

Reducing Adverse Outcomes from Prenatal Alcohol Exposure: A Clinical Plan of Action

R. Louise Floyd, Mary J. O'Connor, Jacquelyn Bertrand, and Robert Sokol

Fetal alcohol spectrum disorders (FASDs) are among the leading preventable causes of developmental disorders in the United States; however, recognition and prevention of these conditions cannot be achieved without informed and educated health providers. This commentary addresses the importance of recognition and prevention of FASDs through the use of well-established standardized practices of diagnosis, screening, and brief alcohol reduction counseling. It is hoped that more knowledge on currently available procedures will encourage their use in the provision of routine health care to all women of childbearing age.

Key Words: Fetal Alcohol Spectrum Disorders, Fetal Alcohol Syndrome, Screening Women For Alcohol Use, Pregnancy and Alcohol, Brief Intervention.

OVER THE PAST 30 years, mounting evidence has prompted increased attention to the role of prenatal alcohol use in the occurrence of a wide range of disorders known as fetal alcohol spectrum disorders (FASDs; Sokol et al., 2003). Adverse effects associated with prenatal alcohol exposure vary depending on the amount and pattern of alcohol consumed and include intrauterine and postnatal growth restriction, selected birth defects, and neurodevelopmental disorders (Sokol et al., 2003). Fetal alcohol syndrome (FAS) is the most severe condition in the live-born offspring of women who used alcohol during pregnancy and is characterized by facial malformations, growth deficiencies, and neurodevelopmental deficits (Jones and Smith, 1973). While prevalence rates for FAS vary widely depending on the epidemiological and clinical methods used to collect information and the populations being studied, one recent report estimated a national rate of 0.5 to 2 cases per 1,000 live births for the United States (May and Gossage, 2001). Recent estimates of the total lifetime cost of FAS are \$2.0 million per individual case, with an annual total cost of \$4 billion (Lupton et al., 2004).

DIAGNOSTIC GUIDELINES FOR FAS

Fetal alcohol syndrome is often not recognized by physicians, leading to underdiagnosis and missed opportunities to provide needed services to affected individuals and their families (Stoler and Holmes, 2004). In 2002, the Centers for Disease Control and Prevention (CDC) was mandated by Congress to develop and disseminate diagnostic guidelines for FAS and other prenatal alcohol-related conditions and to coordinate these efforts with the National Task Force on Fetal Alcohol Syndrome and Fetal Alcohol Effects (CDC, 2002a). An overall goal of this mandate was to increase identification of affected individuals through the use of uniform diagnostic criteria that could be readily disseminated to medical and allied health students and practitioners. The final report, *Fetal Alcohol Syndrome: Guidelines for Referral and Diagnosis*, was released in June 2004 (Bertrand et al., 2004). These guidelines updated the progress in research and practice since the last report on FAS was released by the Institute of Medicine in 1996 (Stratton et al., 1996). The 2004 report provided more specificity to the characteristic facial dysmorphia and growth deficits associated with FAS and described in greater depth the core central nervous system deficits found in children and adults with FAS, along with the cognitive and behavioral manifestations of these deficits. The full report can be accessed online at www.cdc.gov/ncbddd/fas/documents/FAS_guidelines_accessible.pdf.

PREVENTION OF PRENATAL ALCOHOL EXPOSURE

Federal agencies, professional societies, and universities have undertaken ongoing efforts to educate medical and allied health professionals about recognition and diagnosis of FASDs (American Academy of Pediatrics, 2000; Astley, 2004; National Institute on Alcohol Abuse and Alcoholism, 1999; Sharpe et al., 2004). However, to fully address

From the Centers for Disease Control and Prevention National Center on Birth Defects and Developmental Disabilities, Fetal Alcohol Syndrome Prevention Team, Atlanta, Georgia (RLF, JB); the Department of Psychiatry and Biobehavioral Sciences, University of California at Los Angeles, David Geffen School of Medicine, Los Angeles, California (MJO); and the Department of Obstetrics and Gynecology, Wayne State University, School of Medicine, Detroit, Michigan (RS).

Received for publication May 1, 2006; accepted May 22, 2006.

Reprint requests: Mary J. O'Connor, Department of Psychiatry and Biobehavioral Sciences, David Geffen School of Medicine at UCLA, Rm 68-265A, 760 Westwood Plaza, Los Angeles, CA 90024; Fax: 310-825-2682; E-mail: mocconnor@mednet.ucla.edu

Copyright © 2006 by the Research Society on Alcoholism.

DOI: 10.1111/j.1530-0277.2006.00175.x

the public health impact of FASDs, efforts must also be directed toward the primary prevention of these conditions. Current guidelines on clinical thresholds published by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) are that women drinking more than 7 drinks per week or more than 3 drinks on any given day in the past month should be further assessed for risk of developing alcohol-related problems (NIAAA, 2005). Pregnant women are advised to abstain from all alcohol use, a long-standing federal advisory that is supported by major professional societies as well (American College of Obstetricians and Gynecologists, 2005). However, studies conducted by CDC (2002b) and the Substance Abuse and Mental Health Services Administration (2002) found that more than half of all women of childbearing age (18 through 44 years of age) reported alcohol use, and 1 in 8 reported binge drinking (5 or more drinks per drinking occasion) in the past month. Furthermore, 9% to 12% of pregnant women reported consuming alcohol and approximately 3% reported drinking at levels that have been consistently associated with adverse effects on the fetus (Jacobson and Jacobson, 1999). Thus, substantial risk for FASDs persists.

In 2005, following an initial health advisory in 1981, the Surgeon General again issued an advisory stating that pregnant women, women planning to become pregnant, or women at risk of becoming pregnant should not drink alcohol (www.hhs.gov/surgeongeneral/pressreleases/sq02222005.html); that a pregnant woman who has already consumed alcohol during her pregnancy should stop drinking; and that women of childbearing age who are drinking alcohol should consult their physicians to take steps to reduce the possibility of an alcohol-exposed pregnancy. Moreover, the Surgeon General advised that health professionals should inquire routinely about alcohol consumption by women of childbearing age, inform them of the risks of alcohol consumption during pregnancy, and advise them not to drink alcohol during pregnancy.

Effective prevention strategies require the accurate identification of women in the preconception period who are drinking and the initiation of evidenced-based interventions to assist these women in reducing their risk for an alcohol-exposed pregnancy. Over the past 20 years, concerted efforts have been made to identify factors among childbearing-aged women associated with harmful patterns of alcohol consumption. Women who have had a previous child with FAS are at especially high risk of giving birth to a second affected child (Abel, 1988; May et al., 1983). Other reported characteristics of women giving birth to a child with FAS include having a low socioeconomic status (SES); being Black/African American, American Indian/Native American, or Alaska Native; being a smoker; being unmarried; having a history of previous or current illicit drug use; having a history of physical or sexual abuse; experiencing psychological stress; and having mental health disorders (Abel and

Hannigan, 1995; Flynn et al., 2002; Kvigne et al., 2003). In addition, heavy episodic drinking has been identified as an important risk factor because of the demonstrated association between binge drinking and unintended pregnancy (Foster et al., 2003; Naimi et al., 2003) and between higher peak blood alcohol levels and the increased magnitude of the teratogenic effects of alcohol on the fetus (Avaria et al., 2004).

METHODS FOR ESTABLISHING ALCOHOL USE

Accurate assessment of alcohol-related pregnancy risk can be enhanced through the use of reliable screening tools. The most frequently used screening tools measure the level of alcohol consumed, or the consequences of drinking, or both. A commonly employed tool that has proven useful in screening for alcoholism, particularly in clinical populations and in men, is the CAGE (Mayfield et al., 1974). However, evidence suggests that the use of the CAGE with childbearing-aged women who might be at risk but who are not alcohol dependent is not recommended (Sokol et al., 1989). Questionnaires that are recommended for women include the T-ACE, the TWEAK, and the Alcohol Use Disorders Identification Test-C (AUDIT-C) (Bradley et al., 1998; Dawson et al., 2005; Russell, 1994; Russell et al., 1994; 1996; Sokol et al., 1989). Screening tools specifically developed and used with pregnant women are the T-ACE and the TWEAK. The T-ACE has 4 questions that take less than a minute to answer. The questions are: **(T)** TOLERANCE, how many drinks does it take to make you feel high? **(A)** Have people ANNOYED you by criticizing your drinking? **(C)** Have you ever felt you ought to CUT DOWN on your drinking? **(E)** EYE OPENER, Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover? One point is given for each affirmative answer to the **A**, **C**, **E** questions, and 2 points are given when a pregnant woman reports a tolerance of more than 2 drinks to feel high. A positive screen is a score of 2 or more points. The T-ACE has been shown to be a brief, efficient screen for risk drinking and out performs clinical assessment alone (Chang et al., 1998).

The TWEAK (Russell, 1994; Russell et al., 1994) is similar to the T-ACE and elicits information about: **(T)** TOLERANCE for alcohol; **(W)** WORRY or concern by family or friends about drinking behavior; **(E)** EYE OPENER, the need to have a drink in the morning; **(A)** "blackouts" or AMNESIA while drinking; and **(K)** the self-perception of the need to CUT DOWN on alcohol use. Scores range from 0 to 7. If more than 2 drinks are needed to feel high, the tolerance question is scored as a 2. A total score of 2 or more on the TWEAK is suggestive of harmful drinking patterns in obstetric patients (Russell et al., 1994). In a study examining the usefulness of the TWEAK for a group of low-income pregnant women participating in the Special Supplemental Nutrition

Program for Women, Infants, and Children (WIC), the specificity of the TWEAK was high for all racial and ethnic groups studied using a cut point of 2 or more; however, sensitivity, while high for White non-Hispanic women, was moderate for Black/African-American and Hispanic women (O'Connor and Whaley, 2003).

A recent large epidemiological study examined the use of the AUDIT-C on a sample derived from the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) conducted by the NIAAA (Dawson et al., 2005). The NESARC AUDIT-C included modifications to the first 3 questions of the original AUDIT (Saunders et al., 1993) and was based solely on items reflecting alcohol consumption. The tool was developed to meet the challenge of brevity and ease of administration provided by other brief screening instruments. The 3 questions on the screen are: (1) During the past 12 months, about how often did you drink ANY alcoholic beverage? (2) Counting all types of alcohol combined, how many drinks did you USUALLY have on days when you drank during the past 12 months? (3) During the past 12 months, about how often did you drink FIVE OR MORE drinks in a single day? Scores range from 0 to 4 on each question. The AUDIT-C demonstrates good sensitivity and specificity at a cut point of 3 or greater for identifying risk drinking in nonpregnant and pregnant women and performs well across different racial and ethnic groups.

Alcohol use among teenaged girls is an important public health concern and has been associated with decreased use of contraception, increased sexual assault, and more sexually transmitted diseases (Foster et al., 2003; U.S. Department of Health and Human Services, 2000). The CRAFFT is a brief measure designed specifically to identify substance-related problems in adolescent populations (Knight et al., 1999). The measure is simple to score, inquires about alcohol and drug use, and has been found to have good psychometric properties in a predominantly female sample between 14 and 18 years of age (Knight et al., 2003). CRAFFT is an acronym for the first letters of key words in the screener's 6 questions: (C) Have you ever ridden in a CAR driven by someone (including yourself) who was high or had been using alcohol or drugs? (R) Do you ever use alcohol or drugs to RELAX, feel better about yourself, or fit in? (A) Do you ever use alcohol or drugs while you are by yourself, ALONE? (F) Do you ever FORGET things you did while using alcohol or drugs? (F) Does your family or do your FRIENDS ever tell you that you should cut down on your drinking or drug use? (T) Have you ever gotten into TROUBLE while you were using alcohol or drugs? Each question on the CRAFFT is given a score of 1 and a cut point of 2 provides moderate sensitivity and excellent specificity for identifying alcohol use disorders in adolescents. It is recommended that any positive answer on this measure be followed by further assessment of pattern of use to increase sensitivity and to guide decisions about the need for intervention.

In addition to screening for alcohol risk, it is advisable to inquire about actual alcohol consumption levels. The simplest method for ascertaining alcohol consumption levels is by asking the woman about her drinking pattern using quantity (Q) and frequency (F) measures. Q assesses the amount of alcohol consumed on an average drinking day and F assesses how often alcohol is consumed. Heavy episodic or binge drinking is assessed by determining the maximum quantity of drinks consumed over a specific period of time (Day and Robles, 1989). The type of alcoholic beverages consumed also should be considered because reliance on standard drink measurements when assessing women consuming higher alcohol content beverages can result in considerable underestimation of consumption (Kaskutas and Graves, 2001). Although denial can be triggered by direct questioning about alcohol consumption patterns, particularly in heavy consumers, when asked in a standardized nonjudgmental manner, with the questions embedded in the context of a general medical history screen, relatively high sensitivity and specificity can be achieved with minimal cost and effort (NIAAA, 2003).

BRIEF INTERVENTION

For women who screen positive for alcohol use or abuse, brief intervention (BI) has been shown to be a low-cost, effective treatment alternative that uses time-limited, self-help, and preventative strategies to promote reductions in alcohol use in nondependent individuals and, in the case of dependent people, to facilitate their referral to specialized treatment programs (Babor and Higgins-Biddle, 2000; Bien et al., 1993; Fleming, 2003). The approach employs the use of brief motivational counseling and can be delivered by personnel who are not specialists in the treatment of alcohol abuse or dependence. The acronym FRAMES has been used to summarize the key elements found in most successful BIs: Feedback of personal risk, Responsibility for personal control, Advice to change, Menu of ways to reduce or stop drinking, Empathetic counseling style, and Self-efficacy or optimism about cutting down or stopping drinking (Miller and Sanchez, 1994). Brief intervention also involves establishing a drinking goal and follow-up of progress with ongoing support. Recently, the U.S. Preventive Services Task Force (2004) found good evidence that BIs produced reductions in alcohol consumption and recommended their use with women of childbearing age.

Project CHOICES (Changing High-risk alcohol use and Increasing Contraception Effectiveness Study) serves as a good example of an effective BI approach. The study was funded by CDC and aimed at preventing alcohol-exposed pregnancies among high-risk women in various community settings (Project Choices, 2003). This project focused on providing women 2 alternatives: reducing risk drinking levels or instituting effective contraception. Participants

were nonpregnant women who were of childbearing age, fertile, sexually active, and using ineffective or no contraception at study commencement. Results revealed that at 6-month follow-up, 68.5% of the women had lowered their risk of having an alcohol-exposed pregnancy (12.6% reduced their drinking only, 23.1% reported using effective contraception only, and 32.9% reported doing both).

Evidence on the effectiveness of BI during pregnancy is limited; however, 3 completed randomized controlled trials, funded by the NIAAA, have demonstrated the positive effects of BI on decreasing alcohol consumption, increasing positive newborn outcomes, and decreasing alcohol use during subsequent pregnancies in high-risk women (Chang et al., 2005; Hankin et al., 2000; O'Connor and Whaley, 2006). In these studies, BI techniques were used successfully with women from different racial, ethnic, and socioeconomic backgrounds and were administered in obstetrical care clinics as well as non-health care community settings.

MOVING KNOWLEDGE TO PRACTICE

Research to date suggests that routine formal screening for alcohol use should be conducted with all women of childbearing age. Screening can be done in both physicians' offices and in community health settings. Simple screening tools have been found to be beneficial for both nonpregnant and pregnant women. The T-ACE and the TWEAK, in particular, are the recommended tools of choice for pregnant women. The CRAFFT shows promise as an alcohol and other drug screener for female adolescents. Simple screening questions that include measures of quantity/frequency and heavy episodic drinking such as those used on the AUDIT-C have proven beneficial.

Brief intervention administered by physicians and allied health professionals in medical and nonmedical settings are effective in bringing about reductions in drinking in the preconception and pregnancy periods. Women who are pregnant, planning a pregnancy, or at risk of pregnancy should be advised not to drink, as damage to the fetus can occur before pregnancy recognition and no safe threshold of alcohol use during pregnancy has been established. Women who are fertile, sexually active, and not using effective contraception should be advised that they are at risk for an alcohol-exposed pregnancy and should abstain from alcohol use or establish effective contraception. Other women of childbearing age, who are using effective contraception, should be advised to drink no more than 7 drinks per week and no more than 3 drinks on any one occasion.

Recent surveys of practicing obstetricians-gynecologists support their need and desire for information on effective means for screening and counseling women who report alcohol use (Diekman et al., 2000). In an effort to enhance physician use of current screening and intervention approaches for preventing alcohol-exposed pregnancies,

federal agencies have developed and disseminated clinical guidelines and tools for primary care providers for screening pregnant and nonpregnant women on alcohol use and recommendations for appropriate advice depending on the level of alcohol use and consequences. Additionally, 4 regional training centers were funded by CDC to provide education and training to medical and allied health professionals and students in the identification and diagnosis of children affected by prenatal alcohol exposure and effective approaches for intervening with and preventing these conditions. Finally, the American College of Obstetricians and Gynecologists, under the auspices of CDC, is developing materials to enhance formal screening and BI provided by physicians and nurse practitioners.

CONCLUSION

Fetal alcohol spectrum disorders are among the leading, preventable causes of developmental disorders in the United States. Despite progress made, preventing the negative consequences of prenatal alcohol exposure remains an unmet challenge that can be addressed only through standardized and routine screening and brief intervention. It is the goal of this commentary to encourage the use of these techniques by all health practitioners who provide services to women of childbearing age.¹

ACKNOWLEDGMENT

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

REFERENCES

- Abel EL. (1988) Fetal alcohol syndrome in families (Commentary). *Neurotoxicol Teratol* 10:12.
- Abel EL, Hannigan JH (1995) Maternal risk factors in fetal alcohol syndrome: provocative and permissive influences. *Neurotoxicol Teratol* 17:445–462.
- American Academy of Pediatrics. Committee on Substance Abuse and Committee on Children with Disabilities (2000) Fetal alcohol syndrome and alcohol-related neurodevelopmental disorders. *10:358–361*.
- American College of Obstetricians and Gynecologists (2005) *Substance Use: Obstetric and Gynecologic Implications*. ACOG Special Issues in Women's Health, pp 105–150. ACOG, Washington, DC.
- Astley SJ (2004) *Diagnostic Guide for Fetal Alcohol Spectrum Disorders: The 4-Digit Diagnostic Code*. University of Washington, Seattle, WA.
- Avaria MA, Mills JL, Kleinstaub K (2004) Peripheral nerve conduction abnormalities in children exposed to alcohol in utero. *J Pediatr* 144:338–343.
- Babor TF, Higgins-Biddle JC (2000) Alcohol screening and brief intervention: dissemination strategies for medical practice and public health. *Addiction* 95:677–686.

¹More information about federally sponsored programs addressing FASDs and prenatal alcohol screening and intervention can be obtained at the following websites: www.nih.gov, www.cdc.gov, www.samhsa.gov, and www.preventiveservices.ahrq.gov.

- Bertrand J, Floyd RL, Weber MK, O'Connor M, Riley EP, Cohen DENational Task Force on FAS/FAE (2004) *Fetal Alcohol Syndrome: Guidelines for Referral and Diagnosis*. Centers for Disease Control and Prevention, Atlanta, GA.
- Bien TH, Miller WR, Tonigan JS (1993) Brief interventions of alcohol problems: a review. *Addiction* 88:315–335.
- Bradley KA, Boyd-Wickizer J, Powell SH, Burman ML (1998) Alcohol screening questionnaires in women: a critical review. *JAMA* 280: 166–171.
- CDC (2002a) National task force on fetal alcohol syndrome and fetal alcohol effect: defining the national agenda for fetal alcohol syndrome and other prenatal alcohol-related effects. *MMWR* 51 (RR-14): 9–12.
- CDC (2002b) Alcohol consumption among pregnant and childbearing-aged women—United States, 1991–1999. *MMWR* 51:273–276.
- Chang G, McNamara TK, Orav EJ, et al (2005) Brief intervention for prenatal alcohol use: a randomized trial. *Obstet Gynecol* 105:991–998.
- Chang G, Wilkins-Haug L, Berman S, Goetz MA, Behr H, Hiley A (1998) Alcohol use an pregnancy: improving identification. *Obstet Gynecol* 91:892–898.
- Dawson DA, Grant BF, Stinson FS, Zhou Y (2005) Effectiveness of the derived Alcohol Use Disorders Identification Test (AUDIT-C) in screening for alcohol use disorders and risk drinking in the US general population. *Alcohol Clin Exp Res* 29:844–854.
- Day NL, Robles N (1989) Methodology issues in the measurement of substance abuse. *NY Acad Sci* 562:8–13.
- Diekman ST, Floyd RL, Decouffe P, Schulkin S, Ebrahim SH, Sokol RJ (2000) A survey of obstetrician-gynecologists on their patients' alcohol use during pregnancy. *Obstet Gynecol* 95:756–763.
- Fleming MF (2003) Brief interventions and the treatment of alcohol use disorders: current evidence. *Rev Dev Alcohol* 16:375–390.
- Flynn HA, Marcus SM, Barry KL, Blow FC (2002) Rates and correlates of alcohol use among pregnant women in obstetrics clinics. *Alcohol Clin Exp Res* 27:81–87.
- Foster SE, Vaughan RD, Foster WH, Califano JA (2003) Adult consumption and expenditures for underage drinking and adult excessive drinking. *JAMA* 289:989–995.
- Hankin J, Sokol R, Casentrelli J, Shernorr N (2000) Protecting the next pregnancy II: impact on birth weight. *Alcohol Clin Exp Res* 24 (Suppl.): 103A.
- Jacobson JL, Jacobson SW (1999) Drinking moderately and pregnancy: effects on child development. *Alcohol Health Res World* 23:25–30.
- Jones KL, Smith DW (1973) Recognition of the fetal alcohol syndrome in early infancy. *Lancet* 2:999–1001.
- Kaskutas LA, Graves K (2001) Pre-pregnancy drinking: how drink size affects risk assessment. *Addiction* 96:1199–1209.
- Knight JR, Sherritt L, Harris SK, Gates EC, Chang G (2003) Validity of brief alcohol Screening tests among adolescents: a comparison of the AUDIT, POSIT, CAGE, and CRAFFT. *Alcohol Clin Exp Res* 27: 67–73.
- Knight JR, Shrier LA, Bravender TD (1999) A new brief screen for adolescent substance abuse. *Arch Pediatr Adol Medi* 153:591–596.
- Kvigne VL, Lenardsn GR, Borzelleca J, Brock E, Neff-Smith M, Welty TK (2003) Characteristics of mothers who have children with fetal alcohol syndrome or some characteristics of fetal alcohol syndrome. *J Am Board Fam Pract* 16:296–303.
- Lupton C, Burd L, Harwood R (2004) Cost of fetal alcohol spectrum disorders. *Am J Med Genet Part C (Semin Med Genet)* 127C:42–50.
- May PA, Gossage PJ (2001) Estimating the prevalence of fetal alcohol syndrome: a summary. *Alcohol Res Health* 25:159–167.
- May PA, Hymbaugh KJ, Aase JM, Samet JM (1983) Epidemiology of fetal alcohol syndrome among American Indians of the Southwest. *Soc Biol* 30:374–387.
- Mayfield D, McLeod G, Hall P (1974) The CAGE questionnaire: validation of a new alcoholism instrument. *Am J Psychiatry* 131: 1121–1123.
- Miller WR, Sanchez VC (1994) Motivating young adults for treatment and lifestyle change, in *Issues in Alcohol Use and Misuse in Young Adults* (Howard G ed), pp 55–82. University of Notre Dame Press, South Bend, IN.
- Naimi TS, Lipscomb LE, Brewer RD, Gilbert BC (2003) Binge drinking in the preconception period and the risk of unintended pregnancy: implications for women and their children. *Pediatrics* 111:1136–1141.
- National Institute on Alcohol Abuse and Alcoholism (2003) *Helping Patients with Alcohol Problems: A Health Practitioner's Guide*. NIH Pub. No. 03-3769.
- National Institute on Alcohol Abuse and Alcoholism (2005) *Helping Patients Who Drink Too Much: A Clinician's Guide*. NIH Pub. No. 05-3769.
- National Institute on Alcohol Abuse and Alcoholism Office of Research on Minority Health (1999) *Identification and care of fetal alcohol-exposed children: A guide for primary care providers*. NIH Publication No. 99-4369. National Institutes of Health, Rockville, MD.
- O'Connor MJ, Whaley SE (2003) Alcohol use in pregnant low-income women. *J Stud Alcohol* 64:773–783.
- O'Connor MJ, Whaley SE (2006) Brief intervention for alcohol use with pregnant women in the WIC setting. *Am J Public Health*.
- Project CHOICES Intervention Research Group (2003) Reducing the risk of alcohol-exposed pregnancies: a study of motivational intervention in community settings. *Pediatrics* 111:1131–1135.
- Russell M (1994) New assessment tools for drinking during pregnancy, T-ACE, TWEAK, and others. *Alcohol Health Res World* 18: 55–61.
- Russell M, Martier S, Sokol R, Mudar P, et al (1994) Screening for pregnancy risk drinking. *Alcohol Clin Exp Res* 18:1156–1161.
- Russell M, Martier SS, Sokol RJ, Mudar P, Jacobson S, Jacobson J (1996) Detecting risk drinking during pregnancy: a comparison of four screening questionnaires. *Am J Public Health* 86:1435–1439.
- Saunders JB, Aasland OG, Babor TF, del la Fuente JR, Grant M (1993) Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption. II. *Addiction* 88:791–804.
- Sharpe TT, Alexander MA, Hutcherson J, Floyd RL, et al (2004) Physician and allied health professionals training and fetal alcohol syndrome. *J Women's Health* 13:133–139.
- Sokol RJ, Delaney-Black V, Nordstrom B (2003) Fetal alcohol spectrum disorder. *JAMA* 290:2996–2999.
- Sokol RJ, Martier SS, Ager JW (1989) The T-ACE questions: practical prenatal detection of risk-drinking. *Am J Obstet Gynecol* 160: 863–868.
- Stoler MS, Holmes LB (2004) Recognition of facial features of fetal alcohol syndrome in the newborn. *Am J Med Genet Part C (Semin Med Genet)* 127c:21–27.
- Stratton K, Howe C, Battaglia F Eds. (1996) *Fetal Alcohol Syndrome: Diagnosis, Epidemiology, Prevention, and Treatment*. Institute of Medicine. National Academy Press, Washington, DC.
- Substance Abuse and Mental Health Services Administration (2002) *Results from the 2001 National Household Survey on Drug Abuse: Volume 1. Summary of Nation Findings*. Office of Applied Studies, NHSDA Series H-17, DHHS Publication No. SMA 02-3758.
- U.S. Department of Health and Human Services (2000) *Healthy People 2010*, Conference edition. 2:26–29.
- U.S. Preventive Service Task Force (2004) Screening and Behavioral counseling interventions in primary care to reduce alcohol misuse: Recommendation statement. *Ann Intern Med* 140:554–556.