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Rosa Louise Floyd
Centers for Disease Control and Prevention

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Monitoring Prenatal Alcohol Exposure

R. LOUISE FLOYD* AND JASJEET S. SIDHU

Alcohol use during pregnancy is a leading, preventable cause of birth defects and developmental disabilities in the United States, with fetal alcohol syndrome (FAS) being one of the most severe outcomes. Current survey statistics find that approximately one in eight pregnant women (500,000 per year) report alcohol use, with approximately 80,000 reporting binge drinking. While annual rates have fluctuated, trends analysis finds that there has been no significant change in rates of prenatal alcohol exposure over the past 10-year period. Development of effective programs to prevent FAS and to monitor the success of prevention efforts requires epidemiological data systems to inform these activities. This article describes alcohol use patterns among childbearing-age women and data sources that can be used in monitoring this behavior.

KEY WORDS: alcohol misuse; fetal alcohol syndrome; birth defects

INTRODUCTION

Prenatal alcohol use is one of the leading, preventable causes of birth defects and neurodevelopmental disorders in children [American Academy of Pediatrics, 2000] and results in a spectrum of observable outcomes ranging from fetal alcohol syndrome (FAS) to more subtle deficits in growth, development, and cognitive functioning [Astley and Clarren, 2000]. The national prevalence rate of FAS is not known, but Centers for Disease Control and Prevention (CDC) population-based studies in selected states have estimated rates ranging from 0.3–1.5 cases per 1,000 live births [Centers for Disease Control and Prevention, 2002], while other estimates in varying populations combining a variety of case ascertainment methodologies have found estimates ranging from 0.5–2 cases per 1,000 live births [May and Gossage, 2001]. Prenatal alcohol exposure is an important public health concern with national objectives appearing in Healthy People 2010 [U.S. Department of Health and Human Services, 2000] calling for an alcohol abstinence rate of 94% among pregnant women and the complete elimination of binge drinking during pregnancy by the end of the decade.

Achieving significant reductions in rates of prenatal alcohol use could have a major public health impact on reducing rates of FAS and other prenatal alcohol-related developmental disabilities in the United States.

BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM

The BRFSS is a CDC-sponsored surveillance system established in 1984 to...
address the need to provide state-based data, similar to that collected nationally, on health risk behaviors. It is the largest continuously conducted telephone health survey in the world and a primary source of information on health-related behaviors of U.S. adults 18 years of age and older (www.cdc.gov/brfss/). The BRFSS uses a state-based probability sample and data are collected by state health departments using uniform methodologies, procedures, and definitions. Though designed to collect state-level data, some states elect to stratify their samples in order to generate prevalence estimates for regions within the state. The program began with 15 states in 1984 and now includes all states, the District of Columbia, Puerto Rico, the Virgin Islands, and Guam. Data are collected through monthly telephone interviews of adults in sampled households. Data from the survey are used by states to identify and track key health indicators and to develop and evaluate public health prevention programs (www.cdc.gov/brfss/). Given the consistency with which the survey is administered, analyzed, and interpreted from state to state, data can be pooled to generate national estimates of selected health behaviors and practices.

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BRFSS data confirm that alcohol use is prevalent among adults 18 years of age and older in this country (Fig. 1) [Centers for Disease Control and Prevention, 2000] and that while rates vary among states, overall, 54% of survey respondents reported they consumed alcohol in the past month, with 14% reporting one or more episodes of binge drinking (drinking five or more drinks on any one occasion) in the past month. Tables containing both the information provided in Figure 1 and additional sociodemographic information by state can be found in the referenced report [Centers for Disease Control and Prevention, 2000].

A further study released in 2003 utilizing this data set noted significant increases in binge drinking in U.S. adults from 1993–2001 [Naimi et al., 2003]. These and other reports [Foster et al., 2003; Hanson and Li, 2003] attest to the continued and growing presence of alcohol use as a part of the American culture and to the growing potential for adverse outcomes, including FAS and other prenatal alcohol-related neurodevelopmental disorders as a consequence of excessive and inappropriate use of alcohol.

The CDC has used the BRFSS to monitor national trends in prenatal alcohol use consistently since 1991 [Serdula et al., 1991]. Comparative analysis of data from 1991–1995 found that rates of any reported alcohol use among childbearing-age women rose from 12.4% in 1991 to 16.3% in 1995 [MMWR, 1997]; however, trends analysis of data from 1991–2001 appearing in this report (Fig. 2) update earlier reports [MMWR, 2002] and find that while variations in point estimates occurred over the 10-year period, there has been no statistically significant change in trends of any alcohol use or frequent alcohol use over the study period. The data show that in 2001, 12.5% of pregnant women reported some alcohol use, compared to 12.4% in 1991. In 2001, 1.6% of pregnant women reported frequent drinking, compared to 0.8% in 1991.

The BRFSS has also been used by the CDC to monitor trends in nonpregnant childbearing-age women [Centers for Disease Control and Prevention, 1997; Ebrahim et al., 1999]. Updated trends have been developed for this group as well as for 1991–2001 (Fig. 3). Again, there are no significant changes in trends of alcohol use in this group over the 10-year period. In 2001, 54.6% of nonpregnant childbearing-age women reported any alcohol use in
the past 30 days, and in 1991, 51.6% reported any alcohol use. Frequent alcohol use was reported by 12.5% of nonpregnant women in 2001 and 13.2% in 1991.

Rates of alcohol consumption by childbearing-age women overall (pregnant and nonpregnant) vary by state and by region. Highest rates of frequent drinking (defined as greater than or equal to seven drinks per week and/or binge drinking) occur in Wisconsin, Indiana, and New Hampshire, while the lowest rates of frequent drinking are found in Tennessee, Kentucky, and Arkansas.

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In the 1999 report, rates among pregnant women were 13.8% for any alcohol use and 3.4% for binge drinking. Rates for 2000 (combined data from 1999 and 2000 surveys) at 12.4% for any alcohol use and 3.9% for binge drinking.
data from 2000 and 2001 surveys) remained steady at 12.9% of pregnant women reporting any alcohol use and 4.6% reporting binge drinking.

PREGNANCY RISK ASSESSMENT AND MONITORING SYSTEM (PRAMS)

PRAMS is another CDC-sponsored, state-based surveillance program that was established in 1987 to provide high-quality data for use by state health departments in planning programs to improve maternal, infant, and child health outcomes. Using state birth certificate files, a probability sample is drawn of women who gave birth to a live-born infant in the previous year. A mailed survey is sent to the home of sampled women with a telephone follow-up to women who fail to respond to the mailed survey. The survey questionnaire focuses on maternal attitudes and behaviors before, during, and after pregnancy. Alcohol use data are collected for the period before pregnancy and during the third trimester. As with the BRFSS, uniform data collection procedures and questionnaires are used. There are currently 31 states and New York City participating in the PRAMS program. Some states have conducted local PRAMS sampling at the county and regional levels. Data from the last published surveillance summary [Centers for Disease Control and Prevention, 2003] supplies data from the 17 participating states. From 1993–1999 a significant decline in alcohol use during the last three months of pregnancy was reported in 7 of the 17 reporting states. Prevalence rates among the reporting states for alcohol use during the third trimester varied from 1.8–8.2%. A recent analysis of PRAMS data from 1996–1999 from 19 states found that 4.6% of women reported drinking in the last three months of pregnancy and that 0.4% reported binge drinking [Whitehead and Lipscomb, 2003]. More information about this surveillance system and the participating states can be viewed online at www.cdc.gov/reproductivehealth/srv_prams.htm.

SPECIAL POPULATIONS STUDIES

Some studies have used cross-sectional study designs successfully to establish rates of women at potential risk for an alcohol-exposed pregnancy in specific populations within limited geographic areas such as cities or large metropolitan areas. For example, one such study targeted pregnant women in university-affiliated and small, private obstetrics clinics in southeastern Michigan, a population described as consisting of women enrolled in managed care insurance plans, women served by Medicaid, and uninsured women [Flynn et al., 2002]. Overall they found 15% of respondents reporting use of alcohol during their current pregnancy (comparable with national rates). Among those who reported drinking, most reported consuming less than one drink (87%) and 6% of those who drank reported binge drinking. Being at an earlier stage of pregnancy and being a smoker were highly correlated with consuming one or more drinks per week and/or binge drinking. The researchers concluded that this approach to investigating special subpopulations was feasible in that it was relatively easy to incorporate the survey into the routine flow of the clinics and acceptability was high with a response rate of 92%.

As part of a larger study, pregnant women in a group health cooperative in Seattle, Washington, and a medical center in Minneapolis, Minnesota, were surveyed regarding their alcohol use prior to and during pregnancy [Pirie et al., 2000]. The survey found rates of self-reported alcohol use prior to pregnancy much higher (65%) than the national averages quoted earlier in this paper for nonpregnant childbearing-age women (54.6%) (Fig. 3), and rates of alcohol use during pregnancy much lower (5.2%) than reported in this paper (12.8%) (Fig. 3). The study also provided important information about correlates of risk drinking in their study population. Women consuming three or fewer drinks prior to pregnancy were significantly more likely to quit drinking during pregnancy than women consuming more than three drinks per week.

As a final example of special populations surveys, a CDC-sponsored study designed to identify and intervene with high-risk women prior to pregnancy (Project CHOICES) reported on an epidemiological survey of subpopulations of women in Houston, Texas; Fort Lauderdale, Florida; and Richmond, Virginia [Project CHOICES Research Group, 2002]. Subpopulations surveyed...
included women who had experienced incarceration or drug and alcohol treatment, women in university-based gynecological clinics, women in low-income primary care clinics, and women recruited through media advertisement. A woman at risk for an alcohol-exposed pregnancy was defined as a fertile woman consuming seven or more drinks per week and/or binge drinking, and currently sexually active but not using effective contraception. The overall national estimate of nonpregnant women at risk for an alcohol-exposed pregnancy was projected to be approximately 2%. Prevalence rates for risk of an alcohol-exposed pregnancy in the special subpopulations ranged from 5–24%. Multivariate analyses found recent drug use, being a smoker, a history of inpatient treatment for drugs or alcohol, a history of inpatient treatment for mental health problems, having multiple sex partners, and recent physical abuse to be factors significantly associated with being at risk for an alcohol-exposed pregnancy. This information was used to develop a motivational intervention study for implementation in the special settings identified.

UTILITY AND LIMITATIONS OF DATA SOURCES

State health departments throughout the country use data from the BRFSS for monitoring trends in a number of important health behaviors of public health interest. The strength of this data source with regard to monitoring alcohol use among childbearing-age women is that it has provided data on alcohol use by pregnant women 18 years of age and older since 1983, thereby providing an opportunity to assess trends over time. Numerous publications have been cited in this paper describing the findings of these and other analyses. Currently the BRFSS is in every state; however, for some states with lower annual birth rates, the number of pregnant women in the survey for any given year is not sufficient for analysis, which necessitates combining multiple years of data to assess changes over time and to characterize those at greatest risk. Alcohol use in nonpregnant childbearing-age women, which provides a much larger sample, may serve as a proxy indicator of potential numbers of women at risk for an alcohol-exposed pregnancy given that alcohol use prior to pregnancy is a strong predictor of alcohol use during pregnancy [Floyd et al., 1999]. Data on alcohol use in childbearing-age women are available only every other year from 1993–2001. From 2001 on, alcohol questions became part of the annual BRFSS core questionnaire.

PRAMS is another state-based monitoring system that provides data to individual participating states. In addition, data from multiple states are sometimes pooled to conduct epidemiological studies on specific topics of concern (e.g., small-for-gestational-age birth). A strength of this survey is that it was designed specifically to provide information relevant to the goal of improving maternal and child health and, therefore, includes a variety of data elements dealing with maternal behaviors before, during, and after pregnancy. A limitation of the survey is that while it is population based, it is not representative of all pregnant women, but only those who had a live infant birth.

NHSDA data are collected from individuals using national sampling procedures vs. state sampling procedures. Data from this survey are currently used to monitor progress on a number of important national objectives aimed at reducing alcohol and illicit drug behavior (e.g., Healthy People 2010). State-based data were made available in the 2000 report, but these are not routinely provided. National rates of alcohol use during pregnancy are reported on women 15–44 years of age, which some would argue provides a more comprehensive picture of the true childbearing-age population than estimates based on an age cohort of 18–44 years old. Data are also collected on females as young as 12 years of age in the NHSDA.

Data from special populations surveys discussed in this paper allowed researchers to estimate prevalence and identify characteristics associated with alcohol use during pregnancy in smaller geographic areas—data that were not available from larger surveys. Carefully constructed cross-sectional studies can provide substantial information, including greater breadth and depth in questioning than might be incorporated into national or state-based surveys that use a standard format and methodology over time. A limitation of special populations surveys is that they cannot normally be generalized to the population at large.

All monitoring approaches described herein share one common limitation: the alcohol use data are self-reported and, therefore, are subject to biased recall, deliberate nondisclosure due to perceived social desirability of response, and the possibility that respondents did not fully understand the question. Survey nuances in wording and placement of the alcohol question items may also affect participant responses. Mail surveys and in-person household surveys do not take into account women who are without a home, and telephone surveys do not take into account women who are without a telephone or a home. None of the surveys described include women in institutionalized settings. Therefore, it is likely that some women at highest risk for an alcohol-exposed pregnancy are not represented in the surveys. A limitation of the BRFSS and the NHSDA surveys includes the relatively small size of the pregnancy cohort in the overall population surveyed. One trend analysis study using the BRFSS reported the pregnancy cohort of women 18–44 years of age to be 5% of all women in that age group [Ebrahim et al., 1998]. Even with the relatively high rates of alcohol use during pregnancy, the small size of the cohort can sometimes place limitations on what can be concluded from analyses undertaken, particularly for measures of high intake (i.e., binge drinking). Nonresponse rates can also place limitations on survey data and should be evaluated as a data attribute when considering use of data from any survey.

DISCUSSION

National survey data document alcohol use trends among childbearing-age
women that warrant concern for the number of alcohol-exposed pregnancies that occur annually in the United States. Each year, approximately one in every eight pregnant women, which translates to 500,000 pregnant women, drink one or more drinks per week, with as many as 80,000 of those exposures being at levels that have been shown to result in measurable, adverse effects on the child’s growth and development. More than half of all nonpregnant childbearing-age women report alcohol use, with one in eight reporting binge drinking in the past month. High rates of overall reported alcohol use and binge drinking among childbearing-age women are of concern in that approximately half of all pregnancies in this country are unintended [Forrest, 1994] and that many women will continue to drink in the early stages of pregnancy while unaware that they are pregnant. One study found that most women are unaware of pregnancy until the sixth week [Floyd et al., 1999], and that half of all pregnant women surveyed reported drinking alcohol during the three months preceding pregnancy recognition. Of those, 1 in 20 drank six or more drinks per week.

Given the statistics quoted in this report, each year many U.S. women will continue high alcohol intake patterns during early embryonic and fetal development when key organ systems such as the central nervous system, heart, kidneys, and skeletal systems are developing. Levels of alcohol use among childbearing-age women are not uniformly distributed throughout the country but vary widely by state with concern in that approximately half of all pregnancies in this country are unintended [Forrest, 1994] and that many women will continue to drink in the early stages of pregnancy while unaware that they are pregnant. One study found that most women are unaware of pregnancy until the sixth week [Floyd et al., 1999], and that half of all pregnant women surveyed reported drinking alcohol during the three months preceding pregnancy recognition. Of those, 1 in 20 drank six or more drinks per week.

Public health officials have attempted to advise the public on the safe use of alcohol, recommending no more than one drink a day for women and two drinks a day for men, and no more than three drinks on any one occasion [U.S. Department of Agriculture, 2000]. Pregnant women should not drink at all. A long-standing health advisory to this effect was released by the Office of the Surgeon General in 1981 [Food and Drug Administration, 1981] and has appeared in numerous editions of the Department of Health and Human Services’ Dietary Guidelines for Americans [U.S. Department of Agriculture, 2000]. In 1989, Public Law 100-690 was enacted in the United States requiring warning labels on all alcoholic beverages alerting the public to the risks of alcohol use during pregnancy [Hankin, 1994]. Despite studies confirming widespread knowledge of the potential adverse effects of alcohol use during pregnancy [Dufour et al., 1994], patterns of alcohol use among pregnant women continue to be an ongoing public health concern.

Population-based monitoring of prenatal alcohol use for program planning and evaluation requires the establishment and maintenance of an ongoing system of data collection, analysis, and interpretation using uniform methods, procedures, and definitions. Effective prevention programs require increasing awareness of the adverse impact of alcohol on the fetus at the societal, community, and individual level; screening and identification of those at risk for an alcohol-exposed pregnancy; and intervention programs at the individual level for those who screen positive for hazardous drinking. Data sources described in this report provide essential health statistics not only for stakeholders responsible for health care resource allocation, but also for clinicians and health care providers in general in understanding the populations they serve. The CDC and other federal agencies have undertaken a variety of programs in state and local communities aimed at prevention of FAS and other prenatal alcohol-related conditions. More information on these activities can be obtained online at http://www.cdc.gov/ncbddd/fas; http://www.niaaa.nih.gov; and http://www.samhsa.gov.

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