Substance use among New Hampshire adolescents: Attitudes as predictors of substance use behavior

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SUBSTANCE USE AMONG NEW HAMPSHIRE ADOLESCENTS: ATTITUDES AS PREDICTORS OF SUBSTANCE USE BEHAVIOR

BY

JESSICA AIMEE BEAN
BA, UNIVERSITY OF NEW HAMPSHIRE, 2007

THESIS

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May 7, 2009
Date
DEDICATION

To Mom, for always being there.
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ABSTRACT

SUBSTANCE USE AMONG NEW HAMPSHIRE ADOLESCENTS: ATTITUDES AS PREDICTORS OF SUBSTANCE USE BEHAVIOR

by

Jéssica Aimee Bean

University of New Hampshire, May, 2009

The purpose of this thesis was to examine the relationship between substance-related attitudes and substance use behaviors among a sample of New Hampshire adolescents. Data from the New Hampshire Youth Survey, a longitudinal survey of deviance among adolescents, were used, yielding a sample of 760 middle- and high-school students. Hypotheses tested include whether substance use and attitudes varied by sex or age, whether attitudes and behaviors had predictive ability on one another, and whether that predictive ability varied by sex or age. Data were analyzed through a series of logistic and ordered logistic regression models. Findings showed that (1) age, but not sex, differences in substance use are persistent across Times, (2) females and younger students express less favorable attitudes towards use, and (3) attitudes and behaviors predict one another, and may be best explained through a mutually reinforcing, bi-directional relationship, which should be tested more thoroughly in future research.
INTRODUCTION

The purpose of this thesis is to examine the relationship between substance-related attitudes and subsequent substance use behaviors among a sample of New Hampshire adolescents. This thesis will begin with univariate examinations of substance use behaviors and related attitudes. Next, the bivariate relationships between substance-related attitudes and behaviors will be examined alongside two variables of interest: age and sex. This thesis will explore the relationship between attitudes and behaviors in terms of the reciprocal relationship between two attitudinal measures on corresponding subsequent substance use behaviors using several sociological/psychological theories. This relationship will again be examined in terms of age and sex, to see whether the predictive strength of attitudes on behaviors changes with either variable. Finally, the possibility of a bi-directional relationship between attitudes and behaviors will be explored, by examining behaviors for a subsequent influence on attitudes.
CHAPTER I

BACKGROUND AND THEORY

The desire to understand the mechanisms through which young people become involved in drug and alcohol use has spurred a plethora of theories about pathways to substance use. In turn, these theories have influenced many social programs and policies (e.g. DARE) that attempt to change adolescent attitudes about substance use in an attempt to alter behavior. However, there has been little research on the specific nature of the relationship between adolescent attitudes and subsequent substance-related behaviors.

The purpose of this thesis is first to assess the prevalence of substance use behaviors and related attitudes among adolescents and then to determine the relationship between the two. A review of the literature on adolescent substance use and attitudinal-behavioral research is presented below.

Introduction

There are many theories that attempt to explain the mechanisms by which young people become involved in drug and alcohol use (Oetting and Beauvais 1987). In this literature review, I will explore several theories that have garnered empirical support in order to create an inclusive
framework for studying substance use patterns, and to attempt to locate areas that may require theoretical elaboration. The large-scale purposes of this thesis are to (1) provide a current assessment of use patterns among a sample of New Hampshire middle and high school students, and determine how such patterns may vary by sex and age; (2) examine substance-related attitudes, and how they may vary by sex and age; and (3) to determine the relationship between substance-related attitudes and substance use behaviors (based on several existing theoretical models), including whether this relationship differs by either sex or age. The first of these objectives centers on a report of substance use behaviors; the second centers on describing varying substance-related attitudes. Finally, the third aim focuses on the interrelationship between these two dimensions and the potential utility of using one to predict the other.

This literature review will first examine common patterns of use among adolescents in general, as well as summarizing the prevalence of use of various substances. While substance use behaviors have been previously examined in a multitude of studies (Kuehn 2006; Höfler et al. 1999; Wallace et al. 2003; Young et al. 2002), it is imperative that the research informing policy formation remains current and applicable to particular groups of adolescents. In this study, substance use rates will be examined among a longitudinal sample of New Hampshire middle- and high-school students, allowing for a current description of the sample's
substance use patterns over time. While not necessarily representative of the state as a whole, this sample may serve as a window into how a specific state's drug use may vary from national averages. This may be particularly important here, as New Hampshire's demographic composition differs quite markedly from nation-wide averages, both in terms of racial/ethnic make-up and median household income (State and Country Quick Facts 2008).

A second aim of this literature review is to consider the utility of examining students' substance-related attitudes in a more nuanced framework than the traditional risk assessment orientation (Beck 1987). Expansion of attitudinal assessment beyond "how risky" students find substance use to be allows researchers to recognize that students' attitudes towards substance use may have multiple dimensions, which in turn may have differential utility in predicting substance use behaviors. The attitudinal measures to be drawn on here examine "how wrong" and "how deserving of punishment" students find substance use to be. This framework will allow for the possibility that students may have multiple attitudes on substance use that may vary by substance, attitudinal dimension, or by individual. In addition to attitudes' potential utility as predictive factors, this research aims to provide a descriptive insight into student assessments of substance use as wrong or as punishable offenses, which may be found to vary across demographics, such as age and sex.
These variations, in turn, may affect the intensity of attitudes' relationship with behavior, a notion that will be explored more fully below.

The third and central aim of this literature review is to examine the research on the relationship between substance-related attitudes and behaviors, and to determine the predictive ability of attitudes concerning drug use in determining future substance-use behaviors. The current study will assess attitudes regarding "to what extent [students] approved of these [substance using] behaviors (i.e. normative status) and to what extent they approved of enforcing rules against these same behaviors (i.e. enforcement status)" (Cohn and White 1986:201), as well as measures of students' own self-reported substance use behaviors. This literature review aims to evaluate previous attitude and behavior research, while recognizing the potential that this relationship may be moderated by certain demographic characteristics, and may be bi-directional. Below, each of the above aims will be examined in terms of current research in the area, as well as a systematic identification of gaps in the literature that may be addressed by the current work.

**Prevalence of Substance Use among Adolescents**

For the purposes of this review, the focus will be on three substances: alcohol, marijuana, and non-medical prescription drugs (NMPDs). These substances will be examined jointly to provide the widest assessment of substance use practical, including one completely illicit
drug (marijuana), one age-specific illicit drug (alcohol), and one person-specific illicit drug (NMPDs). In addition, alcohol and marijuana are the most widely used substances among adolescents, while NMPD use is an emerging phenomenon requiring more research (Kuehn 2006).

Overall Use Rates

Despite shifting trends in the popularity of particular drugs (Kuehn 2006), rates of substance use among youths in the United States have remained fairly steady over recent years. An evaluation of the nationwide 2005 Monitoring the Future survey data showed that about half of all students will have tried an illicit drug before leaving high school (Kuehn 2006). About 16% of the studied sample reported using drugs in the last month, as compared with 19.4% of students five years prior. While this suggests that overall rates may be declining, it should be noted that for the youngest age group surveyed (8th grade students), past month use has not declined since at least 2004 (Kuehn 2006). Of all substances considered, marijuana consistently emerges as the second most commonly used illicit drug among young people (after alcohol) (Young et al. 2002; Kuehn 2006). As such, attitudes and behaviors related to marijuana use will be a major focus of this research.

Findings for alcohol use indicate that while overall usage is also declining since 2001, it is still the most common substance used among teens, with half of high school seniors and a third of 10th graders having
used alcohol at least once in the past month (Kuehn 2006). A separate study by Young et al. (2002) found rates as high as 88% among 17 and 18 year olds for lifetime alcohol use. As with findings on other illicit drug use, research suggests that alcohol use develops quite linearly over the course of adolescence, with older participants being more likely to have used than younger students (Young et al. 2002). This consistent finding helps to inform the hypotheses for this project in that it is likely that the majority of the younger cohort has not yet begun experimentation with substance use, creating the potential for assessment of pre-use characteristics. This longitudinal analysis will be useful in determining which factors influence adolescents to engage in substance use, and which factors may serve as protection against such behaviors.

In addition, a final important finding from the research on U.S. adolescent substance use generally is that non-medical prescription drug (NMPD) use is at an all-time high (as of 2005), with about one in ten high school seniors admitting to use of painkillers for non-medical purposes (Kuehn 2006; Riggs 2008). This finding seems to be part of a larger substance use trend, as Tetrault et al. (2007) estimate that lifetime prevalence of non-medical prescription opioid medications among people 12 and older increased from about 4% of the population in 1998 to about 10% in 2003. This finding is somewhat supported by Simoni-Wastila, Ritter, and Strickler (2004), who estimate that approximately 9.5% of
Americans, aged 12 or older, have engaged in NMPD use at least once in their lifetime. These statistics suggest the broad-scale importance of examining the young drug using population, particularly if new drug use trends are emerging. As the data to be analyzed for the current project include a survey item about NMPD use, the distribution of use patterns for these newly popularized drugs can be examined here.

**Demographic Differences in Substance Use**

The findings indicating youth participation in a wide variety of substance use behaviors suggest that substance use may differ between groups with varying demographic characteristics. While there are a plethora of variables that are likely to affect students' decisions to engage in substance use, the main foci in this literature review will be sex and age. While these variables have been examined numerous ways, through a variety of sociological and psychological studies, there are some major inconsistencies among findings that are important to address. Previous findings for sex and age, in terms of both substance-related attitudes and behaviors, will be discussed and evaluated below in order to shape hypotheses about the potential findings of this thesis.

As mentioned above, there are many personal or demographic variables that may influence adolescents' substance-related attitudes and behaviors. Such variables include familial arrangement, socio-economic status, peer influence, and race, all of which have been shown
in the past to potentially affect substance use (Barrett and Turner 2006; Höfler et al. 1999; Oetting and Beauvais 1987; Albers et al. 2002). However, due to the utilization of secondary data for this project, it was not possible to measure certain elements of these variables that may be essential in capturing their full effects. For example, the data to be utilized here simply determine which parental figure(s) students live with, and do not inquire about siblings or older cousins that may live with the family. Because the presence of older siblings has been shown to comprise a large part of family effect on adolescent substance use (Windle 2000), it is not possible to test a prediction about the effects of family structure on substance-related attitudes and behaviors without such information.

Additionally, it may not be possible to fully predict the effects of peer influence and SES either, as students' assessments of these variables may also be inaccurate (i.e. students being unable to accurately estimate their peers' substance use rates, or their families true income brackets). Finally, although there has been much research on race/ethnicity and substance use, the limitations of the sample here (e.g. few non-white participants) do not allow for testing of relevant hypotheses. Nevertheless, in the data analysis for this thesis, controls for these demographic variables will be included in the multivariate analyses, but are not to be considered major theoretical foci of the overall project.
Sex and Substance Use. One demographic variable often assessed in the substance use literature is sex, with varying conclusions across studies and over time. Historically, there has been much support for the finding that males consume illicit substances at a higher rate than females (Barnes, Welte, and Hoffman 2002; Höfler et al. 1999; Young et al. 2002). Wallace, Paulson, Lora, and Bond (2003) found that rates of marijuana use among boys in grades 8, 10, and 12, and rates of use for all other illicit drugs among 12th grade boys, are higher than such rates for females. However, the authors did find that “life-time and 30-day prevalence of illicit drug use are roughly comparable for 8th and 10th grade girls and boys, and stimulant use among 8th and 10th grade girls exceeds that of boys” (Wallace et al. 2003:228). This may suggest that for younger cohorts, the sex gap in substance use may be narrowing, a possibility that will be discussed in further detail later.

It has also been suggested that substance use differences between the sexes tend to emerge as adolescents get older (Gatins and White 2006). Young et al. (2002) found that “in sum, gender differences were modest to absent at the early adolescent ages, but began to emerge in middle adolescence as prevalence rates increased overall” (2002:316). This finding held true not just for use, but also for abuse and dependence, with males showing higher rates of diagnoses for all drugs than females of the same age (Young et al. 2002).
Conversely, there have been several studies that did not find results indicative of sex differences in substance use. Gatins and White (2006) found that no significant differences emerged among choice of substance or frequency of use in their study on substance use and gender among students in grades 9-12 in the Northeastern United States. In addition, the authors found no significant differences in use among males and females as students got older, contrary to the findings of Young et al. (2002) cited above. Vaccaro and Wills’s (1998) findings suggested somewhat higher rates of alcohol and marijuana use among males, but these differences did not remain significant across all tests. Clearly, the inconsistencies in previous findings on sex and substance use reflect the need for further research.

Another important trend that has emerged from recent research is the difference in NMPD use between males and females. As noted above, use of NMPDs has increased dramatically in recent years, and the sex distribution of such substance use has varied somewhat. Simoni-Wastila et al. found that “being female contributes significantly to the likelihood of any past-year nonmedical prescription drug use, controlling for daily alcohol use, past-year illicit drug use, and other factors” (2004:9). However, this finding is not consistent across studies, as Tetrault et al. (2007) found support for the more traditional substance use distribution among their national sample, in which males consume more illicit
substances than females, regardless of the specific substance (including NMPD use). As the authors point out, however, the discrepancies in findings may be due to changes in use patterns over time [for example, the Simoni-Wastila et al. (2004) study utilized data from the early 1990s]. As with substance use overall, it is possible that over time the gendered trends of prescription drug use have shifted, making current research imperative for clarification.

**Sex and Substance-Related Attitudes.** Contrary to the plethora of research on sex and substance use behaviors, there is a dearth of literature on differences in substance-related attitudes between males and females. Even in this small body of literature, however, as with the findings on gendered drug use behaviors, there have been major inconsistencies among emergent findings. Albers et al. (2002) found no significant differences between males and females in regards to perceptions of substance use as wrong or as harmful. Conversely, Mushet-Eizenmen, Holub, and Arnett (2003) found among their Midwestern sample that "there are sex differences in mean ratings of harm, with female adolescents usually indicating that substance use has a higher level of risk" (2003:5). This finding is corroborated by Beck and Summons' (1987) finding which suggests that males consistently believe the risks associated with alcohol use to be less serious and less likely to happen than females do. In addition, males perceive themselves to be more
capable of controlling risks and "report their own experience as their best source of information about alcohol" (Beck and Summons 1987:31) more often than females do. These results should be considered alongside the findings of Stylianou (2002) (to be discussed in further detail below), who found that the more harmful respondents believe a substance to be, the more likely they are to recommend that its use be socially controlled. Taken together, these findings suggest that males may be less likely than females to perceive substance use as wrong or as deserving of punishment, perhaps due partially to their own belief that substance use is not a harmful activity.

In addition to differences in actual attitudes towards drugs, there is some evidence that the effect that attitudes have on behaviors may also vary by sex. Musher-Eizenmen et al. (2003) suggest that there may be some differences "in the extent to which male and female adolescents make decisions about the use of various substances based on the influence of peers and/or their own attitudes" (2003:5). The authors suggest that there is some evidence that males' alcohol use is more highly influenced by peers than is female alcohol use. This evidence suggests that there may be some cases for which attitudes are not the best predictor of behaviors and that it is reasonable to hypothesize that attitudes may be better predictors of behavior for female students than for male students.
Sex Conclusions. Overall, the findings on sex and substance use suggest that some major discrepancies exist in conclusions from research concerning whether sex plays a role in susceptibility to substance use. It may be that sex does not directly influence substance-using behaviors, but that a mediating factor (such as decreased perceptions of harm or increased peer pressure among males) is partially responsible for the conflicting findings about sex and substance use. In addition, it is possible that changing gender norms are creating more pressure (or freedom) for females to use, and therefore closing the sex gap in substance use rates. Building on these past findings, it is certainly relevant to include sex as a variable in the current project, as a potential predictor of substance use attitudes and behaviors, and simply as a descriptive control variable in itself.

Age/Cohort and Substance Use. As mentioned above, adolescent substance use tends to develop in a linear pattern throughout the teenage years, increasing as students age, and peaking at or around high school age (Young et al. 2002; Chen and Kandel 1995; Barnes, Welte, and Hoffman 2002). As this finding is particularly well-supported throughout the literature, it is hypothesized here that a similar pattern will emerge, and that substance use will occur at much higher rates in the older cohort. As such, the main cohort effect to be explored in this project is not how use varies with age, but how attitudes may vary with age, and
how this relationship may, in turn, be at least partly responsible for the widely accepted findings on age and substance use. Previous research in the area of age and substance-related attitudes is detailed below.

**Age/Cohort and Substance-Related Attitudes.** Overall, there is strong evidence of differences in substance-related attitudes among different age groups, coinciding with the linear progression of substance use behaviors. Albers et al. (2002) suggest a trend of changing perceptions of drugs with age, observing that “with progressing age...students show less and less generalized condemnation of drugs, but increased awareness of specific negative consequences of substances” (2002:43). Similarly, in a study that included elementary, junior high, high school, and college students, Szalay, Inn, Strohl, and Wilson (1993) found that:

> The elementary school students show the strongest negative attitudes towards drugs but they think in very general terms—bad, stupid, dumb—with little recognition of addiction, abuse, and other specific consequences considered by older students...Not only do the older students perceive more specific harm in drugs but also greater appeal, relating them to fun, parties, and friends. The older student groups, which include drug users as well as non-users, show more mixed evaluation and greater ambivalence (1993:344-346).

These findings suggest that unfavorable attitudes toward substance use may be cultivated among younger students, but without providing pragmatic and realistic descriptions of the harms of substance use. It would seem that as students age, they begin to develop more drug-specific attitudes and to recognize more individual consequences of use,
as well as the pleasures of participation.

In addition to substantive differences in attitudes among different age groups, Zhang, Loeber, and Stouthamer-Loeber (1997) found evidence for varying predictive strength of attitudes across cohorts. The authors found that attitudes had a stronger correlation with behavior in the younger cohort (10-12 year olds) than they did for the 13-16 year old cohort (Zhang et al. 1997). In fact, in the older cohort, the authors found that attitudes were no better at predicting future behaviors than previous behaviors were at predicting future attitudes. This finding may be an extension of the previously mentioned qualitative differences in attitudes between cohorts, in that younger students' generalized rejection of drugs serves as a stronger incentive against use than do the more conflicting and nuanced attitudes of older students. In addition, it is important to note that the Zhang et al. (1997) study used a sample of all boys, a factor that could have contributed to the authors' findings (see Sex and Substance-Related Attitudes for more).

**Age Conclusions.** Based on the above findings, it may be said that age is an important variable in understanding the progression of substance use among adolescents. Generally, it seems reasonable to hypothesize that perceptions of drug use as wrong and/or as deserving of punishment may be much more prevalent and uniform across the younger cohort. It could be that substance use prevention programs are
fresh in students' memories at that age, or perhaps that they simply have not yet been exposed to any real-life drug use in their own lives to contradict their learned opinions. In light of these findings, this thesis seems particularly well suited to clarifying the role of age in substance use patterns, as it will use longitudinal data from both a junior high and a high school cohort (younger cohort sampled in the fall and spring of their 7th grade year; older cohort in the fall and spring of their 10th grade year). As such, it may allow for the emergence of more specific findings regarding the shift in attitudes that seems to occur somewhere between junior high and high school.

Assessing Student Attitudes on Substance Use

In order to better understand potential attitudinal differences between students and to shape the hypotheses guiding this thesis, this section will explore how attitudes regarding substance use have been assessed in previous research. One way of conceptualizing attitudes towards drug use has been to examine them similarly to attitudes regarding other criminal behaviors. In his review of the literature, Stylianou (2002) determined that people tend to judge criminal behaviors in terms of the perceived seriousness of their consequences. While acts causing bodily harm are generally perceived as the most serious, acts resulting in property damage or loss follow closely behind. However, Stylianou found that public consensus in the ranking of behaviors decreases when the
behaviors do not have public consequences—so-called victimless crimes, such as prostitution, vagrancy, and in this case, substance use (2002).

In his study, Stylianou (2002) attempted to determine how people judge the seriousness of drug use by framing attitudes in terms of two general perspectives regarding the law. These perspectives included: (1) paternalism, which suggests that the state has an obligation to protect its citizens from causing harm to themselves, even if that means interfering in individual behaviors against the person’s will; and (2) moralism, or the idea that it is the responsibility of the law to uphold the moral integrity of society, and “prevent moral decay” (2002:125).

Stylianou (2002) had participants rank particular drug use behaviors in terms of perceptions of self-harm (PSH), reflecting paternalistic principles, perceptions of immorality (PIM), reflecting the moralistic perspective, and control attitudes (CA), reflecting degrees of social control of each substance use behavior. Stylianou (2002) found that there was much variation in participants’ rankings of drugs as immoral or harmful, but particularly in regards to marijuana use. Stylianou attributes this finding to the widespread controversy surrounding the legalization of marijuana in contemporary America (2002). As Stylianou’s research samples college students, it is yet to be determined whether an adolescent/teen population is old enough to be differentially influenced by this debate, and if this lack of consensus regarding marijuana use will
emerge among such young students.

In terms of alcohol use, Stylianou (2002) found that alcohol was ranked lowest of any other substance in terms of PIM, PSH, and CA. In addition, alcohol use had the highest degree of consensus among participants about PIM and PSH of any substance. That is, not only was alcohol not viewed as immoral or particularly harmful, but that the majority of participants tended to agree on these points. This may be due to the fact that alcohol is likely a legal practice for some of Stylianou's college population, a factor that was shown to strongly influence how people thought about particular substances (2002). However, as with the findings on marijuana consensus, it will be interesting to determine whether these findings hold true for an adolescent population; perhaps because alcohol is not legal for them, a majority of students will disapprove of its use. Conversely, it is possible that the use of alcohol is so normalized within American culture that students will not view its use as wrong.

In addition to his findings on PSH and PIM, Stylianou found that generally, the more harmful and immoral a drug use behavior was considered to be, the more likely respondents were to recommend that it be socially controlled (2002). These findings suggest that respondents support the strongest social control of heroin and cocaine usage, supporting the criminalization of both behaviors. For the other two drugs
examined (LSD and marijuana), there was much less consensus on appropriate social reactions to their usage (2002). Again, as the sample was drawn from a college population, it may be interesting to determine whether there is a correlation between perceptions of wrongfulness and support for punishing substance use (similar to Stylianou's control attitudes) within a younger sample. The next section will explore how these types of attitudes relate not just to static moral concepts, but how they shape decisions to actually engage in substance use.

**Attitudes as Predictors of Behaviors**

Attitude-behavioral research has been conducted in the social sciences since the early 20th century, with a wide array of findings on the validity of attitudes as predictors of behaviors. The notion of emphasizing "social context and norms as determinants of human action" (Azjen and Fishbein 2005:175) has helped to structure contemporary attitude research, and prompted an examination into the multi-dimensionality of attitudes and attitude measurements.

In the mid-1970s, it was proposed that assessing attitudes about specific behaviors, rather than toward general objects, results in better behavioral prediction from attitudes (Ajzen and Fishbein 2005). In other words, asking students how they feel about "drugs" in general, would not predict substance-using behaviors as well as asking about a particular method of using a particular drug (i.e. smoking marijuana, insufflating
cocaine, etc.). This suggests that questions regarding attitudes towards a specific substance may be the best attitudinal predictors for later use of that same substance (Note: For this thesis, these types of direct attitudinal questions will be used to predict alcohol and marijuana use). Conversely, questions measuring attitudes on "illicit drugs" in general may not be able to predict subsequent use of specific drugs (Note: These types of indirect questions will be used to predict NMPD use, as the NHYS data do not include a specific corresponding item for measuring attitudes on NMPD use). In addition, researchers have found that "attitudes based on direct experience are more predictive of subsequent behavior than are attitudes based on second-hand information" (Ajzen and Fishbein 2005:180). This finding suggests that prior drug use experience may serve as a moderating variable in the relationship between attitudes and behaviors (i.e. predictive ability of attitudes may vary according to whether the student has tried the substance or not).

In terms of attitude-behavior research on drug use specifically, Bachman, Johnston, O'Malley, and Humphrey (1988) attempted to explain the connection between attitudes and behaviors, specifically through research on marijuana use. The authors organized their inquiry into two types of characteristics expected to predict changes in overall substance use: (1) individual characteristics (demographic variables such as sex, age, race, and lifestyle variables such as evenings spent out and
truancy); and (2) drug-specific characteristics (such as disapproval of and availability of particular substances). Because personal characteristics are largely fixed, Bachman et al. (1988) predicted that the drug-specific variables would be more likely to account for the (downward) shifting trend in marijuana use among high school students in the late-1970s to early-1980s.

The authors' hypothesis was supported, with results suggesting that the collection of "lifestyle" variables accounted for less than 25% of the variance in annual marijuana use. Conversely, the single variable of disapproval of marijuana use accounted for more than 45% of the variance in use, emerging as the most powerful predictor of decreased use among students in the model (Bachman et al. 1988). Perhaps most importantly, when the authors considered reverse directionality in the model (i.e. that trends in marijuana use had affected attitudes), they found that "controlling for the behavior of marijuana use does nothing to reduce or 'explain away' the upward trend from 1978 through 1985 in negative attitudes about marijuana" (1988:104).

These findings were replicated in a second study by Bachman, Johnston, and O'Malley (1990), which sought to explain a similar declining trend of cocaine use among youths. The authors suggested that the increases in disapproval and perceived risk of drug use may be due to new information about drugs, "especially risks and consequences...
presented in a realistic and credible fashion" (Bachman et al. 1990:182). Implications from this research are that: (1) attitudes, particularly disapproval of a behavior, may indeed be predictors of subsequent behaviors; and (2) while demographic variables may account for little variance in actual substance use, it is possible that these variables affect attitudes, which in turn could play a role in the display of differential substance use behaviors, to be examined here. While there are countless theories regarding how such attitudes influence behaviors, one theory that may be particularly salient for this thesis will be explored below.

The Theory of Planned Behavior

In addition to the broad attitudinal research reviewed above, there has been much work on examining the relationship between behavioral intentions and actual behaviors (Ajzen and Fishbein 2005). Ajzen and Fishbein’s Theory of Planned Behavior suggests that the decision to engage in a behavior is influenced by three major variables: (1) the positive or negative consequences associated with the behavior; (2) the approval or disapproval of the behavior by respected others; and (3) factors that may facilitate or discourage the behavior (2005). While the potential consequences of substance use may be intuitively negative, it has been suggested that beliefs about behaviors are often a multi-dimensional aggregate of attitudes and evaluations combined to create an overall assessment of the behavior as positive or negative (Ajzen and
Fishbein 2005). With adolescents, it may be that while legal, familial, or health consequences are evaluated as negative, the potential benefits of peer approval may equal or outweigh the costs. As such, in the case of adolescent substance use, it may be impossible to separate "positive consequences" and "approval of the behaviors by respected others" from one another. The potential overlap between the two suggests that when students perceive their peers to be users, their consideration of their peers' approval may doubly impact their decision to engage in substance use. This potentially important influence suggests that it may be important to control for peer use when examining the relationship between attitudes and behaviors, as this variable may be able to account for cases in which there are discrepancies between student's own negative attitudes towards substance use and later using behaviors. A causal model demonstrating the above theory's ordering of attitudes and behaviors is presented as Figure 1.

Figure 1: Attitudes as Predictors of Behaviors

CONTROLS (Age, sex, peer use, etc.) → ATTITUDES (Favorable) → BEHAVIOR

Behaviors as Predictors of Attitudes

In the relationship between attitudes and behaviors, behaviors are
usually studied as the outcome variable, with researchers seeking to predict potentially harmful behaviors prior to their occurrences. However, there is some support for an alternate directionality in the relationship, in which behaviors may influence later attitudes. Brook, Balka, and Whiteman (1999) examined longitudinal data for associations between early marijuana use and later behavioral problems. The authors found a relationship between having used marijuana at Time 1 and decreases in perceptions of marijuana as harmful at Time 2 (OR 0.41; p<0.05), even after controlling for these attitudes at Time 1. The authors cite social-psychological theories in their explanation, suggesting that, "people modify their later attitudes to accord with their earlier behavior...This attitude change enables youth to avoid confronting the realistic consequences of marijuana use" (Brook, Balka, and Whiteman 1999:1552).

Two of these social-psychological theories include self-perception theory, which posits that engaging in a behavior is how people form attitudes regarding the behavior, and cognitive dissonance theory, which suggests that previous behavior triggers changes in later attitudes. Both theories suggest that behaviors are the independent variable in the relationship between attitudes and behaviors.

Further support for this theory was demonstrated in Rebellon and Manasse's (2007) study which, like this thesis, utilizes data on both substance-related attitudes and behaviors. When examining substance-
related attitudes at Time 1 (collected in 1978) as a predictor of substance use behaviors at Time 2 (collected in 1979), the authors found that no significant relationship emerged. However, Rebellon and Manasse did find that "prior behavior appears to be significantly associated with future attitudes" (2007:16), suggesting support for the social-psychological theories that imply that people may adjust their attitudes subsequent to the behavior occurring, (1) to justify actions that may be incongruent with their beliefs (cognitive dissonance theory), (2) because engagement in the behavior affected a change in attitude, or (3) because engagement in the behavior allowed for a corresponding attitude to be formed (self-perception theory). A causal model of these social-psychological theories is presented as Figure 2.

Figure 2: Behaviors as Predictors of Attitudes

Neutralization Theory

Another central theory regarding the relationship between attitudes and behaviors is Sykes and Matza's (1957) neutralization theory. This theory suggests that while delinquents may not always approve of unconventional behaviors (such as substance use) in a general sense, they may engage in the behavior themselves within a delinquent sub-
culture, and then attempt to justify the behaviors afterwards. The authors suggest that delinquents will use a “technique of neutralization” (Sykes and Matza 1957:667), such as denial of responsibility to justify their actions into the broader system of social norms. One technique discussed by Sykes and Matza that may be particularly salient for researching adolescents is “the appeal to higher loyalties” (1957:669). This technique involves “sacrificing the demands of the larger society for the demands of the smaller social groups to which the delinquent belongs....[D]eviation from certain norms may occur not because the norms are rejected but because other norms, held to be more pressing or involving a higher loyalty, are accorded precedence” (Sykes and Matza 1957:669).

Neutralization techniques like this one may be one explanation for some of the incongruity between Time 1 attitudes and Time 2 behaviors found by Rebellon and Manasse (2007), a fact that the authors acknowledge by saying “[the findings] do not necessarily rule out the possibility that individuals’ attitudes change immediately before their criminal behavior and then change back to their prior state immediately following that behavior” (2007:16). The authors suggest that further research should be done involving shorter lags between data collections to attempt to further examine neutralization theory, a suggestion that has helped to shape the design of the current project. With only six months between the Time 1 and Time 2 measures in this project, it may be possible here to capture
delinquent attitudes formed to accommodate and precede delinquent behaviors, prior to their post-behavior re-adjustment. The theoretical implications of neutralization theory include the possibility that attitudes and behaviors are best explained through a bi-directional, mutually reinforcing relationship, as illustrated in Figure 3 below. Figure 3 also maps out the possibility that attitudes have the potential to change back to unfavorable after the behavior has taken place.

Figure 3: Attitudes and Behaviors as Bi-Directional

The causal model presented as Figure 3 shapes the comprehensive causal models to be tested in this thesis. As practical limitations prevent the testing of the true bi-directionality of the relationship, this model will be tested in two separate pieces, visualized in Figures 4 and 5, presented below. Figure 4 can be seen as the major model to be tested, as there are more predictions regarding this relationship than regarding Figure 5.
Figure 4: Causal Model of the Effects of Attitudes on Behaviors

Figure 5: Causal Model of the Effects of Behaviors on Attitudes

Sociological and Policy-Related Significance

Findings from each aim of this project may prove beneficial in the structuring of substance use policy and the dissemination of substance use information. This project will provide a current picture of the using patterns of some New Hampshire adolescents, including prevalence of
use of three substances, as well as potentially revealing demographic subgroups that may be more vulnerable to harmful substance using behaviors. In addition, this project may provide information regarding timing of potentially critical shifts in attitudes towards substance use, by examining two cohorts of students. This information will be quite useful in informing appropriate implementation of programs during crucial points in adolescence.

Perhaps most importantly, clarifying the relationship between attitudes and behaviors may be particularly salient in adolescent substance use education, because it will inform which types of programs are actually effective in preventing substance use. If attitudes do not emerge as a significant predictor of behaviors, it may be that programs aimed at affecting attitudes (such as DARE) will not be able to affect substance use behaviors (Rebellon and Manasse 2007). Furthermore, examining whether attitudes are differentially important in predicting behaviors may allow programs to be better targeted at particular subgroups of the population who may best benefit from attitudinal education. Finally, examination of attitudes in two separate forms may provide valuable insight into precisely what types of attitudinal influences are pertinent in predicting behaviors.

**Summary of Prior Findings and Conclusions**

In sum, there are many inconsistencies within the literature on
adolescent substance use, and even more in the attitudinal-behavioral relationship research. Conflicts in findings regarding the demographic distribution of substance use may be due largely to differing methodological approaches. Lack of current longitudinal data and adequately sized samples is another issue throughout the literature examined here. Some studies utilized here are over a decade old and social shifts, particularly in terms of sex, may have occurred since then to disrupt the traditional gender balance of substance use. This project will provide current, drug-specific information that may allow for clarification, particularly in the sex-substance use relationship.

Finally, as mentioned above, the literature on attitude-behavior research is rife with contradictions. This research may provide an opportunity for clarification in the relationship between the two, as well as providing valuable policy-relevant information (see "Sociological and Policy-Related Significance" above). In addition, a major element of the current project is determining how substance-related attitudes affect later substance-using behaviors, while considering the differences in both use and attitudes across different demographics. Little research has been done on the possibility of sex and age moderating the relationship between attitudes and behaviors, and the research that has been done usually pertains solely to perceptions of risk (Beck and Summons 1987).
Despite the dearth of information, the fact remains that attitudes towards substance use may be good predictors of later behaviors for some groups, and not for others. Examining this possibility is a practical goal of this project, and will potentially provide information that allows attitude-based programs to be targeted to those who would benefit the most from them.

**Hypotheses**

The research design of this thesis is aimed at testing twelve hypotheses regarding substance use behaviors, substance-related attitudes, and the interrelationship between the two. The hypotheses to be tested are listed below.

Based on the most recent findings from the literature:

1. There are no sex differences in alcohol, marijuana, or non-medical prescription drug use.

2. Alcohol, marijuana, and non-medical prescription drug use will vary by age; students from the high school cohort will be more likely to have used any of the three substances than will their middle school counterparts.

3. There are sex differences in substance-related attitudes; females will be more likely to assess alcohol, marijuana, and other illicit drug use as wrong or as deserving punishment than will males.

4. Sex differences in substance-related attitudes will not explain the similar use patterns between males and females.
5. There are age differences in substance-related attitudes; students from the middle school cohort will be more likely to uniformly assess alcohol, marijuana, and other illicit drug use as wrong or as deserving punishment than will their high school counterparts.

6. Differences in substance-related attitudes will explain the disparate use patterns between middle- and high-school students.

7. There is a relationship between substance use at Time 1 and favorable attitudes at Time 2; students who have used a substance before will be more likely to subsequently assess its use as favorable than students who have not used the substance.

8. Attitudes favorable to drug use (i.e. assessments of particular drugs as not wrong or not deserving punishment) at Time 1 will be predictive of corresponding substance use behaviors at Time 2.

9. Favorable/unfavorable substance-related attitudes will be better predictors of use/non-use for females than for males.

10. Favorable/unfavorable substance-related attitudes will be better predictors of use/non-use for middle school students than for high school students.

11. Favorable/unfavorable substance-related attitudes will be better predictors of use/non-use for students who have used a substance before.

12. Behaviors at Time 1 may be predictive of substance-related attitudes at Time 2; students who have used a particular substance may assess its
use as less wrong or less deserving of punishment.
CHAPTER 2

RESEARCH DESIGN AND METHODS

Sample

School Selection & Data Collection Procedure

The sample here was drawn from the New Hampshire Youth Survey (NHYS), a longitudinal survey assessing rule-violating behaviors among adolescents, including drug, property, and violent violations, and funded by the National Science Foundation (Cohn, Rebellon, and Van Gundy 2005). Researchers selected four communities in the state that would provide a diverse sample of New Hampshire youths, selecting eight middle schools and five high schools. Parental consent forms were distributed stating the intent of the study to collect data from the students through five sessions over two and a half years. Students who returned permission slips and obtained parental consent were allowed to participate in the study (N=1128) (Cohn, Bucolo, Rebellon, and Van Gundy 2009). Data were collected through in-person survey administration by the NHYS team of faculty researchers and/or research assistants. Completion of the survey took approximately 35 minutes, and participants were compensated $10 in the form of a gift certificate upon completion of the survey.
Drop-Out Rate

Of the 1128 students who had agreed to participate in the NHYS by Fall 2008, 935 students completed the survey at Wave 1, 939 students at Wave 2, 831 students at Wave 3, and 826 at Wave 4. From all of the students who had completed the survey, 794 students (70.4% of the entire sample) had completed surveys at Waves 3 and 4. No significant differences emerged between students who completed both sessions and students who did not (based on a comparisons of means and standard deviations of demographic variables) (Cohn et al. 2009).

Although the NHYS currently includes four waves of data, the analyses here are based on two such waves, collected in Fall 2007 and Spring 2008. Both waves of data were drawn from a single school year, when the two cohorts of students were in the seventh and tenth grades, respectively. While these waves of data are numbers three and four of the overall NHYS data, they will be referred to from here on as Times 1 and 2, respectively. The sample includes 760 respondents of the original 794 respondents collected who had data for Times 1 and 2. Twenty-eight respondents were excluded from the analyses, having been labeled as poor data by the data entry team, due to missing data, respondent fatigue, or inconsistent responses throughout the survey. Six respondents were excluded based on the fact that their recorded sex did not match across waves; as sex is an important element of the research design, the
researcher found this to be a necessary precaution.

**Participants**

Students from eight middle schools (N=323) and five high schools (N=437) completed the surveys at Times 1 and 2. Gender composition was similar between the two cohorts with a 56.2% female middle school sample (n=246), and a 62.8% female sample from the high schools (n=203). Racial composition was also similar between the middle school and high school students with 81% of the middle school sample and 77% of the high school sample identifying as white. High school students' ages ranged from 14-17 (mean=15.33; SD=0.5) for Wave 3 and 14-17 (mean=15.74; SD=0.57) for Wave 4. Middle school students' ages ranged from 11-14 (mean=12.27; SD=0.48) for Wave 3 and 12-14 (mean=12.7; SD=0.53) for Wave 4. Although students are sampled from one grade-level for each cohort, age ranges are somewhat wide, likely due to students who have been held back or have skipped a grade. Characteristics for the total sample are presented in the Results section.

**Measures**

**Independent Variables**

Demographics. Of particular importance in this thesis are two main sociodemographic variables: respondents’ sex and age. Sex is coded directly from the original survey item as a dummy variable, with 0 representing male and 1 representing female. Age will be examined here
in terms of students' location in one of two cohorts: middle school (coded as 0) or high school (coded as 1), coded by the original data entry team.

In addition to age and cohort, two other sociodemographic variables are to be included in all models as control variables. The first control variable is race, originally a seven-category survey item with categories for several racial/ethnic identities as well as an item for students classifying themselves as “more than one.” Due to the low number of students who reported an identity other than Caucasian, race was recoded into a dummy variable where 0 represents Caucasian respondents, and 1 represents all others. The final control variable is the respondents' income (an indicator of socioeconomic status, or SES), measured on a 5-point scale ranging from “very little money” (coded as 1) to “lots of money” (coded as 5) on which respondents rated how much money they thought their families had.

**Peer Use:** As peer substance use has emerged as one of the strongest and most consistent predictors in the literature (See Chapter 1), it is important that it be controlled for in these analyses. Peer use is measured separately for each substance, with questions asking respondents “In the past six months, how many of YOUR CLOSE FRIENDS have had an alcoholic drink/used marijuana (pot)/used other illegal drugs?” Students were asked to respond on a four-point scale, including “none” (coded as 0), “a few,” “some,” and “many” (coded as 3). These
items were recoded into dummy variables for each substance, where 0 represents students for whom "none" of their friends had used, and 1 represents all others.

**Substance-Related Attitudes.** Respondents' attitudes towards use was measured in two dimensions: normative status and enforcement status. Normative status items ask students: "How WRONG do you think it is to have an alcoholic drink/use marijuana (pot)/use other illegal drugs?" Students were asked to rate each behavior on a four-point scale, including "not at all wrong" (originally coded as 1), "not too wrong," "a little wrong," and "very wrong" (originally coded as 4). Enforcement status items ask students "Should people be PUNISHED for having an alcoholic drink/using marijuana (pot)/using other illegal drugs?" Response categories included "no, definitely not" (originally coded as 1), "no, probably not," "yes, probably," and "yes, definitely" (originally coded as 4). Both normative and enforcement status items were reverse-coded, such that higher numbers represent higher levels of "approval" for ease of interpretation in later analyses; that is, the 4-point scale on which the attitudes were originally coded has been reversed (i.e. "not at all wrong" is recoded as 4 and "very wrong" as 1, etc.).

For some analyses, response categories for attitudinal measures have been collapsed into a dummy variable, for use in logistic regressions. In these dummy variables, normative status responses "not too wrong"
and "not wrong at all" have been classified as "not wrong" (coded as 0) and "a little wrong" or "very wrong" classified as "wrong" (coded as 1). Similarly, regarding whether people should be punished for particular substance use behaviors, the enforcement status responses, "no, definitely not" and "no, probably not" have been recoded as "no" (coded as 0) and "yes, probably" and "yes, definitely" have been recoded as "yes" (coded as 1).

It should be noted that although non-medical prescription drug (NMPD) use is a dependent variable of interest, there is no specifically corresponding normative or enforcement status items. To determine levels of use in the sample, the nonmedical prescription drug use item from the explicit substance use section will be used. For attitudinal assessment, normative and enforcement status items regarding "other illegal drugs" will be explored in lieu of those regarding prescription drugs specifically. In models predicting non-medical prescription drug use from attitudes, these same normative and enforcement status items regarding "other illicit drugs" will be used. These analyses will be executed with the recognition that the predictive abilities of these items may not be as strong for non-medical prescription drug use as for items with precisely corresponding attitudinal measures (i.e. alcohol and marijuana).

A final issue to address is that although both normative and enforcement status items may provide insight into students' degrees of
approval of drug use, these measures will not be combined into one scale of "approval" for the analyses. As the existing measures allow for separate analysis of both normative/moral reasoning and enforcement status attitudes, two separate types of attitudes, it seems most beneficial to examine each separately to determine each rating's distinct influence on behavior.

**Substance Use Behaviors.** See **Dependent Variables** section for information on these measures, to be used as both dependent and independent variables throughout the course of the analyses.

**Dependent Variables**

**Substance Use Behaviors.** In assessing rule-violating behaviors, the NHYS included items regarding how many times in the last six months students had engaged in several deviant behaviors, including "had an alcoholic drink," "used marijuana (pot)," and "used other illegal drugs." Students were asked to fill in the number of times they had engaged in each behavior, ranging from 0 to 180+ times.

These items were cross-checked with the survey's explicit substance use section, which asks, "In the past six months only, have you used each of the following substances for **NON-MEDICAL** reasons (such as for fun, to get high, to feel good, or because you were curious)?" (emphasis in original). Listed substances included alcohol, marijuana, prescription drugs, and "other" drugs. Response categories include seven options,
ranging from "no times" to "nearly every day." Respondents with discrepancies in reporting (i.e. reported use at least one time in one section and 0 times in the other) were excluded from the following analyses (n=69 for alcohol, n=38 for marijuana, and n=46 for other illicit drugs). While these excluded respondents included up to 9% of the sample (alcohol), this was deemed a necessary precaution by the researcher, in order to preserve validity.

Substance-Related Attitudes. See Independent Variables section for information on these measures, to be used as both dependent and independent variables throughout the course of the analyses.

Excluded Demographic Variables. While there are many personal or demographic variables that may influence adolescents' substance-related attitudes and behaviors, not all such demographic variables can be explored here. Such variables include familial arrangement, socio-economic status, peer influence, and race, all of which have been shown in the past to potentially affect substance use (Barrett and Turner 2006; Höfler et al. 1999; Oetting and Beauvais 1987; Albers et al. 2002). However, due to the utilization of secondary data for this project, it was not possible to measure certain elements of these variables that may be essential in capturing their full effects. For example, the data to be utilized here simply determine which parental figure(s) students live with, and do not inquire about siblings or older cousins that may live with the family. Because the
presence of older siblings has been shown to comprise a large part of family effect on adolescent substance use (Windle 2000), it is not possible to test a prediction about the effects of family structure on substance-related attitudes and behaviors without such information.

Additionally, it may not be possible to fully predict the effects of peer influence and SES either, as students’ assessments of these variables may also be inaccurate (i.e. students being unable to accurately estimate their peers’ substance use rates, or their families true income brackets). Finally, although there has been plentiful research on race/ethnicity and substance use, the limitations of the sample here (e.g. few non-white participants) do not allow for testing of relevant hypotheses. Nevertheless, in the data analysis for this thesis, controls for these demographic variables will be applied, but are not to be considered major theoretical foci of the overall project.

**Limitations**

There are some limitations to this study that should be acknowledged here, particularly in regards to the sample. Firstly, the sample is not representative of New Hampshire adolescents, nor of adolescents as a whole, due to the fact that participants were not randomly selected. Additionally, the sample is disproportionately female, which could prevent further generalizations from being made. However, as this sample is quite large, it is likely that the analyses here will provide
information on the patterns of use and attitudes of many youths that may be similar to those found in a representative survey.

A second limitation is that as the surveys were administered in schools, the NHYS data do not include adolescents who have dropped out of school. It is possible that these students may have higher substance use rates than currently enrolled students; however, as inclusion of these students was not possible here, this aspect of the sampling procedure should be kept in mind throughout the analyses.

Finally, as with all social science research of a sensitive nature, it is possible that students were unwilling to make honest reports of their use of illicit substances. However, screening for unusual responses by the data entry team, the maintenance of strict confidentiality and anonymity, and the use of two survey items to cross-check responses increases the likelihood that the responses of included participants are honest.

**Human Subjects**

This thesis utilizes secondary data from the NHYS, data that were collected with strict adherence to the guidelines set forth by the Institutional Review Board for the Protection of Human Subjects Research (IRB). The NHYS data collection strategy emphasized confidentiality regarding responses. Informed consent from participants (and their guardians) was obtained by NHYS researchers, and respondents compensated with a $10 gift card at the time of each data collection.
Use of NHYS data for this thesis was approved by the IRB, contingent on preserving the anonymity and confidentiality of responses. Data for this thesis tracks participants' responses over time with an arbitrary identification number, with no additional identifying information relating the subject to his/her responses. Access to the data was limited to researchers involved in the NHYS data collection or individuals using the materials for research purposes.

Data Analysis Procedures

All analyses in this thesis were conducted using the Stata 10 statistical package. For the bivariate analyses, chi-square tests of independence were used to test differences in substance-related attitudes and behaviors across sex and cohort. Both attitudes and behaviors were assessed across both waves of data to improve reliability of findings and to assess potential changes over time. The multivariate analyses, which test the relationship between attitudes and behaviors with dichotomous dependent variables, were completed with logistic regression. The remainder of the multivariate analyses, specifically those which tested attitudes as the dependent variable, were conducted through ordered logistic regression. All analyses were conducted excluding any missing values from the variables' reported percentages. The variables with the highest numbers of missing values were the items in the section that explicitly inquires about a variety of substance use.
behaviors, however, for no variables did the missing values exceed 3% of the total N. Due to these missing values, the alternate substance use measures (which were part of a comprehensive list of rule-violating behaviors) were used when possible (all alcohol and marijuana analyses), as these items had a missing value rate of 0.4%.
CHAPTER 3

RESULTS

Descriptive Statistics

Sample Demographics

Characteristics of the overall sample were assessed in terms of age, sex, cohort distribution, race, and SES to provide an overall picture of the distribution of the variables to be used as independent, moderating, or control variables in later analyses. The demographics of this sample are presented in Table 1.

Table 1: Sample Characteristics

<table>
<thead>
<tr>
<th></th>
<th>% (N)</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>-</td>
<td>13.57 (1.59)</td>
</tr>
<tr>
<td>Time 2</td>
<td>-</td>
<td>13.99 (1.6)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>40.92 (311)</td>
<td>-</td>
</tr>
<tr>
<td>Females</td>
<td>59.08 (449)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Cohort</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle school</td>
<td>57.5 (437)</td>
<td>-</td>
</tr>
<tr>
<td>High school</td>
<td>42.5 (323)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>79.21 (602)</td>
<td>-</td>
</tr>
<tr>
<td>Non-white</td>
<td>20.79 (158)</td>
<td>-</td>
</tr>
<tr>
<td><strong>SES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES¹</td>
<td>-</td>
<td>3.22 (0.75)</td>
</tr>
</tbody>
</table>

¹Respondents assessment of family SES, based on a 5-point scale, where 1=Very little money, and 5=Lots of money
**Univariate Analyses**

**Substance Use Behaviors**

To compare changes in substance use over time, a series of McNemar's tests were used. This is a variation on a chi-squared test that does not assume independence between samples; that is, it allows for the fact that the two samples are matched over time. Findings from the McNemar's tests are reported below.

Similar to previous findings on substance use among young people, alcohol emerged as the most frequently used substance among respondents here. At Time 1, 20.1% of the sample had used alcohol; at Time 2, this had increased to 22.7%. The McNemar's test reveals that this increase in reported alcohol use from Time 1 to Time 2 was significant (p<0.05).

For marijuana use, the number of students who had used in the last six months was markedly lower than the number who had used alcohol: 8.2% of students had used marijuana at Time 1 and 9.8% had used at Time 2. While this was a slight increase between Times, the McNemar's test revealed that this increase was not significant.

In terms of non-medical prescription drug (NMPD) use, reported use was initially higher than that of marijuana, with 16.2% of respondents reporting use at Time 1. By Time 2, 4.3% of students reported having used NMPDs, a much smaller percentage than those who reported using
marijuana at either Time, and a significant decrease from the number of students who reported NMPD use at Time 1 (p<0.001, McNemar's Test). Levels of use for all substances, at both Times, are presented in Figure 6.

Figure 6: Use Levels at Times 1 and 2

![Use Levels at Times 1 and 2](image)

**Substance Related Attitudes**

Distributions of substance-related attitudes are presented in Table 2. In terms of normative status ratings, Stuart-Maxwell tests (another variation on a chi-square test that does not assume independence of cases) indicated a significant shift for all three substances from Time 1 to Time 2. In all cases, this finding is due to an increase in the number of students who selected more favorable ratings at Time 2 than they had chosen at Time 1 (p<0.001 in all cases). Stuart-Maxwell tests revealed no significant shifts in enforcement status ratings at all Times, although the general pattern of attitudinal shifts mirrored that of normative status ratings (i.e.
increases in favorable ratings between Times).

Table 2: Distribution of Attitudes towards Alcohol, Marijuana, and Other Drugs

<table>
<thead>
<tr>
<th>Attitudinal Items/Response Categories</th>
<th>Alcohol*</th>
<th>Marijuana*</th>
<th>Other Drugs*</th>
</tr>
</thead>
<tbody>
<tr>
<td>How wrong is it to have a drink/smoke marijuana/use other drugs?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very wrong</td>
<td>69.5</td>
<td>79.1</td>
<td>87.2</td>
</tr>
<tr>
<td>A little wrong</td>
<td>14.5</td>
<td>12.5</td>
<td>10.4</td>
</tr>
<tr>
<td>Not too wrong</td>
<td>13.2</td>
<td>5.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Not wrong at all</td>
<td>2.8</td>
<td>2.6</td>
<td>0.5</td>
</tr>
<tr>
<td>Should people be punished for having a drink/smoking marijuana/using other drugs?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, definitely</td>
<td>53.0</td>
<td>66.6</td>
<td>72.6</td>
</tr>
<tr>
<td>Yes, probably</td>
<td>18.8</td>
<td>15.9</td>
<td>16.3</td>
</tr>
<tr>
<td>No, probably not</td>
<td>18.6</td>
<td>10.1</td>
<td>5.6</td>
</tr>
<tr>
<td>No, definitely not</td>
<td>9.6</td>
<td>7.4</td>
<td>5.6</td>
</tr>
</tbody>
</table>

*p<0.001

**Bivariate Analyses**

**Substance Use and Sex**

**Alcohol Use.** At Time 1, about 23% of females reported having used alcohol in the last six months, as compared to approximately 16% of males who reported the same. Chi-square analyses revealed a significant
relationship between sex and alcohol use, particularly in that males reported lower levels of use, and females higher levels, than would be expected if sex and alcohol use were unrelated (p<0.05). At Time 2, this gendered pattern of alcohol use persisted, but was no longer statistically significant.

**Marijuana Use.** In terms of marijuana use, 7.81% of females and 8.71% males had used marijuana at Time 1. At Time 2, reported use had increased to 11.97% for males, and decreased to 8.24% for females. Despite the pattern of higher use among males, there was no statistically significant relationship between sex and marijuana use.

**Non-medical Prescription Drug Use.** At Time 1, use of non-medical prescription drugs was reported by 12% of males and 19.4% of females, a significant relationship as indicated by the chi-square analyses (p<0.01). The largest contribution to the chi-square statistic came from the lower than expected use of males, followed by the higher than expected use among female respondents. At Time 2, use of non-medical prescription drugs was not significantly related to sex, and had decreased to 4.6% use in males and 4.2% in females.

**Summary.** Despite the findings that alcohol use and prescription drug use at Time 1 were related to sex, the remainder of the substance use behaviors were unrelated to sex. Although some evidence for gendered patterns of use emerged, such as higher marijuana use among
males and higher non-medical prescription drug use among females, these differences were not statistically significant across all times. These findings are fairly consistent with the hypothesis that no major differences would emerge between the use patterns of males and females, although the significant relationships will be considered in further detail in Chapter 4.

**Substance Use and Cohort**

**Alcohol Use.** Chi-square analyses of alcohol use and cohort revealed that a statistically significant relationship existed between the two (p<0.001). Approximately 7% of middle school students reported use of alcohol at Time 1, increasing to 9.4% at Time 2. Among high school students, 38.4% and 40.7% of students reported alcohol use at Times 1 and 2, respectively.

**Marijuana Use.** At Time 1, less than 1% of middle school students reported having used marijuana in the last six months, as compared to 18.1% of high school students. By Time 2, use among middle school students had increased to 3% of the sample, while the number of high school students reporting use had increased to 18.9%. As with alcohol use, the chi-square analyses revealed that the relationship between use and cohort was significant (p<0.001).

**Non-medical Prescription Drug Use.** Reported non-medical use of prescription drugs among middle school students totaled 12.1% and 2.6%
at Times 1 and 2, respectively. Among high school students, 21.6% reported use at Time 1 and 6.7% reported use at Time 2. The relationship between cohort and non-medical prescription drug use was significant at both Times. At Times 1 and 2, the largest contribution to the chi-square statistic came from the fact that more high school students and fewer middle school students used prescription drugs than expected (Time 1, p<0.001; Time 2, p<0.01).

Summary. Regardless of specific substance, students from the high school cohort were significantly more likely than the middle school students to report use in the last six months. This finding is consistent with the hypothesis that cohort and substance use behaviors are related in the population, and is supported by the findings of other researchers.

Substance-Related Attitudes and Sex

For the purposes of discussing attitudinal changes in both the normative and enforcement status dimensions collectively, ratings on both measures will be referred to in terms of degrees of "favorable" or "unfavorable" attitudes. Table 3 lists these collective labels and the corresponding ratings for both measures.
Table 3: Collective Attitudinal Ratings Labels

<table>
<thead>
<tr>
<th>Label</th>
<th>Actual Rating</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfavorable</td>
<td>“Very wrong”</td>
<td>NS¹</td>
</tr>
<tr>
<td></td>
<td>“Yes, definitely”</td>
<td>ES²</td>
</tr>
<tr>
<td>Slightly Unfavorable</td>
<td>“A little wrong”</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>“Yes, probably”</td>
<td>ES</td>
</tr>
<tr>
<td>Slightly Favorable</td>
<td>“Not too wrong”</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>“No, probably not”</td>
<td>ES</td>
</tr>
<tr>
<td>Favorable</td>
<td>“Not wrong at all”</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>“No, definitely not”</td>
<td>ES</td>
</tr>
</tbody>
</table>

¹Normative Status (NS)
²Enforcement Status (ES)

Preliminary examination of attitudes by sex included the creation of a dummy variable for each attitudinal item, for each Time. These dummy variables condensed the attitudinal ratings into two categories: unfavorable (combination of “unfavorable” and “slightly unfavorable” categories) and favorable (combination of “favorable” and “slightly favorable”). These dummy variables were examined in terms of sex through chi-square analyses; the only significant relationships emerged between Time 2 ES and NS ratings for alcohol and sex, where females were overrepresented in the “favorable” category (p<0.05). Further exploration of the four-point attitudinal items’ relationship with sex is detailed below.

Alcohol Use. Alcohol-related attitudes were assessed in terms of normative and enforcement status ratings and examined for differences between sexes. Chi-square analysis reveals that normative
status ratings (i.e. how wrong it is to have a drink) are significantly related to sex at both Times 1 (p<0.05) and 2 (p<0.01). Examination of specific normative ratings of alcohol revealed that the “slightly favorable” rating of alcohol lends the largest contribution to the chi-square statistic. Specifically, more females (15.9% at Time 1 and 18.1% at Time 2) and fewer males (9.4% at Time 1 and 9% at Time 2) selected this rating than would be expected if the two variables were unrelated in the population.

The relationship between enforcement status ratings of alcohol and sex was not nearly as pronounced as that of the normative status items. Examination of the specific enforcement status ratings (i.e. whether people should be punished for using alcohol) reveals that the majority of the chi-square statistic comes from the slightly favorable category, selected by fewer males and more females than expected. This tendency for females to over-select a slightly favorable alcohol rating, although similar to the normative status findings from above, is not statistically significant.

An additional interesting trend in gendered attitudes towards alcohol is that the percentage of male respondents in each category consistently declines as ratings become more favorable to use. For example, at Time 1, 71.6% of males responded that drinking was “very wrong,” 15.5% said it was “a little wrong,” 9.4% said it was “not too wrong,” and 3.6% said it was “not wrong at all.” This finding held true for both
attitudinal measures, for both Times 1 and 2. For females, the largest percentage of respondents is also in the category with the least favorable rating towards alcohol, but the next highest percentage of respondents is in the slightly favorable category. This finding is true across both measures for both Times 1 and 2, and will be discussed in greater detail in Chapter 4.

Marijuana Use. The relationship between marijuana use and marijuana-related attitudes is somewhat more complex than the findings on alcohol described above. First, normative status ratings were significantly related to sex at both Times 1 and 2 (p<0.05). At Time 1, the largest contribution to the chi-square statistic comes from the category most favorable to marijuana use. More males (4.5%) and fewer females (1.3%) than expected selected this response at Time 1. At Time 2, the largest divergence from the expected frequency came from the slightly favorable rating; as with alcohol use, fewer male and more female respondents than expected selected this response.

In terms of enforcement status items, there was a significant relationship between attitudes and sex, only at Time 1. Again, the category with the largest difference in observed versus expected responses was the slightly favorable rating which fewer males and more females than expected selected (p<0.01).

It should be noted that particular gendered patterns of attitudes towards marijuana emerged, although they were somewhat different
from the findings regarding alcohol. As was found with males’ attitudes about alcohol, the percentage of females in each response category declines as attitudes become more favorable towards use. That is, in regards to normative status, the majority of females assessed marijuana use as unfavorable, with increasingly fewer responses in each of the progressively more favorable categories. This finding held true across both attitudinal measures, at both times.

For males, the two most prevalent responses were also the unfavorable and slightly unfavorable ratings. However, the remainder of male respondents was more likely to assess marijuana use as favorable than slightly favorable. This finding held true for Time 1 normative status and Times 1 and 2 enforcement statuses, and will be discussed in greater detail in Chapter 4.

**Other Illegal Drug Use.** In terms of sex and normative and enforcement status ratings regarding other illicit drug use (in lieu of specific attitudinal measures corresponding to nonmedical use of prescription drugs), no significant relationship emerged at Times 1 or 2. However, similar to patterns found regarding marijuana, the more favorable the rating to other illicit drug use, the fewer females there were in each category. Again, the most common responses for males were the two least favorable categories. But as was found with marijuana use, the third most common response category was the most favorable response;
this finding held true for normative status ratings at Time 2 and enforcement status ratings at both Times 1 and 2.

**Substance-Related Attitudes and Cohort**

**Alcohol Use.** Chi-square analyses reveal a significant relationship between both normative and enforcement status ratings and cohort at both Times 1 and 2 (p<0.001). For both measures at both Times, the largest difference between observed and expected responses was in the least favorable category, which was selected by many more middle school students and much fewer high school students than was expected.

**Marijuana Use.** A significant relationship emerged again between cohort and both attitudinal measures at both Times. For both items, the largest divergence from the expected responses came from the two mid-range categories (slightly unfavorable and slightly favorable), which fewer middles school and more high school students selected.

**Other Illegal Drug Use.** For other illicit drugs, a significant relationship emerged between attitudes and cohort. The category of most significance for both measures was the slightly unfavorable rating, again selected by fewer middle school and more high school students than expected. This finding is due largely to the fact that the vast majority of middle school students chose the most unfavorable category (91% for normative status and 86.3% for enforcement status), leaving few respondents in the other categories.
**Substance-Related Attitudes and Previous Use**

**Alcohol Use.** Chi-square analyses revealed a significant relationship between having used at Time 1 and attitudes at Time 2 ($p<0.001$). For enforcement status (ES) ratings, the largest contribution to the chi-square statistic came from an underrepresentation of previous users in the least favorable category, followed by an overrepresentation of previous users in the most favorable category. In terms of normative status (NS) ratings, the largest divergence between observed and expected frequencies came from the "slightly favorable" category, which more previous users than expected selected, followed by the least favorable category, selected by about one quarter the number of expected respondents ($p<0.001$).

**Marijuana Use.** For marijuana, the significant relationship between previous use and attitudes persisted ($p<0.001$ for both items). In terms of both NS and ES ratings, the largest contribution to the chi-square statistic came from an overrepresentation of previous users in the most favorable category.

**Other Illegal Drug Use.** The findings from the last bivariate analyses indicate a significant relationship between Time 1 NMPD use and Time 2 ES ratings ($p<0.05$). This finding differs from the previous substances' findings however, in that the largest contribution to the chi-square statistic came from an overrepresentation of previous users in the "slightly unfavorable"
category. Unlike for alcohol and marijuana use, this indicates less favorable attitudes among previous users than non-users. No significant relationship between NMPD use and NS ratings emerged, although the non-significant findings were patterned similarly to the findings on ES ratings and NMPD use in this section.

**Multivariate Analyses**

**Effects of Attitudes on Behaviors**

**Alcohol Use.** To determine the predictive ability of attitudes on behaviors, four models were created for each substance. The first model included demographic and previous use variables, as a baseline model. The second model incorporated peer use of alcohol, along with the previous demographics. In the third model, attitudes at Time 1 were entered as predictors of substance use at Time 2. Due to the strong and significant correlations between both attitudinal measures and their corresponding behaviors across Times (See Appendix A for correlation matrices), the fourth (final) model for each substance controls for Time 2 attitudes. That is, the third model shows the effects of Time 1 attitudes on Time 2 behaviors, whereas the fourth model shows the effects of Time 1 attitudes on Time 2 behaviors net of the effects of Time 2 attitudes (which are highly correlated with Time 1 attitudes). Results for both alcohol models are presented in Table 4.
Table 4: Alcohol-Related Attitudes’ Effects on Alcohol Use

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Model 1 (N=683)</th>
<th>Model 2 (N=683)</th>
<th>Model 3 (N=675)</th>
<th>Model 4 (N=671)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (SE)</td>
<td>OR (SE)</td>
<td>OR (SE)</td>
<td>OR (SE)</td>
</tr>
<tr>
<td>Female</td>
<td>1.3 (0.34)</td>
<td>1.02 (0.31)</td>
<td>1.05 (0.33)</td>
<td>0.98 (0.33)</td>
</tr>
<tr>
<td>High school</td>
<td>3.57*** (0.95)</td>
<td>1.12 (0.37)</td>
<td>0.79 (0.29)</td>
<td>0.86 (0.35)</td>
</tr>
<tr>
<td>SES</td>
<td>0.68* (0.11)</td>
<td>0.64* (0.12)</td>
<td>0.67* (0.13)</td>
<td>0.72 (0.15)</td>
</tr>
<tr>
<td>Non-white</td>
<td>1.01 (0.3)</td>
<td>1.12 (0.4)</td>
<td>1.09 (0.4)</td>
<td>1.29 (0.5)</td>
</tr>
<tr>
<td>Used at Time 1</td>
<td>24.1*** (6.56)</td>
<td>13.31*** (4.26)</td>
<td>8.73*** (3.07)</td>
<td>7.91*** (2.91)</td>
</tr>
<tr>
<td>Peer use</td>
<td>- (14.36)</td>
<td>35.21*** (12.24)</td>
<td>29.58*** (10.86)</td>
<td></td>
</tr>
<tr>
<td>Time 1 Normative status</td>
<td>- (0.36)</td>
<td>1.61* (0.36)</td>
<td>1.25 (0.3)</td>
<td></td>
</tr>
<tr>
<td>Time 1 Enforcement status</td>
<td>- (0.19)</td>
<td>1.12 (0.19)</td>
<td>0.89 (0.16)</td>
<td></td>
</tr>
<tr>
<td>Time 2 Normative status</td>
<td>- (0.32)</td>
<td>- (0.32)</td>
<td>1.61*** (0.32)</td>
<td></td>
</tr>
<tr>
<td>Time 2 Enforcement status</td>
<td>- (0.39)</td>
<td>- (0.39)</td>
<td>2.01*** (0.39)</td>
<td></td>
</tr>
<tr>
<td>Pseudo-R²</td>
<td>0.39</td>
<td>0.56</td>
<td>0.57</td>
<td>0.62</td>
</tr>
</tbody>
</table>

1 For all models, diagnostic statistics were calculated to determine if any patterns of cases were either poorly fit or particularly influential on the model. Nine such cases were identified; removing them from the model slightly increased the pseudo-R² and increased the odds ratios on previous use and peer use. No changes in significance were observed and the models presented include all cases.

2 It should be noted that for all multivariate analyses, familial arrangement items were controlled (whether a respondent lived with their mother, father, step-parent, grandparent, or other). However, these variables were found to unnecessarily complicate the model without lending any predictive ability or substantive changes to the findings. As such, these variables have been excluded from all presented models.
Model 1, including demographic and previous use variables, shows that there are several significant predictors of alcohol use included. First, for that SES, cohort, and having used alcohol at Time 1 are significant predictors of use at Time 2. First, students in the high school cohort are 3.57 times as likely to use alcohol as students in the middle school cohort. Next, for every one-point increase on the SES scale (a 5-point scale ranging from “very little money” to “lots of money”), there is a 0.68 decrease in the odds of having used alcohol at Time 2. Lastly, and perhaps most predictably, having used alcohol at Time 1 emerges as a very strong predictor of alcohol use at Time 2, increasing the odds of use by 24.1.

In the next model, into which peer use is incorporated, SES and previous use are still significant (along with peer use), but cohort no longer is. This suggests that the relationship between cohort and alcohol use is mediated by peer use; that is, while older students are more likely to use alcohol, this is largely a function of the fact that older students have more peers who consume alcohol, which in turn increases the odds that a student will drink by more than 35-fold (OR=35.21; p<0.001).

In terms of attitudinal influences, Model 3 showed that Time 1 normative status significantly predicted alcohol use at Time 2. The odds ratio suggests that for every one-point increase in attitudes favorable towards alcohol use at Time 1, respondents were 1.61 times more likely to have used alcohol at Time 2. Another important finding from this model is
that the incorporation of attitudes into the model produces a substantial change in the odds ratio on cohort. That is, in previous models, being in high school was a predictor of increased likelihood of use. However, when attitudes were incorporated into the model (Model 3), the odds ratio on cohort changed from 1.12 to 0.79 (non-significant). Thus, it can be said that favorable attitudes towards alcohol partially explain the relationship between age and alcohol use; high school students are more likely to use alcohol because they are more likely to hold favorable attitudes towards its use.

Model 4 examines the attitudinal relationship more closely by controlling for both attitudinal items at Time 2. This allows the researcher to determine whether Time 1 attitudes have an effect on alcohol use independent of their relationship to later attitudes. It is important to bear in mind that the independent variables here (attitudes at Time 2) are technically measured after the dependent variable (past six month alcohol use). That is, attitudes are being measured at the time when the survey is administered, and behaviors are being measured by students' recall of the past six months. While this causal ordering technically violates one of the necessary tenets of determining causation (that is, the independent variable must precede the dependent variable in order to establish causality), however, the high degree of correlation between Time 1 and Time 2 attitudes suggests that Time 2 attitudes, although
measured after the behavior, have enough stability over time to infer that
the attitudes as measured at the time of the survey are similar to those at
the time of the substance use. Therefore, a temporal ordering of these
variables is justifiable, but should be borne in mind as a precaution for this
and the following models.

In Model 4, similar results emerged to Model 3, with peer use as the
strongest predictor of use at Time 2, followed by use at Time 1. SES and
Time 1 normative status were no longer significant predictors once
attitudes at Time 2 were entered into the model. In this model, both Time 2
attitudes were significant predictors of use, with increasingly favorable
attitudes being related to increases in the likelihood of alcohol use. The
fact that Time 1 normative status ratings were no longer significant
suggests that the variable’s emergence as significant was largely due to
the fact that it is related to Time 2’s attitudinal ratings.

Marijuana Use. A similar modeling procedure was employed for
examining the effects of attitudes on marijuana use, with two models
examining use absent any attitudinal measures, then one model
examining the effects of Time 1 attitudes alone. Finally, one model was
constructed controlling for Time 2 attitudes, in an attempt to isolate the
effects of Time 1 attitudes on Time 2 behaviors. Table 5 presents the results
from the marijuana use models.
Results from Model 1 indicate similar findings to the alcohol models, with being in high school and having used before as the strongest predictors of marijuana use. Divergent from the alcohol models is the fact that being female is a predictor of decreased use, and SES is non-

3 Diagnostic statistics were calculated for both models, finding two poorly fit patterns of x-variables and two particularly influential patterns. Removing the cases corresponding with these x patterns produced an increase on the odds ratio on peer use and an increase in the pseudo-$R^2$. No changes in significance were observed and the models presented include all cases.
significant. Model 2 indicates a mediating effect, similar to that found in the alcohol models, where incorporation of peer use into the model decreases the effects of cohort on marijuana use. That is, it seems that high school students are more likely to use, in part, because they perceive that they have more peers who use.

Model 3 included attitudinal items at Time 1, neither of which emerged as significant predictors of use at Time 2. In addition, unlike the alcohol models, the incorporation of attitudes into the model does not produce a change in the odds ratio on cohort. That is, the (albeit non-significant) relationship between age and marijuana use is not explained away by increasingly favorable attitudes towards the drug the way that the relationship with alcohol was.

In Model 4, Time 2 normative status ratings emerge as a significant predictor of Time 2 marijuana use, with a one-point increase in favorable attitudes increasing the odds of use by 1.97 ($p<0.05$). These findings reveal that Time 1 attitudes have no effect on marijuana use, either net of their correlation with Time 2 attitudes or on their own.

**NMPD Use.** Following the procedure of previous substances’ models, Table 6 presents Model 1, with demographics and previous use, Model 2, with peer use incorporated, Model 3, which contains Time 1 attitudes as predictors, and Model 4, which includes attitudes from both Times. It should be noted that for NMPD use there was no specifically
corresponding measure for (1) peer use, or (2) attitudes. Instead, these items' inclusion in the model regards peer use and attitudes on "other illegal drug" use. As such, it is expected that these attitudes may have less predictive ability than would items specifically addressing NMPD use (See Azjen and Fishbein 2005, in "Attitudes as Predictors of Behaviors," Chapter 1).
Table 6: "Other-Illegal Drugs'" Attitudes' Effects on NMPD Use

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Model 1 (N=714)</th>
<th>Model 2 (N=711)</th>
<th>Model 3 (N=703)</th>
<th>Model 4 (N=702)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (SE)</td>
<td>OR (SE)</td>
<td>OR (SE)</td>
<td>OR (SE)</td>
</tr>
<tr>
<td>Female</td>
<td>0.61 (0.24)</td>
<td>0.61 (0.25)</td>
<td>0.65 (0.28)</td>
<td>0.7 (0.31)</td>
</tr>
<tr>
<td>High school</td>
<td>2.44* (0.99)</td>
<td>1.38 (0.62)</td>
<td>0.93 (0.45)</td>
<td>0.95 (0.47)</td>
</tr>
<tr>
<td>SES</td>
<td>0.99 (0.26)</td>
<td>1.07 (0.28)</td>
<td>1.12 (0.31)</td>
<td>1.09 (0.3)</td>
</tr>
<tr>
<td>Non-white</td>
<td>0.98 (0.45)</td>
<td>0.91 (0.43)</td>
<td>0.85 (0.42)</td>
<td>0.81 (0.41)</td>
</tr>
<tr>
<td>Used at Time 1</td>
<td>4.16*** (1.65)</td>
<td>3.01*** (1.27)</td>
<td>2.39 (1.12)</td>
<td>2.6* (1.25)</td>
</tr>
<tr>
<td>Peer use</td>
<td>-</td>
<td>8.34*** (3.56)</td>
<td>7.49*** (2.77)</td>
<td>5.57*** (2.72)</td>
</tr>
<tr>
<td>Time 1 Normative status</td>
<td>-</td>
<td>-</td>
<td>1.16 (0.38)</td>
<td>1.0 (0.34)</td>
</tr>
<tr>
<td>Time 1 Enforcement status</td>
<td>-</td>
<td>-</td>
<td>2.16*** (0.45)</td>
<td>1.82** (0.43)</td>
</tr>
<tr>
<td>Time 2 Normative status</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.91** (0.51)</td>
</tr>
<tr>
<td>Time 2 Enforcement status</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.96 (0.26)</td>
</tr>
<tr>
<td><strong>Pseudo-R²</strong></td>
<td>0.08</td>
<td>0.18</td>
<td>0.25</td>
<td>0.28</td>
</tr>
</tbody>
</table>

In Model 1, significant predictors of NMPD use included being in high school, and having used NMPDs at Time 1. When peer use was incorporated into the model (Model 2), the significant effects of cohort disappeared (as with the alcohol models above). This suggests, again, that the relationship between age and NMPD use can be partially

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4 Diagnostic statistics indicated seven cases that were potentially problematic; their removal from the model did not produce any changes of substantive or significant importance, aside from a slight increase in the pseudo-R² of all models.
explained by the fact that older students are more likely to perceive their peers as users, which in turn, increases their own likelihood of use.

In Model 3, peer use again emerged as the strongest significant predictor of use; having at least one friend who used "other illicit drugs" increased the odds of respondents using NMPDs by 7.49 (p<0.001). In terms of attitudinal predictors, enforcement status (ES) ratings emerged as a strong and significant predictor of use, as a one-point increase in favorable ratings (here, regarding whether or not people should be punished for using "other illicit drugs") resulted in a 2.16 increase in the odds of NMPD use (p<0.001). In addition, the incorporation of attitudinal items produces a substantive shift in the odds ratio on cohort. That is, it appears that high school students are more likely to use NMPDs, at least in part, because they are more likely to have favorable attitudes towards use. Finally, it should be noted that whether or not a respondent used NMPDs at Time 1 was not a predictor of use at Time 2, the first model for which this finding has emerged. This finding may be due to the low number of NMPD users at both Times.

Model 4 presents the logistic regression results while controlling for attitudes at Time 2. Unlike the models regarding alcohol and marijuana use, however, the significant effect of Time 1 ES ratings did not disappear when controlling for Time 2 attitudes. Thus, it can be said that with regard to NMPD use, increasingly favorable ES ratings at Time 1 are associated
with an increased likelihood of use at Time 2, net of the attitudes' effects at Time 2. Also interesting to note is the fact that Time 2 ES ratings are not a significant predictor of NMPD use, while Time 2 normative status (NS) ratings are.

**Effects of Attitudes on Behaviors by Sex, Cohort, and Previous Use**

One hypothesis of this thesis was that the effects of attitudes on behaviors would vary by sex, cohort, and whether or not a respondent had used a substance before. To test these hypotheses, several strategies were employed, including estimation of separate-sample models, as well as a pooled-sample model with interaction effects. Preliminary findings indicated some differences in predictive ability for each variable, such as stronger predictive ability of attitudes for females and middle school students (supporting this thesis's hypotheses), and for students who have not used a substance before (contrary to the hypothesis). However, overall findings from statistically comparable (i.e. pooled-sample) models did not support these hypotheses. As such, details of the analysis strategy and findings are not presented here, but may be found in the Appendix. Relevant findings from the preliminary analysis will be discussed in Chapter 4, with the understanding that the results were non-significant and should be used only in informing future research.

**Effects of Behaviors on Attitudes**

To explore the possibility that the relationship between attitudes and
behaviors may be best explained through an alternate causal direction (i.e. behaviors may predict attitudes) or that the relationship may not be exclusively uni-directional, a set of ordered logistic regression models were estimated. In these models, the attitudinal items (NS and ES ratings for each substance) serve as the dependent variables, and Time 1 use (along with the previously used demographic controls) serves as the independent variable. As previous models have shown that there may be a relationship between Time 1 and Time 2 attitudes, Time 1 NS ratings and ES ratings at both Times will be controlled when testing Time 2 NS ratings. Similarly, in models estimating Time 2 ES ratings, the three other attitudinal items will be controlled as well. Additionally, both Time 1 and Time 2 substance use behaviors were entered into the model as predictors to allow for the effects of each Time's behaviors to emerge net of the effects of one another\(^5\). It should be noted again that for NMPD use, there are no corresponding attitudinal items and the items used refer to "other illicit drugs" generally. Results for all three substances are presented in Table 7.

\(^5\) Separate models were estimated that included behaviors only at Time 1 (not shown); for no substance did Time 1 behaviors emerge as a significant predictor of Time 2 attitudes.
From Table 7, several interesting findings emerged: most importantly, in no cases did substance use at Time 1 predict subsequent related attitudes. In fact, in only three of the six models presented above did even use at Time 2 predict Time 2 attitudes. The most consistent predictor of Time 2 attitudes were other Time 2 attitudes, followed by the corresponding Time 1 attitudes. For alcohol-related NS ratings, significant predictors included peer use, Time 1 NS ratings, and Time 2 ES ratings. Predictors of alcohol-related ES ratings included use at Time 2, cohort, SES, Time 1 ES ratings and Time 2 NS ratings.

In terms of marijuana, Time 2 NS ratings were predicted by

<table>
<thead>
<tr>
<th>Substance Use Behaviors' Effects on Attitudes</th>
<th>Alcohol</th>
<th>Marijuana</th>
<th>Other Illicit Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=737</td>
<td>N=741</td>
<td>N=722</td>
</tr>
<tr>
<td>Used at Time 1</td>
<td>T2 NS</td>
<td>T2 ES</td>
<td>T2 NS</td>
</tr>
<tr>
<td></td>
<td>1.12</td>
<td>0.91</td>
<td>0.98</td>
</tr>
<tr>
<td>Used at Time 2</td>
<td>T2 NS</td>
<td>T2 ES</td>
<td>T2 ES</td>
</tr>
<tr>
<td></td>
<td>1.37</td>
<td>2.22**</td>
<td>3.16**</td>
</tr>
<tr>
<td>Race</td>
<td>T2 NS</td>
<td>T2 ES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.09</td>
<td>0.96</td>
<td>1.14</td>
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<tr>
<td>Sex</td>
<td>T2 NS</td>
<td>T2 ES</td>
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<tr>
<td></td>
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<td>1.16</td>
<td>1.10</td>
</tr>
<tr>
<td>Cohort</td>
<td>T2 NS</td>
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<tr>
<td></td>
<td>0.97</td>
<td>1.87**</td>
<td>1.33</td>
</tr>
<tr>
<td>SES</td>
<td>T2 NS</td>
<td>T2 ES</td>
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<tr>
<td></td>
<td>1.19</td>
<td>0.77*</td>
<td>0.82</td>
</tr>
<tr>
<td>Peer use</td>
<td>T2 NS</td>
<td>T2 ES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.58***</td>
<td>1.13</td>
<td>2.64***</td>
</tr>
<tr>
<td>T1 NS</td>
<td>T2 NS</td>
<td>T2 ES</td>
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<tr>
<td></td>
<td>1.66***</td>
<td>0.8</td>
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<tr>
<td>T1 ES</td>
<td>T2 NS</td>
<td>T2 ES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.21</td>
<td>1.84***</td>
<td>1.74***</td>
</tr>
<tr>
<td>T2 NS</td>
<td>T2 ES</td>
<td>T2 ES</td>
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<td></td>
<td>3.82***</td>
<td>-</td>
<td>4.71***</td>
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p<0.05*; p<0.01**; p<0.001***
concurrent use (use at Time 2) and peer use. As with alcohol, significant predictors of each attitude at Time 2 included the other Time 2 attitudinal item and the corresponding Time 1 attitudinal item.

For attitudes regarding "other illegal drugs," NS ratings are predicted by NMPD use at Time 2, peer use, Time 1 ES ratings and Time 2 NS ratings. It should be noted that the corresponding Time 1 attitudinal item was not a significant predictor of the Time 2 ratings. In terms of ES ratings, predictors included cohort, Time 1 ES ratings, and Time 2 NS ratings. These findings follow the pattern of findings from the other two substances.

There is some consistency in the predictors for each substance-related attitude. First, for the majority of the substance-related attitudes examined, attitudinal items were predicted by (1) their corresponding Time 1 attitudes (i.e. Time 2 ES ratings are predicted by Time 1 ES ratings), and (2) the other, simultaneously measured, attitudinal item (i.e. Time 2 ES ratings are predicted by Time 2 NS ratings). This suggests that attitudes may have some stability over time, and that there may be consistency between the two attitudinal items (as mentioned previously). Only two particular attitudes did not fit this model; marijuana-related NS items were predicted by the above as well as by Time 1 ES items and "other illicit drug"-related NS ratings were predicted not by the corresponding Time 1 item, but by ES ratings at both times.
CHAPTER 4

DISCUSSION

This thesis aimed to examine several hypotheses regarding the relationships between substance-related attitudes and substance use behaviors, particularly in regards to how these relationships may vary by sex and age. Below, the hypotheses that guided this research will be revisited and discussed in terms of the findings from the Results section (Chapter 3).

Univariate Analyses

A beginning aim of this thesis was to determine levels and types of substance use among the seventh and tenth grade sample as compared to established national trends. The first corroborating finding from this study was the prevalence of alcohol as the most widely used substance, although the rates of tenth graders who had used alcohol in this study were slightly lower than national estimates (Kuehn 2006). Marijuana rates were roughly comparable to previous findings (Kuehn 2006), and despite its initially higher rates of use at Time 1, NMPD use among the sample had declined drastically by Time 2, to about half the rate of national averages for people aged 12 and older (Simoni-Wastila et al. 2004). Although not entirely representative, overall, the results suggest that use rates among
NH adolescents may be lower than national averages. It should be noted, however, that in the sample, alcohol use had significantly increased between Times, indicating that these rates may still be rising among this sample, possibly to peak by the end of high school.

**Bivariate Relationships**

**Substance Use and Sex**

The analyses in Chapter 3 reveal several important findings regarding the relationship between substance use and sex, particularly that the study’s hypothesis of no relationship between use and sex may not be entirely accurate, and may instead be linked to particular time points in the adolescent life course. In terms of overall trends, there was higher reported use of alcohol among females at both Times, higher reported use of marijuana among males at both Times, and higher rates of NMPD use among females only at Time 1. However, these gendered patterns did not significantly persist over time as by Time 2, the significant gaps between males’ and females’ levels of alcohol and NMPD use at Time 1 had narrowed considerably, resulting in statistical non-significance. In terms of marijuana use, the sex gap had increased by Time 2 (females’ rates increased slightly, while males’ rates increased more drastically), but was still not strong enough to be significant.

These results suggest several important facts about the gendered nature of substance use. The time-differential findings may suggest that
females do not necessarily engage in substance use at higher rates, as the cross-sectional Time 1 findings would indicate, but simply initiate into substance use at earlier ages than their male counterparts. That is, at Time 1, more females may have initiated into use than males, but by Time 2, the male subpopulation had "caught up" with the females' rates of use. This finding would not be evident in a cross-sectional model, which may explain some of the differential findings of previous research. Alternatively, it may be that the sex gap in reported use was not necessarily closing from Time 1 to Time 2, but that the male group was experiencing a rise in use that would eventually surpass female use rates. In this case, it would be useful to examine a current sample of older respondents to see if males' rates continue to rise over time.

Substance Use and Cohort

One of the most consistent findings from substance-use research among adolescents has been that age is positively related to substance use. This finding was strongly supported by the present research, with high school students reporting higher rates of alcohol, marijuana, and NMPD use than the middle school students. Particularly important may be the finding that although the largest disparity between the cohorts' reported rates regarded alcohol use, rates among both groups were fairly high; approximately one in ten middle school students had used alcohol by Time 2 as compared to two in five high school students. In contrast, rates
of marijuana use and NMPD use among middle school students were quite low even at Time 2 (3% and 2.6%, respectively), particularly in comparison to high school students' rates of marijuana and NMPD use (18.9% and 6.7%, respectively). These findings suggest that alcohol use may be initiated even earlier than seventh grade for some respondents, while initiation of marijuana and NMPD use appears to occur at a point beyond seventh grade.

These findings could have important implications for the timing of use prevention programs, in that the potential hazards of alcohol use should be discussed prior to seventh grade, with a discussion of other drugs occurring then or following soon after. For high school students, a large portion of whom report having used at least one of the substances by the 10th grade, programs focused on harm minimization or cessation of use may be more useful.

**Substance-Related Attitudes and Sex**

Based on previous research indicating the existence of gendered methods of assessing drug use, it was hypothesized in Chapter 2 that males would have more favorable attitudes towards drug use. This finding was not uniformly supported in this study, however several important findings regarding gendered attitudes towards substance use did emerge, indicating a somewhat more complex relationship between sex and substance-related attitudes than originally hypothesized.
For alcohol- and marijuana-related attitudes, the largest divergence from the expected findings was the over-representation of females in the "slightly favorable" categories. While by no means do females generally support use of any substance, females who rated use favorably were more likely to express "slight" favorability, rather than a completely favorable rating. Conversely, among males who had favorable attitudes towards drug use, respondents were more likely to select the "favorable" category than the "slightly favorable" rating. That is, while males do not generally support substance use, those who did were more likely to express full favorability, rather than "slight" approval.

This finding may indicate several differences in the way males and females express favorability towards drug use. First, males' tendency to select a fully favorable rating may be reflective of findings from previous research that indicated differences in the contributing components of gendered attitudes. Because females may be more likely to consider risks in their assessment of drugs, their mean ratings of drug use as less favorable may reflect the variety of factors taken into account for the assessment. Conversely, males' reliance on their own (positive) experiences when constructing an opinion on use may lead to a less nuanced (and more positive) assessment of use as wrong or punishable.

A second potential interpretation is that attitudes are expressed differently between the sexes not because of varying attitudinal
components, but because of potential normative constraints regarding substance use. As mentioned in Chapter 1, substance use has historically been more prevalent among males, although recent studies (including this one) indicate that the sex gap in substance use may be closing. This behavioral trend, however, does not necessarily translate into a corresponding adjustment in normative expectations for each sex. That is, while female students may have an increased likelihood of substance use in recent years, conventional gendered notions of use (from parents, friends, or the media) may not have undergone a similar change. Therefore, female respondents may feel that it is inappropriate or unfeminine to express full favorability towards substance use, regardless of their own experience with substance use. As such, female respondents may feel pressured to maintain conventionally feminine attitudes regarding use, which interact with emerging ideas about, or personal experience with, substance use, to result in a somewhat tempered assessment substance use as "slightly favorable." These findings suggest that careful considerations should be made in interpreting gendered attitudes as indicative of future use, as females' slightly favorable attitudes may not necessarily be reflective of a "slight" intention to use.

**Substance-Related Attitudes and Cohort**

The findings regarding substance-related attitudes and cohort are considerably less complex than the findings regarding sex. For each
substance, at each Time, middle school students had considerably less favorable attitudes towards drugs than did high school students, strongly corroborating the hypothesis of attitudinal differences between the two cohorts. Further, there is evidence to suggest that the cohorts’ divergence in attitudes stems largely from the middle school cohort’s tendency for uniform assessments of use as unfavorable. As was hypothesized in Chapters 1 and 2, this may be due to the fact that middle school students have had little exposure to substance use thus far. Without personal or peer drug use experiences to supplement (or deconstruct) attitudes learned through drug prevention tactics, these “anti-drug” opinions remain intact.

It should be noted that by high school age, these “anti-drug” opinions have undergone a marked transformation and include much more variability in student assessments of use. The temporary nature of these attitudes should be considered alongside the findings from the multivariate analyses, which suggests that favorable attitudes towards drug use play a role in increased likelihood of subsequent (or concurrent) drug use.

**Substance Related Attitudes and Previous Use**

The findings regarding previous use and attitudes are fairly straightforward regarding alcohol and marijuana use. For both substances, students who had used at Time 1 were more likely to assess
these substances favorably, and less likely to assess them unfavorably, than non-users at Time 2. This is likely due to the fact that students who drank or smoked marijuana were able to incorporate their own (presumably favorable) experiences into their assessments of use as wrong or punishable, resulting in more favorable ratings of both.

In terms of NMPD use, the findings were opposite of the above findings. That is, students who had used NMPDs at Time 1 were less likely to consistently select favorable ratings, and instead tended to select slightly unfavorable ratings. This finding held true for both attitudinal measures, suggesting either that some students may have had unpleasant experiences with NMPDs, causing an attitudinal adjustment, or that some other experience helped shape attitudes, independent of their previous use (such as a new prevention or awareness program focused on NMPD use).

**Multivariate Analyses**

**Predictive Ability of Attitudes on Behaviors**

The main purpose of this thesis was to examine the relationship between attitudes and behaviors through a series of logistic regression analyses. The most consistent finding from these analyses was the emergence of two control variables, peer use and respondents' previous use, as consistently significant predictors of behavior. These findings, corroborated by much of the adolescent substance use research, were
not surprising, in that (1) it is logical to expect that previous behaviors are an accurate predictor of future behaviors; and (2) peer use of particular substances can provide a normative and physical context in which students can learn how to use, how to enjoy the effects of use, and how to negotiate the potential of stigma of use through peer direction [See Becker 1963(1991)].

In terms of attitudinal items, models were constructed including attitudes only at Time 1 as predictors, then again while controlling for Time 2 attitudes. These models essentially tested the Theory of Planned Behavior, which suggests that the decision to engage in a behavior is preceded by an aggregate of attitudes and evaluations that result in an overall positive assessment. In the initial models, there was some support for this theory, as one Time 1 rating was a significant predictor for each alcohol and NMPD use. However, although these findings were in the direction expected, where the likelihood of use is increased with favorable ratings of substance use, the second set of models (which controlled for Time 2 attitudes) indicated far less support for the Theory of Planned Behavior and instead suggest a different and substantially more complex relationship between attitudes and behaviors.

When controlling for Time 2 attitudes, the predictive ability of Time 1 NS ratings on alcohol use disappeared. Instead of previous attitudes predicting future behaviors, the findings indicated that concurrent (Time
2) attitudes alone predicted Time 2 behaviors. The fact that Time 1 attitudes are a weak and non-significant predictor of later behaviors contradicts the Theory of Planned Behavior and instead, indicates that current (rather than previous) attitudes have more salience in predicting behaviors.

One potential explanation for these findings is that adolescents are still forming attitudes about drugs, which the data show have a tendency to become more favorable over time. As such, adolescent attitudes may change rapidly enough that Time 1 attitudes no longer correspond with adolescent attitudes at Time 2. A second possible explanation suggests support for neutralization theory. Time 1 attitudes may be irrelevant because engaging in a behavior may immediately affect a change in corresponding attitudes. Thus, attitudinal changes from unfavorable to favorable (and perhaps back again) may occur faster than the six-month lag between Times can capture. A final explanation might be that Time 1 attitudes are not actually irrelevant in predicting Time 2 behaviors, but rather that the relationship between Time 1 attitudes and Time 2 behaviors is mediated by Time 2 attitudes. That is, the effects of Time 1 attitudes seem to disappear when Time 2 attitudes are entered into the model because Time 2 attitudes are predicted by Time 1 attitudes, which in turn, predict Time 2 behavior.
**Moderated Models: Previous Use, Sex, and Cohort**

It was hypothesized based on previous research that three variables might moderate the attitude-behavior relationship: previous use of a substance, sex, and age. It was hypothesized that students with first-hand knowledge of a substance would have a more clearly defined (i.e. stronger) relationship between attitudes and behaviors and that attitudes would have a stronger effect on behaviors for females and middle school students. Separate sample findings indicated some patterning that supported the hypothesis of differential predictive ability, particularly that attitudes are stronger and more salient predictors for females for all substances and that previous attitudes matter more for middle school students than for high school students, particularly in regards to NMPD use.

The findings on previous use and attitudes indicated only weak support for the hypothesis that attitudes would be stronger predictors of behavior for students who had engaged in substance use at Time 1. In the separate sample regressions, the moderated model was supported only for alcohol; that is, having used alcohol previously strengthened the effects of attitudes on behaviors for those students. For NMPD and marijuana use, having not used either substance strengthened the effects of attitudes on behaviors. While these effects were not significant in the pooled-sample models, the patterning suggests that alcohol use helps foster positive attitudes that may lead to later use, while use of other drugs...
may not have the same effect. As such, it may be important to include a "substance use reduction" arm within substance prevention programs that can recognize students' past positive experiences, particularly with alcohol, and help them incorporate these experiences into an overall understanding of alcohol use.

The separate sample findings for sex suggest that drug resistance programs that target attitudes may not be effective in changing males' behavior. Conversely, these findings indicate that for females, attitudinal education may be an important component of substance use prevention. This finding could be particularly relevant in light of the recent media glorification of female drunkenness, particularly among celebrities, in the last several years. As these scandals may center on potential role models for young women, it is imperative to reinforce the possible dangers of use, perhaps while invoking the same celebrity's stories to illustrate the downside of substance use (e.g. the hugely publicized struggles of pop-singers Amy Winehouse and Britney Spears with drugs and alcohol).

The fact that middle school students' attitudes appear to have longer ranging influence (as it was one of the only models in which Time 1 attitudes remained significant throughout) suggests several things about the relationship. Most importantly, unfavorable attitudes are effective in curbing drug use when cultivated. However, when considered alongside the findings from other sections, which indicate more favorable attitudes
among high school students, it should be noted that these attitudes must be actively preserved in order to remain effective in the long term. While these differences were not significant in the pooled-sample models, the findings here may serve as a stepping-stone for future research on larger, more evenly distributed samples.

**Predictive Ability of Behaviors on Attitudes**

The possibility that the relationship between attitudes and behaviors may be best explained in an alternate direction was tested through a set of models that used attitudes as the dependent variable. These models essentially tested the social-psychological theories (including self-perception and cognitive dissonance theories) that suggest engagement in a deviant behavior precedes the development of favorable attitudes regarding the behavior.

The most important finding from these analyses is that for no substance did Time 1 use consistently predict Time 2 attitudes. Instead, other attitudes were the strongest predictor of Time 2 attitudes, particularly concurrent attitudes across measures (e.g. Time 2 NS ratings predicted by Time 2 ES ratings) and corresponding attitudes across time (e.g. Time 2 NS ratings predicted by Time 1 NS ratings). These patterns indicate a certain degree of consistency in attitudes, both between multiple attitudinal measure at one Time, and between a single attitudinal measure across Times.
In addition to the findings on attitudinal predictors, there were some instances of behavior predicting attitudes in the models. Use at Time 2 emerged as a significant predictor of favorable attitudes in about half of the models, as use at Time 2 predicted Time 2 ES ratings for alcohol, and Time 2 NS ratings for marijuana and other illegal drugs. It seems that these findings indicate several important things about the attitude-behavior relationship. First, when considered alongside the findings from the previous models, it seems that attitudes and behaviors may be mutually reinforcing constructs. That is, while Time 2 attitudes predict Time 2 behaviors, Time 2 behaviors also inform Time 2 attitudes. While it is not possible to fully disentangle the relationship between the two here, the findings from this thesis should be considered as a stepping-stone for future research.

A second important consideration is the varying salience of each attitudinal item for each substance. Both Time 2 attitudinal measures predict Time 2 alcohol use, while only Time 2 ES ratings are predicted by Time 2 alcohol use. That is, alcohol use is predicted by favorable ratings on both NS and ES measures, but only predicts Time 2 ES ratings. For marijuana and NMPD use, Time 2 NS ratings are predicted by Time 2 use, and Time 2 use is predicted by Time 2 NS ratings. That is, use of both substances is predicted by favorable NS ratings, and favorable NS ratings are predicted by Time 2 use. These findings have several implications.
about the nature of each substance, and how students understand its use.

For alcohol, the findings suggest that multiple considerations may be made when engaging in use (i.e. students consider both how wrong it is and how punishable it should be to drink). On the other hand, alcohol use does not necessarily affect whether a student finds drinking to be wrong, only whether drinking should be punished. This finding could be related to the legal status of alcohol, and to the fact that the normative constraints surrounding alcohol use are easier for students to understand. That is, students know that alcohol use is legally restricted to people aged 21 or older, which may translate into students viewing underage use as technically "wrong." Engaging in use does not affect this understanding (i.e. does not affect NS ratings).

On the other hand, ES ratings are affected by engaging in alcohol use. As with NS ratings, this finding may be related to the legal status of alcohol. Students understand, based on the legal status of alcohol, that not everyone should be punished for drinking; people who are 21 or older are allowed to use alcohol without retribution. Students who have used alcohol may understand that its use is technically wrong (because they are underage), but may perceive their use to be quite similar in structure and consequence to that of legal, adult users. As such, alcohol use's effects on notions of punishment may be related to a personal
application of ES ratings: students who use alcohol may translate "should people be punished for having a drink" into "should you be punished for having a drink." Drawing on their knowledge of alcohol's legal status for older, responsible users, students who drink may perceive their own use to be responsible, like that of a legal user, and be less likely to find themselves deserving of punishment.

For marijuana and NMPD use, the normative context surrounding the use of these substances is quite different than that of alcohol. The sense of drug use (versus alcohol use) as wrong is much more deeply rooted in the normative system, a notion that must be negotiated with in order for students to engage in use. Engaging in drug use may create a space for students to renegotiate their notions of use as wrong in a way that is not necessary for alcohol use. That is, students may find alcohol use to be wrong because they are not old enough to engage in it; its "wrongness" stems from the context in which the use occurs, not from an inherent quality of the alcohol itself. For drug use, the "wrongness" is derived from an intrinsic quality of the substances; its use is socially understood to be always wrong, regardless of context. When students engage in marijuana or NMPD use, their (positive) experiences may diminish the normative perception of drug use as wrong in a way that is not relevant for alcohol use. In other words, students may find value in their drug using experiences that is not validated by eventual legality the
way alcohol use is. This may force students to renegotiate their normative understandings of drugs in a way that incorporates and allows for their positive experiences with use.

Marijuana and NMPD use may not affect ES ratings as directly, because students know that they technically should be punished for breaking a law. That is, while alcohol as "sometimes legal" may temper assessments of its use deserving punishment, drug use as "never legal" may reinforce the widespread cultural notion of punishment for drug use as deserved.

In addition to the above explanations, it is possible that the context in which use occurs plays a role in determining ES and NS ratings. It is possible that alcohol use is more closely related to ES ratings because its connection with parties, large groups, and overt intoxication make it more susceptible to being punished. Conversely, marijuana use may occur in smaller, more private groups, with subtler indications of intoxication to the outside observer. As such, the salience of ES ratings may vary directly in proportion with the potential for getting caught and punished (high for alcohol, and lower for marijuana). In addition, in terms of NMPD use, it is possible that students use these substances for practical utility, such as using stimulants for improving energy and concentration, or using sedatives for inducing sleep or reducing anxiety. As such, these types of use may be situated in an entirely private context, for which the likelihood
of getting caught and punished is greatly reduced. This interpretation of NMPD use may also partially explain why their use decreases perceptions of wrongfulness: when used for specific and pragmatic benefits, use may seem far less "wrong."
CHAPTER 5

CONCLUSIONS

In this study, I set out to examine substance use and related attitudes among a sample of New Hampshire students, and to determine the relationship between those attitudes and behaviors. The literature had indicated a series of contradictory findings regarding substance use and attitudes, some of which were considered and clarified in this thesis. In addition, many drug prevention programs rely on the ability for attitudinal adjustments to produce corresponding behavioral changes, an assumption that should be called into question based on the findings here. Below, the limitations of this study will be discussed, followed by suggestions for future research, and finally, the three major findings of this study will be revisited.

Limitations

The above findings should be considered with the limitations of this study in mind. First, the findings are not entirely generalizable to either the population of NH adolescents, or to the nation as a whole, due to the fact that the sample was not a randomly selected, wholly representative one. Secondly, it should be noted that some potentially important control variables may be missing from the models, including whether or not
students had ever been arrested, which could have significance in how salient students find ES ratings to be, and whether or not students live with an older sibling, which could affect initiation into substance use independently of attitudes. As such, future research should consider incorporating these potentially important variables into the model, both as controls and as potential predictors of use.

**Future Research**

In sum, the research here has achieved several things. First, there has been some clarification of the demographics of substance use and related attitudes. Also, the complexity of the attitude-behavior relationship has been explored, and while the findings here do not provide a clear-cut answer, they contribute to the understanding of this relationship within the sociology of drug use field. Future research should incorporate the additional controls listed in the limitations section as well as include additional waves of data. Incorporating a third Time into the models might help clarify some of the relationships here, as it would allow for further testing of the theory that attitudes might grow progressively more favorable with subsequent instances of substance use. In addition, employing a study design with shorter lags between Times might further clarify the relationship between attitudes and behaviors, particularly in terms of capturing the critical shifts in attitudes that either precede or follow engagement in substance use.
Summary of Findings

Despite the above limitations of this study, several important findings did emerge from this study. These findings will be revisited and discussed in terms of their practical implications below.

(1) There is no persisting gap between males' and females' levels of substance use, but there is one between middle and high school students' levels of use. The findings on sex help to clarify some of the inconsistencies in previous research, particularly in regards to nature of the sex gap in use. While some studies have found that a gap exists, the longitudinal nature of this study allowed for measurement of this gap at two Times. While the cross-sectional findings from Time 1 indicated a disparity in levels of use between males and females, for alcohol and NMPD use, a second measurement at Time 2 showed that these gaps did not persist. Conversely, examination of the age gap in substance use strongly corroborated previous findings that suggested that substance use has a linear relationship with age, which persisted across Times and across all substances.

Understanding the disparities in levels of use across demographics has important implications for substance use prevention programs. The fact that sex gaps in use may be transitory or age-specific, and are perhaps due to an emerging trend of females initiating into use at an earlier age, suggests that prevention programs should be introduced at
ages even younger than the seventh grade. The utility of this suggestion is strengthened in light of the cohort findings, where use is present (albeit at low levels) among seventh graders, and only increases by high school age. In addition, because these initial sex gaps may indicate differential reasoning for engaging in use between males and females, prevention programs should be sex-sensitive, and consider the gendered incentives for use, particularly in terms of alcohol.

(2) There are major disparities between male/female, middle school/high school, and previously using/non-using students' attitudes on substance use, but these different attitudes do not have consistently different predictive powers. These findings somewhat confirm findings from the limited previous research in that attitudes on substance do vary according to several demographic/behavioral factors. Gendered attitudes regarding substance use were shown to have a unique distribution, where males favoring substance use expressed definitive favorability, and females approving of use utilized less authoritative ratings (i.e. "slight" favorability) to indicate favorability. In terms of cohort effects, the hypothesis that younger students would assess substance more uniformly and more negatively than older students was consistently confirmed. Finally, the hypothesis that students who had used at Time 1 would have more favorable substance-related attitudes at Time 2 was confirmed in terms of alcohol and marijuana only.
Despite the finding that attitudes varied by sub-population, the pooled-sample analyses revealed (contrary to my hypothesis) that these attitudes did not have differing predictive ability on behaviors. However, findings from the separate-sample regressions, indicative of attitudes having differential salience between sub-populations are worth considering in future research and policy. First, it is important that programs are developed with a sensitivity to student experiences, and provide realistic and pragmatic understandings of use both for students who have and have not used before. Solely touting the dangers and unpleasantness of substance use will surely be ineffective for students who have already had a positive experience with drugs or alcohol. Second, programs should consider how both males and females assess and understand substance use. For males especially, programs using attitudinal adjustments to incite a reduction in use may not be effective. Instead, programs may be more effective for males if a focus is on helping them incorporate their own experiences into an overall understanding of substance use. In particular, this could refer to acknowledging past pleasant experiences with drugs, while highlighting the fact that potential dangers still exist. Third, policy makers should be cognizant of the fact that while promoting uniformly negative assessments of drug use may be effective among younger students, this strategy has limited utility, and does not appear to last beyond middle school. Instead, programs should
focus on reducing risks, promoting realistic understandings of substance use, and encouraging students to include multiple considerations in their decision to engage in use.

(3) The relationship between attitudes and behaviors is a complex one, and may be classified as a bi-directional, mutually reinforcing relationship that varies by substance. This finding, while perhaps the most important of the entire thesis, is also one of the most complex. The relationship between attitudes and behaviors cannot be neatly summarized through a uni-directional causal relationship. Instead, the findings indicate that neither attitudes nor behaviors are a consistently reliable predictor of the other, and seem to be somewhat overlapping constructs that are being constantly redefined and renegotiated among adolescents. While substance-related attitudes can predict substance use behaviors, this utility is limited to a cross-sectional one. That is, independent of their relationship with current attitudes, previous attitudes do not consistently predict later behaviors. Similarly, net of their relationship with current behaviors, neither do previous behaviors regularly predict later attitudes.

There are several possible explanations for these findings, including those that these data cannot capture. It is possible that students undergo an attitudinal shift, based on others' experiences or new information, which allows them to engage in use (Theory of Planned Behavior).
Alternately, students could succumb to curiosity or pressure and engage in substance use, then search for justification post-behavior (Self-Perception Theory). Despite these possibilities, the lack of a clear cut time ordering within the longitudinal data suggests either that these attitudinal shifts (either pre- or post-behavior) occur too quickly for the data to have captured, or that there is an additional alternate explanation for these findings.

It is my belief that the findings of this thesis demonstrate a bidirectional relationship between attitudes and behaviors, best explained in existing theory by the social-psychological understandings, like neutralization theory. This theory suggests that engagement in substance use can result in a readjustment of attitudes (either pre- or post-behavior) that allow users to justify their using experiences, despite its classification as a deviant behavior. This theory allows for the notion that these favorable attitudes may be impermanent, and may undergo a shift back to unfavorable, to realign with conventional morals. Expanding on this theory, it seems likely that attitudes do not simply shift to accommodate behaviors, but also as a result of behaviors. That is, attitudes may not necessarily change post-behavior to strictly realign with conventional norms, but can possibly be shaped by positive substance use experiences to create drug-tolerant attitudes. In turn, these increasingly favorable attitudes may result in subsequent substance use behaviors, which could
further result in increasingly favorable attitudes. As such, attitudes and behaviors may be understood as mutually reinforcing constructs. While the current findings did indicate support for this hypothesis, this is, of course, only one potential interpretation. Without shorter lags between Times that could potentially capture the timing of attitudinal shifts, it is not possible to decipher this relationship further.
REFERENCES


### Matrix 1: Alcohol-Related Attitudes and Behaviors Correlations Across Times

<table>
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<th>Alcohol</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Used at Time 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2 Used at Time 2</td>
<td>0.62***</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3 Normative Status Time 1</td>
<td>0.63***</td>
<td>0.54***</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4 Normative Status Time 2</td>
<td>0.48***</td>
<td>0.54***</td>
<td>0.6***</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5 Enforcement Status Time 1</td>
<td>0.43***</td>
<td>0.39***</td>
<td>0.6***</td>
<td>0.5***</td>
<td>-</td>
</tr>
<tr>
<td>6 Enforcement Status Time 2</td>
<td>0.44***</td>
<td>0.51***</td>
<td>0.5***</td>
<td>0.7***</td>
<td>0.53***</td>
</tr>
</tbody>
</table>

***p<0.001

### Matrix 2: Marijuana-Related Attitudes and Behaviors Correlations Across Times

<table>
<thead>
<tr>
<th>Marijuana</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Used at Time 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2 Used at Time 2</td>
<td>0.64***</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3 Normative Status Time 1</td>
<td>0.57***</td>
<td>0.5***</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4 Normative Status Time 2</td>
<td>0.48***</td>
<td>0.52***</td>
<td>0.62***</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5 Enforcement Status Time 1</td>
<td>0.4***</td>
<td>0.35***</td>
<td>0.57***</td>
<td>0.56***</td>
<td>-</td>
</tr>
<tr>
<td>6 Enforcement Status Time 2</td>
<td>0.4***</td>
<td>0.45***</td>
<td>0.52***</td>
<td>0.76***</td>
<td>0.58***</td>
</tr>
</tbody>
</table>

***p<0.001
Matrix 3: Other Illicit Drug-Related Attitudes and NMPD Behaviors
Correlations Across Times

<table>
<thead>
<tr>
<th>NMPD/Other Illicit Drugs</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used at Time 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used at Time 2</td>
<td></td>
<td>0.17***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normative Status Time 1</td>
<td></td>
<td>0.12***</td>
<td>0.22***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normative Status Time 2</td>
<td></td>
<td>0.08*</td>
<td>0.32***</td>
<td>0.37***</td>
<td></td>
</tr>
<tr>
<td>Enforcement Status Time 1</td>
<td></td>
<td>0.07</td>
<td>0.24***</td>
<td>0.44***</td>
<td>0.45***</td>
</tr>
<tr>
<td>Enforcement Status Time 2</td>
<td></td>
<td>0.06</td>
<td>0.21***</td>
<td>0.34***</td>
<td>0.66***</td>
</tr>
</tbody>
</table>

* p<0.05 ** p<0.01 *** p<0.001
**APPENDIX B: MODERATED RELATIONSHIPS**

**Effects of Attitudes on Behaviors by Sex**

To assess whether the predictive ability of attitudes on behaviors vary by sex, several strategies were employed. First, to preliminarily examine the possibility of gendered effects, a separate sample strategy was utilized, with separate logistic regression models for males and females. This method "produces valid estimates of the (conditional) effects of the...variables at these different values of the 'moderating' variable [and] commendably recognizes the conditionality of the underlying arguments" (Kam and Franzese 2007:104). Next, a pooled-sample regression model was created, including a series of interaction terms, generated by multiplying sex by each Time 1 attitudinal item. This method produces the same benefits as a separate sample model, but also "facilitate[s] statistical comparisons of the effects of 'moderated' or 'moderating' variables" (ibid:104) and allows the researcher to determine "whether any differences in estimated effects across subsamples are statistically significant" (ibid). All interaction terms were centered at their means to mitigate possible multicollinearity between the interaction term and its components in the model. Results from both the separate sample and pooled-sample models are presented below.
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Alcohol Use. In the separate-sample regressions, attitudinal items
emerged as differentially predictive for male and female respondents. In the males' model, the significant predictors of alcohol use were socioeconomic status (OR=0.5; p<0.05), use at Time 1 (3.43; p<0.05), and peer use (OR=39.8; p<0.001). For females, significant predictors included use at Time 1 (OR=12.99; p<0.001), peer use (OR=17.52; p<0.001), Time 2 NS ratings (OR=1.68; p<0.05), and Time 2 ES ratings (OR=2.48; p<0.001). These results suggest that there may be differential predictive ability of attitudes for males and females, specifically that attitudes are both stronger and more salient predictors for females' alcohol use than for males.

To determine whether these differences were pronounced enough to be statistically significant, a second, pooled-sample model was constructed that included males and females, as well as interaction terms for sex multiplied by both NS and ES items. While the separate sample model suggested that attitudes were better predictors for females, the results from the pooled-sample model were non-significant. This finding may be due to the difference sample sizes, as the NHYS data has a higher rate of female respondents (for females, N=397; for males, N=274), which could lead to better estimations of independent variables' effects among the female sample.

Marijuana Use. A similar procedure to the above was used for determining marijuana-related attitudes' effects on behaviors by sex, with a separate-sample model being estimated first, followed by a pooled-
sample model. In the separate sample model, previous use (OR=10.57; p<0.01) and peer use (OR=6.0; p<0.01) emerged as the only significant predictors of marijuana use among males. For females, it should first be noted that peer use was not included in the model; the statistical package used here (STATA) would not allow peer use to remain in the model, as not having a peer that used "predicts failure perfectly." In other words, not one female respondent used marijuana if she did not have a peer that used. As such, predictors of females' use were socioeconomic status (OR=1.02; p<0.05), previous use (OR=33.21; p<0.001), and Time 2 NS ratings (OR=2.73; p<0.05).

These findings suggest that, similarly to alcohol use, attitudes are a stronger and more salient predictor for females than males. However, in order to facilitate statistical comparisons, a pooled-sample regression model with interaction terms was constructed. The results from this interactive model reveal that the above differences were non-significant, again, likely due to the differences in sex distribution of the sample.

Other Illicit Drug Use. The results from the NMPD models echo the findings from the models of the previous substances. The separate sample models revealed only one significant predictor of NMPD use for each sex; for males, previous NMPD use was a strong and significant predictor (OR=5.49; p<0.05) and for females, Time 2 NS ratings were significant (OR=3.92; p<0.05). Again, the interaction terms of sex multiplied by
attitudes in the pooled-sample model did not emerge as significant, suggesting that these differences were not strong enough to be significant in the overall sample.

Effects of Attitudes on Behaviors by Cohort

To examine the conditional effects of attitudes on behaviors by cohort, a similar strategy to the above was employed, with separate sample models estimated to reveal potential patterns, and a pooled-sample model estimated to determine whether these effects were statistically significant. Results from both methods are presented below.

Alcohol Use. For alcohol use, the results from the separate sample regressions were remarkably similar. For both middle and high school students, previous use, Time 2 enforcement status ratings, and peer use emerged as significant predictors of use at Time 2, with the odds ratios on each being roughly comparable. In the pooled-sample model, interaction terms generated from cohort multiplied by each attitudinal item (and centered on their means) were included in the model. In this model, no significant differences of the predictive strength of attitudes between cohorts emerged.

Marijuana Use. Findings regarding differential cohort effects of attitudes on marijuana use emerged as similar to those on alcohol use. In the separate sample models, only peer use emerged as a significant predictor of Time 2 use among middle school students (OR=50.42; p<0.01).
For high school students, being female was a predictor of decreased odds of use (OR=0.35; p<0.05), while having used marijuana previously and peer use both emerged as predictors of increased use (OR=15.12; p<0.001 and OR=10.2; p<0.01, respectively). The pooled-sample model showed that the interaction terms were weak and non-significant, indicating that there are no cohort effects on attitudes with regard to marijuana use.

Other Illicit Drug Use. The final test of cohort as a moderating variables examined whether strength and predictive ability of attitudes on NMPD use vary by cohort. The separate sample findings indicated that for middle school students, the sole significant predictor of use at Time 2 was Time 1 ES ratings. That is, independent of its relationship with Time 2 attitudes, students with increasingly drug-favorable attitudes regarding punishment for using "other illicit drugs" at Time 1 were significantly more likely to use at Time 2 (OR=1.87; p<0.05).

For high school students, significant predictors included NMPD use at Time 1 (OR=3.77; p<0.05) and Time 2 NS ratings (OR=3.46; p<0.01). These findings suggest that attitudes do not necessarily have differential predictive ability for students of different cohorts, but that these attitudes vary in salience for predicting NMPD use among cohorts. That is, Time 1 ES ratings predicted Time 2 NMPD use among middle school students, while Time 2 NS ratings predicted for high school students. Despite these trends,
findings from the pooled-sample regression showed that the interaction
effects between cohort and attitudinal items were non-significant.

Similar to findings regarding gendered effects of attitudes on
behaviors, there seem to be no significant cohort effects on the attitude-
behavior relationship. While some significant effects emerged from the
separate sample regressions, these are simply indicative of some patterns
within the middle/high school subsamples and cannot be generalized to
full sample effects. As with the distribution of sex, the overrepresentation of
middle school students in the sample may be partially responsible for the
inability for extrapolation of subsample effects to the full sample model.

Effects of Attitudes on Behaviors by Previous Use

The final moderated model being tested here regarded a possible
interaction between having used a substance at Time 1 and attitudes. It
was hypothesized that for respondents who had had personal experience
with a substance, attitudes would be a stronger and more salient
predictor of future use, due to the effects of personal experience on
shaping attitudes (See Chapter 1). A similar modeling technique to the
above was employed, by conducting tests on the separate-samples (of
users/non-users at Time 1) to indicate possible patterning of predictors,
and a test of interaction terms in the pooled sample to determine whether
any emergent differences were statistically significant.

For alcohol use, the hypothesis was somewhat supported in the
separate sample logistic regressions, as Time 2 ES ratings emerged as a stronger and more significant predictor of use at Time 2 among previous users than among students who had not used at Time 1. These findings were reversed for the other substances examined, as Time 1 attitudes were significant predictors of NMPD and marijuana use only for the students who had not used at Time 1. None of the subsample effects emerged as significant in the pooled-sample model that examined the interaction between use at Time 1 and Time 2 attitudes. It is likely that the hypothesis was supported in the alcohol model alone due to the low number of previous users in the marijuana model (N=53) and the low number of current users in the NMPD model (N=32).
21-Nov-2008

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IRB #: 4368
Study: Substance Use Among NH Adolescents: Attitudes as Predictors of Substance Use Behavior
Approval Date: 18-Nov-2008

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study as Exempt as described in Title 45, Code of Federal Regulations (CFR), Part 46, Subsection 101(b). Approval is granted to conduct your study as described in your protocol.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the attached document, Responsibilities of Directors of Research Studies Involving Human Subjects. (This document is also available at http://www.unh.edu/osr/compliance/irb.html.) Please read this document carefully before commencing your work involving human subjects.

Upon completion of your study, please complete the enclosed Exempt Study Final Report form and return it to this office along with a report of your findings.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or Julie.simpson@unh.edu. Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,

Julie F. Simpson
Manager

cc: File
    Vangundy, Karen