Int J Public Health (2010) 55:627–635
DOI 10.1007/s00038-010-0186-8

ORIGINAL ARTICLE

Knowledge, attitudes, and behaviors of health, education, and service professionals as related to fetal alcohol spectrum disorders

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Received: 5 November 2009 / Revised: 30 March 2010 / Accepted: 11 July 2010 / Published online: 1 September 2010

Abstract
Objectives We explored differences in fetal alcohol spectrum disorders (FASD) knowledge, attitudes, and behaviors across six groups of professionals in key position to provide primary and secondary prevention efforts (physicians, educators, correctional staff, social workers, public health nurses, and substance abuse counselors).
Methods Achieving a 60.1% response rate, 2,292 professionals returned surveys, providing data on basic knowledge of FAS, FASD-associated risks and cognitive deficits, and willingness to confront and recommend treatment to alcohol-consuming pregnant women.
Results Across groups, findings revealed ample FASD knowledge and willingness to confront and recommend treatment to alcohol-consuming pregnant women that increases as consumption becomes more frequent and severe. However, results revealed significant between-group differences data that provide valuable guidance for targeted future FASD education efforts.
Conclusions Public health initiatives regarding FASD have been effective in increasing knowledge among a broad range of professionals. However, between-group differences indicate the need for targeted, discipline-specific interventions. These differences highlight the need for all professional groups to provide a consistent public health message regarding maternal alcohol consumption.

Keywords FAS · FASD · Fetal alcohol spectrum disorders · Fetal alcohol syndrome · Prenatal alcohol · Exposure

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Introduction

Recognition of the adverse effects of prenatal alcohol consumption on the fetus is by no means a modern phenomenon. Indeed, such adverse effects of prenatal alcohol consumption have been acknowledged throughout much of written history. For example, Plato recommended that newlywed couples avoid alcohol so "…that the child that is begotten may be sprung from the loins of sober parents" and Aristotle stated, "foolish, drunken or hair-brained women, for the most part, bring forth children like unto themselves, morose and languid." However, it was not until 1968 (Lemoine et al. 1968) that fetal alcohol syndrome (FAS) was first described, and 1973 (Jones and Smith 1973) that diagnostic criteria were established for FAS.

Over the 40 years since FAS was first described, knowledge of negative consequences of prenatal alcohol consumption has increased exponentially. It is now recognized that FAS is but the most severe manifestation of such negative consequences and that there is a wide range of adverse effects on the fetus. This wide range of effects has been described as fetal alcohol spectrum disorders (FASD). It is estimated that up to 10 per 1,000 newborns (1%) experience some adverse effects from prenatal alcohol consumption that may be characterized as an FASD (May and Gossage 2001). Lifetime costs of these disorders

have been estimated to reach as high as $9.69 million per individual (Harwood and Napolitano 1985; Lupton 2003).

Given that prenatal alcohol consumption is the leading known cause of preventable birth defects in the United States, considerable efforts have been made to prepare healthcare professionals for FASD prevention efforts. One indicator of the success of such efforts is revealed through surveys of physicians over the years. Specifically, earlier surveys revealed a consistent need for physicians to obtain accurate and current FASD information (Abel and Kruger 1998; Diekman et al. 2000; Nanson et al. 1995). However, more recent surveys have indicated that physicians generally have basic knowledge about FASDs (Elliott et al. 2006; Gahangan et al. 2005; Mengel et al. 2006; Tough et al. 2005). Although similar surveys among allied healthcare providers have been sparser, findings indicate that basic FASD knowledge is relatively widespread among professionals who interact with women at risk of an alcohol-effected pregnancy or individuals experiencing FASD (Brimacombe et al. 2008; Sharpe et al. 2004).

To date, the literature is lacking a systematic comparison of knowledge, attitudes, and behavior across various groups of health and allied healthcare providers that would help inform targeted education programs. By better understanding the distinct needs of diverse professional groups, discipline-specific education and training requirements can be determined and curricula and training programs can be tailored to address gaps in knowledge and variations in attitudes and behavior. The purpose of this study was to explore differences in FASD-related knowledge, attitudes, and behavior across six groups of professionals, namely physicians, educators, correctional staff, social workers, public health nurses, and substance abuse counselors, who are in key positions to provide primary and secondary FASD prevention efforts to pregnant women and women of childbearing age.

Methods

Participants

Of the approximate 4,000 professionals across the state of Alaska who were approached to participate in the study, 165 were ineligible, 1,523 were nonrespondents, and 2,292 completed the survey, for an overall participation rate of 60.1%. The professional groups included in the final sample and corresponding response rates were 509 corrections personnel (65.1% response rate), 33 OB/GYNs (48.5% response rate), 61 pediatricians (59.8% response rate), 149 family physicians (48.2% response rate), 105 public health nurses (84.0% response rate), 340 social workers (61.5% response rate), 320 substance abuse counselors (64.4% response rate), and 775 educators (56.2% response rate).

Instrumentation

Knowledge, attitudes, beliefs, and behavior survey (KABB)

As part of a prevention project funded by the State of Alaska and the Substance Abuse and Mental Health Services Administration, the KABB survey was developed to assess knowledge about FASD, attitudes about primary and secondary prevention, beliefs about alcohol consumption during pregnancy, and behavior related to FASD-related care. Included in the survey are 28 core questions, seven demographic questions tapping similar concepts but specific to each professional group, two open-ended questions, and five to nine additional profession-specific questions. Specific items can be gleaned from Tables 1, 2, and 3. A copy of the survey is available from the first author. For the purposes of this article, we focused on the 28 items common to all groups. These items were organized into the following five subscales:

1. *Basic knowledge about FAS risk*: Four items assessing basic knowledge about FAS risk using different choice formats depending upon question (i.e., yes/no; 0, 1 to 2, 3 to 4, or 5 or more drinks; and never during pregnancy; first trimester; second trimester; and third trimester). Responses were considered correct if the participant endorsed the appropriate answer.
2. *General FAS knowledge*: Eight items assessing general knowledge about prenatal alcohol exposure and associated disorders, scored on a 4-point likert-scale (1 = strongly agree to 4 = strongly disagree). Responses of strongly agree or agree were considered correct.
3. *Knowledge about FAS-related cognitive deficits*: Six items assessing knowledge related to cognitive deficits associated with prenatal alcohol exposure and FAS, scored on a 4-point likert-scale (1 = strongly agree to 4 = strongly disagree). Responses of strongly agree or agree were considered correct.
4. *Willingness to confront about alcohol consumption*: Five items assessing willingness to talk to a pregnant friend or relative about the effect of different levels of alcohol consumption during pregnancy, scored on a 4-point likert-scale (1 = highly likely to 4 = highly unlikely).
5. *Willingness to recommend alcohol treatment services*: Five items assessing willingness to talk to a pregnant friend or relative about getting professional help for different levels of alcohol consumption scored on a 4-point likert-scale (1 = highly likely to 4 = highly unlikely).

Table 1 Fetal alcohol syndrome knowledge, by professional groups in Alaska, 2006

	Corrections ($n = 480$) (%)	Physicians ($n = 237$) (%)	Public health nurses ($n = 105$) (%)	Social workers ($n = 329$) (%)	Substance abuse counselors ($n = 308$) (%)	Educators ($n = 743$) (%)	χ^2
Percent providing correct response to the following questions about FAS risks							
Basic knowledge about FAS risk							
Is it okay for a pregnant woman to have an occasional alcoholic beverage? (percentage answering no)	91.4	82.7	97.1	94.7	94.1	91.7	36.36**
Is it okay for a nursing mother to have an occasional alcoholic beverage? (percentage answering no)	80.4	36.2	53.3	71.8	87.5	71.2	223.11**
What do you think is the most alcohol that a woman could drink during her pregnancy that would probably be safe for her developing baby? (percentage answering 0 drinks)	83.9	66.7	87.6	88.2	93.4	82.3	81.24**
When do you think that a woman could drink during her pregnancy that would probably be safe for her developing baby? (percentage answering never)	86.4	72.4	88.6	90.6	92.2	84.5	54.73**
Average % correct across all basic knowledge about FAS risk items	85.5	64.5	81.7	86.3	91.8	82.5	
General FAS knowledge							
People with FAS have a set of birth defects	82.5	87.2	85.7	85.9	89.7	86.2	9.03
People with FAS have brain damage	92.1	94.2	97.1	92.1	94.7	92.7	5.97
People with FAS are affected physically	85.1	94.2	92.4	77.9	88.4	88.3	41.57**
People with FAS will outgrow these effects	93.1	99.2	93.3	95.0	90.0	95.2	24.91**
People with FAS have these effects through adulthood	92.3	93.4	98.1	95.3	91.6	91.6	10.24
Drinking alcohol during pregnancy can cause birth defects	96.7	98.4	100.0	98.8	99.7	98.7	16.00*
Currently, the only known cause of FAS is alcohol consumption by a birth mother during her pregnancy	78.4	91.4	94.3	90.9	91.9	83.1	56.93**
Fetal alcohol syndrome is preventable	97.1	98.4	100.0	99.7	99.7	98.7	16.77*
Average % correct across all general FAS knowledge items	89.7	94.6	95.1	92.0	93.2	91.8	
Knowledge about FAS-related cognitive deficits							
FAS affects a person's motor skills	87.6	89.3	94.3	87.1	92.8	92.8	18.37*
FAS affects a person's memory	92.5	91.8	96.2	93.2	95.3	97.2	20.34**
FAS affects a person's judgment	95.1	96.7	99.1	97.1	98.4	96.8	9.29
FAS affects a person's ability to plan	93.7	96.7	98.1	96.8	97.8	97.4	16.21*
FAS affects a person's ability to reason	93.7	96.3	99.1	96.5	95.0	97.8	17.76*
FAS affects a person's ability to learn	92.9	97.1	99.1	95.3	93.8	98.3	30.95**
Average % correct across all knowledge about cognitive deficit Items	92.6	94.7	97.6	94.3	95.5	96.7	

FAS fetal alcohol syndrome

* $p < 0.01$; ** $p < 0.001$

Table 2 Willingness to confront about alcohol consumption, by professional groups in Alaska, 2006

Willingness to confront about alcohol consumption	Corrections ($n = 480$) (%)	Physicians ($n = 237$) (%)	Public health nurses ($n = 105$) (%)	Social workers ($n = 329$) (%)	Substance abuse counselors ($n = 308$) (%)	Educators ($n = 743$) (%)
Percent responding likely or highly likely to the following questions						
Your friend or relative drank 1 or 2 alcoholic beverages during her entire pregnancy	63.4	44.8	74.2	67.8	80.0	54.4
Your friend or relative drank 1 or 2 alcoholic beverages a month during her pregnancy	81.9	79.9	97.1	89.0	90.6	83.1
Your friend or relative drank 1 or 2 alcoholic beverages a week during her pregnancy	89.7	94.2	99.0	96.1	95.0	94.1
Your friend or relative drank 5 or more alcoholic beverages on any one occasion during her pregnancy	92.3	98.5	99.0	97.3	95.6	96.6
Your friend or relative drank 1 or 2 alcoholic beverages a day during her pregnancy	91.9	99.8	99.0	97.9	95.9	96.6

Table 3 Willingness to recommend alcohol treatment services, by professional groups in Alaska, 2006

Willingness to recommend alcohol treatment services	Corrections ($n = 480$) (%)	Physicians ($n = 237$) (%)	Public health nurses ($n = 105$) (%)	Social workers ($n = 329$) (%)	Substance abuse counselors ($n = 308$) (%)	Educators ($n = 743$) (%)
Percent responding likely or highly likely to the following questions						
Your friend or relative drank 1 or 2 alcoholic beverages during her entire pregnancy	33.3	14.8	32.3	29.5	46.8	25.4
Your friend or relative drank 1 or 2 alcoholic beverages a month during her pregnancy	60.6	40.8	67.6	58.4	74.6	56.4
Your friend or relative drank 1 or 2 alcoholic beverages a week during her pregnancy	85.4	79.2	97.1	87.8	91.8	85.5
Your friend or relative drank 5 or more alcoholic beverages on any one occasion during her pregnancy	91.9	93.8	96.1	94.9	95.3	92.8
Your friend or relative drank 1 or 2 alcoholic beverages a day during her pregnancy	92.3	97.9	100	98.2	97.1	94.5

Procedures

Potential participants were identified through publicly available lists of corrections personnel, physicians (OB/GYN, family practitioners, and pediatricians), public health nurses, social workers, substance abuse counselors, and educators. A sample of 50% of all front-line staff from each Alaskan correctional institution was approached for participation. All educators were coded based on school location into urban or rural, and a random sample of 1,400 educators (50% urban, 50% rural) was approached for participation. For the other groups, all members were invited to participate.

Survey procedures followed recommendations by Dillman (2000). Specifically, the survey process began with a preletter notifying potential participants that they would soon receive a survey. The preletter was followed 2 weeks later by the survey packet, including a cover letter, informed consent, survey, and postage-paid envelope. Reminder postcards were sent 2 weeks later to non-participants, followed by a second survey packet mailed 2 weeks later, then by a reminder postcard 2 weeks later, and a final survey 2 weeks later.

Data analyses

Primary data analyses involved comparing responses from targeted professional groups. For all analyses, general physicians, pediatricians, and OB/GYNs were combined, resulting in six groups of Professional Disciplines (i.e., correctional personnel, physicians, public health nurses, social workers, substance abuse counselors, and educators). Separate Chi-square analyses were conducted for each of the knowledge items. Analyses compared proportions of

individuals within the professional groups who answered items correctly. Separate one-way MANOVAs were conducted for two subscales assessing willingness to confront a pregnant friend or relative about the effects of alcohol consumption and willingness to recommend alcohol treatment services to a pregnant friend or relative. For each MANOVA, the independent variable was Professional Discipline; dependent variables were the five items that comprised each subscale. Significant multivariate findings were explored using ANOVA and Duncan's Multiple Range tests.

Results

Of the 2,292 participants, 861 were men and 1,402 were women, and 29 did not provide their gender. Participants' mean age was 46.5 years (SD 10.3) and the average length of time since participants completed their highest degree or certification was 15 years (SD 10.3). Participants reported an average of 14 years of experience in their profession (SD 9.3), with an average of 11 years of this experience (SD 7.9) in Alaska.

Basic knowledge about FAS risk

Table 1 presents the percentage of participants who answered each FAS risk item correctly, by professional group. Overall, the majority of professionals responded correctly to these questions assessing knowledge of when and how much alcohol pregnant and nursing women can safely drink. However, significant between-group differences were revealed on all items (see Table 1 for Chi-square results). For all items, substance abuse counselors had the highest percentage correct, whereas physicians had the lowest. The most discrepant items were the appropriateness of nursing mothers having an occasional alcoholic beverage with 36.2% of physicians answering "no" and 87.5% of substance abuse counselors saying "no".

General FAS knowledge

Table 1 presents the percentage of participants who answered each general FAS knowledge item correctly, by professional group. Correct responses were determined based on clinical guidelines for physicians that state there is no known safe amount of alcohol consumption during pregnancy or breastfeeding (American Academy of Pediatrics 2005; American College of Obstetricians and Gynecologists 2006). The vast majority of professionals in all groups correctly answered each of these items. Indeed, the average percentage of correct answers across all items ranged from 89.7% for corrections personnel to 95.1% for public health nurses. Significant between-group differences were revealed for five of the eight knowledge items (see Table 2 for Chi-square results). Most of these differences are accounted for by corrections personnel having a lower percentage or physicians and public nurses having higher percentages.

Knowledge about FAS-related cognitive deficits

Table 1 presents the percentage of participants who answered each knowledge item about FAS-related cognitive deficits item correctly, by professional group. Overall, the vast majority of professionals in all groups correctly answered each of these items. The average percentage correct across all items ranged from 92.6% for corrections personnel to 97.6% for public health nurses. Significant between-group differences were revealed for five of the six items (see Table 3 for chi-square results). Most of these differences were accounted for by corrections personnel having a lower percentage correct or public health nurses having a higher percentage correct.

Willingness to confront about alcohol consumption

As illustrated by Fig. 1, across all groups, professionals become increasingly willing to confront a pregnant friend or relative about the effects of alcohol as consumption becomes more frequent and severe. In other words, when consumption is 1 or 2 alcoholic beverages during the entire pregnancy, most professionals are somewhat likely to confront. However, when consumption is 5 or more beverages on one occasion or 1 or 2 beverages daily, most professionals are highly likely to confront.

Results of a one-way MANOVA revealed significant between-group differences, $F(25, 8048) = 5.81$, $p < 0.001$. Univariate differences were revealed on four of five items, with binge drinking being the exception. Post hoc tests revealed that for 1–2 beverages throughout entire pregnancy, physicians and educators were less likely to confront than all other groups; and corrections personnel and social workers were less likely to confront than substance abuse counselors. For 1–2 beverages per month, physicians were less likely to confront than all other groups; and educators and corrections personnel were less likely to confront than substance abuse counselors and public health nurse. For 1–2 beverages per week, corrections personnel were less likely to confront than substance abuse counselors and public health nurses. For 1–2 beverages per day, corrections personnel were less likely than physicians and public health nurses. Table 2 provides the percentage of participants in each professional group who were likely or highly likely to confront about alcohol consumption.

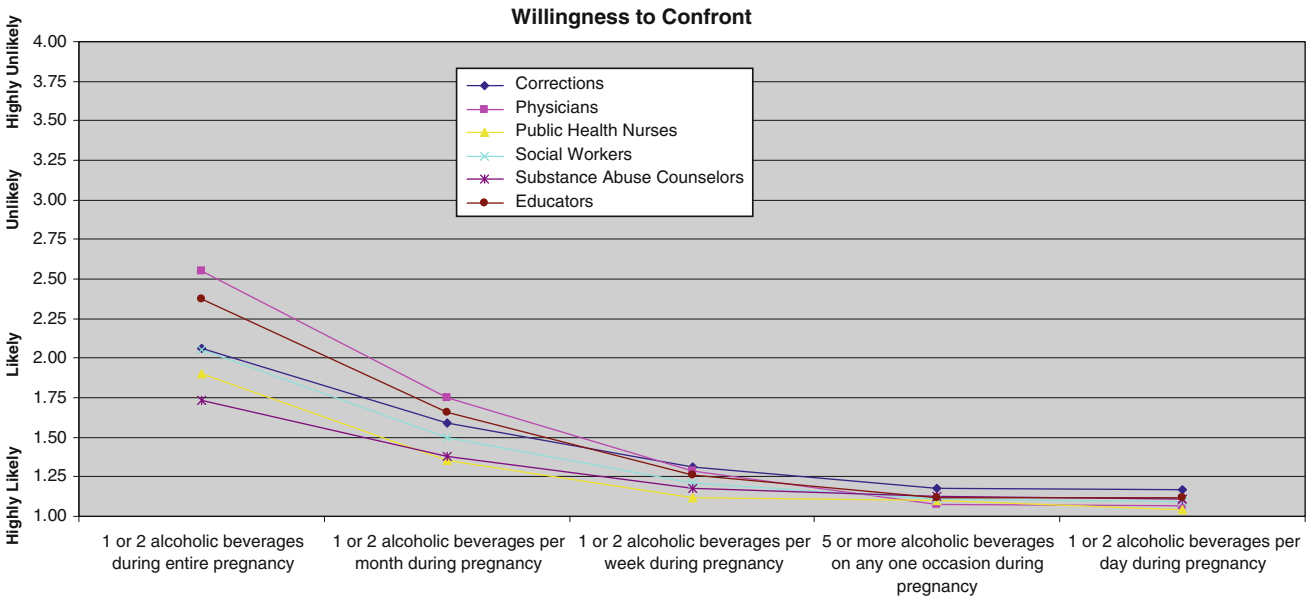

Fig. 1 Willingness to confront a pregnant friend or relative about their alcohol consumption, by different levels of consumption and professional groups in Alaska, 2006. Scale ranges from 1 (highly likely to confront) to 4 (highly unlikely to confront)

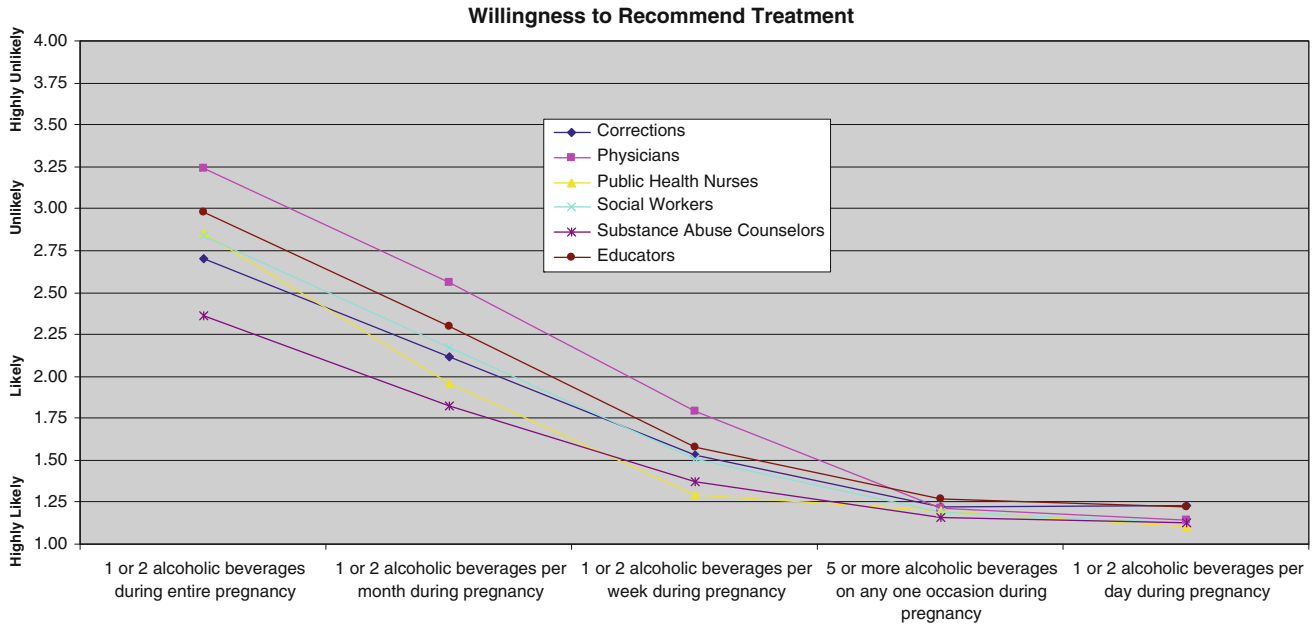

Fig. 2 Willingness to recommend that a pregnant friend or relative seek professional help for their alcohol consumption, by different levels of consumption and professional groups in Alaska, 2006. Scale ranges from 1 (highly likely to recommend) to 4 (highly unlikely to recommend)

Willingness to recommend alcohol treatment

As illustrated by Fig. 2, across all groups, professionals become increasingly willing to recommend alcohol treatment to a pregnant friend or relative as consumption becomes more frequent and severe. In other words, when the consumption is 1 or 2 alcoholic beverages during entire pregnancy, most professionals are unlikely to recommend treatment. When consumption is 5 or more beverages on one occasion or 1 or 2 beverages daily, most are highly likely to recommend treatment.

Results of the one-way MANOVA revealed significant between-group differences, $F(25, 7929) = 7.53, p < 0.001$[1]. Post hoc tests revealed that for 1–2 beverages throughout the entire pregnancy, physicians were less likely to

[1] Full results, including means and standard deviations are available from the first author.

recommend treatment than all other groups; educators, social workers, and public health nurses were less likely to recommend than substance abuse counselors; and substance abuse counselors were more likely to recommend than all other groups. For 1–2 beverages per month, physicians were less likely to recommend treatment; educators and social workers were less likely to recommend than corrections, public health nurses, and substance abuse counselors; and substance abuse counselors were more likely to recommend treatment than all other groups. For 1–2 beverages per week, physicians were less likely to recommend treatment than all other groups; educators, social workers and corrections personnel were less likely to recommend than substance abuse counselors and public health nurses. For 1–2 beverages per day, educators and corrections personnel were less likely than public health nurses to recommend treatment. Table 3 provides the percentage of participants in each professional group who were likely or highly likely to recommend alcohol treatment.

Discussion

This study represents the first systematic investigation of FASD-related knowledge, attitudes, and behavior among professionals from various disciplines that are likely to encounter women at risk for an alcohol-exposed pregnancy or individuals who experience FASD. Across all groups, the findings revealed ample knowledge about FASD, risks associated with consuming alcohol during pregnancy, and the potential effects of prenatal alcohol exposure. Professional discipline aside, participants' willingness to confront a pregnant friend or relative about alcohol consumption, and willingness to recommend alcohol treatment to a pregnant friend or relative for alcohol consumption, increased as consumption became more frequent and severe. All findings point to the effectiveness of efforts to inform professionals about FASD. However, results revealed significant between-group differences, differences that may provide valuable guidance for future FASD education efforts.

Differences in general FAS knowledge and FAS-related cognitive deficits

Across all groups, general FAS knowledge and knowledge about FAS-related cognitive deficits was ample, with most professional groups evidencing at least an average of 90% correct. Significant between-group differences revealed that correctional personnel had significantly lower knowledge and public health nurses had significantly higher knowledge. Relative to correctional personnel, the impact of this lower level of knowledge may be critical as many high-risk individuals have contact with the correctional system (Burd et al. 2004; Streissguth et al. 1996) and overall prevalence of FASD is higher in correctional settings than in the general population (Burd et al. 2004). The cognitive deficits associated with FASD, including impaired judgment, memory problems, and difficulty in planning may contribute to individuals' involvement with the correctional system and limit their ability to follow rules and regulations set forth by this complex system. Furthermore, women who are incarcerated experience increased rates of substance use and abuse (Fazel et al. 2006), placing them at a greater risk of having an alcohol-exposed pregnancy.

Given their high level of contact with women at risk of alcohol-exposed pregnancies and individuals with FASD, correctional personnel are in an ideal position to educate women on the effects of prenatal alcohol exposure and advocate for prevention and intervention efforts, such as substance abuse treatment services. A recent study on the knowledge and attitudes of criminal justice professionals about FASD revealed that these professionals desire more education and training related to FASD to support their work with alcohol-affected individuals (Cox et al. 2008). Tailored training aimed at increasing knowledge of corrections personnel to support efforts aimed at FASD identification, prevention, and intervention within the criminal justice system.

Knowledge about FAS risk

Relative to differences in knowledge about FAS risk, findings revealed significant between-group differences, with physicians having the lowest scores on four of six items. For example, 17.3% of physicians endorsed occasional alcoholic beverage consumption during pregnancy. These findings represent a discrepancy between physicians' responses and the predominant public health message that states, "A pregnant women should not drink alcohol during pregnancy" (State of Alaska Office of FAS 2005). The findings are also contrary to clinical practice guidelines that state there is no known safe amount of alcohol consumption during pregnancy (American College of Obstetricians and Gynecologists 2006). Further, 63.8% of physicians endorsed occasional use of alcohol by nursing mothers, a stance that is inconsistent with the recommendations of the March of Dimes and the American Academy of Pediatrics (2005). On the other hand, public health nurses and substance abuse counselors' responses were congruent with both these abstinence messages.

Findings regarding physician's incongruence with predominant public health messages about FASD are particularly important given that physicians are uniquely positioned to educate women of childbearing age about

alcohol consumption during pregnancy. Inconsistent messages regarding prenatal alcohol use may thwart prevention efforts, especially when the message comes from physicians who are typically considered the pre-eminent authorities on health-related issues. It should be noted that the issue of prenatal alcohol exposure is complex and the disorder does not fit into a simple cause-effect model (Maier and West 2001). Physicians' responses may represent more nuanced thinking about the effects of prenatal alcohol exposure than lack of knowledge. However, inadequate instructions regarding the hazards associated with prenatal alcohol exposure may also account for physicians' responses. For example, a recent review of obstetrical textbooks found that only 24% of the texts published since 1990 recommended abstinence from alcohol throughout the course of pregnancy (Loop and Nettleman 2002). According to Mengel and colleagues, FASD-related training in medical schools tends to focus on identification of clinical features of FASD, with limited guidelines related to primary and secondary prevention (Mengel et al. 2006). Further, only 28% of postgraduate physicians reported being trained on FASD-screening and diagnosis and only 50% received training about screening for risky drinking behavior (Gahangan et al. 2005).

Willingness to confront and to recommend treatment

Across all professional groups, individuals were more likely to confront a friend or relative about alcohol consumption during pregnancy or to recommend substance abuse treatment as drinking became more frequent and severe. Indeed, for both daily drinking of 1 or 2 and binge drinking of 5 or more alcoholic beverages, professionals across all groups were highly likely to confront and recommend treatment. However, significant between-group differences were revealed. The most consistent finding was that, for lower levels of alcohol consumption, physicians were less likely than other professionals to confront or recommend treatment. These findings are inconsistent with referral guidelines for prenatal alcohol consumption (Bertrand et al. 2004). It is unclear whether this inconsistency represents a more nuanced understanding among physicians of risks associated with prenatal alcohol consumption, an increased likelihood that physicians facilitate brief interventions themselves, or misinformation. Future research is needed to clarify these findings.

Limitations

Some limitations of this study should be considered when interpreting these findings. Regarding instrumentation, the KABB survey asked participants to answer questions based on opinions and asked participants to answer questions related to behavior with friends and relatives. Therefore, it is possible that results do not accurately represent *practice* behavior. However, past research on knowledge, attitudes, beliefs, and behavior among specific professional disciplines revealed similar results (Elliott et al. 2006; Sharpe et al. 2004; Tough et al. 2005). It is likely, therefore, that FASD-related attitudes and behavior do cross over into professional practice. Regarding statistical analyses, the large sample size resulted in small between-group mean differences that may demonstrate statistical, but not clinical, significance. Finally, this study only surveyed professionals in Alaska, a state with relatively high FASD rates and a history of considerable statewide education and prevention efforts (State of Alaska Office of FAS 2005). Although findings are consistent with those reported in other surveys, future research is needed in other US regions.

Conclusion

Given that adverse effects of prenatal alcohol consumption have only been recognized in the scientific literature for 40 years, findings indicate that public health initiatives and efforts to publicize information regarding this hazard has reached deeply into the awareness of professionals. However, despite increased knowledge and awareness, data show that 12.2% of women report drinking alcohol during pregnancy and 2% report binge drinking during pregnancy (Denny et al. 2009; Tsai and Floyd 2004). Professional groups surveyed in this study are ideally positioned to implement FASD prevention and intervention strategies to increase awareness of this critical public health issue. The need for targeted, discipline-specific interventions aimed at closing gaps in knowledge and behavior are evident in these data. Such interventions could increase the role of each discipline in FASD prevention and intervention efforts, greatly advancing this important endeavor. Providing a consistent public health message regarding prenatal alcohol consumption across all professional groups is essential for FASD prevention and intervention efforts. Gaining buy-into a consistent public health message across professional groups may prove to be more challenging than disseminating knowledge. One avenue for increasing communication about FASD prevention and intervention may be clinical messaging, an electronic system for securely delivering medical information. Using such emerging technologies may prove to be a powerful adjunct to the existing public health avenues for educating healthcare professionals about the consequences of prenatal alcohol exposure or for prompting professionals to screen for alcohol use with women who may be at risk of an alcohol-exposed pregnancy.

Acknowledgments This study was supported in part by Grant Number 5UD1SP09198 from the Substance Abuse and Mental Health Services Administration, US Department of Health and Human Services. Contents are solely the responsibility of the authors and do not necessarily represent the views of the funding agency.

Conflict of interest The authors declare that they have no competing interests.

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