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Perceived behavioral control among non-pregnant women: a study of two behaviors related to fetal alcohol spectrum disorders

Jessica Danielle Hanson
University of Iowa

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PERCEIVED BEHAVIORAL CONTROL AMONG NON-PREGNANT WOMEN: A
STUDY OF TWO BEHAVIORS RELATED TO FETAL ALCOHOL SPECTRUM
DISORDERS

by

Jessica Danielle Hanson

An Abstract

Of a thesis submitted in partial fulfillment
of the requirements for the Doctor of
Philosophy degree in Community and Behavioral Health
in the Graduate College of
The University of Iowa

May 2012

Thesis Supervisor: Associate Professor Faryle Nothwehr

ABSTRACT

Maternal alcohol consumption during pregnancy is a public health concern due to the possible lifelong physical and cognitive effects in offspring. Prevention of alcohol-exposed pregnancies (AEP) should begin preconceptionally, either by preventing unintended pregnancies or by discouraging alcohol consumption in women who are at-risk for pregnancy. The purpose of this dissertation is to utilize the Theory of Planned Behavior's construct of perceived behavioral control (PBC)—including perceived power and control beliefs—to guide the measurement and understanding of two behaviors related to AEP among non-pregnant women: birth control use and binge drinking. For the first specific aim—to estimate the prevalence of alcohol-exposed pregnancies—a secondary data analysis was conducted using surveillance data from North Dakota and South Dakota women who have had a child with FAS. The FAS prevalence estimates (per 1,000 live births) in both states (ND=0.8/1,000; SD=0.9/1,000) were found to be higher than that calculated from national averages (0.7/1,000) using a comparable surveillance methodology.

The goal of Specific Aim 2 was to determine risk for AEP among a random group of women, while Specific Aim 3 determined the control beliefs and perceived power to using birth control and decreasing binge drinking levels, and Specific Aim 4 focused on relating PBC of these two behaviors to behavioral intentions. Data for aims 2-4 were derived from a mailed, cross-sectional survey of 190 non-pregnant women randomly chosen from an electronic health records system in the upper Midwest. Of the 190 women included in the analyses, eight (6.6%) were binge drinking while being at-risk for

pregnancy (i.e., being sexually active but not always using an effective form of birth control) (Specific Aim 2). This is lower than national estimates. For Specific Aim 3, there were high direct PBC scores for both birth control and binge drinking, and there was a positive correlation between birth control direct and indirect scores (although a negative correlation between binge drinking direct and indirect scores). Finally, Specific Aim 4 uncovered high intentions to both use birth control and to not binge drink. Also, the direct birth control PBC measure was significantly associated with birth control intention when controlling for other variables, although neither PBC nor intention appeared to be associated with actual birth control behavior. For binge drinking, the intention score and the direct measure of PBC were significantly associated with one another; as well, the direct measure of PBC and intention were both significantly associated with actual binge drinking behavior. Therefore, the relationship between PBC and intention was validated for both behaviors, and the association between PBC, intention, and actual behavior was indicated for binge drinking. Overall, the study both supported and disagreed with previous research, indicating that additional research with this theory and topic matter is necessary.

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CERTIFICATE OF APPROVAL

PH.D. THESIS

This is to certify that the Ph.D. thesis of

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Maternal alcohol consumption during pregnancy is a public health concern due to the possible lifelong physical and cognitive effects in offspring. Prevention of alcohol-exposed pregnancies (AEP) should begin preconceptionally, either by preventing unintended pregnancies or by discouraging alcohol consumption in women who are at-risk for pregnancy. The purpose of this dissertation is to utilize the Theory of Planned Behavior's construct of perceived behavioral control (PBC)—including perceived power and control beliefs—to guide the measurement and understanding of two behaviors related to AEP among non-pregnant women: birth control use and binge drinking. For the first specific aim—to estimate the prevalence of alcohol-exposed pregnancies—a secondary data analysis was conducted using surveillance data from North Dakota and South Dakota women who have had a child with FAS. The FAS prevalence estimates (per 1,000 live births) in both states (ND=0.8/1,000; SD=0.9/1,000) were found to be higher than that calculated from national averages (0.7/1,000) using a comparable surveillance methodology.

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CHAPTER 1

REVIEW OF LITERATURE

Introduction

Maternal alcohol consumption during pregnancy is a public health concern due to the possible lifelong physical and cognitive effects in offspring.^{1,2} Many types of interventions have been implemented to prevent alcohol-exposed pregnancies, most of which have promoted alcohol cessation among pregnant women.^{3, 4, 5} More recent studies now conclude that prevention of alcohol-exposed pregnancies should begin preconceptionally, either by preventing unintended pregnancies or by discouraging alcohol consumption in women who are at-risk for pregnancy.^{6, 7}

Previous research among non-pregnant women suggests that understanding their perspectives regarding birth control use (i.e., prevention of pregnancy) and drinking behaviors is important to planning effective interventions.⁸ Most importantly, these perceptions remain understudied in populations of non-pregnant women. The focus of this dissertation was to utilize the Theory of Planned Behavior construct of perceived behavioral control—including perceived power and control beliefs—to guide the measurement and understanding of these two behaviors among non-pregnant women.

To estimate the prevalence of alcohol-exposed pregnancies (AEPs) and identify specific demographic characteristics of women with such pregnancies, a secondary data analysis was conducted using surveillance data from North Dakota and South Dakota women who have had a child with FAS (Specific Aim 1). These epidemiologic data provided a useful background to understand the determinants of risk behaviors of AEP

among a group of randomly selected women in the Upper Midwest (Specific Aim 2) and to determine the control beliefs and perceived power to using birth control and decreasing binge drinking levels among these women (Specific Aim 3). The perceived behavioral control of these two behaviors was then related to behavioral intentions as a way to understand behaviors surrounding prevention of AEPs among non-pregnant women (Specific Aim 4). Understanding how to either encourage consistent birth control use or lower binge drinking levels will inform future interventions on prevention of AEPs among non-pregnant women.

Prenatal Alcohol Consumption

Outcomes of prenatal alcohol consumption. Alcohol consumption during pregnancy, especially binge drinking, has the potential to cause lifelong physical and cognitive effects.^{1,2,9} Fetal alcohol spectrum disorders (FASD) is the continuum of outcomes in children prenatally exposed to alcohol and includes a diagnosis of fetal alcohol syndrome (FAS), partial-FAS, alcohol-related neurodevelopmental disorders (ARND), or alcohol-related birth defects (ARBD).¹⁰ FAS, the most damaging outcome of alcohol consumption during pregnancy, is characterized as having facial abnormalities (i.e., palpebral fissures, thin vermilion, smooth philtrum); evidence of growth retardation; evidence of delayed brain growth, including small head circumference; and if possible, confirmation of maternal alcohol consumption.¹¹⁻¹³ The other diagnoses contain a combination of some of these facial and growth characteristics.

In addition to physical features, prenatal exposure to alcohol is linked to conduct disorder (i.e., delinquency and aggressiveness), mental illness (i.e., depression, anxiety

disorders) and psychosocial functioning.¹⁴⁻¹⁶ One study found a fourfold increased risk for ARBDs (including heart defects, kidney problems, and skeletal abnormalities) among children whose mothers drank ‘heavily’ in the first trimester.¹⁷ Additionally, consumption of four or more drinks in one day, defined as binge drinking for women, carries risk for hyperactivity/inattention when compared to children whose mothers completely abstained.^{18,19} Behavioral issues are likely caused by damage to the child’s central nervous system (CNS). Damage to the CNS because of alcohol exposure have been found in both animal and human studies, all of which show “a range of short- and long-term cognitive and behavioral outcomes resulting from these CNS abnormalities.”¹²

Prevalence estimates of FAS vary in the United States, with a rate as low as 0.3 per 1,000 live births in a four-state surveillance study,²⁰ to as high as 3.9-9.0 per 1,000 live births among American Indians in the Northern Plains.^{1,20,21} Most surveillance efforts focus on specific geographic areas or specific populations rather than establishing national FASD prevalence.²²⁻²⁶ In addition, prevalence of partial-FAS, ARND, and ARBD are less clear, with few recent research studies determining estimates of these disabilities.²⁷

Incomplete surveillance data on FASD is largely due to lack of provider training on screening and diagnosing patients, few available referrals for children with these disabilities, and inconsistent screening methods.¹² There are several FAS diagnostic tools that can be utilized, including one from the Institute of Medicine (IOM; 1996), the revised IOM diagnostic criteria (2005), the University of Washington’s 4-Digit Code (2004), and the Centers for Disease Control and Prevention criteria (2004).^{11,12,27-29} These tools differ in numbers and overall percentiles used to define the facial

abnormalities, brain growth, and overall growth retardation, although they are identical in criteria used to confirm maternal alcohol consumption. Unfortunately, lack of consistent diagnostic methods ensures no consistent screening and therefore no clear statistics on the total number of individuals impacted by prenatal exposure to alcohol.

Behavior, attitudes, and demographics associated with prenatal alcohol consumption. Although the American College of Obstetricians and Gynecologists (ACOG) advises against any drinking during pregnancy, the Centers for Disease Control and Prevention found between 2% and 5% of women report binge drinking during pregnancy and 10-13% of pregnant women consume moderate amounts of alcohol.^{2,30} Other studies with different methodologies have found higher rates of prenatal alcohol consumption. For example, data from the National Birth Defects Prevention Study showed that over 30% of women with a live birth unaffected with a major birth defect reported drinking alcohol at some point during pregnancy, with 8.3% reporting binge drinking and 2.7% reporting drinking during all trimesters of pregnancy.³¹ Characteristics associated with prenatal alcohol consumption include pre-pregnancy binge drinking behavior, socioeconomic status, cigarette smoking during pregnancy, and having an unintended pregnancy.^{31,32}

Many women who continue to drink after pregnancy confirmation believe that it is acceptable to drink during pregnancy or have misperceptions about how much alcohol intake or what type of alcohol (beer, wine) is safe.^{33,34} Social networks can also play a role. Many women who continue drinking during pregnancy reported frequently drinking with family members and also substance abuse problems in the woman's siblings.³⁵ In

addition, perceived riskiness of drinking during pregnancy was lower for women who had previously given birth to a healthy child.³⁴

Alcoholism also impacts prevention efforts to reduce alcohol-exposed pregnancies. Defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM IV) as “physiological dependence on alcohol as indicated by evidence of tolerance or symptoms of withdrawal,” about 15% of the general population (both men and women) meet the criteria for alcohol dependence.³⁶ The National Institute on Alcohol Abuse and Alcoholism reports that an estimated 5.3 million women in the United States drink in a way that “threatens their health, safety, and general well-being.”³⁷ Young women in their twenties and early thirties are more likely to drink than older women. Also, some life experiences, such as a previous history of physical or sexual abuse, may make it more likely that women will have drinking problems when compared to men.³⁸

Previous interventions. Besides alcohol treatment programs for women with alcohol dependence,³⁹ the most common ways to prevent FASD are through behavioral interventions with pregnant women to encourage complete alcohol abstinence.⁴⁰ One study used a case management system to prevent FASD in American Indian communities through motivational interviewing and social support with heavily drinking pregnant women, finding that 76% of the women involved had normal deliveries and did not appear to have a child affected by FASD.³ Another brief intervention with a general population of pregnant women and their partners concluded that goal selection and social support was successful in encouraging pregnant women to abstain from drinking alcohol.⁴ Other successful intervention efforts with pregnant women included personalized feedback, perceived risk and severity, cues to action, and

identifying/seeking specific health needs, including alcohol treatment and prevention of unplanned pregnancies.^{5,41}

Many other interventions have been implemented as a way to reinforce the ACOG recommendation of complete alcohol abstinence during pregnancy. As shown in Figure 1.1, there is a continuum of interventions to prevent FASD, including universal interventions (prevention messages for all women); selective interventions (targeted to a population subgroup of women at high risk of delivering a child with FASD simply by virtue of belonging to that subgroup); and indicated interventions, or those that are targeted to high-risk individuals who are identified as having minimal but detectable signs or symptoms foreshadowing a condition or who have biological markers indicating predisposition.²⁷

Examples of universal interventions with all pregnant women to encourage alcohol abstinence include the use of mass media campaigns.⁴² For pregnant women who believe that alcohol consumption during pregnancy is safe or who are unsure as to a safe amount of drinking, social change strategies through social marketing campaigns, especially those that use educational techniques to elicit behaviors through informational messages, are one option.⁴³ These campaigns are often population-based approaches to prevention, or those that target all pregnant women, regardless of risk category. For example, formative research with pregnant women in California found that women receive mixed messages about drinking during pregnancy, thus a mass media campaign was created to encourage pregnant women to abstain completely from alcohol.⁴⁴ This intervention, while not evaluated for effectiveness, used a social norms approach and

normative beliefs by using positive role models to normalize abstaining from drinking during pregnancy.

Non-Pregnant Women: Risk and Prevention

Traditionally, interventions to prevent FASD have focused on pregnant women, although recent research concludes that prevention of FASD must begin preconceptionally, or before a woman even becomes pregnant.⁷ The National Task Force on Fetal Alcohol Syndrome and Fetal Alcohol Effect states screening and providing interventions for women at-risk for an alcohol-exposed pregnancy is essential in promoting alcohol-free pregnancies.⁴⁵ Two of the task force's recommendations focus on universal prevention of FASD through reducing alcohol-related problems in women of child-bearing age.⁴⁶ There are several key areas in understanding prevention of FASD and alcohol-exposed pregnancies (AEPs) among non-pregnant women, including:

- The relationship between sexual activity and alcohol consumption;
- Epidemiology of at-risk women; and
- Findings from past prevention efforts with non-pregnant women.

Relationship between sexual activity and alcohol consumption. The risk for an AEP extends beyond prenatal alcohol consumption, as there are three factors that influence actual risk for an AEP: alcohol use, sexual activity, and birth control use.⁴⁷ Many women are vulnerable for an AEP because of continued drinking while being at-risk for an unintended pregnancy, defined as being sexually active but using ineffective, inconsistent, or no birth control methods.^{48,49} About one-half of all pregnancies in the United States are unplanned,⁵⁰ and among women who are susceptible to an unintended

pregnancy, approximately 55% consume some amount of alcohol, with 12.4-13.1% either binge drinking or drinking frequently.^{9,30} About 48% of women from the ages of 18-44 in South Dakota (where data collection was conducted) consumed at least one drink,⁵¹ with 30% having a binge drinking episode in the past 30 days.⁵² Therefore, the potential for a woman in South Dakota to have an AEP, however unintentional, appears considerable.

Unintended pregnancies are problematic when women are drinking at risky levels (i.e., binge drinking, or four or more drinks on any one occasion), as these women may not realize they are pregnant for several weeks and are thus exposing the fetus to alcohol during an especially vulnerable developmental period.⁵³ Also, as the National Birth Defects Prevention Study found, having an unintended pregnancy is associated with binge drinking during pregnancy.³¹ Though “many women significantly reduce their alcohol use once they know they are pregnant,”⁵⁴ alcohol use before pregnancy is a strong predictor of alcohol use during pregnancy, especially during the first trimester. Often, the level of drinking during this trimester and before confirmation of pregnancy may have already been detrimental to the developing fetus.^{7,31,53}

Alcohol consumption can also have an impact on the prevention of pregnancy, specifically method and consistency of birth control utilization,⁵⁵ especially with ‘casual’ partners.⁵⁶ Unplanned sexual intercourse under the influence of alcohol or other drugs has been found to be an “independent risk factor for multiple sexual partners and inconsistent condom use.”⁵⁷ For example, adolescents who said they had sex after drinking were less likely to report using condoms when compared to their sexual activity when sober,⁵⁸ and heavier drinkers have been found to be more likely to have casual sex

without condoms.⁵⁹ In addition, a study with both Caucasian and African American women found that binge drinking in the preconception period was associated with unintended pregnancies for Caucasians (but not African Americans); specifically, women with the highest reported binge drinking episodes also had the highest rate of unplanned pregnancies.⁶⁰ Therefore, the dyadic relationship of alcohol and sexual behavior influences birth control use and causes an increased risk for an AEP among the offspring of thousands of women.

Epidemiology of at-risk women. Overall, although there are certain risk factors for FASD, including race/ethnicity and socioeconomic status,⁵⁰ any sexually active woman who is consuming alcohol and not using consistent, effective forms of birth control is at-risk for an AEP and potential FASD in the offspring. Certain demographic characteristics are more prevalent in non-pregnant women that consume alcohol. For example, younger age (i.e., women of college-age, between 18 and 24), a single marital status, and a higher income are each associated with high rates of alcohol consumption.^{6,61} One study of college women found that 49% reported binge drinking and using withdrawal (or ‘natural’ family planning) as their method of birth control.⁴⁷ In addition, social network and influences from a woman’s support system play a large role in a woman’s drinking patterns.⁶²

In addition, although there has been a large increase in the use of birth control services among the general population,⁶³ 38% of women in one study reported having missed at least one active pill in the prior three months and 61% of condom users had not used a condom at every sexual encounter.⁴⁹ Women that are less likely to use birth control during sex include those who have less than a college education; are African

American; are 35-44 years old; and believe that health care providers did not respond adequately to method-related questions.^{49,64} In addition, women over 30 years old and those that are nonwhite tend to express more ambivalence about their intentions to become pregnant, a factor that has been associated with using less effective birth control methods.^{49,64,65}

Prevention. Because of the focus to prevent FASD among pregnant women, there have been few evidence-based studies to prevent AEPs in non-pregnant women. This is problematic as studies have shown that between 10-26% of women are at-risk for an AEP due to continued drinking while not preventing pregnancy.⁸ However, the literature in this area is growing. Below are the names and descriptions of the outcomes of previous interventions with non-pregnant women to prevent AEPs.

Project CHOICES. One of the major efforts to decrease risk for AEPs among non-pregnant women was Project CHOICES (Changing High-risk alcOhol use and Increasing Birth control Effectiveness Study). This intervention focused on reducing risk for AEPs through alcohol reduction and pregnancy prevention. A brief intervention was utilized and included four motivational interviewing sessions.^{8,54,66-69} Motivational interviewing is a counseling style that “guides the individual to explore and resolve ambivalence about changing [behavior], highlighting and increasing perceived discrepancy between current behaviors and overall goals and values.”⁶⁷ Elements of the brief motivational intervention utilized for this intervention included personalized feedback about drinking and utilization of birth control compared to population norms and goal setting regarding birth control and drinking.⁶⁷ The intervention also included a separate session to discuss birth control methods.

Participants in Project CHOICES were non-pregnant women from various settings in three Southern states who were at high risk for an AEP. They were randomized to receive information plus the brief intervention sessions or information only.^{14,66} Overall, the Project CHOICES intervention significantly decreased the risk of an AEP in the intervention group. Of the participants who completed all the intervention sessions, 68.5% were no longer at-risk for an AEP through either increasing birth control or decreasing binge drinking rates.⁶⁷ There was a statistically significant difference in risky drinking and birth control utilization between the two groups, with the intervention group having significantly lower drinking rates and increased birth control use nine months after completing the five intervention sessions.^{17,18} However, attitudes and perceptions toward birth control and alcohol consumption were not measured; therefore utilization of theoretically-based measures is necessary to evaluate the hypothesized chain of events among attitudes, intentions, and behavioral outcomes.

Project BALANCE. An intervention with non-pregnant, college-aged women was Project BALANCE (Birth control and Alcohol Awareness: Negotiating Choices Effectively). This was adapted from Project CHOICES (see above) and included a single session of personalized feedback with a motivational interviewing-based intervention.⁴⁷ Women from one university who binge drank and were using birth control ineffectively were recruited and assigned to either the intervention or control group (education only). Based on the single intervention, significantly more women in the intervention group were no longer at risk for an AEP at one month when compared to those in the control group (i.e., decreased drinking and/or increased birth control use).⁴⁷ Although these findings are promising, there was no additional follow-up after one month, and it is

impossible to conclude that the behavior change and lowered risk for an AEP was sustained beyond that initial period.

Project EARLY. Project EARLY (no acronym definition given), another spin-off of Project CHOICES, was a randomized control trial to test the efficacy of a one-session motivational interviewing intervention to reduce the risk for AEPs in non-pregnant women of childbearing age (18-44). It involved utilization of the Transtheoretical Model Stages of Change (precontemplation, contemplation, preparation, action, and maintenance) regarding alcohol use (i.e., readiness to decrease drinking) and consistent use of birth control.⁴⁸ Initial results indicated that there were differences in drinking behavior and birth control use depending on where a woman falls in the Stages of Change continuum. Specifically, there were significant differences found in the total number of drinks consumed in the past 90 days for women in the respective five stages of change, with women in the Preparation stage reporting drinking a significantly higher amount of alcohol.⁴⁸ In addition, significant differences in birth control ineffectiveness were found for women at different stages of change, with women in Precontemplation reporting higher levels of birth control ineffectiveness.⁴⁸ Based on this research, there appears to be a clear relationship between motivation to change and actual behavior.⁴⁸

Theory of Planned Behavior

Various theories have been utilized to understand and prevent the outcomes resulting from prenatal alcohol consumption, including the Theory of Planned Behavior (TPB). The TPB shows that human behavior is guided by three kinds of considerations: beliefs about the likely outcomes of the behavior and the evaluations of these outcomes;

beliefs about the normative expectations of others and motivation to comply with these expectations; and beliefs about the presence of factors that may facilitate or impede performance of the behavior and the perceived power of these factors (control beliefs, or the barriers to abstaining completely from alcohol consumption during pregnancy). This last construct is called perceived behavioral control (PBC), or the factors outside individual control that may affect intentions and behaviors.⁷⁰

Although this dissertation is focused only on the construct of perceived behavioral control, the TPB as a whole has been used once previously to understand alcohol consumption in pregnant women. Specifically, surveys with pregnant African American women found that the TPB constructs were associated with an intention to quit drinking alcohol: correlation for attitude was 0.80, perceived control was 0.89, and the correlation with subjective norms was 0.77.⁷¹ The study concluded that these are three major factors that need to be changed to reduce alcohol consumption by pregnant women.⁷¹ Other studies with pregnant women focused mainly on attitudes toward drinking during pregnancy^{33,72} and the role of subjective norms on risk beliefs of prenatal alcohol consumption.^{73,74}

Besides studies with pregnant women, other studies relevant to the topic of FASD prevention that used the TPB constructs focused either on understanding binge drinking behaviors or on birth control utilization. Nearly all studies on alcohol consumption that used the TPB focused on drinking among undergraduate students or adolescents, with social norms and peer socialization being a primary focus.⁷⁵⁻⁸⁰ Among these populations, the TPB explained 56% of the variance in binge drinking intention and 22% of the variance of actual drinking behavior.⁸¹ In addition, both intention and perceived

behavioral control emerged as significant independent indicators.⁸¹ Another study of undergraduate students also found that attitude, self-efficacy, and perceived control were predictive of binge drinking intentions.⁸²

Previous studies that have used the TPB constructs to understand birth control utilization among women focused on adolescents⁸³⁻⁸⁶ or Muslim women.^{87,88} In addition, two key studies of adult women in the United States both applied qualitative methodology.^{89,90} These two studies found that factors influencing birth control usage with lower-income women included acquisition and use (condoms) and concerns about the potential risks and side effects (hormonal birth control). The women in these qualitative studies noted far more advantages than disadvantages in using birth control, generally indicating positive attitudes toward birth control. Perceived behavioral control questions found that accessibility and embarrassment both served as barriers/facilitators in utilizing birth control methods.^{89,90}

Perceived behavioral control. The focus of the dissertation is on applying the construct of perceived behavioral control (PBC) within both birth control utilization and binge drinking. Within the Theory of Planned Behavior, PBC encompasses factors outside individual control that may affect intentions and behaviors.⁷⁰ PBC is an important component of the TPB because it is expected to have a direct effect on behavior, especially when a person's perceived control is an accurate assessment of their actual control. There is also a relationship between perceived control and behavioral intention, where perceived control is expected to moderate the effect of intention on behavior; however, this interaction hypothesis has received very little empirical support.⁷⁰

Within the TPB, both indirect and direct measures are used. The indirect measures of PBC are characterized by “*control beliefs* concerning the presence or absence of facilitators and barriers to behavioral performance,” and are weighted by *perceived power*, or the “impact of each control factor to facilitate or inhibit the behavior.”⁷⁰ However, few studies have operationalized PBC using the underlying measures of control beliefs and perceived power and instead have mostly focused on the direct measure of perceived control. It is important to include indirect measures, as control beliefs are the “antecedents of PBC” and play a large role in understanding specific factors that “facilitate or inhibit performance of the behavior.”^{91,92}

Studies on both alcohol consumption and pregnancy prevention highlight the importance of PBC in understanding intention. The study of pregnant African American women described earlier that utilized all constructs of TPB found that PBC was correlated highly with behavioral intention ($r=0.89$).⁷¹ Barriers/facilitators to controlling (i.e., stopping) drinking during pregnancy included lack of awareness about how much alcohol is safe if a woman becomes pregnant and a lack of knowledge of the spectrum of disabilities caused by prenatal alcohol consumption, the desirability of the pregnancy (i.e., was it planned), and social support from family and friends.⁷¹

With regard to studies of non-pregnant women, both intention and PBC emerged as significant independent indicators to actual alcohol consumption among undergraduates,^{81,82} and PBC measures were significantly correlated with alcohol expectancies and reasons for drinking among these students.⁹³ Qualitative studies with non-pregnant women that focused on birth control acquisition also identified several key perceived control factors, including accessibility and embarrassment,^{89,90} while studies of

adolescents noted limited behavioral control because of their young age and concerns about confidentiality.⁸⁴

Dissertation Overview

There are two major limitations to the previously mentioned studies. First, although the studies on binge drinking found a significant relationship between PBC and intention, these studies were conducted with undergraduate students, a limitation because the generalizability to the general population is restricted. Second, previous studies that focused on the TPB and birth control used qualitative methods to initially identify key variables within the TPB constructs but did not have a sufficient sample size in the quantitative assessment to test for statistical significance.^{89,90} There have been few studies that have utilized indirect measures, important as indirect measures play a large role in understanding specific factors that “facilitate or inhibit performance of the behavior.”^{91,92}

To prevent AEPs, it is therefore important to develop and test measures of PBC among non-pregnant women and to identify the association between perceived control and intention for both alcohol consumption and birth control utilization as a way to both understand and prevent AEPs. The results of this dissertation research are organized in the next five chapters. Chapter 2 will focus on formative, qualitative research with pregnant women, which produced data that were used in the development of the survey to administer to the dissertation sample (Chapters 4 and 5). Chapter 3 is dedicated to Specific Aim 1, or statewide surveillance data on FAS from North Dakota and South Dakota using retrospective chart abstractions. Chapters 4 and 5 related to Specific Aims

2, 3, and 4, with Chapter 4 focused on measuring direct and indirect constructs of birth control and binge drinking (Specific Aim 3), and Chapter 5 focused on the association between direct measures, intention, and actual behavior of these two behaviors related to AEP (Specific Aim 4). See Figure 1.2 for Specific Aims 3 and 4 outlined in the overall TPB model. Specific Aim 2 (the number of women in the sample at-risk for an AEP) will be detailed in Chapter 5. The final chapter, Chapter 6, will present a summary of the dissertation, including a synthesis of results, directions for future research, and implications for public health practice.

Figure 1.1: Indicated Interventions for FAS Prevention²⁷

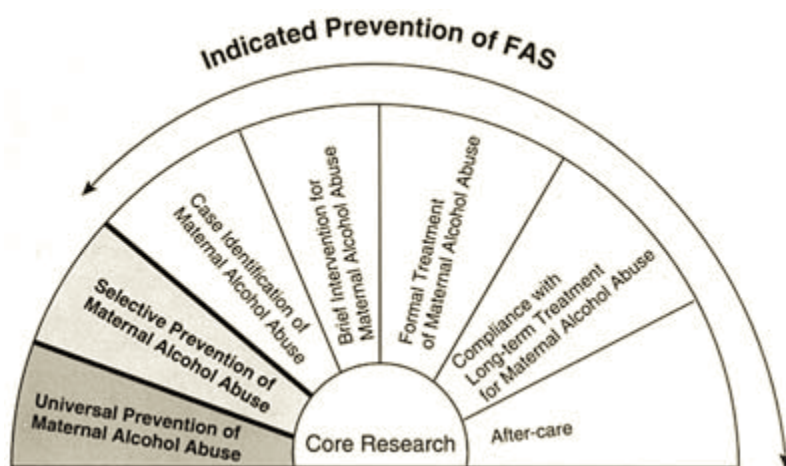
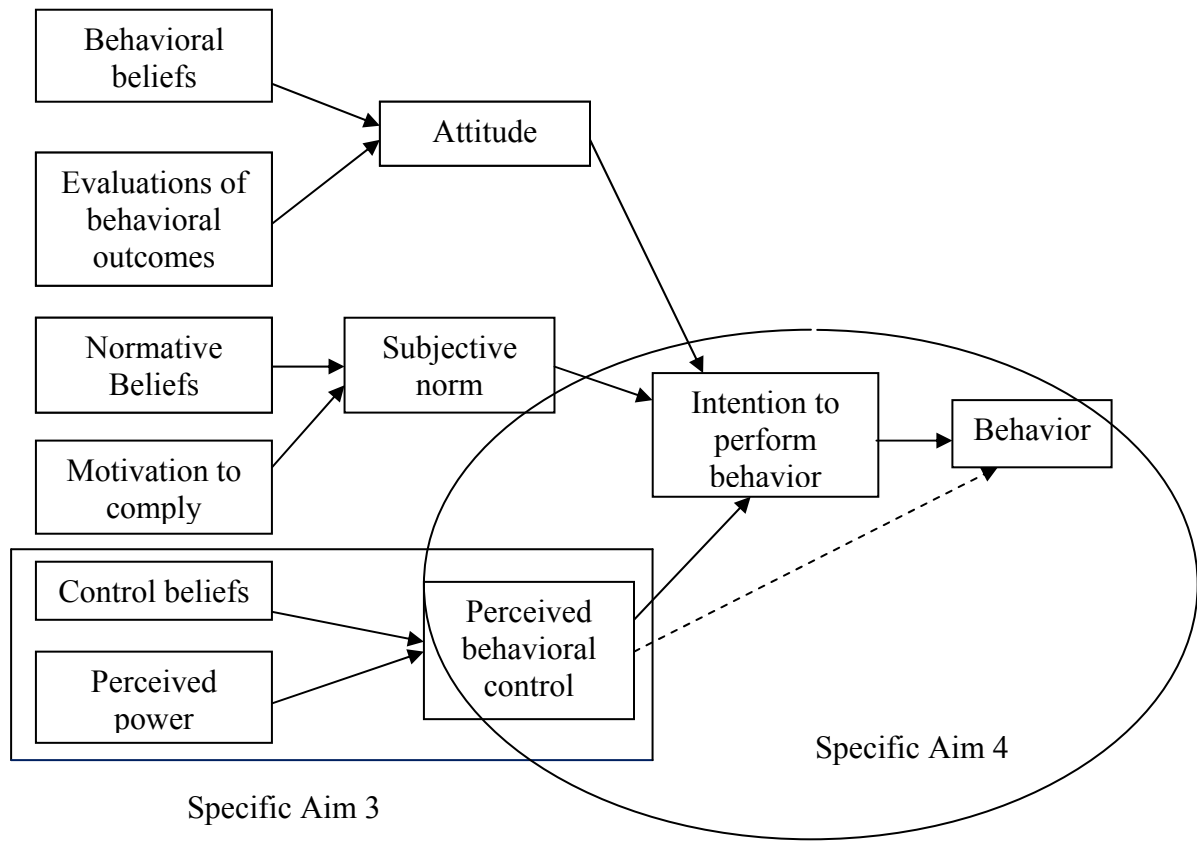


Figure 1.2: Theoretical Model with Specific Aims 3 and 4



CHAPTER 2

FORMATIVE RESEARCH USED IN THE DEVELOPMENT OF THE SURVEYS

Introduction

The overall purpose of the current project was to utilize the Theory of Planned Behavior (TPB) to guide the evaluation of attitudes, norms, and perceived behavioral control regarding drinking during pregnancy among pregnant women in South Dakota. As stated above, the TPB shows that human behavior is influenced by following determinants: beliefs about the likely outcomes of the behavior and the evaluations of these outcomes, beliefs about the normative expectations of others and motivation to comply with these expectations, and beliefs about the presence of factors that may facilitate or impede performance of the behavior and the perceived power of these factors.⁷⁰

The TPB has been used previously to understand alcohol consumption in pregnant women. Specifically, surveys with pregnant African American pregnant women found that the TPB constructs predicted an intention to quit drinking alcohol; correlation for attitude was 0.80, perceived control was 0.89, and the correlation with subjective norms was 0.77.⁷¹ Another study with pregnant and parenting adolescents using the Theory of Reasoned Action found that changes in intentions, attitudes, and perceived social norms changed at six months postpartum, with smoking and drinking behavior increasing sharply and then leveling off at twelve months postpartum. The results indicated that adolescents' substance use behavior appeared to be impacted during pregnancy by

attitudes and perceived norms, although this behavior change was not sustained longitudinally.⁷⁴

Prior to implementing the specific aims for the dissertation, a small group of women from the Upper Midwest were sampled and TPB theoretical constructs were applied to collect pilot data on the attitudes, subjective norms, and perceived behavioral control regarding alcohol consumption among pregnant women. The information collected was utilized to develop the surveys administered for Specific Aims 2, 3, and 4.

Methods

The methodology utilized a semi-structured interview guide with open-ended questions comprised of the TPB constructs, with four major sections: demographics; attitude questions; subjective norm questions; and perceived control questions. The questions and probing statements are listed in Table 2.1.

Questions were pre-tested with a convenience sample of 16 women. After pre-testing, sixteen women at various stages of pregnancy from eastern South Dakota were enrolled using a snowball sampling method and interviewed in-person. Each interview lasted between 15 and 20 minutes and was audio-recorded. After the interview, the audio-recording was transcribed verbatim and manually coded. Data were analyzed using a conventional content analysis methodology; specifically, themes were uncovered through reading all interview transcripts, making notes on initial impressions, and letting the codes emerge directly from the text.⁹⁴

Results

Of the 16 women interviewed, 15 were Caucasian and one was American Indian (Table 2.2), with an average age of 29 years (standard deviation = 3.84). Five of the 16 women were in their first trimester of pregnancy, five in their second trimester, and six women in their third trimester. Overall, the average number of weeks pregnant was 22 (standard deviation = 10.87), with a range of 5-36 weeks. In addition, 11 of the 16 women had experienced at least one prior pregnancy. Although the women were not specifically asked about their marital status, responses to the open-ended questions indicated that each was married.

Behavioral attitude. While each woman stopped consuming alcohol once her pregnancy was confirmed, eight of the 16 did not feel that a drink “once in awhile” or “occasionally” was altogether negative for pregnant women, although binge drinking or “getting drunk” was not appropriate. Some women reported that occasional alcohol consumption was “okay” (age 24, second pregnancy) or that “nothing happens” (age 32, first pregnancy), or that they were unsure as to the harms of an occasional drink of alcohol during pregnancy. As one woman (age 32, first pregnancy) stated, “I wouldn’t raise an eyebrow if someone told me that they had a glass of wine every night.” Another (age 34, second pregnancy) referred to a friend that consumed alcohol while pregnant, concluding that, “She would drink, have a glass of wine once in a great while, but I wouldn’t make an issue out of it, and that’s up to her, she’s educated.”

Each woman reportedly had general knowledge about the effects of binge drinking, although there were differences in attitudes, such as drinking early in the pregnancy is not as dangerous. Varying attitudes about prenatal alcohol consumption

were also seen with regard to the type of alcohol that the women believed is safe; for example, six women stated that hard liquor was more harmful than other types of alcohol. Finally, very few of the participants specifically stated that they would be uncomfortable or unwilling to voice their concerns if they saw another pregnant woman drinking. For example, one woman (age 34, first pregnancy) stated that, “I’m not big on the big brother. Somebody has to tell me or another pregnant lady you can’t drink.”

Subjective norms. Each woman interviewed stated that she would be most likely to listen to a physician or other health care provider’s recommendations about drinking during pregnancy. They felt that a physician or midwife was an important source of health information because of their training and desire for the woman to have a healthy pregnancy and baby. Unfortunately, although physicians and midwives were indicated as the most important source of health information regarding drinking during pregnancy, none of the women had any in-depth or ongoing conversations about prenatal alcohol consumption with her health care provider, as drinking alcohol was just one of the items on a long list of banned items. A clear message and follow-up discussions between a physician/midwife and a pregnant patient are imperative because, as one woman stated, “she’s (the doctor) the one who is the pro here” (age 24, second pregnancy).

Social support from a partner/spouse and friends was also seen as essential in helping to prevent the detrimental outcomes of prenatal exposure to alcohol. Specifically, most of the women mentioned that they had at least one conversation with family and friends about drinking during their pregnancy, although the conversation was not often with the woman’s spouse. The conversations tended to be very short and were

described as superficial. Although the majority of respondents felt that their family and friends were supportive of their decision not to drink during pregnancy, many gave examples of friends or family members who drank occasionally and had an apparently healthy baby. This point is critical because each woman said they get most of their information/advice on drinking during pregnancy from family (especially mothers) and friends within their social network. Stories of other women drinking during pregnancy did not appear to impact these women's behavior, as none drank after pregnancy confirmation, but it still appears that a woman's social circle could impact her own drinking behavior during pregnancy, thus additional studies are warranted.

Perceived behavioral control. Because none of the women drank after pregnancy confirmation, the women were asked why they thought some women drank during pregnancy and others did not, and also to speculate on what was needed (i.e., what type of intervention) for women to abstain completely from alcohol during pregnancy. When asked why some women continue to consume alcohol while pregnant, most participants mentioned addiction to alcohol as a main variable, as well as "education," whether that be a formal education from college classes or nursing school, or an informal education, which many of the respondents defined as being "mature" or "ready for parenting." Many of the participants also stated that unplanned pregnancy is a likely reason for continuing to consume alcohol while pregnant, either because the woman doesn't know she is pregnant for several weeks or months or that "there is less concern for what's happening [with the pregnancy]" (age 32, first pregnancy) or "resentment about what pregnancy has done to their lives" (age 27, first pregnancy).

When asked what intervention would work best for pregnant women to encourage abstinence from alcohol, the women mentioned support from friends and family. This includes a support group for pregnant women who are addicted to alcohol. In addition, many of the women also stated that women need clear information about the potential harms of consuming alcohol while pregnant before they even become pregnant, and even include messages about drinking during pregnancy in sex education classes in high school. The women in this study concluded that the mixed messages about alcohol during pregnancy need to be clarified via educational materials and interaction with their physicians or midwives. Overall, however, several of the women believed that messages about binge drinking have reached pregnant women, and that the real confusion is how much is a safe amount to drink.

Discussion

Though this preliminary study produced interesting results that support previous research studies in this area, it has several major limitations. First, the sample size was small and homogenous, which means the results are difficult to generalize. Also, although the questions were based within the TPB constructs, additional demographic and quantitative data gathered through use of a validated survey tool would be helpful in moving toward development and evaluation of an intervention. Finally, the use of a purposeful sampling methodology—snowball sampling—may have created a biased sample. A greater number of participants selected from a randomized process would aid in creating more generalizable and representative data.

Despite these limitations, these findings are an important first step in understanding pregnant women's attitudes toward low to moderate drinking; where they get most of their information about prenatal alcohol consumption and how that affects their behavior; and what informational messages about low to moderate drinking during pregnancy are needed. These findings also helped to clarify that low to moderate prenatal alcohol consumption was not of great concern; that physicians or health care providers are important sources of information about drinking during pregnancy; and that social support and normative beliefs may be important determinants of behavior. Studies such as these with pregnant women inform research on FASD prevention with non-pregnant women by utilizing theoretical constructs and laying the groundwork for other qualitative and quantitative studies.

This preliminary study was especially vital in helping to develop some of the dissertation survey questions. Specifically, the TPB questions were used to identify relevant environmental facilitators and barriers for avoiding binge drinking, as the focus of the dissertation research was on using PBC for binge drinking and birth control utilization. This formative research identified indirect perceived control questions for alcohol consumption, while previous literature was used to develop other survey questions as described in Chapters 4 and 5.

Table 2.1: Qualitative survey

General	<ul style="list-style-type: none"> • What are your overall thoughts on drinking during pregnancy? • Describe how much you drank before you found out you were pregnant. <ul style="list-style-type: none"> • Probe: Are you drinking the same amount now, a little more, a little less?
Attitudes	<ul style="list-style-type: none"> • How much do you feel is too much to drink during pregnancy? <ul style="list-style-type: none"> • Probe: Is there an amount you think is too much? • Probe: Is it okay to drink once a week versus every day? • Probe: Are there types of alcohol (for example, beer versus wine) that are safer for pregnant women? • Describe the results of women drinking this amount during pregnancy. <ul style="list-style-type: none"> • Probe: How do you feel about women that drink this amount (too much) during pregnancy? • Probe: What happens to babies if women drink “too much” during pregnancy? • Describe what you think happens to babies if women drink only a little once in during pregnancy.
Subjective norms	<ul style="list-style-type: none"> • Who have you spoken to in order to learn about drinking during your pregnancy? <ul style="list-style-type: none"> • Probe: How much have you talked to your spouse, family, and friends about drinking during your pregnancy? • Probe: How much have you talked to your doctor about drinking during your pregnancy? • How strongly do these people influence your behavior during pregnancy? <ul style="list-style-type: none"> • Probe: Describe who most influences your decision to drink or not to drink. • Probe: Why you feel they have such an impact on your behavior?
Perceived behavioral control	<ul style="list-style-type: none"> • Why do you think some women don’t drink at all while others drink some during pregnancy? <ul style="list-style-type: none"> • Probe: What do you think might prevent some women from not drinking alcohol during pregnancy? • Probe: Do women continue to drink because their friends are doing it? Or they are addicted? • If someone told you that you shouldn’t drink at all during pregnancy, what do you think you would have to do to stop or not drink at all? <ul style="list-style-type: none"> • Probe: What would have to happen for you to drink less than what you think is safe (if occasional drinking is defined as safe)? • Probe: What sort of information would you need to make this decision? • Probe: What sort of support from the people you mentioned earlier would you need? • Probe: What would happen if, even with this knowledge, your friend or mother said that drinking during pregnancy was okay?

Table 2.2: Demographic characteristics of preliminary study participants

Variable	N	%
Race/ethnicity		
Caucasian	15	93.8
American Indian/Alaskan Native	1	6.2
Trimester		
First	5	31.3
Second	5	31.3
Third	6	37.5
Prior pregnancies		
Zero	5	31.3
One or more	11	68.7

CHAPTER 3

STATEWIDE SURVEILLANCE OF FETAL ALCOHOL SYNDROME USING RETROSPECTIVE CHART ABSTRACTIONS

Summary of Findings

The purpose of this study was to establish statewide FAS prevalence data in North Dakota (ND) and South Dakota (SD). Data were analyzed from specialty diagnostic clinics and hospitals located across both states that incorporated the International Classification of Diseases, version 9, (ICD-9) code of 760.71 from the birth years of 1995-2006. Based on nearly 1,000 medical chart abstractions, the FAS prevalence estimates (per 1,000 live births) in both states (ND=0.8/1,000; SD=0.9/1,000) were higher than that calculated from national averages (0.7/1,000) using a comparable methodology. The average age of the biological mother was 26.1 years and the average gestational age of the child was 36.9 weeks (standard deviation = 3.6). Nearly 43% of children diagnosed were American Indian, a large proportion when considering that 6-9% of the states' populations are American Indian. These findings add to previous literature on FAS by determining statewide FAS estimates rather than focusing on a particular racial/ethnic group. Of interest is the higher prevalence of FAS in ND and SD and that a large proportion of children diagnosed were American Indian. Based on these results, more prevention efforts in these two states are necessary.

Introduction

Fetal alcohol syndrome surveillance. Alcohol consumption during pregnancy, especially binge drinking (i.e., four or more drinks in a single sitting), has the potential to cause adverse lifelong physical and cognitive effects in offspring.^{1,2,9} Fetal alcohol spectrum disorders (FASD) is the continuum of outcomes in those prenatally exposed to alcohol and includes a diagnosis of fetal alcohol syndrome (FAS), partial-FAS, alcohol-related neurodevelopmental disorders (ARND), and alcohol-related birth defects (ARBD).¹⁰ FAS, the most damaging outcome of alcohol consumption during pregnancy, is characterized by facial abnormalities (i.e., palpebral fissures, thin vermilion, smooth philtrum); evidence of growth retardation; delayed brain growth, including small head circumference; and if possible, confirmed maternal alcohol consumption.^{11,12} In addition to the physical features of FAS, prenatal exposure to alcohol is linked to conduct disorder (i.e., delinquency and aggressiveness), mental illness (i.e., stress, depression, anxiety disorders), and psychosocial functioning.¹⁴⁻¹⁶

Ascertaining prevalence estimates of FASD has involved various techniques with most prevalence studies focused on FAS and partial-FAS as these conditions are the most well-defined. In their review article, May et al. (2009) described three main surveillance methods, each of which has unique strengths and weaknesses.⁹⁵ One method is the use of surveillance and retrospective record reviews utilizing existing records (such as medical records) and registries specific to FASD, such as the CDC's Birth Defect Monitoring Program (BDMP). Once the diagnostic criteria are established, reviewers identify documented or probable cases of children with FASD. The cases typically are identified through birth certificates, special registries for children with developmental disabilities,

and/or medical records. The major advantage of chart abstractions is that they are inexpensive and relatively easy to implement. The disadvantage is that they are inconsistent (i.e., use of birth certificates, registries, or medical records are technically different sources) and depend on others for complete record compilation.⁹⁵

A second method is the use of clinic-based studies, where researchers target prenatal clinics in order to prospectively follow the substance use behaviors of pregnant women and examine their infants at birth. Maternal behaviors are compared with pregnancy outcomes based on the infant evaluation for FASD. Advantages of clinic-based studies include the opportunity to prospectively collect maternal information on drinking and to include a large number of pregnancies with various levels of alcohol exposure. The disadvantages are that the participants are self-selected and that those at highest risk of having a child with FASD are less likely to attend prenatal visits regularly, if at all, as well as the variability in reporting alcohol use and difficulty in generalizing prevalence estimates.⁹⁵

Lastly there is active case ascertainment, where children with FASD are “aggressively” sought in select populations, such as within certain racial/ethnic groups or in specific school districts. For example, a diagnostic team may target an entire first grade cohort at an elementary school and evaluate each of them for FASD. This method generally yields the highest estimates of FASD. The advantage to this approach is that it allows more generalizability of the findings. The disadvantages are that it is costly, labor intensive, and time consuming.⁹⁵

Estimated rates of FAS. In the United States, prevalence of FAS varies, with a rate as low as 0.3 per 1,000 live births in a four-state surveillance study (retrospective

chart abstractions),²⁰ to as high as 3.9-9.0 per 1,000 live births among American Indians in the Northern Plains (active case ascertainment).¹ Most FAS surveillance efforts focus on specific states (i.e., FAS case ascertainment and screening in Wisconsin, Alaska, and Georgia) rather than the nation as a whole.²²⁻²⁶ Many FAS prevalence studies also focus on specific populations that are considered “high-risk.” For example, previous studies in both North Dakota (ND) and South Dakota (SD) have conducted FAS surveillance studies with American Indian communities.^{1,96-99}

Although these latter efforts are important in determining population-specific prevalence estimates and the biological mother’s demographic characteristics, they do not capture statewide surveillance, which is important for state and federal funding allocations. A previous study in North Dakota utilized birth certificates as a data source and a FAS prevalence of 1.1-2.0 per 1,000 live births among a small sample (n=97).¹⁰⁰ The current study seeks to expand knowledge on prevalence of FAS in ND and SD by using a standardized case determination for multi-site FAS case ascertainment.

The goal of this piece of the dissertation is to determine FAS prevalence estimates in a two-state area in the Upper Midwest. Using existing data from retrospective chart abstractions, FAS prevalence will be estimated and demographic characteristics of both the affected children and their biological mothers will be described. These data will add to previous literature on this health outcome in the Upper Midwest by examining FAS estimates statewide rather than focusing on a particular racial/ethnic group and by including a large number of potential cases, as stated above. Based on this objective, the following specific aim was proposed for this project: *Calculate FAS prevalence in two*

states in the Upper Midwest of the United States and describe women who have previously given birth to a child with FAS.

Methods

From 2004-2007, efforts were made to establish a FAS surveillance program in ND and SD using a passive surveillance. Data were obtained from retrospective chart abstractions from specialty diagnostic, specialty health care clinics, and hospitals located across North Dakota and South Dakota (i.e., statewide surveillance effort). This included four hospitals (three in South Dakota, one in North Dakota); two clinics (one in South Dakota and a genetics clinic in North Dakota) that specifically diagnosed FAS; and a specialty clinic in South Dakota that saw children for diagnosis of developmental disabilities.

From these sites, the retrospective chart abstractions incorporated data with an International Classification of Diseases, version 9, (ICD-9) code of 760.71 from the birth years 1995 through 2006; the North Dakota genetic clinic abstracted all medical charts, not just those with the ICD-9 code. To diagnose a child with FAS, the diagnostic clinics use the following three required components that are necessary for a FAS diagnosis:

- 1) Face: Abnormal facial features consistent with FAS or two or more of the following: short palpebral fissures, abnormal philtrum, and/or thin upper lip;
- 2) Central Nervous System (CNS): At least one structural (birth or postnatal head circumference \leq 10th centile) or functional (e.g., mental retardation, developmental delay) central nervous system anomaly; and

- 3) Growth: Intrauterine or postnatal growth delay (e.g., weight for age \leq 10th centile, length corrected for gestational age \leq 10th centile).¹⁰¹

Data were abstracted by one trained chart abstractor; therefore no inter-rater reliability was measured, and there was no inter-abstractor reliability calculated. Data collection took place over the course of three years. The database was created and enforced by a database manager who, along with the Project Director, oversaw database maintenance. Data from the retrospective chart abstractions were transferred to a Statistical Package for the Social Sciences (SPSS), version 17.0, database for analysis. Several records had duplicates, indicating that the child was seen at more than one location. For example, a child may have been born at one of the catchment area hospitals and was later seen in an FAS diagnostic clinic. In these cases, these duplicates were handled by combining all pertinent information into one record so that there was one comprehensive record of each participant. Based on date of birth and other descriptors, it was established that a mother was not included more than once.

Data elements focused on the child's diagnosis and information on the biological mother. Data analyses included the number of confirmed cases of FAS (if 'Face,' 'CNS' and 'Growth' are all flagged in the system); probable cases (if 'Face' is flagged and either 'CNS' or 'Growth' are flagged), and pending cases. Based on these criteria, having 'confirmed' or 'probable' FAS indicated a FAS diagnosis, whereas 'pending' indicated no diagnosis. Pending was used rather than 'not FAS' since additional data could change an individual's case status.

The demographic features of the child who has confirmed or probable FAS were analyzed, including race/ethnicity, sex, and estimated gestational age of the child at the

time of delivery. Other descriptive statistics included race/ethnicity and age of the mother, as well as any confirmed substance use (alcohol, drugs, and smoking) via self-report. If maternal alcohol consumption, drug use, or smoking were included at any point in the original charts that were abstracted, a box was checked to indicate these behaviors. An estimated FAS prevalence rate per 1,000 live births was also calculated for the two states from 1995-2006.

Results

A total of 1,052 charts (766 [72.8%] from ND and 286 [27.2%] from SD) during the birth years between 1995 and 2006 were abstracted from 2005 through 2009 and entered into the FAS Surveillance Application. After combining duplicate records as detailed earlier, there were 987 mothers included. However, only 204 (20.7%) of these had either confirmed or probable FAS, while the rest were coded as “pending,” indicating a non-diagnosis. Data were not analyzed if it was coded as “pending” because this indicated a non-diagnosis of FAS.

Of the 204 mothers with an FAS delivery (n=131 confirmed, n=73 probable), 82 (40.2%) were from ND and 122 (59.8%) were from SD. The prevalence using 1,000 live births in the catchment area as the denominator is highlighted in Table 3.1; in North Dakota, the estimated rate of FAS was 0.8/1,000 live births, and in South Dakota, FAS rates were 0.9/1,000. This is compared to 0.7 per 1,000 births in the overall U.S. using a comparable passive surveillance.^{95,102}

Table 3.2 highlights some basic demographic characteristics of the biological mother and child, including race/ethnicity and sex of the child. A large proportion

(43.6%) of children diagnosed were American Indian, which compares to American Indians constituting 8.5% of the population in South Dakota and 6% of the population in North Dakota.^{103,104} In addition, although there were some missing data, the average gestational age of the child at the time of delivery was 36.9 weeks (standard deviation = 3.6, range 24-42, median = 39.0) and the average age of the biological mother was 26.1 years (standard deviation = 6.3, range 15-40, median = 25.0).

Mothers were also asked questions about their use of alcohol, drugs (i.e., marijuana, cocaine, crack), and smoking during the pregnancy. Table 3.2 highlights use of these substances during their pregnancy, with 144 (70.6%) reporting alcohol consumption during pregnancy. As confirmed maternal alcohol consumption is a component of making a FAS diagnosis, the sources for information on maternal alcohol use during pregnancy are listed in Table 3.3. Half of the women (n=83) self-reported their alcohol consumption, while another 34 (20.5%) had their prenatal alcohol consumption reported to a health care provider by someone else. Also, although much data (n=169; 82.8%) were missing regarding alcohol treatment, 23 (11.3%) of biological mothers had a history of receiving such treatment.

Discussion

Statewide retrospective chart abstractions in North Dakota and South Dakota revealed a FAS prevalence of 0.8-0.9 per 1,000 live births, which is higher in both states when compared to national averages using a comparable methodology. This is one of the first efforts examining FAS prevalence in general rather than focusing on a particular racial/ethnic group and including a large number of potential cases, which is important as

this is an area of the United States with high rates of alcohol consumption. For example, 58% and 62% of residents in South Dakota and North Dakota, respectively, consumed at least one drink in the last month.⁵¹

This study also found that over 70% of the biological mothers of children with FAS admitted to drinking during pregnancy, with smoking and drug use also high among this group of women. The most common way of confirming maternal alcohol use is a self-report by the mothers themselves. Though it is possible that these numbers underestimate the actual number of women drinking, smoking, and using drugs, self-report data on use of alcohol and drugs has been found to be a valid and reliable way to determine prenatal consumption of these substances.¹⁰⁵

Finally, a large proportion of the children diagnosed were American Indian. Considering the fact that 6-9% of the states' populations are American Indian and that active case ascertainment found FAS in 3.9-9.0 per 1,000 live births among American Indians in these states,¹ one of two explanations are possible. First, it is possible that FAS is actually significantly higher in American Indian communities for a myriad of reasons, including social and economic hardships and higher rates of alcohol consumption.¹⁰⁶ A second explanation is that there is more focus on FAS in this population (i.e., clinicians and researchers focus efforts more in American Indian populations compared to other populations), therefore more American Indians are included in these types of surveillance studies and receive a diagnosis of FAS. For example, until 1997, many surveillance efforts had been used exclusively among American Indians.⁹⁵ It is not possible to extrapolate the answer based on the data in this

study, but future research should nonetheless focus on statewide surveillance, in concert with more direct and community-based prevention efforts.

There are a few limitations to this study and in the use of records review to establish FAS prevalence estimates for ND and SD. Overall, these state-based prevalence efforts may not be representative of FAS cases nationwide. Also, as May et al. (2009) conclude, passive and retrospective chart reviews “suffer from dependence on ...complete and consistent record compilation,” compounded by the fact that few good records exist with accurate and detailed information on diagnosing FAS and confirming maternal drinking.⁹⁵ This could lead to a non-diagnosis of FAS or a diagnostic misclassification. In addition, FAS may overall be underestimated in prevalence studies. FAS is a complex disability to diagnose because of the “multiple indicators of physiology, development and behavior, many of which are neither obvious nor easily identified.”⁹⁵

Finally, a large percentage of the individuals identified with FAS in this study were American Indian; and the age of the women included was younger than previous populations. Specifically, while a study of American Indian mothers of children with FAS found similar ages when compared to the current study (between 26.6 and 28.0 years old),⁹⁷ in studies involving broader populations, the average age of biological mothers of children impacted by prenatal alcohol exposure has been found to be older (30+).¹⁹ However, it’s important to note that there are large numbers of demographic variables that have missing data, including age, meaning that the data are incomplete and difficult to compare to other studies.

Conclusion

While the benefits of a retrospective chart abstraction are that it is relatively inexpensive and easily implemented,⁹⁵ a better approach for future efforts in FAS surveillance might be an active case ascertainment, such as school-based studies where all students of a particular age are screened for FAS. An active case ascertainment is likely to be more representative of entire local populations, and clinicians are able to travel to schools to screen children, making the service less disruptive than being seen at a clinic. Overall, regardless of the method used, it is obvious that more attention needs to be paid to screening and diagnosing FAS, as prevalence of FAS vary geographically and racially in the United States. It's likely that establishing a clearer rate of FAS and FASD will aid in developing interventions to prevent this disability.

Table 3.1: Estimated FAS prevalence per 1,000 live births from 1995-2006

	North Dakota	South Dakota	TOTAL
Total live births*	96,995	129,164	226,159
Confirmed + probable FAS cases	82	122	204
Confirmed + probable prevalence / 1,000 births	0.8	0.9	0.9

**Information courtesy of the Departments of Health from North Dakota and South Dakota^{107,108}*

Table 3.2: Demographic and behavioral descriptions (N=204)

Variable (# missing)	N	%
Mother's race/ethnicity (49)		
American Indian/Alaskan Native	80	39.2
Caucasian	61	29.9
Hispanic	4	2.0
Not stated	4	2.0
Multi-racial	3	1.5
African American	2	1.0
Native Hawaiian	1	0.5
Child's race/ethnicity (19)		
American Indian/Alaskan Native	89	43.6
Caucasian	64	31.4
Multi-racial	18	8.8
Hispanic	10	4.9
Not stated	2	1.0
African American	2	1.0
Child's sex (0)		
Male	123	60.3
Female	81	39.7
Alcohol use during pregnancy (5)*	144	70.6
Drug use during pregnancy (67)*	53	26.0
Smoking during pregnancy (44)*	99	48.5

**Yes to these behaviors while pregnant; excluding the missing data cited, the remainder either did not use this during pregnancy or were unsure if they used.*

Table 3.3: Sources for confirming maternal alcohol use

	N	%
Self-reported	83	50.0
Health care provider	34	20.5
Family/direct observation	18	10.8
Third-party/hearsay	12	7.2
Other	11	6.6
Blood-alcohol level/Lab report	4	2.4
Not stated	4	2.4
Total	166	100.0

**Note that some participants had multiple sources for confirming maternal alcohol use*

CHAPTER 4

PERCEIVED BEHAVIORAL CONTROL MEASURES OF TWO BEHAVIORS RELATED TO RISK OF ALCOHOL-EXPOSED PREGNANCY

Summary of Findings

The focus of this study was to utilize the Theory of Planned Behavior construct of perceived behavioral control (PBC)—including perceived power and control beliefs—to guide the measurement and understanding of birth control use and binge drinking among non-pregnant women. A randomly selected sample of patients at a health care system in the Upper Midwest was sent a self-administered survey that included perceived behavioral control measurements. Demographic variations in these measures were explored, followed by a test of the correlation between indirect measure score and direct measure score for both birth control and binge drinking. A total of 190 non-pregnant women were included in the analyses. The majority of participants (84.7%) reported they were sexually active and using a form of birth control (67.3%), and many reported they were current, although not binge, drinkers ($n = 128$ [67.4%] drank at least once during the week). Mean scores for direct measures of birth control and binge drinking were 6.34 (standard deviation = 1.47) and 6.36 (standard deviation = 1.31), respectively, with several significant demographic differences for both measures. In addition, there was a positive correlation between birth control direct and indirect scores ($r = 0.15$, $p = 0.05$), meaning that as direct scores increased, so did indirect scores. There was a negative correlation between binge drinking direct and indirect scores ($r = -0.19$, $p = 0.01$), meaning that as direct scores increased, indirect scores decreased. Overall,

responses of study participants to the direct and indirect measures of PBC for two behaviors—birth control and binge drinking—have the potential to inform future interventions on prevention of FASD with non-pregnant women. However, because the binge drinking indirect and direct scores were negatively correlated, more work needs to be done with these measures before they are fully practical for intervention development.

Introduction

Alcohol consumption during pregnancy is a public health concern for a variety of reasons, including the possibility for lifelong physical and cognitive effects.^{1,2} Fetal alcohol spectrum disorders (FASD), which can include a diagnosis of fetal alcohol syndrome (FAS), partial-FAS, alcohol-related neurodevelopmental disorders (ARND), or alcohol-related birth defects (ARBD), is the continuum of outcomes in children prenatally exposed to alcohol.¹⁰ The prevalence of FAS varies geographically and by race/ethnicity, with estimates as low as 0.3 per 1,000 live births in a four-state surveillance study,²⁰ to as high as 3.9-8.5 per 1,000 live births among American Indians in the Northern Plains.¹

Though previous research has focused on preventing FASD in pregnant women, many researchers now conclude that prevention of FASD must begin in the preconceptional period, or before a woman even becomes pregnant, as a large percentage of women are at-risk for an alcohol-exposed pregnancy (AEP).^{7,8} Studies have shown that between 10-26% of women are at-risk for an AEP due to continued drinking while not preventing pregnancy.⁸ Unintended pregnancies are problematic when women are drinking at risky levels (i.e., binge drinking, or four or more drinks on any one occasion),

as these women may not realize they are pregnant for several weeks and are thus exposing the fetus to alcohol during an especially vulnerable developmental period.⁵³ Often, the level of drinking during this trimester and before confirmation of pregnancy may have already been detrimental to the developing fetus.^{7,31,53}

Prevention of AEPs among non-pregnant women has typically focused on either reducing alcohol consumption in women at-risk for pregnancy or decreasing women's risk for pregnancy by encouraging birth control at each sexual encounter.^{8,47,48,54,66-69} However, because of the importance of focusing on non-pregnant women, the goal of this dissertation was to utilize a theoretical model in order to understand how much control non-pregnant women feel they have over both binge drinking or birth control use. Specifically, the Theory of Planned Behavior's construct of perceived behavioral control—both direct and indirect measures—were utilized.

Theoretical framework. The Theory of Planned Behavior (TPB) is a public health theory that has been used with both pregnancy prevention projects and reduction of binge drinking behavior. The TPB shows that human behavior is guided by three kinds of considerations: beliefs about the likely outcomes of the behavior and the evaluations of these outcomes; beliefs about the normative expectations of others and motivation to comply with these expectations; and beliefs about the presence of factors that may facilitate or impede performance of the behavior and the perceived power of these factors (control beliefs, or the barriers to abstaining completely from alcohol consumption during pregnancy). See Figure 4.1.

This last construct is called perceived behavioral control (PBC), or the factors outside individual control that may affect intentions and behaviors.⁷⁰ PBC is “determined by control beliefs concerning the presence or absence of facilitators and barriers to behavioral performance,” and is weighted by perceived power, or the “impact of each control factor to facilitate or inhibit the behavior.”⁷⁰ This construct is an important component of the TPB because it is, along with behavioral intention, expected to have a direct effect on behavior, especially when a person’s perceived control is an accurate assessment of their actual control.⁷⁰

Within PBC, both indirect and direct measures are used. A direct measure of overall perceived behavioral focuses on control over the behavior.⁷⁰ For example, a survey might include a question on how easy or difficult a behavior is using a Likert scale. Indirect measures include asking about the likelihood of occurrence (i.e., how likely a certain behavior is) and the perceived power of each factor and then finding how much influence these will have in making the behavior difficult/easy for them to perform (i.e., perceived control).

However, few studies have operationalized perceived control using the indirect measures of control beliefs and perceived power and instead have mostly used the direct measure of perceived control.⁷⁰ There is also a relationship between PBC and behavioral intention, where perceived control is expected to moderate the effect of intention on behavior; however, this interaction hypothesis has received very little empirical support.⁷⁰ Indirect measures can be especially useful because they typically identify specific behaviors that could be targeted for behavior change.

Previous TPB/PBC studies. The TPB and PBC have been used previously to understand alcohol consumption and FASD prevention, although specifically in pregnant women. Surveys with pregnant African American women found that the TPB constructs were associated with an intention to quit drinking alcohol; correlation for attitude was 0.80, perceived control was 0.89, and the correlation with subjective norms was 0.77, suggesting that perceived control was most highly associated with intention to quit drinking while pregnant.⁷¹ This study concluded that attitudes, perceived control, and subjective norms are three major factors that need to be changed to reduce alcohol consumption among pregnant women.⁷¹ Other studies using TPB with pregnant women focused mainly on attitudes toward drinking during pregnancy^{33,72} and the role of subjective norms on risk beliefs of prenatal alcohol consumption.^{73,74}

Besides studies with pregnant women, other studies relevant to the topic of AEP prevention and that used TPB constructs focused either on understanding binge drinking behaviors or on birth control use. Among college students, the TPB explained 56% of the variance in binge drinking intention and 22% of the variance of actual drinking behavior, and both intention and PBC emerged as significant independent indicators.⁸¹ Two qualitative studies that used the TPB constructs to understand birth control utilization found that factors influencing such use included acquisition, use, and concerns about the potential risks and side effects. PBC questions found that accessibility and embarrassment both served as barriers/facilitators in utilizing birth control methods.^{89,90}

There are several limitations to these previous studies. First, although the studies on binge drinking found a significant relationship between PBC and intention, these studies were conducted among undergraduate students, a limitation because the results

cannot be generalized to the general population.^{75-78,82} In addition, previous studies that focused on the TPB and birth control used formative qualitative methods to identify key TPB variables, but the quantitative studies that followed did not have a large enough sample size to test for significance.^{89,90}

Because PBC is an important determinant of intentions and behaviors and because data in this area are clearly lacking (i.e., few published studies on prevention of AEP with non-pregnant women and using PBC to examine two behaviors at the same time), knowledge of PBC would be useful in the development of future interventions on prevention of AEPs among non-pregnant women. The focus of this study was to test and analyze direct and indirect measures of PBC of binge drinking and birth control among non-pregnant women and by demographic feature to understand relevant behavioral determinants of birth control utilization and binge drinking behavior. This information could, in turn, inform future interventions designed to decrease a woman's risk for exposing her unborn baby to alcohol *in utero*.

Methods

Participants and recruitment. The target population for this study was non-pregnant, adult women of childbearing age who were of legal drinking age (21-44) and who were patients at a health care system in the Upper Midwest. This particular healthcare system has over 100 clinics in seven states (North Dakota, South Dakota, Iowa, Minnesota, Nebraska, California, and Oklahoma). Eligible participants were recruited through the health care system's Electronic Health Record (EHR) system. It is important to note that at the time of data collection, only three of the six states (South

Dakota, Minnesota, or Iowa) had the EHR system in their clinics due to the length of time and complexity of changing current records systems to EHR. Therefore, participants were current or former (within three years) patients at clinics with active EHR systems from one of these three states.

A sample size was calculated. Using a power of 80%, six co-variables (age, race/ethnicity, marital status, education, employment status, and previous pregnancy), and a variability of 0.20, the sample size needed was 200 women. Estimating a 30% response rate, a total of 670 non-pregnant women were randomly selected through the EHR system via a random number generator. Pregnancy status was established using current records in the EHR system (i.e., currently being seen for prenatal care). It was anticipated that the EHR system would not identify every pregnancy (i.e., the woman is in early pregnancy or obtains prenatal care from another clinic); thus, women were asked to return a blank survey if they were currently pregnant.

Before collecting data, a pre-notice letter was sent to participants to give them advance notice about receiving a survey. To collect data, each participant received a letter of explanation, a survey, a self-addressed and stamped envelope for returning the survey, and a small bookmark as an incentive (see the Appendix A for the letters and Appendix B for the survey). Participants that were pregnant and/or not interested in completing the survey were asked to mail back a blank survey. Participants that did not send back their survey after two weeks received another letter of explanation and copy of the survey to encourage a response. The initial goal was to conduct a second follow-up with non-respondents two weeks after the first follow-up, but because of the large number of surveys received after the initial and first follow-up mailings (i.e., 25% of

surveys completed after the initial wave and an additional 10% after the first follow-up), a second follow-up mailing was not conducted.

Instrument and establishment of validity and reliability. The survey was five pages, single-spaced, and printed double-sided. There were three major sections to the survey (see Appendix B). Demographic variables were collected in Section 1, as were behavioral measures (i.e., binge drinking, sexual activity, and birth control use). Section 2 questions focused on indirect and direct measures of both birth control use and binge drinking, and Section 3 had questions on future intention for both birth control use and binge drinking.

Before beginning data collection with the 670 selected women, the survey was piloted with a non-random sample of 10 non-pregnant women of varying ages from the same population. These participants completed the survey and made note of areas and questions that were problematic. The goals of the pre-testing were to discover and retain the items that were understood, determine whether responses were highly skewed for certain questions, and learn if the response categories needed to be altered.

Internal reliability of the measures was calculated using Cronbach alphas. In addition, reliability was assessed using a test-retest methodology. Within the survey was a question asking if the participants would agree to complete a similar survey within a two-week period. Because of the large number of participants who agreed to complete a second survey, a random selection of fifty participants received a second survey. Of these fifty, $n=40$ sent back a second survey. The responses from the test-retest were compared by calculating the intra-class correlation coefficient between the two sets of responses.

Variables and measurements. Demographic measures included age, race/ethnicity, marital status, education history, employment status, and number of previous pregnancies. Several of these have been found to be related to birth control use in other studies; for example, women that are less likely to use birth control during sex include those who have less than a college education; are African American; and are between 35-44 years old.^{49,64} Additional variables captured included smoking, history of substance abuse treatment, binge drinking habits of the woman's partner, and problems with drinking within the woman's immediate social circle, all important because of the role of smoking and the social network in a woman's drinking patterns.^{35,62,109} The woman's drinking was gauged using the Quick Drinking Screen, a three-question screening tool with established reliability and validity.¹¹⁰ In addition, birth control/sexual activity were evaluated using existing categorical scales (current method and consistency of use in the past three months) used previously in an AEP prevention project with non-pregnant women.^{8,66,67,69} The specific types of birth control were categorized into four major types: hormonal (Depo Provera, the Pill, IUD/Mirena, and vaginal rings), sterilization (hysterectomy, tubes tied, vasectomy), barrier method (condoms), and no protection (rhythm method, withdrawal, or nothing).

Section 2 focused on the PBC questions, including the indirect measures of control beliefs and perceived power, as well as direct measures for both birth control and binge drinking. To develop the survey questions, TPB questions were identified through qualitative/formative research before data collection. For the purposes of this study, previous interviews conducted using TPB constructs (see Chapter 2) were utilized to identify indirect perceived control questions for alcohol consumption. In addition, the

literature on previous utilization of TPB constructs with both birth control and alcohol consumption was used to develop direct perceived control questions.^{90,111,112}

To measure indirect PBC constructs, the ‘likelihood of occurrence’ (or control beliefs) for each behavior was measured through a bipolar likelihood of occurrence/control belief scale score (1 to 7) and the perceived power of each factor measured on a bipolar ‘easy-difficult’ (-3 to 3) scale.⁷⁰ There were four control beliefs questions and four perceived power questions for both birth control and binge drinking (the methods of scoring the indirect measures of perceived control are described below). Direct measures were asked using one question for each of the two behaviors (i.e., how difficult or easy the behavior is). Finally, Section 3 included the intention questions and is more thoroughly described in Chapter 5.

A new continuous variable was calculated to represent the indirect measure scores (for both birth control and binge drinking). This was calculated using $(a \times e) + (b \times f) + (c \times g) + (d \times h)$, where a, b, c, and d are scores for the four control beliefs used in this survey; and e, f, g, and h are scores for perceived power relating to each control belief. Reverse scoring was completed for two scores because they were negatively worded (i.e., are *not* able to go “out” a lot because of work or school schedule). Also, the indirect control belief responses were recoded from a -3 to 3 scale to a 1-7 scale based on TPB protocol.

Finally, new dichotomous demographic variables were created if there appeared to be a lack of variance and/or to further test for significance. This occurred for: race (1 = Caucasian, 2 = other than Caucasian); marital status (1 = currently married, 2 = other than currently married); employment (1 = currently employed, 2 = other than currently

employed); education (1 = at least a college degree, 2 = less than a college degree); gravidity (1 = never been pregnant, 2 = has had at least one previous pregnancy); and spouse/partner alcohol consumption (1 = partner does not drink, 2 = partner drinks) and (1 = partner binge drinks, 2 = partner does not binge drink).

Data analysis. Once the surveys were collected, all data were transferred to the Statistical Package for the Social Sciences (SPSS), version 17.0, database for analysis. Data were rechecked by a second individual for data integrity purposes (i.e., incorrectly entered or missing data, outliers). Four errors in the original data entry found by the recheck were corrected before data analysis.

The scores for direct and indirect measures for both birth control and binge drinking were analyzed, respectively, by demographic features and the risk behavior variables. Independent sample t-tests were used to compare the differences in the scores for subgroups with dichotomous variables (yes/no for previous pregnancy, current smoker, previous alcohol/drug treatment, partner binge drinks, close friends/family have been in alcohol/drug treatment; Caucasian versus other than Caucasian; married versus other than married; college degree and higher versus less than a college degree; and employed versus other than employed). ANOVA tests were used for some of these same variables as their original categories, with Spearman's rho for age as a continuous variable. Corresponding non-parametric tests conducted for non-normally distributed variables included Mann-Whitney *U* statistic and the Kruskal-Wallis one-way analysis of variance.

Besides creating new variables and assessing significant relationships, the key piece of the data analysis was to test the correlation between indirect measure scores and

direct measure scores for birth control and binge drinking, respectively, using the Spearman rho because the variables were not normally distributed. As little previous research has focused on indirect measures of PBC, especially as they relate to binge drinking and birth control among women, the focus of the next section is to highlight the results on the relationship between direct and indirect measures of PBC among these two behaviors related to AEP prevention.

Results

Validity and reliability. Based on input from a non-random sample of 10 non-pregnant women of varying ages, minor changes were made to the survey. These changes included rephrasing questions and bolding and underlining certain words for clarity. For example, the word “circle” was circled in the survey to make it clear how the respondent should mark her answer. Based on this input, it was felt that face validity was established for the survey. In the survey sample, both the birth control and binge drinking indirect measure scales had good internal consistency for the 190 participants, with a Cronbach alpha coefficient at 0.73 (birth control) and 0.70 (binge drinking). In addition, both the birth control and binge drinking intention scales had a good internal consistency, with a Cronbach alpha coefficient at 0.98 (birth control) and 0.96 (binge drinking).

A test-retest was used to measure reliability between the indirect, direct, and intention scores for both birth control and binge drinking from each administration of the survey. Of the 40 retest surveys that were returned, 16 of these had missing data either from the first or second survey that impacted the ability to compare responses; thus, 24

retest surveys were used. The birth control indirect scale had Cronbach alpha coefficients of 0.54 at pre-test and 0.64 at post-test. The binge drinking indirect scale had Cronbach alpha coefficients of 0.82 at pre-test and 0.83 at post-test. Using intra-class correlation coefficients, there was a small degree of reliability between the direct PBC birth control pre-test and post-test ($r = -0.06$) and small degrees of reliability between the direct PBC binge drinking pre-test and post-test ($r = -0.16$).¹¹³

Characteristics of participants. A total of 604 surveys were mailed (excluded 66 the addresses that were out of date). Of those, 196 (32%) completed surveys were returned, with 152 received during the initial wave of surveys sent and 44 during the follow-up wave. In addition, 77 (13%) returned blank surveys due to pregnancy or not being interested, and 331 (55%) provided no reply. A preliminary analysis of the returned surveys revealed that six participants did not complete the birth control or binge drinking indirect measure questions and also did not complete the intention questions important for Chapter 5, thus they were excluded from analysis, leaving $n=190$ included in the analysis.

See Table 4.1 for demographic details, including race/ethnicity, marital status, employment, and education. Overall, this appears to be a representative sample of the health system's patients, where the average age of women seen is 31 and 91% are non-Hispanic Caucasian. The average age of participants was 32.8 (standard deviation = 7.2, median = 33.0) and the average number of previous pregnancies was 1.5 (standard deviation = 1.6), ranging from 0 to 8 (median = 1); seventy-four (38.9%) women were nulliparous. There were several important variables related to risky drinking, and thus to a potential AEP, that were captured. Specifically, 24 (12.6%) women were current

smokers, and 21 (11.1%) had partners or spouses that binge drank. Only five (2.6%) women had been in an alcohol or drug treatment program before, although 71 (37.4%) had family or close friends who had been in an alcohol or drug treatment program in the past.

Risk behaviors. The majority of participants (n=161; 84.7%) reported being sexually active. Table 4.2 highlights the type of birth control used during sexual activity in the past 90 days, with 29 missing responses, which coincides with the number who reported they were not sexually active. The most common method was use of a hormonal method, such as oral contraceptives. As shown, six participants also checked ‘other,’ which included those who reported using more than one method or a method not included in the survey’s list of birth control (i.e., Novasure, Encare). The majority (113/122; 92.6%) stated they ‘always’ used this method, regardless of what their method was (i.e., including ‘no protection’). Forty participants who listed a birth control method did not respond to the query on how often they use their birth control method.

Participants were also asked about their alcohol consumption using the Quick Drinking Screen. As shown in Table 4.2, over two-thirds of the women were current drinkers (n= 128 or 67.4% drank at least once during the week), although not binge drinkers, defined as having four or more drinks on any one occasion. The average times per week that participants drank was 1.1 (standard deviation = 1.2, range 0-6, median = 1.0), with an average of 2.1 standard drinks in the past 90 days (standard deviation = 2.2, range 0-15, median = 2.0). The average number of binge drinking episodes (i.e., how many times have you had 4 or more standard drinks on one occasion during the past three months) averaged 2.1 (standard deviation = 5.1, range 0-50, median = 0.0). When asked

about preferred alcohol type, participants chose beer (n=63; 33.2%), mixed drinks with hard liquor (n=45; 23.7%); wine (n=38; 20.0%); other (n=17; 8.9%); and shots of hard liquor (n=10; 5.3%). The ‘other’ types of drinks included wine coolers and hard lemonade. Those that chose more than one of the above drink types were also put into the ‘other’ category.

Direct and indirect scores and differences by demographics. The scores for direct and indirect measures for both birth control and binge drinking were calculated, respectively. The direct scores, which had the possibility of ranging from 1-7 based on one question asked for each behavior, had means of 6.4 (standard deviation = 1.4) and 6.3 (standard deviation = 1.3) for birth control and binge drinking, respectively, indicating high control over using birth control and/or avoiding binge drinking among this sample of women. The indirect scores, on the other hand, could range from -84 to 84 based on the potential for different responses and the scoring mechanism detailed in the methods section. The mean indirect scores were 2.2 (standard deviation = 27.3, median = 0.0) for birth control and -4.7 (standard deviation = 20.9, median = 0.0) for not binge drinking. See Table 4.3 for averages for both the control beliefs (i.e., factors that may facilitate or impede performance of the behavior) and perceived power (how strongly those control beliefs influence behavior).

The scores for direct and indirect measures for both birth control and binge drinking were analyzed by demographic characteristics (age, race/ethnicity, marital status, education, employment status, and previous pregnancy) and the other co-variables (current smoker, previous alcohol/drug treatment, partner binge drinks, close friends/family have been in alcohol/drug treatment) using bivariate analyses. Table 4.4

highlights demographic differences in direct and indirect scores. There were a few significant differences for *indirect* scores. Specifically, the binge indirect score significantly decreased as age went up, and indirect scores were significantly higher among participants whose partner was a binge drinker, although conversely indirect binge drinking scores were significantly higher among those whose partner drank some versus none at all.

Of additional note were significant differences for PBC *direct* scores. For example, women with a college degree or higher had significantly higher mean direct scores for both birth control and binge drinking compared to those that did not have a college degree. In addition, age correlated significantly with direct scores for birth control, with increasing scores as age increased. As well, those participants who did *not* have friends or relatives with a history of drug or alcohol treatment had significantly higher direct birth control scores. For binge drinking direct scores only, women who were married, who did not smoke, and whose partners did not binge drink or drink at all had significantly higher direct PBC scores than women who were not married, smoked, and whose partners binge drank. Finally, women with at least one previous pregnancy and women with no history of alcohol or drug treatment had significantly higher scores than women who did not have a previous pregnancy nor had a history of alcohol/drug treatment.

Correlation between direct and indirect scores. There was a positive correlation between birth control direct and indirect scores ($r = 0.15$, $n = 177$, $p = 0.05$), with high direct scores associated with high indirect scores. Conversely, there was a negative correlation between binge drinking direct and indirect scores ($r = -0.19$, $n = 181$,

$p = 0.01$), with higher direct scores associated with lower indirect scores. See Table 4.5.

There were also relationships found between the birth control and binge scores. There was a positive correlation between birth control and binge direct scores ($r = 0.21$, $n = 182$, $p < 0.01$), so that as birth control direct scores rose, so did the binge direct scores. However, there was a *negative* correlation between the birth control and binge indirect scores ($r = -0.23$, $n = 185$, $p < 0.01$) (Table 4.5).

Discussion

Demographics and risk status. The focus of this research was to test direct and indirect measures of PBC of binge drinking and birth control among non-pregnant women. As shown in the Results section, the sample was generally representative of this patient population, and unlike other studies, involved a broader range of participants as opposed to just college students.

The majority of participants drank each week (56.3% drank 1-2 times per week and 1.2% drank more than two times per week), and nearly one-half (49.2%) had at least one binge drinking episode in the last 90 days, although when they drank, they typically had only 1-3 drinks. These statistics are higher than a previous study that found about 48% of women in the Upper Midwest between the ages of 18-44 consumed at least one drink,⁵¹ with 30% having a binge drinking episode in the past 30 days.⁵² Also, in the current study, most participants were using some type of birth control method to protect against pregnancy, with one-quarter being at-risk for pregnancy because of not using a consistent form of birth control at each sexual encounter. National studies conclude that about one-half of all pregnancies in the United States are unplanned,⁵⁰ with another

national sample of almost 2,000 women of childbearing age finding that 38.5% of birth control users and 61.1% of condom users were using their birth control inconsistently.⁴⁹

PBC scores. When the scores for direct and indirect measures for both birth control and binge drinking were calculated, the direct scores for birth control use and binge drinking were similar (6.3 and 6.4 respectively). Both these scores suggest that women felt a high degree of control over their birth control use/preventing pregnancy and ability to avoid binge drinking. This compares to average direct scores (using seven-point scales) of 5.8 for adolescent girls and birth control⁸³ and 5.5 for female college students and alcohol consumption.¹¹² Other studies utilizing the PBC direct measures and these two behaviors did not report mean scores^{81,82,113} or used five-point scales, thus making them non-comparable to this study.⁷⁹ The current study utilized a TPB guidebook to construct question structure and has seven-point scales.¹¹⁴

In the current study, there were several significant differences for direct scores for both birth control and binge drinking, such that having a college degree; increased age; being in a significant relationship with partners who did not binge drink; not smoking; having had a previous pregnancy; and not having friends or relatives with a history of alcohol or drug treatment proved significant in increased direct PBC scores, indicating that women with these demographic features felt significantly more control over using birth control and/or avoiding binge drinking.

The indirect scores, which could range from -84 to 84, were 2.2 (standard deviation = 27.3) for birth control use and -4.7 (standard deviation = 20.9) for binge drinking, indicating that participants felt they had more control over birth control than binge drinking, although both scores were near the median of possible scores. Significant

differences for indirect scores included those for age and partner's drinking, especially for binge drinking. Although it is difficult to find comparison means for these behaviors as various researchers used different and more/fewer questions for their particular populations, one study with college-aged women found a mean indirect score of 45.4 for condom use, with the range falling between 8-56, indicating high perceived control for indirect measures of condom acquisition.¹¹⁵

Similar articles on indirect measures of PBC and binge drinking were not uncovered, as most studies have focused on binge drinking using PBC direct measures, especially among college-aged students.^{76,79,81,82,111-113} This is not surprising, as few studies have operationalized perceived control using the underlying measures of control beliefs and perceived power and instead have mostly used the direct measure of perceived control.⁷⁰ In addition, studies have found that although direct PBC measures can predict behavior, the effects are no longer significant if indirect measures of TPB are entered into a multivariate model.¹¹² However, the current study found a significant positive correlation between birth control direct and indirect scores, which provides evidence for the construct validity of these measures. In contrast, there was a significant negative correlation between binge drinking direct and indirect scores, with higher direct scores associated with lower indirect scores. Although the reasons behind the negative relationship in binge drinking scores remain unclear, it appears that indirect measures do interplay with direct measures (whether a significant positive or negative relationship), important as direct measures have been found in previous research to impact both intention and actual behavior.⁸¹

Overall, this information adds to the literature on FASD prevention by focusing on understanding women's perspectives regarding binge drinking and birth control use/pregnancy prevention, important in planning effective FASD prevention programs.⁶⁸ In addition, this study is one of the few efforts to correlate direct and indirect measures of PBC in birth control use and binge drinking. The reason indirect scores are so important is that they identify specific behaviors that could be targeted for behavior change (see Table 4.3). Future interventions could target these demographic areas in preventing AEP, especially when using PBC measurements.

Limitations. There are a few limitations of this study. First, because of the lack of variability in the participant pool (i.e., the majority were non-Hispanic Caucasian, married, and employed, with an average age of 32.8), there is a low generalizability to the general population. In addition, the use of self-report surveys may have led to a response bias, meaning that some respondents may have under-reported alcohol consumption or over-reported utilization of birth control or the control they feel they have over these two behaviors. It is also unknown whether non-respondents were simply not interested or were not eligible (i.e., pregnant); future studies should attempt to determine reasons for non-response in order to eliminate additional response bias.

There were some unexpected findings uncovered in this study. For example, indirect scores for binge drinking appeared to significantly decrease as age increased and were significantly higher among participants whose partners were binge drinkers, while the opposite was true for direct scores. Also, there was a negative correlation between binge drinking direct and indirect scores, with higher direct scores associated with lower indirect scores. It is possible that some of these unexpected findings were related to the

low correlations found in the pre-post tests. For instance, there was only a small degree of reliability between the direct PBC binge drinking pre-test and post-test ($r = -0.16$), meaning that the behavior was not necessarily stable between the pre- and post-test.

Additional statistics were conducted to evaluate this challenge, such as deleting each question in turn (i.e., first deleting the question on knowledge of binge drinking and creating a score, then deleting the question on peer pressure and binge drinking and creating a new score) and analyzing the new score with direct scores, all with the same results (i.e., a negative linear correlation). In addition, each individual indirect score (i.e., the score for knowledge of binge drinking) was tested with direct scores, and all were again negatively correlated but one (if a person's schedule impacts of they can go "out" a lot). Finally, because two of the questions were reverse scored for binge drinking because of the negative wording (see Methods section), an analysis was run without these reverse scores, but again, it was still significantly negatively correlated. It is unclear if this is because of the limitations listed above (i.e., cross-sectional surveys may have led to participants not understanding or reading the questions carefully); if indirect measures are more complicated to measure; if it was the behavior itself (binge drinking) that impacted results; and/or if indirect measures were more difficult for the participants to understand (i.e., it was the wording of the questions themselves that caused confusion).

Conclusion

Regardless of these limitations, direct and indirect measures of PBC for two behaviors—birth control and binge drinking—have the potential to inform future interventions on prevention of FASD with non-pregnant women. This is one of few

studies that have operationalized indirect measures of PBC—control beliefs and perceived power—with the majority of previous research using direct measures of PBC.⁷⁰ Indirect measures can be vital in identifying specific behaviors that could be targeted in prevention efforts.

Theorists have concluded that PBC is expected to have a direct effect on behavior, especially when a person's perceived control is an accurate assessment of their actual control.^{70,79} Future interventions can screen women using the PBC measures to evaluate how in-control they are of using birth control or not binge drinking and focus interventions on feasible behavior changes. It is important to note that the relative importance of PBC measures in predicting intention to certain behaviors will vary among different populations and behaviors,¹¹⁶ therefore future research must include similar surveys using PBC measures before implementing prevention efforts.

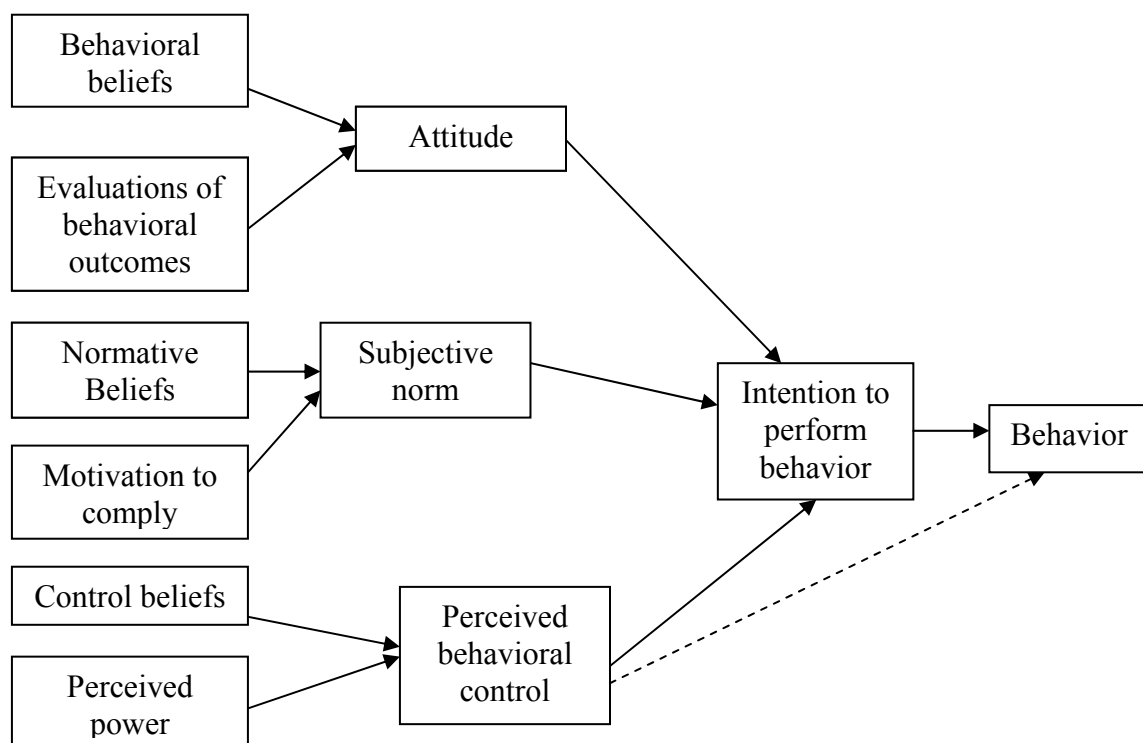
Figure 4.1: Theory of Planned Behavior Conceptual Model⁷⁰

Table 4.1: Demographic description of participants (N=190)

Variable	N	%
Race/Ethnicity		
Caucasian	178	93.7
African American	4	2.1
Hispanic	3	1.6
American Indian/Alaska Native	2	1.1
Asian	2	1.1
Other	1	0.5
Marital Status*		
Married	114	60.0
Single, never married	44	23.2
In a relationship, not married	21	11.1
Previously married	10	5.3
Employment*		
Employed/ Self-employed	141	74.2
Homemaker/	22	11.6
Student	15	7.9
Out of Work/Unable to work/Other	11	5.8
Education		
College degree	63	33.2
Some college	48	25.3
Associates degree	37	19.5
High school degree or less	25	13.1
Graduate degree	17	8.9

*Missing n=1

Table 4.2: Alcohol consumed and birth control used in past 90 days

Alcohol consumed		N	%
Number of drinking days/week			
	0	62	32.6
	1-2	107	56.3
	>2	21	11.1
Standard drinks on each occasion*			
	0	51	26.8
	1-3	103	54.2
	≥4	35	18.4
Binge drinking episodes*			
	0	106	55.8
	≤12	78	41.1
	>12	5	2.6
Birth control method**			
Hormonal		75	46.6
Sterilization		33	20.5
No protection		33	20.5
Barrier method		14	8.7
Other		6	3.7

*Missing $n=1$

**Missing $n=29$ women are not sexually active

Table 4.3: Averages of indirect measures

	Mean (S.D.)	
	Control beliefs	Perceived Power
Birth control indirect measure		
Expense	5.3 (0.8)	-0.1 (1.5)
Embarrassment	5.2 (0.7)	0.2 (1.4)
Difficulty in use	5.1 (0.6)	0.1 (1.4)
Difficult to obtain	5.2 (0.7)	0.1 (1.6)
Binge drinking indirect measure		
Deal with stress	5.3 (0.8)	-0.6 (1.9)
Peer pressure	5.2 (0.8)	-0.7 (1.8)
Not enough knowledge	5.2 (0.7)	-1.2 (1.5)
Schedule prevents drinking	-0.1 (2.4)	-1.7 (1.5)

Table 4.4: Significant differences of direct and indirect scores by demographics

Variables	Birth Control						Binge Drinking					
	<i>Direct score</i> (0 to7)			<i>Indirect score</i> (-84 to 84)			<i>Direct score</i> (0 to7)			<i>Indirect score</i> (-84 to 84)		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Race/Ethnicity	181			184			182			187		
<i>Caucasian</i>	175	6.4	1.4	174	1.3	26.8	174	6.4	1.3	178	-5.6	20.9
<i>Other than Caucasian</i>	6	6.3	1.2	10	-3.6	36.6	8	6.0	2.1	9	3.0	16.9
Marital status	181			184			181			187		
<i>Married</i>	108	6.4	1.5	110	1.6	25.9	108	6.6	1.1	112	-6.4	19.5
<i>Other than married</i>	73	6.3	1.5	74	0.3	29.4	73	6.0**	1.6	75	-2.9	22.4
Employment	181			184			181			187		
<i>Employed</i>	129	6.3	1.5	130	2.4	29.1	130	6.3	1.3	134	-5.3	21.3
<i>Other than employed</i>	52	6.4	1.4	54	-2.2	22.5	51	6.5	1.2	53	-4.3	19.3
Education	182			185			182			188		
<i>College degree</i>	114	6.5	1.2	114	1.4	25.6	113	6.7	1.0	115	-5.1	19.2
<i>Less than college degree</i>	68	6.0*	1.7	71	0.5	29.8	69	5.9***	1.7	73	-5.2	23.0
Gravidity	182			185			182			188		
<i>No previous pregnancy</i>	71	6.3	1.5	72	1.7	28.3	70	5.9	1.6	73	-2.5	21.6
<i>Previous pregnancy</i>	111	6.4	1.4	113	0.6	26.7	112	6.6**	1.0	115	-6.8	20.0
Smoking status	182			185			182			188		
<i>Currently smokes</i>	23	6.2	1.5	22	0.2	34.3	24	5.5	2.0	24	-4.1	30.0
<i>Does not smoke</i>	159	6.4	1.5	163	1.2	26.3	158	6.5**	1.1	164	-5.3	19.1
Partner's drinking	152			153			152			157		
<i>Does not drink</i>	33	6.3	1.6	35	1.8	25.9	31	6.8	1.1	36	-11.9	18.7
<i>Drinks some</i>	119	6.4	1.3	118	1.4	26.9	121	6.3**	1.3	121	-3.5*	20.2

Table 4.5: Correlations between direct and indirect scores for birth control and binge drinking

Variables	1. Birth control direct score	2. Birth control indirect score	3. Binge drinking direct score	4. Binge drinking indirect score
1. Birth control direct score	-			
2. Birth control indirect score	0.15*	-		
3. Binge drinking direct score	0.21**	-	-	
4. Binge drinking indirect score	-	-0.23**	-0.19*	-
<i>M</i>	6.4	6.3	2.2	-4.7
<i>SD</i>	1.4	1.3	27.3	20.9
Range	1 - 7	-63 - 69	1 - 7	-72 - 63

* $<.05$, ** $<.01$

CHAPTER 5

**ASSOCIATION BETWEEN DIRECT MEASURES, INTENTION, AND
BEHAVIOR OF TWO BEHAVIORS RELATED TO RISK FOR AN ALCOHOL-
EXPOSED PREGNANCY**

Summary of Findings

The focus of this part of the dissertation was to utilize the Theory of Planned Behavior to test the association between direct measures of perceived behavioral control and intention related to birth control utilization and binge drinking, as well as the association between intention and measures of these two behaviors. A cross-sectional, randomly selected sample of patients at a health care system in the Upper Midwest was sent a self-administered survey. Relationships between direct measures of birth control and binge drinking and intention for these respective behaviors were explored, as well as relationships between intention and actual behavior using separate multiple logistic regression models. The mean intention score for birth control was 5.8 (standard deviation = 2.1), and the mean intention score for binge drinking was 6.3 (standard deviation = 1.4). Those who were not married and with advanced degrees had significantly higher birth control intention scores; in addition, women that were Caucasian, married, had a partner that did not binge drink, were older, and who had a previous pregnancy had significantly higher intention scores to not binge drink. The hierarchical multiple regression revealed that, for birth control, the direct perceived behavioral control (PBC) measure was significantly associated with birth control intention when controlling for other variables, but that neither PBC nor intention

appeared to be associated with actual behavior. For binge drinking behavior, binge drinking intention score and the direct measure of PBC were significantly associated with a measure of behavior; as well, intention was significantly associated with actual binge drinking behavior, but PBC was not with intention in the model. Overall, the relationship between PBC and intention was validated, although neither PBC nor intention was related to actual birth control behavior, which is dissimilar to other research. The strength of this piece of the dissertation is in investigating the mitigating role that PBC plays with intention and actual behavior for both birth control and binge drinking. Future research is needed to further define the important relationship that PBC has with two behaviors related to FASD prevention—birth control and binge drinking.

Introduction

Fetal alcohol spectrum disorders (FASD) is the continuum of outcomes in children prenatally exposed to alcohol and includes a diagnosis of fetal alcohol syndrome (FAS), partial-FAS, alcohol-related neurodevelopmental disorders (ARND), or alcohol-related birth defects (ARBD).¹⁰ Although interventions to prevent alcohol-exposed pregnancies (AEPs) have traditionally focused on pregnant women, recent research concludes that prevention of FASD must begin preconceptionally, or before a woman even becomes pregnant.⁷ As the National Task Force on Fetal Alcohol Syndrome and Fetal Alcohol Effect concludes, screening and providing interventions for women at-risk for an alcohol-exposed pregnancy is essential in promoting alcohol-free pregnancies. In fact, two of the Task Force's recommendations focus on universal prevention of FASD through reducing alcohol-related problems in women of child-bearing age.⁴⁶

Risky drinking is especially problematic for women who are at-risk for an unintended pregnancy. These women may not realize they are pregnant for several weeks, and thus expose their fetus to alcohol during an especially vulnerable developmental period.⁵³ Though most women abstain completely from alcohol once they find out they are pregnant, alcohol use before pregnancy is a strong predictor of alcohol use during pregnancy, especially during the first trimester.^{7,31,53} Also, as the National Birth Defects Prevention Study found, having an unintended pregnancy is associated with binge drinking during pregnancy.³¹

Alcohol consumption can also have an impact on the prevention of pregnancy, specifically method and consistency of birth control use,⁵⁵ especially with ‘casual’ partners.⁵⁶ Unplanned sexual intercourse under the influence of alcohol or other drugs has been found to be an “independent risk factor for multiple sexual partners and inconsistent condom use.”⁵⁷ For example, adolescents who said they had sex after drinking were less likely to report using condoms when compared to their sexual activity when sober,⁵⁸ and heavier drinkers have been found to be more likely to have casual sex without condoms.⁵⁹ In addition, a study with both Caucasian and African American women found that binge drinking in the preconception period was associated with unintended pregnancies for Caucasians; specifically, women with the highest reported binge drinking episodes also had the highest rate of unplanned pregnancies.⁶⁰ Therefore, the dyadic relationship of alcohol and sexual behavior influences birth control use and causes an increased risk for an AEP for the children of thousands of women.

Previous research among non-pregnant women suggests that understanding women’s perspectives regarding birth control use (i.e., prevention of pregnancy) and

drinking behaviors is important to planning effective interventions. Most importantly, these perceptions remain understudied in populations of non-pregnant women. The focus of this part of the dissertation is to use a theoretical model to better understand intention toward avoiding binge drinking and using effective birth control at every sexual encounter.

The Theory of Planned Behavior's (TPB) perceived behavioral control (PBC) is one construct related to intention and thus to actual behavior surrounding risk for an AEP. PBC encompasses factors outside individual control that may affect intentions and behaviors and is "determined by control beliefs concerning the presence or absence of facilitators and barriers to behavioral performance" and weighted by perceived power, or the "impact of each control factor to facilitate or inhibit the behavior."⁷⁰ PBC is an important component of the TPB because it is, along with behavioral intention, expected to have a direct effect on behavior, especially when a person's perceived control is an accurate assessment of their actual control. There is also a relationship between perceived control and behavioral intention, where perceived control is expected to have an indirect effect on actual behavior through its influence on behavioral intention; however, this mediational hypothesis has received very little empirical support.⁷⁰

PBC has been used previously in the study of AEP prevention. Specifically, surveys with pregnant African American women found that the TPB constructs were associated with an intention to quit drinking alcohol; correlation for attitude was 0.80, perceived control was 0.89, and the correlation with subjective norms was 0.77, meaning that in this sample, perceived control was most highly associated with intention to quit drinking while pregnant.⁷¹ The study concluded that these are three major factors that

need to be changed to reduce alcohol consumption by pregnant women.⁷¹ Besides studies with pregnant women, other studies relevant to the topic of AEP prevention found that the TPB explained 56% of the variance in binge drinking intention and 22% of the variance of actual drinking behavior.⁸¹ In addition, both intention and perceived behavioral control emerged as significant independent indicators.⁸¹

Because perceived behavioral control is an important determinant of intentions or behaviors, knowledge of the effects of control beliefs concerning each facilitator or constraint would be useful in the development of future interventions on prevention of AEPs with non-pregnant women. Figure 4.1 highlights the relationships between control beliefs and perceived power of two behaviors (binge drinking and birth control use) and perceived behavioral control, and also between perceived control itself and behavioral intentions. The overall goal of this piece of the dissertation was to test the association between PBC measures and intention of two separate behaviors related to AEP risk—birth control utilization and binge drinking levels—as well as the association between intention and these two behaviors.

Methods

Participants and recruitment. As described in Chapter 4, the target population for this dissertation was non-pregnant, adult women of childbearing age and also legal drinking age (21-44), specifically those that were patients at a health care system in the Upper Midwest. Participants were randomly selected through the health care system's Electronic Health Record (EHR) system, with a goal of obtaining 200 participants. Estimating a 30% response rate, 670 non-pregnant women were randomly chosen

through the EHR system via a random number generator to complete a self-administered survey. After the initial mailing, 25% of surveys were returned completed, and an additional 10% were returned after a follow-up mailing.

Validity and reliability. To help assure a valid survey, it was piloted with a non-random sample of 10 non-pregnant women of varying ages. These participants completed the survey and made note of areas and questions that were problematic. The goals of the pre-testing were to discover and retain the items that were understood, determine whether responses were highly skewed for certain questions, and learn if the response categories needed to be altered. Internal reliability of the measures was calculated using Cronbach alphas. In addition, reliability was assessed using a test-retest methodology. Within the survey was a question asking if the participants would agree to complete a similar survey within a two-week period. Because of the large number of participants who agreed to complete a second survey, a random selection of fifty participants received a second survey. Of these fifty, n=40 sent back a second survey. The responses from the test-retest were compared by calculating the intra-class correlation coefficient between the two sets of responses.

Measurements. The focus of this piece of the dissertation was testing the association of direct measures of PBC for two behaviors—binge drinking and birth control utilization respectively—with intention and the behaviors themselves. There were three major sections to the survey (see Appendix B). Section 1 was comprised of demographic items (age, race/ethnicity, marital status, education history, employment status, and number of previous pregnancies) and relevant behaviors, including actual drinking and birth control behavior. The woman's drinking was gauged using the Quick

Drinking Screen, a three-question screening tool with established reliability and validity.¹¹⁰ In addition, birth control/sexual activity were evaluated using existing categorical scales (current method and consistency of use in the past three months) used previously in an AEP prevention project with non-pregnant women.^{8,66,67,69} The specific types of birth control were categorized into four major types: hormonal (Depo Provera, the Pill, IUD/Mirena, and vaginal rings), sterilization (hysterectomy, tubes tied, vasectomy), barrier method (condoms), and no protection (rhythm method, withdrawal, or nothing).

Section 2 focused on the PBC questions, including the direct measures for both birth control and binge drinking. To develop the survey questions, TPB questions were identified through qualitative/formative research before data collection. Section 3 included the intention questions, which were taken from previous research on the TPB and alcohol consumption^{81,82,111} and birth control utilization.¹¹⁵ As TPB experts conclude, adequate internal consistency for intention can be demonstrated using three items: *expect to*, *want to*, and *intend to* complete a behavior, such as using birth control or not binge drinking.¹¹⁴ Therefore, this survey asked if participants expected, wanted, and intended to either use birth control or not binge drink on a scale of one (strongly disagree) to seven (strongly agree).

Based on responses to the alcohol (i.e., responses to the Quick Drinking Screen) and birth control (i.e., current method and consistency of use in the past three months) questions, new categorical variables were created to capture risk for AEP based on a combination of whether a woman was at high or low risk for pregnancy and whether a woman was at high or low risk of binge drinking. It is important to note that a woman

could be at-risk for pregnancy but not drinking, thus not at-risk for an AEP. For a woman who reported having sex within the last month, the risk for pregnancy was coded as 'high' if she fell in the 'no protection' category or if the woman fell in the 'hormonal' or 'barrier' methods but stated they used these 'usually,' 'sometimes,' or 'never.' If a woman used a reliable form of birth control at each encounter, she was coded as 'low' risk for pregnancy. The binge drinking risk behavior was coded as 'high' if a woman reported at least one binge drinking episode in the past 90 days; otherwise, the binge drinking risk behavior was coded as 'low.' Risk categories were created taking into account both behaviors with '1' indicating both risks low, '2' indicating low in pregnancy risk but high on binge drinking risk, '3' indicating high in pregnancy risk but low in binge drinking risk, and '4' indicating both risks high.

Data analysis. Once surveys were collected, all data were transferred to a Statistical Package for the Social Sciences (SPSS), version 17.0, database for analysis. The scoring of intention was completed by calculating the mean of the three intention questions (*expect to, want to, intend to*) for both birth control and binge drinking. The scores were compared by demographic features and risk questions (age, race/ethnicity, marital status, education, employment status, previous pregnancy, current smoker, previous alcohol/drug treatment, partner binge drinks, close friends/family have been in alcohol/drug treatment) through one-way ANOVA, Pearson's correlation, and independent sample t-tests (corresponding non-parametric tests were conducted for non-normal variables).

Multivariate analyses. Preliminary data analysis included identifying demographic and other possible determinant variables that were statistically significantly

related to the key constructs of binge drinking and risk for pregnancy (i.e., $p < .05$). Any items that were significant were considered for inclusion in the multivariate models. To test the association between direct measures of perceived behavioral control and intention of the two behaviors related to AEP risk and the association between intentions and actual behavior, separate hierarchical linear (for dichotomous variables) and multiple logistic regression analyses were conducted for each behavior (consistent birth control use and binge drinking). The goal was to assess the association between perceived behavioral control and behavior, testing whether intentions serve as a mediator between them. A detailed list of the models is below using birth control as the first behavior. The same procedures were repeated to examine binge drinking behavior.

- Model 1: Intention = demographics + perceived behavioral control.

Beginning with birth control, the association between perceived behavioral control for consistent birth control use and intention to use consistent birth control was estimated in a multivariate model controlling for relevant demographic factors. These relevant demographic factors were based on the preliminary data analyses described above.

- Model 2: Behavior = demographics + intention. Similarly, the association between intention to use consistent birth control and the reported behavior of consistent birth control use was tested.

- Model 3: Behavior = demographics + perceived behavioral control. Relevant demographic co-variables were again entered as a block, followed by perceived behavioral control.

- Model 4: Behavior = demographics + perceived behavioral control + intentions. Intention was added for Model 4, meaning that this analysis was focused on

the association between perceived behavioral control (direct measures) and behavior, with and without controlling for intentions to test whether intention mediates the relationship between perceived behavioral control and actual behavior.

- Model 5: Behavior = demographics + perceived behavioral control + intentions + (perceived behavioral control score * intention score). Within Model 4, the interaction between PBC score and intention score was tested for both behaviors.

Results

Validity and reliability. Both the birth control and binge drinking intention scales showed a good internal consistency, with a Cronbach alpha coefficient of 0.98 (birth control) and 0.96 (binge drinking). A test-retest was used to measure reliability between the two sets of scores, with 24 retest surveys examined. Using intra-class correlation coefficients, there was a small degree of reliability between the direct PBC birth control pre-test and post-test ($r = -0.06$) and small degrees of reliability between the direct PBC binge drinking pre-test and post-test ($r = -0.16$).¹¹³ In addition, the Cronbach alpha coefficients for the birth control intention scale at pre-test was 0.98 and for the post-test was 0.99. The Cronbach alpha coefficients for the binge drinking intention scale at pre-test was 0.96 and for the post-test was 0.97.

Demographic information. As stated in Chapter 4, 604 women received the survey. Of those, 196 (32%) returned the survey, with 152 received during the initial wave of surveys sent and 44 during the follow-up wave. A preliminary analysis of the returned surveys revealed that six participants did not complete the PBC or intention questions, thus they were excluded, leaving 190 surveys for analysis. The average age of

participants was 32.8 (standard deviation = 7.2, median = 33.0) and the average number of previous pregnancies was 1.5 (standard deviation = 1.6), with a range of 0-8 (median = 1); 74 (38.9%) women were nulliparous. Twenty-four (12.6%) women were current smokers, and 21 (11.1%) had partners or spouses that binge drank. Only five (2.6%) women had been in an alcohol or drug treatment program before, although 71 (37.4%) had family or close friends who had been in an alcohol or drug treatment program in the past.

Also, as detailed in Chapter 4, most participants (n=161; 84.7%) reported that they were sexually active; of these, the majority (n=113; 92.6% of the 122 who responded) stated they ‘always’ used their birth control method, regardless of what their method was (i.e., including ‘nothing’). In addition, many participants reported that they were current drinkers. The average times per week that participants drank was 1.1 (standard deviation = 1.2, range 0-6, median = 1.0), with an average of 2.1 standard drinks in the past 90 days (standard deviation = 2.2, range 0-15, median = 2.0). The average number of binge drinking episodes (i.e., how many times have you had 4 or more standard drinks on one occasion during the past three months) averaged 2.1 (standard deviation = 5.1, range 0-50, median = 0.0). Table 4.2 shows the responses to birth control and binge drinking questions.

Risk for AEP, defined as having at least one drinking episode in the last three months and being at risk for pregnancy by being sexually active but not using birth control at each sexual encounter or using an unreliable form of birth control, is highlighted on Table 5.1. Of the 122 who responded to the pregnancy and drinking questions, risk for an unintended pregnancy was found in 31 (25.4%) women, and binge

drinking was found in 60 (49.2%) women. Eight participants (6.6%) were at-risk for an AEP because they were binge drinking while being susceptible for an unintended pregnancy. All those vulnerable for AEPs in this sample were non-Hispanic Caucasians and seven were living with a spouse or partner, had completed at least some college (i.e., bachelor's or master's degree), and had a partner or spouse who drank alcohol. Only one at risk for AEP had previously been in an alcohol or drug treatment program.

Intention scores. The mean intention score for birth control (i.e., to use birth control at every sexual encounter) was 5.78 (standard deviation = 2.1, median = 7), and the mean intention score for binge drinking was 6.29 (standard deviation = 1.4, median = 7). When analyzing birth control intention scores by demographic features, those who were not married had significantly higher birth control intention scores compared to those that were married ($p=0.02$). In addition, those whose family members/close friends had never been in an alcohol or drug treatment program had significantly higher birth control intention scores compared to women who had friends or family with a previous history of treatment ($p=0.003$; Table 5.2).

Binge drinking intention scores (i.e., intention to not engage in binge drinking) also varied by several demographic factors. For example, non-Hispanic white women had significantly higher intention to not binge drink when compared to women in other racial/ethnic categories ($p=0.04$), as did women that were married compared to those who were not married ($p=0.001$). Also, intention to quit binge drinking was significantly lower among those whose partner binge drank when compared to all other drinking categories ($p=0.001$). Finally, as age and gravidity increased, intention to not binge drink also significantly increased (age: $r=0.25$, $n=184$, $p=0.001$; gravidity: $r=0.17$, $n=190$,

$p=0.003$). More specifically, women who had previous pregnancies had significantly higher intention scores than women with no previous pregnancy (Table 5.2).

Multivariate analyses. To test the pathways between PBC, intention, and behavior, the models detailed in the methods section were utilized. Separate analyses were conducted for birth control and binge drinking. The following co-variables were included in the models as they had significant relationships to intention ($p<0.10$): for birth control, marital status (married versus not) and previous alcohol and drug treatment history of woman's social network (yes/no); and for binge drinking, race/ethnicity (non-Hispanic white versus all other races/ethnicities), marital status (married versus other than married); partner's drinking, age (continuous), and gravidity (continuous). It is important to note that there were variables that were not included in the models because they were not statistically significant, although have been found to be significant in other studies.^{35, 49, 62, 64, 109} However, they were not "forced" into the model because past research was either limited by the cross-sectional nature of the study;³⁵ included individuals of various ages in the study;⁶² or found differences by race/ethnicity, such as between African Americans and Caucasians.^{49, 64, 109} Also, because the current study had little variability for race (i.e., majority of participants were Caucasian), race/ethnicity was only included in the models if it was found to be significant with a behavior in the current study.

Birth control. For Model 1, hierarchical linear regression was used with intention of use of birth control as an outcome. Marital status and previous treatment history of family/friends were entered at Step 1, explaining 5% of the variance in the birth control intention score. After entry of the direct measure of perceived behavioral control at Step

2, the total variance explained by the model as a whole was 34.8%, $F(3, 173) = 30.8, p < 0.001$. The direct measure of perceived behavioral control explained an additional 30.4% of the variance when controlling for marital status and previous treatment history of family/friends, $R^2 \text{ change} = 0.304, F \text{ change}(1, 173) = 80.7, p < 0.001$. In the final model, both marital status and the direct measure of perceived behavioral control were statistically significant, with the direct measure recording $\beta = 0.56, p < 0.001$ and marital status with a $\beta = 0.18, p < 0.01$. See Table 5.3.

For Model 2, logistic regression was used for the dependent variable ‘birth control behavior’ (measured as birth control use at every sexual encounter, yes/no). There were three independent variables: marital status (i.e., married versus other than married), history of family and/or close friends in alcohol or drug treatment (yes/no), and the birth control intention score. The full model containing both predictors was not statistically significant, $\chi^2(1, N=117) = 0.7, p > 0.05$, indicating that birth control intention was not associated with birth control behavior. The model as a whole explained between 0.2% (Cox and Snell R^2) and 0.5% (Nagelkerke R^2) of the variance in birth control behavior, and correctly classified 94.0% of cases. None of the three independent variables was a significant predictor of birth control behavior (Table 5.4).

For Model 3, logistic regression was used for the dependent variable ‘birth control behavior,’ and there were three independent variables: marital status, history of family/friends in treatment, and the direct measure of perceived behavioral control for birth control. The full model containing both predictors was not statistically significant, $\chi^2(2, N=116) = 0.2, p > 0.05$, indicating that perceived behavioral control for birth control was not associated with birth control behavior. The model as a whole explained

between 0.1% (Cox and Snell R square) and 0.4% (Nagelkerke R square) of the variance in birth control behavior, and correctly classified 94.8% of cases. None of the three independent variables was a significant predictor of birth control behavior (Table 5.4).

For Model 4, logistic regression was used for the dependent variable ‘birth control behavior.’ There were four independent variables: marital status, history of family/friends in treatment, the direct measure of perceived behavioral control for birth control, and birth control intention score. The full model containing all predictors was not statistically significant, $\chi^2(1, N=114) = 0.8, p > 0.05$, indicating that perceived behavioral control for birth control and birth control intention were not associated with birth control behavior, after adjusting for other covariates. The model as a whole explained between 1.2% (Cox and Snell R square) and 3.6% (Nagelkerke R square) of the variance in birth control behavior, and correctly classified 94.7% of cases. None of the independent variables were significant predictors of birth control behavior (Table 5.4). The interaction between PBC and intention scores was non-significant.

Binge drinking. For Model 1, hierarchical linear regression was used with ‘intention to not binge drink’ as the outcome. Race/ethnicity, marital status, partner’s drinking, age, and gravidity were entered at Step 1, explaining 19.5% of variance in the binge drinking intention score. After entry of the direct measure of perceived behavioral control at Step 2, the total variance explained by the model as a whole was 35.6%, $F(6, 169) = 15.6, p < 0.001$. The direct measure of perceived behavioral control explained an additional 16% of variance in the binge drinking intention score after controlling for race/ethnicity, marital status, partner’s drinking, age, and gravidity, $R^2 \text{ change} = 0.16, F \text{ change}(1, 169) = 42.3, p < 0.001$. In the final model, age, race/ethnicity, and the

direct measure of perceived behavioral control were statistically significant, with the direct measure recording a $\beta = 0.42, p < 0.001$; the variable race/ethnicity had a $\beta = -0.29, p < 0.001$; and the age variable's $\beta = 0.17, p < 0.05$. See Table 5.5.

For Model 2, logistic regression was used for the dependent variable 'binge drinking behavior' (measured as if the individual had at least one binge drinking episode drunk in the past 90 days, yes/no). There were six independent variables: race/ethnicity (Caucasian versus other than Caucasian), marital status (married versus other than married), if their partner binge drank (yes/no), age (continuous), gravidity (continuous), and binge drinking intention score. The model as a whole explained between 22.1% (Cox and Snell R square) and 29.6% (Nagelkerke R square) of the variance in binge drinking behavior, and correctly classified 73.7% of cases. The full model containing all predictors was statistically significant, $\chi^2(1, N=152) = 6.95, p < 0.01$, indicating that intention was significantly associated with actual binge drinking behavior. Both intention ($p < 0.05$) and marital status ($p = 0.01$) were significantly related to the woman's own binge drinking behavior after adjusting for other covariates. See Table 5.6.

For Model 3, logistic regression was used for the dependent variable 'binge drinking behavior,' and there were six independent variables: race/ethnicity, marital status, if their partner binge drinks, age, gravidity, and perceived behavioral control score for binge drinking. The model as a whole explained between 21.8% (Cox and Snell R square) and 29.2% (Nagelkerke R square) of the variance in binge drinking behavior, and correctly classified 88.8% of cases. The full model containing all predictors was statistically significant, $\chi^2(1, N=147) = 5.17, p < 0.05$, indicating that the model was able to distinguish between women who did and did not binge drink. The variables partner's

binge drinking ($p < 0.05$), marital status ($p < 0.05$), and perceived behavioral control ($p < 0.05$) were significantly related to the woman's own binge drinking. See Table 5.6.

For Model 4, logistic regression was used for the dependent variable 'binge drinking behavior,' and there were seven independent variables: race, marital status, if their partner binge drinks, age, gravidity, perceived behavioral control score for binge drinking, and binge drinking intention score. The model as a whole explained between 24.8% (Cox and Snell R square) and 33.2% (Nagelkerke R square) of the variance in binge drinking behavior, and correctly classified 65.3% of cases. The full model containing all predictors was statistically significant, $\chi^2(1, N=147) = 5.75, p < 0.05$, indicating that the model was able to distinguish between women who did and did not binge drink. Both marital status ($p < 0.05$) and intention ($p < 0.05$) were significantly related to the woman's own binge drinking. See Table 5.6. The interaction between PBC and intention scores was non-significant.

Discussion

Based on responses to the survey, only 6.6% of respondents were at-risk for an AEP, compared to national studies that have found among women who are susceptible to an unintended pregnancy, approximately 55% consume some amount of alcohol, with 12.4-13.1% either binge drinking or drinking frequently.^{9,30} There are certain risk factors for AEP, including age, race/ethnicity, and socioeconomic status.⁵⁰ For example, younger age (i.e., women of college-age, between 18 and 24), a single marital status, and a higher income are all factors related to high rates of alcohol consumption.^{6,61} Women that are less likely to use birth control during sex include those who have less than a

college education; are African American; and who are between 35-44 years old.^{49,64}

Therefore, it is not surprising that the AEP risk in the current study sample was small as they did not fit many of these risk factors. A study with another population, for example college-aged women, likely will yield higher rates of AEP risk.

Birth control intention scores. The mean intention score for use of birth control was 5.8 (standard deviation = 2.1), meaning that, in general, the women sampled intended to use birth control at each sexual encounter as measured by *expect*, *want*, and *intend*. Because few of the participants were at-risk for an alcohol-exposed pregnancy, it is possible that those who do not intend to use birth control are trying to conceive or have other reasons for not utilizing birth control (i.e., partner/spouse is sterilized). Future studies could tease out that information by asking a question specifically on reasons for not using birth control. In addition, it is difficult to compare the mean intention score for birth control use in this dissertation to other published studies, as some of the published studies have used five-point scales¹¹⁷ instead of the seven-point scales as used in this dissertation. A study with adolescents found that the mean intention score to use birth control pills daily was 5.1 (standard deviation = 1.9) and mean intention score to use condoms was 6.5 (standard deviation = 1.2).⁸³

Significant demographic differences were that women whose friends or family did *not* have a previous history of treatment and women who were not married had significantly higher birth control use intention scores. Comparison data are difficult to obtain, as previous studies that look at intention to use birth control have focused almost exclusively on adolescents^{84,85,118} and college-age females.¹¹⁷ The studies on birth control intention scores that focused on a general adult population included Muslim

women from Jordan. However, these only included married women and those researchers developed their own intention scale (i.e., Intention to Use Oral Birth control Tool) for use with this population,^{87,119} therefore it is not possible to compare the intention scores from the Muslim sample of adult women with intention scores from the dissertation data. Future studies are necessary to collect comparison data from an adult, non-college focused sample in order to better understand women's birth control intentions.

Binge drinking intention scores. When looking at intention scores to *not* binge drink, the mean intention score was 6.3 (standard deviation = 1.4). This implies that the sample had high intentions to not binge drink as measured by *expect*, *want*, and *intend* to not binge drink. This is unexpected, as nearly half (49.2%) had at least one binge drinking episode in the last 90 days (see Chapter 4) and previous data find 30% of women in the Upper Midwest had a binge drinking episode in the past 30 days.⁵² It is possible the high intention to not binge drink from this sample stems from response bias (i.e., stating a socially acceptable answer). There are few similar studies that look at intention to binge drink among a sample of women. The majority focus on undergraduate college students, a group that has high levels of binge drinking and is not comparable to a general sample of adult women.^{75,76,79,81} As well, one of the few studies that reports the intention score used a five-point scale, while the current dissertation study used a seven-point scale.⁷⁹

There were several significant demographic differences in binge drinking intention scores. Binge drinking intention scores (i.e., intention to not engage in binge drinking) were higher among Caucasian women (than other races), married women, and

women whose partner did not binge drink; in addition, intention to not binge drink also significantly increased as age and gravidity increased. Unfortunately, comparison data are not readily available, as most previous studies focus on undergraduate college students, as stated above. One study that focused on female undergraduates and binge drinking using the TPB did not include intention scores in the analysis and did not report any significant demographic differences, likely because of the focus on college students, most of whom were young and single (race and employment were not specified).¹¹²

Relationship between perceived control, intention, and behavior. Previous research has found a relationship between PBC and behavioral intention in various behaviors, but this causal hypothesis has received very little empirical support.⁷⁰ In this dissertation, the measure of PBC was significantly related with intention to use birth control at each sexual encounter, which is similar to other research which finds a significant correlation between PBC and intention to use birth control.^{85,88} Likewise, the measure of PBC of binge drinking was significantly associated with intention to *not* binge drink, similar to other research where high perceptions of control are associated with intention to not binge drink among college students.⁸²

When evaluating actual birth control behavior (i.e., does participant use birth control at each sexual encounter, yes/no), neither PBC nor intention were significant predictors of birth control behavior. This is dissimilar to other research, which found strong correlations between PBC and birth control behavior and intention and birth control behavior ($r = 0.36$ for PBC and behavior and $r = 0.44$ for intention and behavior, with significance for both at $p < 0.01$).⁸⁸ However, this previous study did not conduct multiple regression using the three key variables (PBC, intention, and actual behavior)

and no other studies could be identified that investigate this relationship. Because a significant association was found between PBC and birth control intention, as highlighted above, additional research is necessary to further corroborate what, if any, relationship there is between PBC, intention, and birth control behavior.

When evaluating binge drinking (i.e., does participant currently binge drink, yes/no), binge drinking intention was able to predict binge drinking behavior. This is similar to previous research, which has found that intention emerged as a significant independent predictor for alcohol consumption, with PBC being non-significant.^{82,113} However, other research has found that intention and PBC were “significant independent predictors,”⁸¹ and this study did find that PBC was significantly associated with behavior when intention was not in the model. As these previous research results were conducted with college students, additional studies in a more general population are needed to verify the role that PBC plays with binge drinking behavior.

Overall, these findings are important because few studies have looked at how PBC directly relates to behavior. This study supports previous research that finds that intention is significantly associated with actual binge drinking behavior, with PBC significantly related to behavior with intention not included in the model (when both were added, PBC was not significant). However, previous published research both supports⁸¹ and diverges^{82,113} with this finding for binge drinking, meaning additional research is necessary. In addition, while the PBC measure for birth control was not associated with actual birth control use, neither was intention directly related to birth control use. This is dissimilar to previous research, which found strong correlations between PBC and birth control behavior and intention and birth control behavior.⁸⁸

Because a significant association was found between PBC and birth control intention, it is still possible that there is a relationship between PBC and actual birth control behavior, and additional research is necessary to further corroborate the relationship.

Limitations. The limitations for Chapter 5 are similar to those detailed in Chapter 4. First, the use of self-report surveys may have led to a response bias, meaning that some respondents may have under-reported alcohol consumption or over-reported utilization of birth control or the intention they have toward those behaviors in order to be more socially acceptable. It is also unknown whether non-respondents were simply not interested or were not eligible (i.e., pregnant); future studies should attempt to determine reasons for non-response in order to eliminate additional response bias.

Finally, although cross-sectional studies are often used to test TPB, they may provide a poor prediction and understanding of future behavior because the time order of motivations and behavior cannot be discerned.^{70,120} Cross-sectional studies measure behavior and intention at the same time, and as this study had no follow-up with participants, the findings on the relationship between behavioral intention and actual behavior may not be accurate because actual behavior was not measured subsequent to the behavioral intention. In addition, the measures of binge drinking and birth control employ a relatively long recall period, making them more subject to memory or recall bias.

There were also some unexpected findings uncovered in this dissertation that may be related to these limitations and warrant additional research. Of note, while there were only small correlations between the pre- and post-test for binge drinking direct scores, there were high reliability scores for both the indirect and intention scales. This suggests

that the direct PBC questions may reliably capture birth control and binge drinking intention at a given point in time, but these results might vary significantly across time points due to some combination of measurement error and actual fluctuations in intentions. Such fluctuation could make it more difficult to ascertain the effects of an intervention designed to change intentions. In addition, although PBC measures for birth control were significantly correlated with birth control intention, neither PBC nor intention were significant predictors of actual birth control behavior, which is dissimilar to other research. As stated, there was a significant association found between PBC and birth control intention and normally behavioral intention is significantly related to birth control behavior, therefore the role of PBC as directly related to birth control behavior is unclear.

Conclusion

PBC has been found to be a significant predictor toward *intention* for certain behaviors.^{71,88} The strength of this dissertation is in investigating the mitigating role that PBC plays with intention and actual behavior for both birth control and binge drinking. This dissertation showed that PBC can have a direct effect on binge drinking behavior, although not when intention is added as a mediator. While this did not hold true for birth control behavior, neither PBC nor intention were able to predict birth control behavior, thus additional studies in this behavior are necessary and do not point to the lack of importance of PBC. As stated in Chapter 4, the relative importance of PBC will vary among different populations and behaviors,¹¹⁶ therefore future research is needed to

define the important relationship that PBC has with two behaviors related to FASD prevention—birth control and binge drinking.

Table 5.1: Risk for AEP

	Risk status for binge drinking = low		Risk status for binge drinking = high		TOTAL	
	n	%	n	%	n	%
Risk for unintended pregnancy = low	39	31.9	52	42.6	91	74.6
Risk for unintended pregnancy = high	23	18.9	8	6.6	31	25.4
TOTAL	62	50.8	60	49.2	122*	100.0

Missing data: n=68

Table 5.2: Significant differences in intention scores by demographics

Variables	Birth Control Intention			Binge Drinking Intention		
	n	Mean	SD	n	Mean	SD
Race/Ethnicity	181			187		
<i>Caucasian</i>	172	5.8	2.1	178	6.4	1.3
<i>Other than Caucasian</i>	9	5.6	2.6	9	4.3*	2.8
Marital status	181			186		
<i>Married</i>	106	5.6	2.3	112	6.6	1.0
<i>Other than married</i>	75	6.2**	1.7	74	5.7***	1.9
Employment	181			186		
<i>Employed</i>	129	5.7	2.1	133	6.3	1.4
<i>Other than employed</i>	52	5.8	2.2	53	6.5	1.4
Education	182			187		
<i>College degree</i>	112	5.9	2.1	115	6.5	1.2
<i>Less than college degree</i>	70	5.6	2.3	72	6.1	1.7
Gravidity	182			187		
<i>No previous pregnancy</i>	73	5.7	2.2	72	5.7	1.9
<i>Previous pregnancy</i>	109	5.8	2.1	115	6.6***	0.9
Smoking status	182			187		
<i>Currently smokes</i>	23	5.3	2.4	24	6.0	1.4
<i>Does not smoke</i>	159	5.8	2.1	163	6.4	1.4
Partner's drinking	150			157		
<i>Does not drink</i>	34	5.2	2.4	35	6.7	1.4
<i>Drinks some</i>	116	5.9	2.1	122	6.2	1.4
<i>Does not binge drink</i>	130	5.7	2.3	136	4.8	2.0
<i>Binge drinks</i>	20	5.8	2.1	21	6.6****	1.1
Social network—alcohol or drug treatment history	175			180		
<i>Friend or family had previous tx</i>	66	5.3	2.4	70	6.3	1.3
<i>Friend or family did not have previous treatment</i>	109	6.0*	2.0	110	6.4	1.3
Self—alcohol or drug treatment history	182			187		
<i>Yes, history of alcohol or drug tx</i>	5	5.0	3.5	5	4.3	3.0
<i>No history of alcohol or drug tx</i>	177	5.8	2.1	182	6.4	1.3
Age (continuous)	184	r = 0.06		184	r = 0.25***	

* $<.10$, ** $<.05$, *** $<.01$, **** $<.001$

Table 5.3: Summary of linear regression analysis for variables predicting birth control intention

Variables	<i>B</i>	<i>S.E.</i>	<i>p</i>
Marital status	0.18	0.26	0.003
Previous treatment of friends/family	0.03	0.24	0.65
Perceived behavioral control	0.56	0.09	<0.0001
R^2		0.35	
R^2 change		0.30	

Table 5.4: Summary of multiple logistic regression analysis for variables predicting birth control behavior

	<i>B</i>	S.E.	Wald	<i>df</i>	<i>p</i>	Odds ratio	95% C.I. for Odds Ratio	
							Lower	Upper
<u>Model 2</u>								
Marital status	-0.24	0.81	0.09	1	0.77	0.79	0.16	3.84
Previous treatment of friends/family	-0.45	0.78	0.33	1	0.57	0.64	0.14	2.97
Intention score	0.14	0.17	0.73	1	0.39	1.15	0.83	1.60
Constant	3.05	1.87	2.66	1	0.10	21.16		
<u>Model 3</u>								
Marital status	0.26	0.89	0.09	1	0.77	1.30	0.23	7.46
Previous treatment of friends/family	-0.34	0.85	0.16	1	0.69	0.71	0.14	3.74
Perceived behavioral control	0.19	0.25	0.59	1	0.44	1.21	0.75	1.96
Constant	1.93	2.13	0.82	1	0.37	6.88		
<u>Model 4</u>								
Marital status	0.20	0.90	0.05	1	0.83	1.22	0.21	7.16
Previous treatment of friends/family	-0.36	0.85	0.18	1	0.67	0.70	0.13	3.69
Perceived behavioral control	0.01	0.31	0.00	1	0.96	1.01	0.56	1.85
Intention score	0.20	0.21	0.87	1	0.35	1.22	0.81	1.84
Constant	2.05	2.12	0.93	1	0.33	7.76		

Table 5.5: Summary of linear regression analysis for variables predicting binge drinking intention

Variables	<i>B</i>	<i>S.E.</i>	<i>p</i>
Race/ethnicity	-0.29	0.39	<0.0001
Marital status	-0.05	0.23	0.55
Partner's binge drinking	-0.08	0.08	0.27
Age	-0.07	0.07	0.35
Gravidity	0.17	0.02	0.02
Perceived behavioral control	0.42	0.07	<0.0001
R^2		0.36	
R^2 change		0.16	

Table 5.6: Summary of multiple logistic regression analysis for variables predicting binge drinking behavior

	<i>B</i>	S.E.	Wald	<i>df</i>	<i>p</i>	Odds ratio	95% C.I. for Odds Ratio	
							Lower	Upper
<u>Model 2</u>								
Race/ethnicity	-1.52	1.32	1.33	1	0.25	0.22	0.02	2.89
Marital status	1.10	0.46	5.69	1	0.02	3.01	1.22	7.42
Partner's binge drinking	-1.21	0.73	2.71	1	0.09	0.29	0.07	1.26
Age	-0.04	0.03	1.15	1	0.28	0.97	0.91	1.03
Gravidity	-0.03	0.13	0.07	1	0.79	0.97	0.75	1.25
Intention score	-0.53	0.23	5.49	1	0.02	0.59	0.38	0.92
Constant	6.87	2.87	5.72	1	0.02	965.65		
<u>Model 3</u>								
Race/ethnicity	-0.03	1.26	0.00	1	0.98	0.98	0.08	11.43
Marital status	1.01	0.48	4.49	1	0.03	2.75	1.08	6.99
Partner's binge drinking	-1.50	0.72	4.36	1	0.04	0.22	0.05	0.91
Age	-0.06	0.03	3.15	1	0.08	0.94	0.88	1.01
Gravidity	0.01	0.13	0.00	1	0.97	1.01	0.77	1.30
Perceived behavioral control	-0.39	0.19	4.39	1	0.04	0.68	0.47	0.98
Constant	-5.97	2.64	5.13	1	0.02	391.46		
<u>Model 4</u>								
Race/ethnicity	-0.34	1.43	0.06	1	0.81	0.71	0.04	11.66
Marital status	0.99	0.49	4.11	1	0.04	2.68	1.03	6.93
Partner's binge drinking	-0.94	0.77	1.51	1	0.22	0.39	0.09	1.75
Age	-0.05	0.03	1.88	1	0.17	0.95	0.89	1.02
Gravidity	-0.04	0.14	0.08	1	0.78	0.96	0.74	1.26
Perceived behavioral control	-0.24	0.19	1.55	1	0.21	0.79	0.54	1.15
Intention score	-0.62	0.29	4.55	1	0.03	0.54	0.31	0.95
Constant	7.94	3.00	6.99	1	0.008	2804.12		

CHAPTER 6

DISCUSSION AND CONCLUSIONS

The methods described and results presented in the previous chapters focused not only on the epidemiology of fetal alcohol spectrum disorders (FASD), but also on developing and testing theoretically-based measurements that can guide the prevention of alcohol-exposed pregnancies (AEP). This chapter herein provides a brief synthesis of these results and outlines the unique contribution that they provide to the current literature. Finally, the chapter summarizes the limitations of this dissertation research and potential for future research and public health practice development.

Synthesis of Results

Specific Aim 1. Using a secondary data analysis, the purpose of this specific aim was to establish statewide fetal alcohol syndrome (FAS) prevalence data in North Dakota (ND) and South Dakota (SD). Based on nearly 1,000 medical chart abstractions, the FAS prevalence estimates (per 1,000 live births) in both states (ND=0.8/1,000; SD=0.9/1,000) were higher than that calculated from national averages (0.7/1,000) using a comparable surveillance methodology. This information is helpful in framing the overall public health concern of FAS (and therefore alcohol-exposed pregnancies) in the overall target area, the Upper Midwest.

Specific Aim 2. Although only a small part of Chapter 5, the goal of this specific aim was to determine the number of women in this sample at-risk for an alcohol-exposed pregnancy. Of the 190 women included in the analyses, eight (6.6%) were binge

drinking while being at-risk for pregnancy (i.e., being sexually active but not always using an effective form of birth control). This is lower than national estimates, which have found that among women who are susceptible to an unintended pregnancy, about 55% consume some amount of alcohol, with 12.4-13.1% either binge drinking or drinking frequently.^{9,30} However, it is not surprising that the AEP risk in the current sample was small, as the sample did not fit many of risk factors associated with AEP.^{6,49,50,61,64} Additional studies with another population, for example college-aged women, would likely yield higher rates of AEP risk.

Specific Aim 3. The focus of this specific aim was to develop and test measurements based on the Theory of Planned Behavior (TPB) construct of perceived behavioral control (PBC) and indirect measurements of PBC: perceived power and control beliefs. TPB questions were identified through qualitative/formative research before data collection. To measure indirect PBC constructs, control beliefs for each behavior were measured through a bipolar likelihood of occurrence/control belief scale score (1 to 7) and the perceived power of each factor measured on a bipolar ‘easy-difficult’ (-3 to 3) scale. There were four control beliefs questions and four perceived power questions for both birth control and binge drinking. Indirect measure scores were calculated using $(a \times e) + (b \times f) + (c \times g) + (d \times h)$, where a, b, c, and d are scores for the four control beliefs used in this survey, and e, f, g, and h are scores for perceived power relating to each control belief. Direct measures were asked using one question for each of the two behaviors (i.e., how difficult or easy the behavior is).

The mean scores for direct measures of birth control and binge drinking were 6.3 (standard deviation = 1.5) and 6.4 (standard deviation = 1.3), respectively. Compared to

other studies, these scores were higher and suggested that women in this dissertation study felt a high degree of control over their birth control use/preventing pregnancy and ability to avoid binge drinking.^{83,112} In addition, a positive correlation between birth control direct and indirect scores was found, meaning that as direct scores increased, so did indirect scores. Within this specific aim, one unexpected finding was a negative correlation between binge drinking direct and indirect scores. Few studies have operationalized PBC using the underlying measures of control beliefs and perceived power and instead have mostly used the direct measure of perceived control.⁷⁰ Because of this and because some of these findings contradicted previous research conclusions, additional research is necessary.

Specific Aim 4. The focus of this final specific aim was to test the association between direct measures of PBC and intention for birth control and binge drinking, as well as the association between intention and actual behaviors. The mean intention score for birth control was 5.8 (standard deviation = 2.1), and the mean intention score for binge drinking was 6.3 (standard deviation = 1.4), indicating a high intention to both use birth control and to not binge drink. Using both hierarchical linear and multiple logistic regression techniques, the direct birth control PBC measure was significantly associated with birth control intention when controlling for other variables, although neither PBC nor intention appeared to be associated with actual birth control behavior. For binge drinking, the intention score and the direct measure of PBC were significantly associated with one another when controlling for other variables; as well, both the direct measure of PBC and intention were significantly associated with actual binge drinking behavior, although PBC was not when both PBC and intention were added to the model.

Therefore, the relationship between PBC and intention was validated for both behaviors, and the association between PBC, intention, and actual behavior was indicated for binge drinking. The strength of this specific aim was in investigating the mitigating role that PBC plays with intention and actual behavior.

Unique Contributions

Dual-focus on behaviors. As stated in earlier chapters, understanding women's perspectives regarding binge drinking and birth control use/pregnancy prevention are important in planning effective FASD prevention programs.⁶⁸ Traditionally, interventions to prevent FASD have focused on pregnant women. This is problematic because many women are vulnerable for an alcohol-exposed pregnancy because of continued drinking while being sexually active but using ineffective, inconsistent, or no birth control methods.^{48,49} Therefore, a focus on preventing FASD before a woman becomes pregnant is key. However, previous studies using PBC with non-pregnant women and related to the current project focused mainly on college students and binge drinking *or* birth control utilization.^{81,82} The current study modeled the two behaviors separately but was still able to report findings for both behaviors related to FASD, something lacking in published research.

The recent trend is to focus on non-pregnant women in FASD prevention efforts using both behaviors and broaden the population of at-risk women. As cited extensively in Chapter 1, validated efforts, such as Project CHOICES, Project EARLY, and Project BALANCE, have all aimed to decrease alcohol-exposed pregnancies in non-pregnant women using various theoretical frameworks and techniques, including motivational

interviewing and the Transtheoretical Model (i.e., Stages of Change).^{8,47,48,54,66-69} As shown in this dissertation, an important addition to these previous endeavors is PBC, specifically indirect and direct measures of birth control and binge drinking behavior. Chapter 4 highlights one of the major findings, that being there was a significant positive correlation between the direct scores for birth control and binge drinking. In terms of prevention of alcohol-exposed pregnancies and FASD, this connection between the perceived control of these two behaviors is important and points to the need for additional FASD prevention efforts with non-pregnant women using PBC.

While the focus of this overall study was to focus on two behaviors related to FASD, some of the unexpected findings for birth control and binge drinking might be because they are two completely different behaviors. For example, a finding in Chapter 5 was that neither birth control PBC nor intention was a significant predictor of actual birth control behavior, which is dissimilar to other research. This may be because use of birth control is likely associated with sexual activity and thus may involve more than one person on the birth control decision-making process. On the other hand, binge drinking, while often related to “peer pressure,” is usually an individual decision. Therefore, PBC may be more significant when studying binge drinking compared to birth control use, although, again, literature that includes both behaviors is lacking.

Theoretical contributions. This dissertation is one of the few efforts to correlate direct and indirect measures of PBC in birth control use and binge drinking. Although there were unexpected findings in relation to binge drinking indirect and direct scores (see Limitations discussion below), a significant positive correlation was found between birth control direct and indirect scores, meaning that as direct scores increased, so did

indirect scores. The reason indirect scores are so important is that they identify specific behaviors that could be targeted for behavior change. For example, the survey identifies four mitigating factors that may impact birth control utilization: expense, embarrassment, using the birth control method correctly, and difficulty in obtaining birth control due to cost or availability. These can be used either individually or as a group to focus pregnancy prevention efforts via policy or educational efforts.

Although the negative correlations between direct and indirect measures for binge drinking was unexpected and perplexing, additional research is necessary to further test binge drinking indirect scores. It is possible that the indirect measures for binge drinking were not accurate regarding the current study population, indicating the importance of further formative work in survey development. It is also possible that the wording of the surveys was confusing (i.e., were focused on *not* binge drinking), so more careful pre-testing of the survey may be beneficial. Therefore, the negative correlations for binge drinking direct and indirect scores do not necessarily indicate that indirect scores are meaningless for binge drinking.

Another interesting focus of this dissertation is that it used regression techniques to identify the role that PBC has with intention and with birth control and binge drinking behaviors. As stated in earlier sections, there is a relationship between PBC and behavioral intention, where intention is expected to moderate the effect of PBC on behavior.⁷⁰ However, few studies have looked at how PBC itself directly relates to behavior. This dissertation research found that the direct PBC measure for binge drinking was significantly associated with actual binge drinking behavior, although was non-significant when intention was added to the model. However, previous published

research both supports⁸¹ and disagrees^{82,113} with this finding for binge drinking, meaning additional research is necessary.

In addition, although the PBC measure for birth control was not associated with actual birth control use, neither was intention. This is dissimilar to previous research, which found strong correlations between PBC and birth control behavior and intention and birth control behavior.⁸⁸ Because a significant association was found between PBC and birth control intention, it is still possible that there is a relationship between PBC and actual birth control behavior, possibly in other populations of women. Also, as stated earlier, birth control is likely associated with sexual activity and thus may involve more than one person on the birth control decision-making process, whereas binge drinking is typically an individual decision. Therefore, PBC may be more significant when studying binge drinking compared to birth control use.

Limitations

As highlighted in the previous chapters, there were several limitations to this dissertation. For Chapter 3, it is important to note that passive and retrospective chart reviews “suffer from dependence on ...complete and consistent record compilation,” compounded by the fact that few good records exist with accurate and detailed information on diagnosing FAS and confirming maternal drinking.⁹⁵ This could lead to a non-diagnosis of FAS or a diagnostic misclassification. In addition, FAS rates are typically lower when using a passive surveillance methodology.⁹⁵ Finally, this sample may not be representative of FAS cases nationwide; a large percentage of cases were

American Indian; and the age of the women included was younger than previous populations.

For Chapters 4 and 5, there were additional limitations. The use of cross-sectional surveys may have led to a response bias, meaning that some respondents may have under-reported alcohol consumption or over-reported utilization of birth control or the control they feel they have over these two behaviors. Also, although cross-sectional studies are often used to test TPB, they may provide a poor prediction and understanding of future behavior because the time order of motivations and behavior cannot be discerned.^{70,120} Finally, because of the rather homogenous participant pool (i.e., the majority were non-Hispanic Caucasian, married, and employed), there is a low generalizability to the general population, especially related to risk for an AEP, which has been found to be higher in the general U.S. population than in this sample.

Specific to Chapter 5, which focused on behavioral intention and actual behavior, a limitation is that cross-sectional nature of this study measured behavior and intention at the same time and had no follow-up with participants. This indicates that the findings on the relationship between behavioral intention and actual behavior may not be accurate because actual behavior was not measured subsequent to the behavioral intention. In addition, the measures of binge drinking and birth control employ a relatively long recall period, making them more subject to memory or recall bias.

It is possible that the unexpected findings highlighted throughout the chapters are related to these limitations. For example, indirect scores for binge drinking appeared to significantly decrease as age increased and were significantly higher among participants whose partners were binge drinkers, with the opposite true for direct scores. Also, there

was a negative correlation between binge drinking direct and indirect scores, with higher direct scores associated with lower indirect scores. These remained true even after running additional analyses, such as deleting each question in turn and analyzing the new score with direct scores, testing each individual indirect score with direct scores, and analyzing questions without reverse scores. However, the additional analyses were again negatively correlated.

In addition, although PBC measures for birth control were significantly correlated with birth control intention, neither PBC nor intention was a significant predictor of actual birth control behavior, which is dissimilar to other research. Finally, there were non-significant negative (for birth control) and positive (for binge drinking) correlations for the intention scores, although there was good internal reliability for these scores. This suggests that the questions may reliably capture birth control and binge drinking intention at a given point in time, but these results might vary significantly across time points due to some combination of measurement error and actual fluctuations in intentions.

Directions for Future Research

Additional questions and analyses. There were additional questions that arose from completing the first five chapters that may be of interest for future research. First, it would be interesting to see if intention to use birth control varied by the type of birth control in a much larger sample of women, and if control over using birth control at each sexual encounter depended on the type. Second, how would the responses to both the binge drinking and birth control questions have been different if the sample had been just college students or a group made up of more racial/ethnic diversity? The majority of

previous research using TPB with either binge drinking or birth control use is with college students and does not combine both behaviors into one survey.

Therefore, it would be interesting to conduct the survey with just college students to both see how it replicates previous research and also how the data compares to the dissertation findings, which is with a more general population (i.e., mean age is 32.8). Finally, additional research needs to be conducted on the major unexpected findings. Were the indirect and direct binge questions not correlated because of the questions themselves? Or is it more related to the actual behavior? In addition, why was neither PBC nor intention significantly related to actual birth control behavior? This finding was contrary to the theoretical underpinnings of TPB, which state that intention is directly related to behavior, and previous research on intention to use birth control supports this.⁸⁸

More in-depth formative research. An interesting evaluation technique of TPB-based surveys from French et al. (2007) could be included in future research with TPB and PBC in particular.¹²¹ Specifically, the goal was to identify problems of two TPB-based surveys using a “think aloud” methodology, where they “verbalized all thoughts that would normally be silent” as they completed the TBP survey, with the qualitative analyses of these “think aloud” sessions focused on comprehension of questions, retrieval of information, judgment, and overall response. In the French et al. (2007) study, some participants found questions difficult if they wanted to disagree with negatively-worded phrasing (i.e., they were too complex or were confusing).¹²¹ Other participants found problems with the way questions were worded and how sensible they were (i.e., they may have been too similar to a previous question), impacting how they

decided to respond. Finally, at times participants seemed to answer a different question than what was asked or giving reasoning that is inconsistent with the answer given.¹²¹

In future uses of TPB and PBC in particular, this author could utilize a similar methodology to uncover problems with PBC-based survey questions, thereby more clearly instituting validity. It's possible that some of the unexpected findings outlined above came from some of these same difficulties. For example, the binge drinking questions were negatively worded (i.e., *not* binge drink), which could have impacted how the participants responded to the question. Having a "think aloud" methodology would help in reformatting questions that are deemed confusing, too complex, or inapplicable to the individuals sampled, going beyond the formative research conducted for this current study.

Future grant idea. Based on the limitations outlined throughout these chapters, it is ideal to conduct a prospective study and measure behaviors at various points to more fully understand the role that PBC and intention have with *current* behavior. A longitudinal study could be conducted that follows women long-term and uncovers birth outcomes and how birth control and binge drinking PBC and intention scores relate to these outcomes. In addition, it would be crucial to more fully delve into the differences between binge drinking and birth control behavior. While they are both vital for preventing AEP, future studies and interventions must take into account that they are two separate behaviors and that participants will have varying reasons for binge drinking versus birth control behavior.

In the short-term, this author is interested in continuing to develop and test PBC measurements, in particular with a subpopulation that appears most impacted by

alcohol-exposed pregnancies—American Indian communities. In brief, Indian Health Service (IHS) reported that 56% of pregnant patients admitted prospectively to drinking alcohol during their pregnancy.^{122,123} Binge drinking is of prominent concern in American Indian communities, with one study finding that 43% of American Indian women in the Aberdeen Area (tribes in North Dakota, South Dakota, Nebraska, and Iowa) were binge drinking in the three months prior to pregnancy, and seven out of ten pregnancies were unplanned.¹²⁴ In addition, estimated rates of fetal alcohol syndrome (FAS) among Northern Plains American Indians range as high as 9 per 1,000 births, which is “several times that of the country in general” or other Native communities.²¹

Therefore, this author would like to pilot test the dissertation survey with non-pregnant American Indian women, with a focus on determining how much control (via PBC) this population has over two behaviors related to alcohol-exposed pregnancy—binge drinking and pregnancy prevention via birth control. The short-term goal of this proposed study would be to utilize direct and indirect measures of PBC to measure birth control and binge drinking among non-pregnant American Indian women. Understanding the relationship between control of these two behaviors, behavioral *intention* and *actual* behavior, will inform the long-term goal of this future project, which is to enhance an intervention on prevention of FASD with non-pregnant American Indian women.

Based on these goals, the specific aims of this future grant idea are to test the appropriateness and validity of the survey items in American Indian women and to determine the effects of a pilot intervention that include PBC measures. This will be accomplished by: 1) Pilot testing the survey on PBC measures with a sample of non-

pregnant American Indian women from one tribe and through key informant interviews with Aberdeen Area Indian Health Service (AAIHS) staff to further evaluate the survey's efficacy; 2) modifying the survey and distribute it to a random sample of American Indian women seen at AAIHS facilities; and 3) pilot testing an intervention at two tribal clinics based on results from the first two specific aims. Specifically, non-pregnant American Indian patients who are at-risk for an alcohol-exposed pregnancy will randomly be selected to either receive the pilot intervention based on the PBC survey results or will receive standard care, which, at the AAIHS facilities involved in this proposed project, is the Project CHOICES intervention discussed in Chapter 1. This author is currently working with the Oglala Sioux Tribe (OST) on the Pine Ridge Indian Reservation to implement and evaluate Project CHOICES in tribal health clinics.

The proposed project will enhance the OST's Project CHOICES program by utilizing the validated PBC- based survey (SA 1 and 2), to measure control of both binge drinking and birth control utilization. Through a randomized process, fifty non-pregnant American Indian women at-risk for an alcohol-exposed pregnancy will be referred to the OST Project CHOICES program, but will first complete the PBC measurements. Those who score lower on control measures for either binge drinking or birth control will have their CHOICES intervention focus more intently on that particular behavior. The results from this pilot intervention will be compared to a matched sample of fifty women who only received the CHOICES intervention to see if inclusion of PBC made a statistically significant difference in behavior change at the end of their CHOICES sessions.

Conclusion: Implications for Public Health Practice

The first major section of this dissertation reported estimated statewide FAS prevalence rates of 0.8-0.9 per 1,000 live births for this area of the country, which is higher when compared to national averages using a comparable methodology. This finding is important because it examines FAS prevalence in general rather than focusing on a particular racial/ethnic group and includes a large number cases, which is important as this is an area of the United States with high rates of alcohol consumption. The data will influence public health practice by establishing a clear rate of FAS in these states, which will aid in funneling funding toward developing interventions to prevent this disability in high-risk populations.

The rest of the sections make significant theoretical contributions to public health practice. This is one of few studies that have operationalized indirect measures of PBC—control beliefs and perceived power—with the majority of previous research using direct measures of PBC.⁷⁰⁷⁰ Indirect measures can be vital in identifying specific behaviors that could be targeted in prevention efforts. In addition, future interventions can screen women using the PBC measures to evaluate how in-control they are of using birth control or not binge drinking and focus interventions on feasible behavior changes.

Another important implication for public health practice comes in the testing of how PBC mediates intention and actual behavior. This dissertation shows that PBC can have a direct effect, although the limitation sections of Chapters 5 and 6 caution against any final conclusions due to the cross-sectional nature of this study. While future research is needed to define the important relationship that PBC has with two behaviors related to FASD prevention—birth control and binge drinking—future public health

studies can additionally test the role that intention has in determining various behaviors. PBC as a theoretical construct has the potential for future public health interventions. Logically, it may be simpler to modify control rather than intention, as certain control factors, such as how much birth control costs or not understanding what binge drinking is, can be altered via policy changes or educational efforts. On the other hand, trying to change intention may be more difficult considering that intention is often an internal component, and it can be more difficult to change the person's behavioral intentions rather than trying to provide education or enact policy changes.

Overall, focusing efforts on curbing rates of alcohol-exposed pregnancy and FASD by how much control a woman feels she has over these behaviors will better inform interventions and clinical practice by focusing interventions on more feasible behavior changes, or those that women feel they are in more control of. In addition, understanding the relationship between PBC and *actual* behavior can inform future interventions on prevention of FASD with non-pregnant women. This dissertation provided important theoretical information in the effort to prevent AEP.

Utilizing theoretical frameworks to influence preconceptual health is an important public health area that can be further explored. This dissertation is unique in that it focused on non-pregnant women using theoretical construct and including two behaviors related to FASD prevention—birth control utilization (pregnancy prevention) and binge drinking. The study both supported and disagreed with previous research, indicating that additional research with this theory and topic matter is necessary. While ideas for an intervention were proposed, more formative research is needed before developing or

implementing such an intervention. However, there is potential for PBC inform future studies on FASD prevention with non-pregnant women.

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APPENDIX A
LETTERS TO PARTICIPANTS (3)

DATE

Dear <NAME>:

I am writing to ask for your help with an important research study being conducted by an employee of Sanford Research to understand how much control women feel they have over using birth control and drinking. You were randomly selected as a possible participant because you have been a patient at a Sanford Clinic at least once in the last three years. In the next few days, you will receive a request to participate in this project by answering questions about birth control and alcohol consumption.

We would like to do everything we can to make it easy and enjoyable for you to participate in the study. I am writing in advance because many people like to know ahead of time that they will be asked to fill out a survey. This research can only be successful with the generous help of people like you.

To say thanks, you will receive a small token of appreciation with the request to participate. I hope you will take 10-15 minutes of your time to help us. I can be reached at (605)-312-6209 or Jessica.D.Hanson@sanfordhealth.org if you have any questions.

Sincerely,

Jessica D. Hanson
Project Manager, Sanford Research
Doctoral Candidate, University of Iowa

Dear <NAME>:

You are invited to participate in a research study about using birth control and drinking alcohol. You were selected as a possible participant because you have been a patient at a Sanford Clinic at least once in the last three years. Your name was chosen randomly from a list of Sanford patients. About 200 women will take part in this study.

The purpose of this research study is to understand how much control women feel they have over using birth control and also drinking. There are also questions about your current method of birth control and how much you consume alcohol. The risks of completing the survey are not viewed as being more than a “minimal risk.” Some of these questions are sensitive and might make you feel uncomfortable. You can skip any question you don’t want to answer.

It will take between 5-10 minutes to complete the survey. If you decide to complete the survey, send it in using the enclosed stamped envelope. You will have a study ID number, so you should not write any identifying information (name, address) on the survey. Please keep in mind that there will be a temporary link between your name and your subject ID number. This is for any follow-up purposes. Once all the surveys are received (after about 6 weeks), the link between your name and subject ID number will be destroyed so that I won’t be able to identify your name and how you answered the questions.

When I receive your survey, I won’t contact you again unless you answer “yes” to Question 42. **Completing and sending back the survey means you consent to participating in this project.** If you change your mind and don’t want your answers included in the analysis, please contact me using the phone number or email below. After the links between your name and subject ID number are destroyed, I won’t be able to take your answers out of the analysis, so please let me know as soon as possible.

If I don’t receive your survey, I will send you up to two reminder letters to encourage participation. **If you are pregnant or trying to get pregnant, or if you do not want to complete the survey, please send back a blank survey—that way I will know not to contact you again.**

Your participation is completely voluntary. Your decision whether or not to participate will not affect your current or future relations with Sanford Health.

There are no costs for being in this research study, and you will **not** be paid for participating. You also probably won’t benefit personally from being in this study. However, we hope that, in the future, other people might benefit from the study and that the information will be useful in the development of future interventions.

Thank you so much for taking the time to complete the survey! If you have any questions or concerns, please contact me at the phone number or email address below.

Sincerely,

Jessica D. Hanson

Project Manager, Health Disparities Research Center

Doctoral Candidate, University of Iowa’s College of Public Health

(605)-312-6209

Jessica.D.Hanson@sanfordhealth.org

Dear <NAME>:

Two weeks ago you received a survey about using birth control and drinking alcohol. You were selected as a possible participant because you have been a patient at a Sanford Clinic at least once in the last three years. Your name was chosen randomly from a list of Sanford patients. About 200 women will take part in this study.

The purpose of this research study is to understand how much control women feel they have over using birth control and also drinking. There are also questions about your current method of birth control and how much you consume alcohol. The risks of completing the survey are not viewed as being more than a “minimal risk.” Some of these questions are sensitive and might make you feel uncomfortable. You can skip any question you don’t want to answer.

It will take between 5-10 minutes to complete the survey. If you decide to complete the survey, send it in using the enclosed stamped envelope. You will have a study ID number, so you should not write any identifying information (name, address) on the survey. Please keep in mind that there will be a temporary link between your name and your subject ID number. This is for any follow-up purposes. Once all the surveys are received (after about 6 weeks), the link between your name and subject ID number will be destroyed so that I won’t be able to identify your name and how you answered the questions.

Completing and sending back the survey means you consent to participating in this project. If you change your mind and don’t want your answers included in the analysis, please contact me using the phone number or email below. After the links between your name and subject ID number are destroyed, I won’t be able to take your answers out of the analysis, so please let me know as soon as possible.

If you are pregnant or trying to get pregnant, or if you do not want to complete the survey, please send back a blank survey—that way I will know not to contact you again.

Your participation is completely voluntary. Your decision whether or not to participate will not affect your current or future relations with Sanford Health.

There are no costs for being in this research study, and you will **not** be paid for participating. You also probably won’t benefit personally from being in this study. However, we hope that, in the future, other people might benefit from the study and that the information will be useful in the development of future interventions.

Thank you so much for taking the time to complete the survey! If you have any questions or concerns, please contact me at the phone number or email address below.

Sincerely,
 Jessica D. Hanson
 Project Manager, Health Disparities Research Center
 Doctoral Candidate, University of Iowa’s College of Public Health
 (605)-312-6209
 Jessica.D.Hanson@sanfordhealth.org

APPENDIX B

SURVEY

Study ID: _____

*You have been sent this survey because you are a non-pregnant woman between the ages of 21 and 44 who has been seen at a Sanford Health clinic at least once in the past three years. You were randomly chosen. The purpose of this study is to collect information from women about what makes getting birth control easy or difficult for you, and also what makes it easy or difficult to not drink in social situations. **If you are pregnant or do not want to fill out the survey, please send back a blank survey.***

Some of these questions are sensitive and may make you feel uncomfortable. We are asking questions about sexual activity and alcohol consumption. You should know that you can skip any question you don't want to answer. Please answer each question to the best of your ability; if you have any questions or concerns, please call the telephone number located in the cover letter. Thank you for taking the time to fill out and mail back this survey!

Section 1:

1. Age: _____

2. Which one or more of the following would you say is your race (check all that applies)?:

<input type="checkbox"/> American Indian or Alaska Native	<input type="checkbox"/> Native Hawaiian/other Pacific Islander
<input type="checkbox"/> Asian	<input type="checkbox"/> White
<input type="checkbox"/> Black or African American	<input type="checkbox"/> Other (please specify): _____

- 2a. Are you Hispanic or Latino?

<input type="checkbox"/> Yes
<input type="checkbox"/> No
<input type="checkbox"/> Don't know/not sure

3. What is your marital status?

<input type="checkbox"/> Married, living together	<input type="checkbox"/> Divorced
<input type="checkbox"/> Partnered, living together	<input type="checkbox"/> Single, never married
<input type="checkbox"/> Partnered, not living together	<input type="checkbox"/> Widowed
<input type="checkbox"/> Separated	

4. What best describes your current job (mark the one where you spend most of your time)?

<input type="checkbox"/> Employed	<input type="checkbox"/> Self-employed
<input type="checkbox"/> Homemaker	<input type="checkbox"/> Student
<input type="checkbox"/> Out of work (specify how long)	<input type="checkbox"/> Retired
○ <u>More</u> than one year	<input type="checkbox"/> Unable to Work
○ <u>Less</u> than one year	<input type="checkbox"/> Other: _____

5. What is the highest level of education you have completed?

<input type="checkbox"/> Less than high school	<input type="checkbox"/> 4-year college degree (BA, BS)
<input type="checkbox"/> High school/GED	<input type="checkbox"/> Master's degree
<input type="checkbox"/> Some college	<input type="checkbox"/> Doctorate degree
<input type="checkbox"/> 2-year college degree (Associates)	<input type="checkbox"/> Professional degree (MD, JD)

6. Have you ever been pregnant before?
☐ Yes: _____ (number of previous pregnancies)
☐ No
7. Do you currently smoke cigarettes?
☐ Yes
☐ No

Now I have some questions about your sexual activity and alcohol consumption in the last 90 days, or three months.

8. Have you had sex in the past 90 days (3 months)?
☐ Yes
☐ No (→ Skip to question 11)
9. When you had sex during the past 90 days (3 months), what were you or your partner(s) using to keep you from getting pregnant? Check the one that you use the majority of the time.
- | | |
|---|---|
| <input type="checkbox"/> Condoms | <input type="checkbox"/> Pill |
| <input type="checkbox"/> Depo-Provera (the Shot) | <input type="checkbox"/> Rhythm method |
| <input type="checkbox"/> Diaphragm | <input type="checkbox"/> Ring (NuvaRing) |
| <input type="checkbox"/> Female condom | <input type="checkbox"/> Spermicidal foam/jelly |
| <input type="checkbox"/> Hysterectomy (→ Skip to question 11) | <input type="checkbox"/> Tubes tied (→ Skip to question 11) |
| <input type="checkbox"/> IUD | <input type="checkbox"/> Vasectomy (→ Skip to question 11) |
| <input type="checkbox"/> Morning-after pill | <input type="checkbox"/> Withdrawal |
| <input type="checkbox"/> Nothing | <input type="checkbox"/> Other (specify) _____ |
| <input type="checkbox"/> Patch | <input type="checkbox"/> Don't know |
10. During the past 90 days (3 months), how often did you use this method while having sex?
- | | |
|---------------------------------------|-------------------------------------|
| <input type="checkbox"/> Almost never | <input type="checkbox"/> Always |
| <input type="checkbox"/> Sometimes | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Usually | |
-
11. On average in the last 90 days (3 months), how many days per week did you drink alcohol?
 _____ days per week (should not be greater than 7)
12. When you did drink, on average, how many standard drinks would you have had in each occasion in the last 90 days (3 months)?
 _____ drinks
13. How many times in the past 90 days (3 months) have you had 4 or more standard drinks on one occasion?
 _____ times
14. When you drink, what type of alcohol do you prefer to have (choose one)?
- | | |
|--|--|
| <input type="checkbox"/> Beer | <input type="checkbox"/> Mixed drinks with hard liquor |
| <input type="checkbox"/> Wine | <input type="checkbox"/> Other: _____ (specify) |
| <input type="checkbox"/> Hard liquor (rum, vodka, whiskey) | |

15. Has there been a time in the past 90 days (3 months) where you have been drinking and not using birth control every time you have sex ?
- ☐ Yes: _____ (how many times?)
- ☐ No
- ☐ Not applicable
16. When your spouse or partner drinks, on average, how many standard drinks (see chart on previous page) would s/he have had on each occasion in the last 90 days (3 months)?
- ☐ None
- ☐ 1 drink
- ☐ 2-4 drinks
- ☐ 5 or more drinks
- ☐ Not applicable (I don't live with anyone/I don't have a sexual partner right now)
17. Have you been in an alcohol or drug treatment program before?
- ☐ Yes: _____ (how long ago?)
- ☐ No
18. Have any family members or close friends been in an alcohol or drug treatment program before?
- ☐ Yes
- ☐ No
- ☐ Don't know

Section 2

There are many reasons why women don't use birth control each time they have sex. For each of the statements below, circle the number that best reflects **how likely or unlikely a situation is for you.** Circle "zero" if you feel neutral.

19. How likely is it to be too expensive for you to buy birth control?
- Not at all likely -3 -2 -1 0 1 2 3 Very likely
20. How likely is it to be embarrassing for you to buy birth control?
- Not at all likely -3 -2 -1 0 1 2 3 Very likely
21. How likely is it that it's hard for you to figure out how to use the birth control correctly (for example, taking a pill at the same time every day or how to use a condom)?
- Not at all likely -3 -2 -1 0 1 2 3 Very likely
22. How likely is it to be too difficult to get birth control (for example, I have to get a physical exam to get pills or I have to drive to the pharmacy to pick up condoms).
- Not at all likely -3 -2 -1 0 1 2 3 Very likely

There are also various situations that impact a woman's decision to use birth control each time they have sex. For each of the statements below, circle the number that best reflects how each situation affects your ability to use birth control. Circle "zero" if you feel neutral.

23. When birth control is too expensive, I am
 Less likely -3 -2 -1 0 1 2 3 More likely...
 ...to use birth control each time I have sex.
24. When it's embarrassing to buy birth control, I am
 Less likely -3 -2 -1 0 1 2 3 More likely...
 ...to use birth control each time I have sex.
25. When it's hard to figure out how to use the birth control correctly, I am
 Less likely -3 -2 -1 0 1 2 3 More likely...
 ...to use birth control each time I have sex.
26. When it is not easy or convenient to get my birth control, I am
 Less likely -3 -2 -1 0 1 2 3 More likely...
 ...to use birth control each time I have sex.

There are various reasons why women binge drink (or drinking four or more drinks on any one occasion). For each of the statements below, circle the number that best reflects how likely or unlikely a situation is for you. Circle "zero" if you feel neutral.

27. How likely is it that drinking alcohol will help you deal with stress?
 Not at all likely -3 -2 -1 0 1 2 3 Very likely
28. How likely is it that peer pressure will make you feel like you have to drink?
 Not at all likely -3 -2 -1 0 1 2 3 Very likely
29. How likely is it that you feel like you don't have enough knowledge about binge drinking, such as what binge drinking means (how many drinks that is)?
 Not at all likely -3 -2 -1 0 1 2 3 Very likely
30. How likely is it that your work or school schedule means you can't go "out" a lot?
 Not at all likely -3 -2 -1 0 1 2 3 Very likely

Finally, there are various situations in which women are more likely to binge drink (or four or more drinks on any one occasion). For each of the statements below, circle the number that best reflects **how each situation affects your ability to not binge drink.** Circle “zero” if you feel neutral.

31. When I have a lot of stress in my life, I am
 Less likely -3 -2 -1 0 1 2 3 More likely...
 to binge drink.
32. When I have peer pressure to go to the bar or social situations, such as going to parties, I am
 Less likely -3 -2 -1 0 1 2 3 More likely...
 ...to binge drink.
33. When I don't feel I know a lot about binge drinking, such as what binge drinking means (how many drinks that is), I am
 Less likely -3 -2 -1 0 1 2 3 More likely...
 ...to binge drink.
34. When I have a busy work or school schedule, I am
 Less likely -3 -2 -1 0 1 2 3 More likely...
 ...to binge drink.
-
35. For me to use birth control each time I have sex is:
 Difficult 1 2 3 4 5 6 7 Easy
36. For me to drink alcohol without having four or more drinks is:
 Difficult 1 2 3 4 5 6 7 Easy
-

Section 3

37. I **expect to** use birth control every time I have sex.
 Strongly disagree 1 2 3 4 5 6 7 Strongly agree
38. I **want to** use birth control every time I have sex.
 Strongly disagree 1 2 3 4 5 6 7 Strongly agree
39. I **intend to** use birth control every time I have sex.
 Strongly disagree 1 2 3 4 5 6 7 Strongly agree
40. I **don't expect to** binge drink (four or more drinks on any one occasion) in the next week.
 Strongly disagree 1 2 3 4 5 6 7 Strongly agree
41. I **don't want to** binge drink in the next week.
 Strongly disagree 1 2 3 4 5 6 7 Strongly agree
42. I **don't intend to** binge drink in the next week.
 Strongly disagree 1 2 3 4 5 6 7 Strongly agree
43. Would you be willing to complete a similar survey in two weeks?
☐ Yes
☐ No