.

none of the participants failed to navigate through the web-based program.

Analysis of treatment effect at Follow-Up I revealed no significant differences between the experimental and the control condition on any of the alcohol measures at 1-month post-intervention (Table 3). However, a reduction in all measures of quantity and frequency of risky alcohol use (approximately a 2-fold decrease) was noted in both the control and experimental groups (Table 3).

Regardless of treatment condition, the majority of participants reported a reduction in number of RDO at Follow-Up I (total 92/131, 70%; control 43/63, 68%; experimental 49/68, 72%). However, treatment condition did not significantly predict reduction in number of RDO (OR 1.200, 95% CI 0.567 to 2.539, $p = 0.634$) (Table 4). Similarly, after controlling for baseline MDPO there was no significant effect of treatment on MDPO at Follow-Up I ($p = 0.403$) (Table 5).

Of the 131 participants who completed Follow-Up I, 92 participants reported a reduction in the number of RDO in the previous month at Follow-Up I and, of these, 64 completed Follow-Up II and were included in the analysis of sustained reduction between Follow-Up I and Follow-Up II (control $n = 28$ and experimental $n = 36$). Consistent with the findings regarding reduction of RDO at Follow-Up I, the majority of individuals at Follow-Up II reported a sustained reduction 49 (77%). However, there was no significant difference by treatment group ($\chi^2 = 0.068$, df = 1, $p = 0.795$) (data not shown).

DISCUSSION

This study evaluated the efficacy of a web-based assessment and tailored intervention in reducing risky alcohol consumption in low-income women of childbearing potential. We found no significant effect of treatment on any outcome measure. However, women in both treatment conditions reported similar and substantial reductions in the number of risky alcohol consumption occasions in the previous month as well as MDPO in the previous 2 weeks. In addition, those who reported reduction in RDO at Follow-Up I were likely to sustain that reduction at Follow-Up II regardless of treatment condition. These findings suggest a possible effect of the web-based assessment alone that was not significantly improved by the personalized feedback. These results are consistent with other studies (Chang et al., 2000) that suggest that simply assessing a behavior may result in a change in that behavior (Clifford and Maisto, 2000). For example, Kypri and colleagues (2007) have shown that hazardous drinkers are likely to reduce their drinking following assessment, and have suggested that this demonstrates the *Hawthorne Effect*, a change in behavior as a result of external interest in that behavior. In other words, the process of being asked about alcohol in a detailed and comprehensive manner both via screening and the web-based assessment increased the woman's awareness of actual levels of consumption and functioned to modify her behavior on that basis alone.

It is possible that the general information on health risks of alcohol and on recommendations about drinking in pregnancy provided for participants randomized to the control condition served as an intervention as well, resulting in convergence of the 2 treatment groups with respect to outcome. It is also possible that in this population, a brief web-based intervention would have been differentially more effective among women who were much heavier drinkers and who were not included in our sample. Nevertheless, the sample that was recruited may represent the larger number of more moderate drinking women in the general population who are potentially at risk of an adverse outcome should they become pregnant and continue drinking in current patterns.

Table 3. Comparison of Participants at Follow-Up I by Treatment Condition

Variable	Control	Experimental	*p*-Value
No. RDO in last month, mean (±SD)	2.87 (3.316)	2.51 (2.751)	0.475
Reduction in no. RDO in last month [Yes], *n* (%)	43 (68)	49 (72)	0.634
Total no. drinks in past 2 weeks, mean (±SD)	6.96 (8.454)	5.37 (5.518)	0.592
Reduction in total no. drinks in past 2 weeks [Yes], *n* (%)	48 (79)	52 (78)	0.883
MDPO in past 2 weeks, mean (±SD)	2.28 (1.898)	1.96 (1.643)	0.298
Mean difference in MDPO in past 2 weeks, mean (±SD)	0.75 (1.996)	0.85 (1.819)	0.759
No. RDO in past 2 weeks, mean (±SD)	1.21 (1.737)	0.96 (1.177)	0.651
Mean difference in no. RDO in past 2 weeks, mean (±SD)	−0.90 (1.491)	−0.84 (1.675)	0.815
Most no. drinks in past 2 weeks, mean (±SD)	2.84 (2.233)	2.56 (2.242)	0.389
Mean difference in most no. drinks in past 2 weeks: mean (±SD)	−1.33 (2.264)	−1.28 (2.194)	0.911
Currently pregnant [Yes], *n* (%)	2 (3)	2 (3)	0.988
Currently using contraceptives [Yes], *n* (%)	35 (52)	44 (65)	0.142
Contraceptive effectiveness, *n* (%)			0.317
Not effective (not using)	32 (48)	24 (35)	
Somewhat effective (condoms)	8 (12)	6 (9)	
Effective (shot, pill, ring, patch)	18 (27)	23 (34)	
Very effective (IUD, implant)	9 (13)	15 (22)	

Follow-up was conducted via telephone using selected measurements from Baseline; *p*-Values for differences between treatment groups were calculated using chi-squared analyses for dichotomous data, independent *t*-tests for continuous data, and nonparametric analyses (Mann–Whitney *U*-test) for non normally distributed data.

MDPO, mean drinks per occasion; RDO, risky drinking occasions.

Table 4. Reduction of Risky Drinking Occasions at Follow-Up I by Treatment Condition ($N = 131$)

Variable	*B* (SE)	df	Wald	Odds ratio	95% CI	*p*-Value
Condition (experimental group)	0.182 (0.382)	1	0.226	1.200	0.567–2.539	0.634
Constant	0.765 (0.271)	1	7.999	2.150	–	0.005

Logistic regression df = degrees of freedom.

Table 5. Mean Drinks per Occasion (MDPO) at Follow-Up I by Treatment Condition ($N = 128$)

Source	Sum of squares	df	Mean square	*F*-ratio	*p*-Value	η_{p2}
Baseline MDPO	26.623	1	26.623	9.094	0.003**	0.068
Condition (experimental group)	2.057	1	2.057	0.703	0.403	0.006
Error	365.937	125	2.927	–	–	–
Condition	Adjusted mean (SE)				95% CI	
Control	2.238 (0.220)				1.804–2.672	
Experimental	1.983 (0.209)				1.569–2.398	

Analysis of covariance df = degrees of freedom and η_{p2} = partial ETA squared, $R^2 = 0.076$ (adjusted = 0.062).
**Significant at $p \leq 0.05$.

Finally, since we relied on subjective reporting of alcohol use, and in particular because the follow-up interviews were by telephone, it is possible that the women reported reduction in risky drinking due to social desirability or fear of consequences related to WIC benefits for their children, and not due to a true change in behavior. To help address this possibility, we assured participants of the confidentiality of the information they provided to the research staff and, as part of the consent process, women were advised that participation would have no impact on their ability to receive benefits through WIC. Nevertheless, approximately 75% of risky drinking women in this study reported reductions in that behavior and reported maintaining those reductions for 2 months postassessment which suggests promise for the impact of an eHealth approach to primary prevention of alcohol-exposed pregnancies.

From a public health and translational research perspective, the use of HIT to develop self-administered, cost-effective (low cost and feasible for implementation with limited resources) methods for efficiently conducting alcohol assessments and for delivering targeted interventions has broad-based appeal for integration into a variety of health service settings including maternal and child primary care. This study applied this methodology to a low-income population specifically at risk for an alcohol-exposed pregnancy and having children with alcohol-related birth defects. The methodology used in this study may provide valuable information to better address the recognized health disparities associated with alcohol use in pregnancy (Havens et al., 2009). Participant satisfaction ratings indicate that the web-based assessment is both feasible and acceptable in this population; with consistently positive responses on the 7 domains assessed (comfort, ease of use, usefulness, interest, quality, length, and repeated use). These findings suggest that HIT may be a valuable tool in the development, evaluation, and translation of assessment and prevention efforts for alcohol consumption among women of childbearing potential.

In addition to cost savings, SBI approaches using HIT have multiple advantages over traditional approaches to assessment and brief intervention. There are substantial limitations in the accurate assessment of alcohol consumption quantity and frequency (Dawson, 2003). Technology can help researchers and health providers mitigate this limitation. Through increased anonymity and more interactive methodology, such as the drink-size photos used in combination with the timeline follow-back procedure in this study, the quantity and frequency of alcohol consumption may be measured more accurately. Furthermore, as evident from the empirical research, misinformation about alcohol use during pregnancy, both on the part of healthcare consumers and providers, persists (Morse and Hutchins, 2000). HIT can be used to deliver a consistent and standard message to healthcare consumers. Improved assessment and intervention approaches using technology may help increase the primary prevention of prenatal alcohol use and therefore have a broad public health impact.

Although the participants in this study were predominantly Latina and Caucasian women of low-income status, if the findings of this study can be replicated and in other populations, the use of this program is likely to be generalizable with culturally specific modifications to other groups. This study provides a starting point for additional studies testing the effectiveness of web-based assessments/interventions to appropriately capture and modify alcohol consumption in women at risk of an alcohol-exposed pregnancy. Future studies might address the question of assessment itself as an intervention. A study that includes a comparison group for which alcohol consumption data is available without a comprehensive study-driven assessment component and a study that compares multiple levels of intensity of assessment alone would help address this important issue. Future studies might

also seek to validate maternal report of consumption through use of one or more biomarkers of exposure.

Primary prevention in risky drinking women prior to conception is the optimum intervention for FASD. The many benefits of eHealth technology may make this possible for the substantial proportion of the population who binge drink and are likely to experience an unplanned pregnancy.

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