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**THE EFFECTS OF ALCOHOL AND ILLEGAL DRUG USE
ON INITIAL FAMILY FORMATION**

A Dissertation in
Rural Sociology and Demography

by

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ABSTRACT

Adolescent alcohol and illegal drug use creates problems for individuals, families, and society. Relatively young and frequent users risk lifelong physical and mental health problems and relatively low socioeconomic success. Adolescent substance use also has been linked to risky behaviors that lead to early and unwed pregnancy, teenage marriage, and premarital cohabitation. Role Strain Theory argues that illegal substance users take the atypical path into adult family roles and choose cohabitation or parenthood over marriage. This study assessed the influence of alcohol and illegal drug use on the choice of parenthood, cohabitation, not forming a family, or marriage as the first family type. It also examined whether the effects, if any, of substance use differed by gender, race/ethnicity, and residence.

The sample consisted of the 4,011 14 to 16 year old respondents to the 1979 wave of the NLSY79 who had not formed a family before 1979. Multinomial Logistic Regression analysis was used to predict the likelihood that a subject was classified into each of three types of first families versus marriage. Indicators of the type of substance use by type and use of multiple types assessed the effects of polydrug use on first family type. Measures of the age at first alcohol, marijuana, or other illegal drug use; the frequency of alcohol or marijuana use in 1979; binge drinking; and familial alcoholism assessed the effects of characteristics of specific substances among users of those substances. First, the effects of alcohol and illegal drug use on first family type were assessed and then net of the effects of 27 control variables. Separate analyses that mirrored the analysis of the entire sample were performed for males and females, among racial/ethnic groups, and by rural and South regional residence.

The statistical findings of the full sample analysis suggested that those who used alcohol and illegal drugs before forming their first adult families were much more likely to cohabit than marry as a first union and were less likely to become parents before first marriage. Age at first use and frequency of use did not predict group membership except among those who started at the youngest ages and used at the highest frequencies. Males' family formation behavior appeared to be significantly more influenced by their marijuana use but not by their alcohol or other illegal drug use than their female counterparts. Substance use was not predictive of first family type among Blacks or Hispanics, was mildly predictive of parenthood or cohabitation as the first family type among American Indians, and was strongly predictive of cohabitation or parenthood versus marriage among non-Hispanic whites. First family type was significantly influenced by alcohol and illegal drug use among those living in the rural South, less so among those in the rural non-South, and did not significantly influence the odds of atypical family formation versus marriage among those in the two non-rural groups.

While most research finds significant effects of alcohol and illegal drug use on the likelihood of premarital pregnancy, this analysis found little effect on parenthood. Since alcohol and illegal drug users are significantly more likely than non-users to resolve premarital pregnancy with elective abortion and to experience spontaneous abortion, further research that incorporates measures of abortion would clarify the relationship of substance use to childbearing.

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CHAPTER ONE

INTRODUCTION

Initial Family Formation

A successful transition to adulthood matters to Americans' health and well-being as well as to their social and economic resources both in the short run and over the life course (Hogan and Astone 1986; Settersten 2002; 2003). For most of the past 100 years, a successful transition to adulthood has been gauged by adherence to an orderly and age-graded progression between 18 and 28 years old from educational completion to physical and financial independence followed by marriage and children (Furstenberg, Rumbaut and Settersten 2005; Lovett 2007). The idealized end state was the "model" American family—an educated and employed husband with a supportive wife who raised their children born within that union, all of whom would be contributing and engaged members of society (Lovett 2007). By the 1950s, that model had become the predominant, customary, and "typical" family form. Cohabiting and single parent family arrangements were generally considered "atypical" because they were less common and also because they were less socially accepted (Hogan 1980).

Typical family formation in the mid-twentieth century, particularly the coupling of marriage and parenthood, has been giving way to multiple, less orderly patterns since about the 1970s (Cherlin 2005; MacMillan 2005). The change often has been attributed to the timely coincidence of affordable and accessible contraception and increased educational and occupational opportunities for females in a general climate of social change in the 1960s (Oppenheimer 1994; 1997). At the start of the 21st century marriage followed by children remains the most typical path from one's parents' home or single independent living into adult family life but about half of young adults live with a heterosexual partner before marrying (Cherlin 2005). And, in 2005, births to unmarried women accounted for almost .37 of all births (Child Trends Data Bank 2008).

As the number and proportion of people who enter adulthood via an atypical route has increased, social acceptability has grown, stigma and sanctioning have

lessened, and these alternatives have risen in status (Thornton and Young-DeMarco 2001). As a result, the structure or form of the American “family” has become somewhat deinstitutionalized—the legal and normative demands of marriage have for the most part remained intact but non-marital heterosexual partnerships have gained rapid social acceptance and legal recognition (Cherlin 2004; 2005; Thornton and Young-DeMarco 2001). Single parent “family” units consisting of a parent and child(ren) where a spouse never was present (even when a separate household has not been established) have become as legally and culturally legitimate as family units consisting of a divorced parent and child(ren) (Cherlin 2005). While there are other forms of adult living arrangements that strive for legal and cultural acceptance, such as homosexual partnerships, communal living, and friendship networks, only heterosexual cohabitation and non-union parenthood have gained legal and social recognition sufficient to promote them to “family” status.

There is evidence that atypical family formation has negative consequences for individuals and society (MacMillan 2005). Prolonged singlehood (delayed marriage) or teenage unions (precocious marriage or cohabitation), premarital parenthood, and premarital cohabitation have been related to subsequent poverty, educational failure, unstable labor force participation, criminality, depression, stress, partner violence, and poor physical health (Brown 2000; Crane 1991; DeKlyen et al. 2006; Frye et al. 2007; Hagestad 2007; Knight, Osborn and West 1977; Marini, Shin and Raymond 1989; Popenoe 2007). On a societal level, off-timing or disorder in the transition to adult family roles are linked to increases in and the reproduction of social inequalities (MacMillan 2005). How and when adult families are initially formed bears on future labor market structures, social mobility rates, and the age structure of the population (Hacker, 2003; Rindfuss, Morgan and Swicegood 1984; Schoen 2004). Thus, both individuals and society stand to gain from an enlightened explanation of the underlying reasons for atypical family formation choices.

Research has detected certain contexts and conditions in which atypical family formation is more likely to occur. Particular attention has been given to the influence of the local socioeconomic context and to the intergenerational

replication of family formation behavior. However, outside of fertility-related behavior, the relationships of pre-existing behaviors to the family formation choices that people make have been ignored. Since marital, cohabital, and parental roles are by definition distinct bundles of defining behaviors, it is reasonable that individuals with incompatible roles would make different family formation choices from those with congruency among their roles' demands. This study focuses on the effects of alcohol and illegal drug use behaviors that are incompatible with normatively defined spousal and parental roles and considers whether substance use is related to the first type of adult family that is formed.

Substance Use and Initial Family Formation

Immoderate alcohol and/or illegal drug use are behaviors often associated with a counter-cultural lifestyle and value system that is believed to be incongruent with normative family roles. As such, intransigent immoderate substance use may foster disordered timing and/or sequencing of marriage and parenthood and increase the likelihood of premarital cohabitation. Goode (1960) devised a "theory of role strain" to explain the choices people make when faced with incompatibility among their roles' obligations. Yamaguchi and Kandel (1985b) followed Goode and argued that illegal drug users anticipate role strain and choose to form their families in ways that reduce the anticipated incompatibility between illegal drug use behaviors and normatively prescribed spousal roles (that eschew illegal drug use). They argued that illegal drug use may be so embedded in an individual's life that giving up or radically decreasing her or his use is not an acceptable option. Users may resist surrendering their drug-supply contacts and friendships and they may oppose any adjustment to their "value hierarchy" to meet the requirements of the dominant culture for family formation (Goode 1960:490; see also Akers 1992). Yamaguchi and Kandel (1985b) proposed that steadfast illegal drug users choose to delay marriage, increasing the likelihoods of foregone marriage or atypical family formation.

Adolescent immoderate alcohol and illegal drug users may face a higher likelihood of atypical family formation than non-users because they are more sexually promiscuous and more likely to be sexually active before they are

psychologically ready (“precocious adulthood”) and thus more likely to experience teenage premarital pregnancy (Newcomb and Bentler 1985). Teenagers’ responses to premarital pregnancy may be marriage, cohabitation, non-union parenthood, termination of the pregnancy, or neglectful fetal/newborn death. A typical transition to family roles is affected whichever path is taken to resolve the situation. Moreover, the normative flexibility of the cohabiter versus spousal role may appeal to young and single alcohol and illegal drug users as a way to simultaneously maintain their substance use and enter adult family life.

Yamaguchi and Kandel (1985a; 1985b; 1987), Rosenbaum and Kandel (1990), and Mensch and Kandel (1992) addressed these issues in their research on a small regional sample of New York State adolescents and on some of the adolescent subjects of the NLSY79. The studies used event history techniques to assess the effects of marijuana and other illegal drug use on marital timing, the likelihood of cohabitation as the first union, age at first intercourse, the likelihood of premarital pregnancy, and the resolution of premarital pregnancy via elective abortion. Males and females in both samples who used marijuana and/or other illegal drugs were significantly more likely than non-users to marry after age 24, cohabit as a first union, first have sexual intercourse before age 16, experience premarital pregnancy, and to elect abortion to resolve that premarital pregnancy. The investigators repeatedly pointed to some basic limitations of the conclusions that could be drawn from the New York State research. Their regional samples lacked external reliability and enough cases to analyze population subgroup differences, the subjects in all the studies were young enough to still be forming their first families at the time of the follow-up interviews and, generally, there were inadequate data to control for other explanations of atypical family formation. Replication and extension were encouraged.

Little research has built on the seminal groundwork laid by Kandel and colleagues in 1985 and 1987 about the relationship of illegal drug use¹ to marital timing and cohabitation. The few studies that have investigated the relationship have barely added to what Kandel and colleagues already found about the

¹ A distinct literature has addressed questions about the association of alcohol use with marriage that has mostly focused on changes in alcohol use after marriage.

importance of such use to the choices people make. One reason for the lack of progress is that controlling for alternative hypotheses has been unusual. Also, few studies have analyzed cohabitation, marriage, and parenthood as an array of “first family” options from which people may choose and, instead, have focused on one outcome without accounting for the effects of the others (with the notable exception of Brien, Lillard and Waite (1999) who found that the timing of one state significantly depended on the timing of the others).

Moreover, the influence of adolescent substance use on teenage or non-union parenthood is not known although research has established a consistent association between substance use and a number of precursors to parenthood. But, teenage substance users and non-users do not seem to respond the same way to their premarital pregnancies, calling into question whether the likelihood of parenthood differs. There also is little information about how effects may differ across population subgroups although distinctive gender and racial/ethnic patterns of family formation and substance use in the United States are evident (Bramlett and Mosher 2002; Johnston et al. 2007). No known research has examined the association of adolescent alcohol use or illegal drug use with aspects of initial family formation in rural versus non-rural or metro versus non-metro locations.

Given the consistent findings (since the mid-1980s) of an increased likelihood of premarital pregnancy among young substance users, their proclivity toward cohabitation as a first union, and that both substance use and atypical family formation can extract a social and economic cost for individuals and families, the lack of research attention to the way that substance use relates to the timing and ordering of family formation is surprising.

Objectives

The main purpose of this study was to build on the research of Kandel and colleagues by asking similar research questions and addressing some of the limitations of their studies. The specific research questions addressed in this study were:

1. How does the use of alcohol, marijuana, or other illegal drugs alone or concurrently² (“polydrug use”) relate to the first type of family formed?
 - a. How do the effects of alcohol and illegal drug use on the first type of family formed differ by gender?
 - b. How do the effects of alcohol and illegal drug use on the first type of family formed differ by race/ethnicity?
 - c. How do the effects of alcohol and illegal drug use on the first type of family formed differ by rural/non-rural and South regional residence?
2. How do (a) the age at first monthly or more frequent alcohol use, (b) the frequency of alcohol use at 14 to 16 years old, (c) the occurrence of binge drinking, and (d) the type of problem drinker relative (if any) relate to the first type of family formed?
3. How do (a) the age at first marijuana use and (b) the frequency of marijuana use at 14 to 16 years old relate to the first type of family formed?
4. How does the age at first use of illegal drugs other than marijuana relate to the first type of family formed?

This study addresses four limitations of the prior work by Kandel and colleagues. Specifically, (1) the current study employed nationally representative data where the findings of three of their five studies could not be generalized to a population beyond New York State; (2) the current study responded to the fundamental research question (Research Question 1 above) separately for males and females, by race/ethnicity, and by rural and South regional residence where the previous research was unable to adequately examine population subgroup differences; (3) initial family formation in the current study was identified when the subjects were 39 to 41 years old and most of them had formed a first family while initial family formation was still in process for a large proportion of the samples in the previous studies, who were at most 24 or 30 years old at the time; and (4) where Kandel and colleagues generally lacked data on other possible explanatory factors for their outcomes, the current research included control variables in five

² This study follows current research and uses the term “concurrent use” interchangeably with the term “polydrug use,” both of which refer to the use of different illicit substances on separate occasions or in combination within a certain time frame such as the past 12 months (McCabe et al. 2006).

domains (physical characteristics, family background factors, socio-cultural indicators, attitudes, and behaviors) that prior research has found to be important to marital timing or the likelihoods of cohabitation or premarital pregnancy or childbearing. Moreover, this study addresses the research questions using multinomial logistic regression modeling in a competing risks approach to family formation behavior. Thus, this study potentially adds to our knowledge of the consequences of alcohol and illegal drug use for initial family formation behavior and contributes to the development of role theory as it relates to the transition into adult family roles.

The 1963 to 1965 Birth Cohort

The subjects of this analysis were drawn from the National Longitudinal Survey of Youth 1979, born between January 1, 1963 and December 31, 1965, and adolescents in 1979. The American family has undergone rapid social change since about 1970. The stigma and sanctions associated with atypical family formation that were experienced when Yamaguchi and Kandel's New York State sample was 24 years old in 1980 were undoubtedly weaker in 1988 when the NLSY79's 14 to 16 year olds were 23 to 25 years old. Gender roles also have grown more egalitarian over time (Thornton and Young-DeMarco 2001) and some estimates show a .72 increase in cohabitation rates between 1990 and 2000 (Kleder 2003). In 2008, domestic partnerships are fairly common, singles over age 65 are cohabiting more often than remarrying, and on May 15, 2008 the California Supreme Court overturned the ban on "gay" marriage (Dolan 2008). Moreover, illegal drug use has undergone dramatic changes in prevalence and the types of substances used by teenagers (Johnston et al. 2007). The legal consequences for illegal drug use have sharpened and there is less social tolerance of alcohol use by minors. Thus, to understand the results of this study it is important to place its subjects in their socio-historical context.

Born at the tail end of the Baby Boom (United States Census Bureau 2006), the subjects of this study were 14 to 16 years old in 1979 when the NLSY79 first was fielded. They were coming of age during a time of struggle and social ambivalence in the institution of the family. The proportions of high school seniors

expecting to first marry at ages older than 23 increased from .21 in 1977 to .25 in 1980 to .31 in 1986 (Thornton and Young-DeMarco 2001). The federal Comstock Act and several state laws outlawing the advertising, sale, and distribution of birth control devices or information were being eroded by popular opinion, demand for increased availability of the birth control pill, and legal challenges on both the state and federal levels. In 1972 and 1977, the Supreme Court of the United States struck down two state laws restricting the dissemination of birth control devices. The Court ruled in favor of women's reproductive freedom in *Roe v. Wade* in 1973, initiating the still-bitter battle of women's versus fetal rights (Encyclopedia of Everyday Law 2008). Women's college enrollment and labor force participation were noticeably increasing along with the age at first marriage, the rate of cohabitation, and age at first birth (Oppenheimer 1997; U.S. Census Bureau 2006). Childbearing outside of marriage was gaining acceptance and prevalence, at least among those under 25 (Cherlin 2005; Thornton and Young-DeMarco 2001). Paul Ehrlich's *The Population Bomb* (1968) spurred the already increasing likelihood of small family size in America and a growing concern about national and worldwide overpopulation (The Week 2005). The topic of Sexually Transmitted Diseases (STDs) was not yet a public conversation; homosexuality remained a taboo topic and an illegal activity in many states. There were 31 total known deaths in the United States in 1980 that were attributed to HIV-AIDS (Kingwood College Library 2006); the number of diagnosed cases jumped from zero in 1979 to 900 in 1982 (Ruel and Campbell 2006).

Many trends and attitudes of the 1960s hippie "flower power" generation were mainstreamed in the 1970s. Civic activism in civil rights, women's rights, free love, Gay rights, the Vietnam War, and growing fears and awareness of environmental encroachments (heightened by the 1978 evacuation of Love Canal, New York and the 1979 radioactive leak at Three Mile Island, Pennsylvania) framed the subjects' childhoods. As children they experienced the worst recession (in 1974) since the era of The Great Depression. Politically disillusioned by the resignations of Vice President Spiro Agnew and President Richard Nixon (in 1973 and 1974, respectively), people turned to literature and music that revolved around dark themes of alienation and moral decay, and that encouraged resistance

against social norms. Music, in particular, advocated psychic “enlightenment” and self-medication by using illegal drugs (Kingwood College Library 2006).

Illegal drug use in the 1960s was widely discussed but relatively uncommon (about .04 of the population on average used during the decade) and its effects were unclear. Proponents lobbied on behalf of the use of hallucinogens for their mind-expanding effects and detractors employed (unfounded) scare tactics to deter adolescents from using. During the 1970s illegal drugs, especially cocaine and marijuana, became glamorous but their effects were no better understood than before (Robison 2002). The general public thought that most illegal drug use was a transient, relatively harmless, and (certainly) not addictive, teenage and “beatnik/hippie” phenomenon less harmful than alcohol. According to a 1973 Gallup poll, about .12 of Americans admitted to having used marijuana; by 1977, the proportion had doubled (Kingwood College Library 2006). The Substance Abuse and Mental Health Services Administration 1979 survey results suggested that more than .15 of 12 to 17 year olds had used at least one illegal drug in the month before the survey (Substance Abuse and Mental Health Services Administration 2003).

Teenagers’ rebellion in the 1970s found expression in unrestrained sexual intercourse, rejection of all things conventional, and illegal drug use that many thought was relatively harmless, even sexy. A counter-cultural social movement that grew out of the hippie lifestyle shunned everything traditional and normative and embraced “sex, drugs, and rock ‘n roll.” Illegal drug use in the 1970s was not compatible with conventional behavior in any domain of American life. Illegal drug users rejected legal marriage and the nuclear family and aimed to reform conjugal (“Bob and Carol and Ted and Alice”) and parent-child (“permissive parenting”) relations. Unprotected sex with multiple partners or serial monogamy (“free love”), unwed parenthood (“love children”), and non-marital cohabitation and communal living all were associated with the perceived positive effects of mind-expanding illegal drugs on the sexual revolution (Kingwood College Library 2006).

Some non-users, some Christian religious dogma, and societal norms in some areas of the country embraced the typical family formation timing and order and resisted the liberal changes in attitudes toward gender roles in marriage, non-

marital childbearing, and cohabitation. While cultural conservatives agreed with advocates of the counter-culture that illegal drug use was incompatible with the traditional family, they argued that society's expectations of its men to be breadwinners, of its women to be child nurturers, and of both to fill their roles in the marketplace could not be fulfilled by illegal drug users. The argument centered on what should be compromised—family or drug use.

Outline

The thesis is organized into four additional chapters. Chapter Two, "Literature Review," discusses the nature of family formation in the United States and then provides the conceptual background by articulating how the theory of role strain as devised by Goode (1960) and articulated by Yamaguchi and Kandel (1985b) is applied to explain the effect of substance use on initial family formation. Yamaguchi and Kandel did not elaborate on the ways that role strain may differ by gender, race/ethnic, and residence; however, role strain may have significantly different effects for these groups in light of the distinctiveness of their family formation and substance use behaviors and cultural preferences and these ideas are discussed. A review of the previous relevant empirical research follows, beginning with an exhaustive synopsis of the research literatures on the relationships of alcohol and illegal drug use to marital timing, premarital parenthood, and premarital cohabitation. The relevant body of published research by Kandel and colleagues is discussed in depth.

Then, the current findings on the associations of control factors with marital timing, cohabitation, and premarital childbearing are briefly reviewed. In the area of "Physical Characteristics," teenagers' physical development has been linked to their fertility-related and union formation behavior and there is a small body of research examining height, weight, and age-related pubertal changes to family formation behavior that is reported. Current findings on the relationships of "Family Background Factors" in the area of parents' socioeconomic status and family structure to family formation then are reviewed. Reported next are the currently observed differences between males and females, among racial/ethnic groups, and by residential context in both family formation and substance use behaviors

("Socio-cultural Indicators"). Individual attitudes toward marriage and parenthood, expectations for the future, and attitudes towards one's self ("Attitudes") often have been associated with marital timing and fertility-related behavior and the findings of that literature are presented next. The fifth domain that was reviewed consists of findings regarding certain "Behaviors," both fertility-related and otherwise, that have been associated with atypical family formation.

Chapter 2 concludes with the specification of the hypotheses about the effects of alcohol and illegal drug use on initial family formation that are addressed in the analysis. These hypotheses were derived from a critical evaluation of role strain theory (Goode 1960) as employed by Yamaguchi and Kandel (1985b), by the findings of Kandel and colleagues (1985a; 1985b; 1987; 1990; 1992), and were informed by what scholars have reported in the relevant research literature from about 1985 to the present.

Chapter 3, "Methodology," first describes the source of the data being used to address the research questions. The National Longitudinal Survey of Youth 1979 (NLSY79) is a large probability sample that has followed the 1958 to 1965 American birth cohort since they were 14 to 21 years old in 1979 (N=12,686) to the present. The original study was a compilation of three samples that included an oversampling of the non-Hispanic poor white population and members of the military along with a general population sample. The main purpose of the NLSY79 was to obtain panel data on the labor and educational behavior and outcomes of a diverse sample over the life course. Along with labor-related data, extensive family formation data in the form of yearly or biennially updated marital, cohabitation, fertility, and parenthood histories were obtained. Detailed information about alcohol use, marijuana use, and the use of other illegal drugs obtained in 1979 was supplemented in numerous subsequent waves until 1998. Moreover, a wealth of information on health, family background, attitudes, and behaviors was collected in the first wave and periodically thereafter. The NLSY79 was an excellent source of data for this study because it provided the sample (and subsample) size, external reliability, and variables that allowed for replication and extension of Kandel and colleagues foundational work and also would address some of the limitations of their research.

The portion of the sample that was analyzed in this study consists of the respondents who were 14 to 16 years old in 1979 who had never married, cohabited, or parented (N=4,011). The study sample was restricted to the cases in this age range because (1) data on alcohol use in 1979 were not collected on respondents over age 16 and (2) the full sample's age range was too developmentally and socially heterogeneous for the respondents to be meaningfully evaluated as a whole and preliminary analysis found significant age effects between the younger and older sample members with respect to many of the variables. This reduced sample of 4,011 cases was of adequate size for the analysis. Sampling weights provided by the NLSY79 were used to account for the probability of selection into the original sample and sample attrition.

The next portion of this chapter describes the methods that were used to construct the four-category nominal dependent variable ("first family type"), the key independent alcohol and illegal drug use variables, and the control variables in the five domains. The marital, cohabital, fertility, and parental histories between 1979 and 2004 were used to identify the first family type of each of the 4,011 subjects, all of whom initiated their first families in 1979 (N=38) or later. In 2004, at ages 39 to 41, about .10 of the sample had yet to marry, cohabit, or parent a child. Whether alcohol, marijuana, and/or other illegal drugs were used at ages 14 to 16 (in 1979), the age at first use of the three types of substances, and the frequency of alcohol and marijuana use when the subjects were 14 to 16 years old (in 1979) was identified with self-reported alcohol and drug use information provided in 1980, 1981, 1983, 1984, 1988, 1989, 1992, 1994, and 1998. Information on binge drinking was measured using data collected in 1982, 1983, and 1984 and information on family-level alcoholism was measured with data collected in 1988. The measures of the control variables all were derived from data gathered in 1979 or 1980.

An explanation of the multinomial logistic regression statistical and modeling approach that was used to address each of the research questions and test the hypotheses closes the chapter. The full sample was analyzed first. That analysis was followed with analyses of males and females, racial/ethnic groups, and residential groups. The full sample and subsample analyses addressed the

first research question regarding the effects of the type of substance used on initial family formation. Then, those who used only alcohol at ages 14 to 16 (in 1979) and non-users of any substance (in 1979) were analyzed to assess the effects of four characteristics of alcohol use on initial family formation. Those who used only marijuana at 14 to 16 years old and non-users of any substance (in 1979) were analyzed next to ascertain the effects of two characteristics of marijuana use on initial family formation. The last model employed the users of all three types of substances at ages 14 to 16 (in 1979) and non-users (in 1979) to examine the effects of the age at first use of illegal drugs other than marijuana, the characteristics of alcohol use, and the characteristics of marijuana use on initial family formation.

In Chapter 4, "Analysis," the results of the analyses are presented. Each research question and its associated hypotheses are addressed in turn. The effects of alcohol and illegal drug use on the likelihood that a subject was a member of each of the four first family types are described and evaluated using summary statistics, odds ratios, and statistical significance.

The results and their implications are discussed in Chapter 5, entitled "Summary and Discussion." Particular attention is paid to differences between users and non-users in initial family formation in the full sample and in the population subgroups. Similarities and differences in the effects of different types of substance use and polydrug use on first family type are discussed. The ways that the current study builds on the existing findings and its success as an extension of Kandel and colleagues' foundational research are considered as well as the extent to which it supported Goode's theory of role strain. Its contributions to the current body of knowledge on the consequences of substance use to family formation are discussed. The study's applicability to public policy programs and its limitations are identified. Directions for future research are suggested.

CHAPTER TWO

LITERATURE REVIEW

In this chapter, the theory and empirical findings that guided the research questions and related hypotheses are explained. The chapter begins with a general description of the nature of family formation in the United States. This provides the social context for the explanation of role strain theory that follows. Then, Yamaguchi and Kandel's (1985b) application of role strain theory to the relationship of substance use and family formation of young adults in the 1980s is elaborated. Role strain may distinctively influence the family formation behavior of males and females, of different racial/ethnic groups, and of people living in different residential contexts. Those different expectations are discussed. The chapter then reviews the empirical findings on the associations of alcohol, marijuana, and/or other illegal drug use with marital timing, premarital parenthood, and cohabitation. Particular attention is given to the contributions of Yamaguchi and Kandel (1985a; 1985b; 1987), Rosenbaum and Kandel (1990) and Mensch and Kandel (1992) to our understanding of these relationships. Following that is a brief summary of the research on the associations of other factors that are important to family formation in the domains of physical characteristics, family socioeconomic status and family structure, individual attitudes, and behaviors. The chapter closes with the explicit hypotheses that are tested in the analysis.

Conceptual Background

The conceptual background is organized into four sections. These sections structure the presentation of the theory and empirical literature and form the basis for the organization of the description of the measures and methods.

The transition to family roles

Public consensus about the preferred ideal timing and ordering of family formation is decreasing (Arnett 2000). The proportions of Americans with egalitarian gender role attitudes are increasing (Thornton and Young-DeMarco

2001). But there is evidence that Hogan and Astone's (1986) age-graded pattern remains the most common path taken into family life (Cherlin 2005; Jackson and Berkowitz 2005; Mouw 2005)—most Americans marry in their twenties and then have children. Moreover, the typical path still may be the “ideal” way to form a family. A majority of young people do not want to be teenage parents or raise their children outside of a formal marriage (Thornton and Young-DeMarco 2001).

And while cohabitation has been a common first union type for twenty or more years, marriage occupies a privileged status and growing prestige. There is a sense of seriousness and importance and high regard placed on marriage that is not enjoyed by cohabitation (Cherlin 2004; 2005; Smock 2004). Thornton and Young-Demarco (2001) concluded from their study of trends in attitudes toward marriage over the past 30 years that marriage not only is “centrally significant and meaningful to the vast majority of Americans but may have become more valued, desired, and expected in recent decades” (p. 1030).

Thus, marriage seems to be most Americans' personal first choice for family formation. Why, then, do people delay marriage or choose an atypical alternative? Some scholars suggest that increased limitations in men's labor market options and a broader range of career opportunities for women have made it more difficult to conform to the social scripts of family formation (McLanahan 2004). Cherlin (2005) argues that people want to be “ready” for the responsibilities and privileges of the commitment they make when they marry and it simply takes longer to get there now than it did twenty or thirty years ago. If these factors lead to a delay in marital formation, social forces outside of individuals' control may have some influence on the likelihoods of cohabitation or parenthood as the first family type (Macmillan 2005; McLanahan 2004).

Anticipatory role strain

Being “ready” for the responsibilities and privileges of marriage requires clarity about the attitudes and behaviors demanded by the spousal role so that one can know how to prepare. Such clarity is provided by the idealized, common, and valued social norms about what is expected of married people—the directives about what husbands and wives *should* think and do (Marini, 1984; Merton 1957b). The

social norms about entry into family life mostly concern the timing (or “readiness”) and ordering of marriage and parenthood. The norms about spousal behaviors focus on the ability and willingness to behave as a husband or wife are expected to behave. In a broad sense, husbands traditionally are expected to be able and willing providers; wives to be able and willing supporters. Many American still hold to these expectations even as attitudes about the role of provider and sharing of household and child responsibilities have changed as women’s contributions as providers have increased (Thornton and Young-DeMarco 2001).

The anticipatory period between the promise to marry and the marriage is an opportunity for self-evaluation of readiness, ability, and willingness to comply with the expectations of the roles about to be entered (Smock 2000; Thornton and Nardi 1975). But, when people are anticipating marriage, they tend to negotiate with its normative role demands. Mostly using social norms to guide them, people imagine and fantasize their futures as husband or wife and how well they will fit into the spousal role based on what they believe the role *should* involve rather than what it actually entails (Thornton and Nardi 1975:875). Negotiation usually involves some modification of the anticipated role demands as well as willingness to change some individual behaviors (Biddle 1986).

Role conflict arises during the anticipatory period when it is imagined and anticipated that the central expectations of simultaneously-held roles will be incompatible. Anticipatory role conflict is closely linked to anticipatory role strain—the anticipation that one’s ability or willingness to adequately perform the demands of the conflicting roles will be strained (Biddle 1986; Gross, McEachern and Mason 1966; Merton 1957b). Goode’s (1960) view was that when anticipated role strain is perceived people have (and generally take) the unique opportunity to preclude the problem. By imagining the potential strain, an individual may pre-emptively resolve anticipated role conflicts: “first, by selecting a set of roles which are singly less onerous, as mutually supportive as he can manage, and minimally conflicting; and, second by obtaining as gratifying or value-productive a bargain as he can. . .” (Goode 1960:490). Thus, to ease anticipated role strain among present and future roles, Goode (1960) suggested that individuals may be expected to seek harmony

among roles by choosing those that minimally conflict, maximally adapt, and offer the greatest benefits.

Anticipatory role strain and the relationship of substance use to family formation

Yamaguchi and Kandel (1985b) agreed with Goode (1960). They reasoned that the illegal, counter-cultural, risk-taking lifestyle and drug use of illegal drug users is incompatible with the normative expectations of spousal or parental behavior. Illegal drug users most likely would anticipate the incompatibility and role strain and move to alleviate it. But the extent of the role incompatibility is so high, they argued, that negotiation and modification of the demands of the incompatible roles would be absurd. For modification to alleviate role strain, it would need to be extensive. The behavioral boundaries of one or more of the roles would be distorted to the point where preservation of one or more of the roles would be impossible. So negotiation and modification likely would be rejected as a solution. Simply walking away from one or the other role also seemed unlikely. It is more reasonable that people would resist letting a desired prospective spouse or child go and illegal drug users additionally would be unable or unwilling to relinquish or drastically reduce their illegal drug use or lifestyle.

Goode's (1960) ideal solution to such an impasse is to wisely choose those roles that minimally conflict, maximally adapt, and that provide the greatest gratification. Thus, Yamaguchi and Kandel (1985b) suggested that illegal drug users alleviate anticipated role strain by avoiding marriage. When the illegal drug user anticipating role strain wants both a family and illegal drugs, an option exists other than remaining single, one that has become an increasingly popular alternative to marriage—cohabitation. Nock (2000:247) pointed out the fundamental benefits of cohabitation versus marriage when he wrote:

One thing that cohabitation offers is freedom from the rules of marriage because there are no widely accepted and approved assumptions and ideals. Unmarried partners have tremendous freedom to decide how they will arrange their legal and other arrangements. In . . . small and large ways, cohabiting couples and

their associates must *create* a relationship. . . . The institution of marriage is a template. This is what cohabiting couples lack. They are exempt from the vast range of marriage norms (and laws in many cases).

Yamaguchi and Kandel (1985b) thus expected that marijuana and other illegal drug users would be significantly more likely to cohabit than marry as a first union and that they would be significantly more likely than non-users to choose cohabitation over marriage as a first union. Moreover, they expected pregnant substance users would be more likely than pregnant non-users to cohabit or reject the parent role or terminate the pregnancy than marry before the birth. In this way, illegal drug users can alleviate anticipated role strain by choosing a path into family life where the roles are the most harmonious, there is the least burden of behavior modification, and illegal drug use and its lifestyle may be maintained.

Population subgroup differences

The alleviation of anticipated role strain between substance use and spousal roles by avoiding marriage or parenthood may be less likely for females, Hispanics, and rural residents. Because female substance users are more likely to be physically and financially responsible for children and less likely to have the means to fulfill that responsibility than males, they may value marriage more highly and be more likely than their male counterparts to modify their substance use rather than avoid marriage. In light of the theory and research on Hispanics' persistent culturally-based high valuation of marriage, their likelihood to marry prior to childbirth and to form their initial adult families at relatively young ages (Oropesa and Landale 2004), Hispanics also may be more likely to relinquish their substance use than to avoid marriage. Albrecht and Albrecht (2004) and Snyder (2006) pointed out that family formation behavior and cultural preferences for marriage have been more prevalent in rural than non-rural areas. Pressure to comply with cultural prescriptions for traditional family formation may be stronger there than in non-rural areas and rural residents may be more likely to yield their alcohol and illegal drug use to the normative expectations of typical marital and

parental role behavior. This may be particularly true in the rural South where political and religious conservatism are strong influences on family behaviors.

Blacks and American Indians form their families in distinct socio-cultural contexts that blend aspects of the dominant ideology with their own unique traditional norms. The substance use of both groups is more serious and less modifiable than in other racial/ethnic groups. Prevalence of the use of many illegal substances is lower among black than other youth, but the blacks who use substances are more likely to use the more addictive types of drugs, to use them with less moderation, and to experience related problems (Johnston et al. 2007). The prevalence of substance use among American Indians is significantly higher than among other racial/ethnic groups. Both on and off reservations, the majority of American Indians are substance users and those users tend to use alcohol, illegal drugs, and other intoxicating substances to the point of incapacitation (Beauvais 1992a; Johnston et al. 2007; Plunkett and Mitchell 2000). It is reasonable that modification of substance use to resolve anticipated role strain among blacks and American Indians would be less likely to occur than in the other groups. Moreover, neither blacks nor American Indians have a strong tradition of compliance with or cultural attachment to the conventional non-Hispanic white pattern of family formation. Anticipated role strain between substance use and spousal roles among blacks and American Indians would likely be resolved by delaying marriage and an increased likelihood of cohabitation as a first union. Pregnant substance users also would be expected to avoid marriage, and black pregnant substance users would be expected to avoid elective abortion, increasing the odds of non-union parenthood.

Empirical Findings on Alcohol Use and Initial Family Formation

Alcohol use and marital timing

Delaying marriage may be a strategy used by alcohol users to avoid anticipated role strain associated with social pressure to decrease their alcohol use. Findings from longitudinal research such as Duncan, Wilkerson, and England's (2006) or Miller-Tutzauer, Leonard, and Windle's (1991) studies of the NLSY79 or Bachman, et al.'s 1997 and 2002 research on the Monitoring the

Future Study have suggested that people adjust their alcohol consumption downward in anticipation of marriage. However, many people may be unwilling or unable to change the extent of their alcohol consumption and/or its accompanying lifestyle. Adult alcoholics or those seeking treatment for alcohol dependence, high frequency users, and binge drinkers are significantly more likely than those who use with less frequency or intensity to have delayed first marriage (to be never married significantly beyond the modal age at first marriage) than to be currently married (Substance Abuse and Mental Health Services Administration 2007). These differences may be less evident over short periods or among younger subjects--Chilcoat and Breslau (1996) found no significant difference in marital timing between those with and without alcohol disorders in a 3.5 year follow-up study of young adults. Thus, while decisions about alcohol consumption may be made in anticipation of marriage, alcohol users also may make decisions to delay or forego marriage.

Selection may play a significant part in later marriage among immoderate alcohol users (those who use at the highest frequencies or who regularly binge drink), although whether it is the alcohol users or their prospective partners who are doing the selecting has not been investigated. Both females and males who linked negative consequences (such as injury) to their age 21 alcohol use were less likely to have ever married by age 24 than their counterparts who reported no negative consequences (Horwitz and White 1991). Power, Rodgers and Hope (1999) found that marriage had not occurred by age 33 among the people with the most alcohol consumption during the week before the age 23 interview, suggesting that the most immoderate drinkers were less likely than the other drinkers and the non-drinkers to marry. Fu and Goldman (1996) examined the marital timing of the non-Hispanic, non-black subjects in the NLSY79. Controlling for other substance use, they found that the males and females who drank the most frequently or were binge drinkers were significantly older than the less frequent or non-drinkers when they formed their first marriages.

At some point a delayed marriage is a foregone marriage. Both Fu and Goldman (1996) and Power, Rodgers and Hope (1999) found that the most frequent drinkers in their samples had never married by the end of their study

periods. Marriage appeared to be foregone. But neither study followed the subjects beyond age 33, leaving open the question of whether very frequent alcohol use is associated with a delay in marriage or whether those users tend to never marry at all. In the United States in 1990 (the year that Fu and Goldman's study concluded), about 22 percent of 30 to 34 year old males and females had never married. That proportion was up from 13 percent in 1980 and, in 2006, 29 percent of 30 to 34 year olds had never married (United States Census Bureau 2008; United States Department of Commerce 1993). Thus, first marriage in the mid-thirties among some alcohol users may be nothing more than on the cutting edge of normative timing. An exhaustive search of the literature revealed that no other similar study had followed their subjects beyond age 30. Thus, the question of foregone marriage among alcohol users has yet to be investigated.

Immoderate alcohol use also has been associated with teenage (early) marriage. Early marriage may be likely when monthly or more frequent drinking begins in pre-adolescence. These early-drinking youth start using alcohol as young as age nine, tend to be involved with other delinquent behaviors and risky sexual behavior, and are more likely to be fulltime workers (Stueve and O'Donnell 2005). An early study simply compared the living arrangements of young adults (mean age 21.75) who had reported on their alcohol use four years earlier and found that those who were married³ by age 21 had reported the highest frequencies of alcohol use at ages 15 or 16 (Newcomb and Bentler 1985). Newcomb and Bentler (1985) also found the most frequent users also were fulltime or part-time employees rather than in school at about age 21. Although this may be normative for some segments of the population, the investigators suggested that very frequent alcohol consumption at a younger than average age fostered "pseudomaturity"—adult behaviors without the developmental readiness for adult responsibilities—that pushed them into adult family roles before they were prepared for them.

More recently, Power and Estaugh (1990) and Forthofer, et al. (1996) found that those who were dependent on alcohol or who immoderately used it before or

³ The possible living arrangements were: alone, in a dormitory, with a roommate, with parents, cohabiting, married, or other.

in early adolescence were more likely than same age infrequent users to have married as teenagers. Missing from these and from Newcomb and Bentler's (1985) studies were measures of other factors that might both explain early marriage (such as racial/ethnic subgroup differences, family poverty, pregnancy, low educational achievement/aspirations, or rural residence) and be associated with pre-teen ages at first alcohol use, binge drinking, and highly frequent use. Moreover, in light of the association between young ages at first alcohol use and risky sexual behaviors (discussed below), young age at first marriage may be in response to a pregnancy. For instance, when Martino, Collins and Ellickson (2004) introduced socioeconomic status, gender, and race/ethnicity into their analysis, they found that alcohol use had no significant direct effect on early marriage but their mediational models led them to suspect that alcohol use influenced early marriage through its effect on pregnancy and low educational attainment.

Alcohol use and premarital parenthood

Much research about the association of alcohol use with fertility fundamentally pertains to young female users' and non-users' likelihoods of pre-union motherhood—comparatively young, unattached females bearing and raising children. However, most of this research has investigated the influence of alcohol use on preliminary conditions that lead to a pregnancy outcome but may or may not lead to a parenthood outcome (see Abrahamse, Morrison and Waite's (1988) discussion of the pathway to premarital parenthood). While pregnancy is a necessary condition of biological parenthood, it is not a sufficient indicator since alternative ways to resolve pregnancy have been increasingly available across time. Thus, the conclusions about premarital parenthood drawn by the studies on the association of alcohol use with behaviors or conditions antecedent to premarital parenthood should be considered with caution.

To date, studies have emphasized the association of alcohol use with the likelihood of what is termed "risky sex" which is, for heterosexuals, the likelihood of pregnancy and/or sexually-transmitted diseases such as HIV/AIDS (Donovan and McEwan 1995). Early teen initiation of sexual intercourse, multiple sex partners, casual sex, and unprotected sex—factors that increase the likelihood of premarital

pregnancy and parenthood (Leigh and Stall 1993; Miller and Heaton 1991; Rosenbaum and Kandel 1990; Woodward, Fergusson and Horwood 2001)—are more often found among adolescent girls and boys who use alcohol than among their counterparts who abstain (Cooper 2002; Deardorff, et al. 2005; Guo, et al. 2002; Mott and Haurin 1988; Shrier, et al. 1996; The National Center of Addiction and Substance Abuse at Columbia University 2002). Disinhibition and impaired judgment under the influence of alcohol are the most common explanations put forth to make sense of a disregard for contraceptive protection among alcohol users (Steele and Josephs 1990). Shrier, et al. (1996) and others have argued on behalf of a “risk behavior syndrome” that places the underlying cause of both risky sexual behavior and immoderate alcohol use temporally before both behaviors in an individual’s dispositional proneness to risky activities.

While alcohol-using adolescent males and females may be more likely than their non-using counterparts to bring about a pregnancy or to become pregnant⁴, they are not necessarily more likely to become parents. There are five possible pregnancy outcomes: (1) spontaneous abortion, (2) clinical abortion, (3) infant death, (4) relinquishment of parental rights, or (5) parenthood. Only a few studies have examined the outcomes of the premarital pregnancies of alcohol users and non-users, but there may be significant differences. Studies in the United States and Europe have found a significantly higher incidence of spontaneous abortion before the end of the second trimester among alcohol-using than non-using females, even when alcohol was moderately used (Abel 1997; Harlap and Shiono 1980; Henriksen, et al. 2004; Kesmodel, et al. 2002; Kline, et al. 1980). Alcohol users also may be more likely than non-users to experience elective (clinical) abortion and repeat abortions (Coleman, et al. 2002; Prager, et al. 2007). Babies born to mothers who used alcohol during the pregnancy (even in moderation) face a higher risk of infant mortality because they are more likely to be low birth weight, have Fetal Alcohol Syndrome, and to die of Sudden Infant Death Syndrome (Friend, Goodwin and Lipsitt 2004). Finally, infants and babies may be

⁴ It is important to note that, while alcohol users may be prone to becoming pregnant, moderate alcohol use has been related to an increased risk of specific types of behavior-related infertility in adult females seeking to conceive. Its effects on adolescent females’ ability to conceive are not known (Grodstein, Goldman and Cramer 1994).

relinquished by or removed from the care of their mothers and fathers at the time of delivery because of alcohol misuse and many of these infants are adopted into other families (Dorris 1989; Vanderploeg, et al. 2007). Thus, while young, single female and male alcohol users (especially younger adolescents) apparently have greater odds of experiencing pregnancy than their non-using counterparts, their alcohol-related behaviors may complicate their pregnancies and the lives of their newborns, decreasing the odds of premarital parenthood.

Alcohol use and premarital cohabitation

Cohabiting people report lower physical and mental health, happiness, and relationship quality than married people (Brown 2000; Marcussen 2005; Waite 2000) and are more likely than married people to immoderately drink (Marcussen 2005; Power, Rodgers and Hope 1999). Yet, there is little research on the association of alcohol use with the likelihood of cohabitation as a first union.

At least one implication is emerging from the small body of studies that has compared the drinking behavior of married, single, and cohabiting people: The relationship of alcohol use to cohabitation is different from its relationship to marriage. While immoderate alcohol use appears to be incompatible with marriage, highly frequent and/or binge drinking may be congruent with cohabitation. The greater flexibility in the behavioral “rules” of cohabitation may tolerate both immoderate alcohol use and some of its negative consequences (Horwitz and White 1998). Using 21 years of longitudinal data from the NLSY79, Duncan, Wilkerson and England (2006) examined changes in binge drinking (controlling for other substance use) in the 10 years either side of union formation; when the union was a marriage, significant declines in binge drinking were found but, when the union was cohabitation, men’s binge drinking (which was significantly more frequent than among the men who married) was unchanged. These findings imply that alcohol users who will not or cannot modify the extent of their pre-union use may be entering cohabitation instead of marriage as a way to form a union and continue their alcohol use behavior unabated.

To summarize, immoderate alcohol use, usually conceptualized as and measured by (1) high frequency of use, (2) binge drinking, and (3) young age at

first use, has been associated with atypical initial family formation. Teenagers and young adults who most frequently use alcohol or are binge drinkers have a tendency to marry “off-time”—either significantly delayed or early when compared to the less frequent or non-binge users. Delayed marriage, in turn, increases the odds of cohabitation or parenthood as the first family type. Premarital pregnancy may be particularly likely among immoderate male and female alcohol users because they disproportionately engage in risky sexual behaviors. However, these alcohol users may be neither more nor less likely than non-users to become parents before union formation because of the greater risk they face that the pregnancy will end with fetal or infant death. While there is no direct evidence that alcohol use is associated with cohabitation as the first type of adult family, descriptive research suggests that alcohol use is more compatible with cohabitation than marriage which may encourage cohabitation among immoderate alcohol users.

Empirical Findings on Illegal Drug Use and Initial Family Formation

We know less about the association of illegal drug than alcohol use with initial family formation. For one thing, the reported prevalence of all types of illegal drug use in the population is significantly lower than alcohol use, yielding sample sizes that often are not large enough for meaningful analysis. Sample size aside, there are fewer available data sets that include reliable information on illegal drug use and data on the other factors that are vital to addressing important differences in family formation. Kaestner (1997) noted that only Yamaguchi and Kandel’s (1985b) study preceded his investigation of the association of illegal drug use with marital timing (p. 146). Even so, the picture that has emerged suggests an association between illegal drug use and initial family formation that is similar to what we have found with respect to alcohol use.

Illegal drug use and marital timing

Kandel and colleagues interviewed a sample of 10th graders in New York State public schools in 1971. Their initial goal was to ascertain the contexts and conditions in which marijuana and other illegal drug use would be likely to occur

among adolescents. Nine years later, they followed up on about 1,300 of those subjects and re-interviewed them, again focusing on their marijuana and other illegal drug use. During the 1980 interviews, they collected detailed retrospective data on the subjects' drug use during the intervening years in the form of monthly history calendars. They also collected historical information on the timing of the subjects' marital, cohabital, pregnancy, and abortion statuses. The main goal of the follow-up interview was to obtain enough data to assess the consequences of marijuana and other illegal drug use to the family formation behavior of the sample.

Yamaguchi and Kandel (1985b) applied an event history analysis to the adolescent and young adult drug use and marital histories of the 706 females and 619 males in the New York State sample who were 14 to 16 years old in 1971 and 23 to 26 years old in 1980. The investigators followed Goode (1960) and argued that: (1) "role incompatibility" between the marital role and the illegal drug user role (2) results in "role strain" that (3) compels an individual to compromise either marital formation or drug use to resolve the strain. This reasoning led to their first hypothesis: "Current marijuana use postpones the timing of marriage and/or reduces the rate of getting married" (p. 1287). In their sample, 369 females and 250 males married between the first and the follow-up interviews. The net effects of marijuana and/or other illegal drug use (psychedelics, cocaine, heroin, stimulants, sedatives, tranquilizers, antidepressants, and methadone) on the likelihood of first marriage were assessed controlling for the effects of age, race, father's educational attainment, high school or college enrollment status, employment status, and the amount of time spent with friends in high school.

Yamaguchi and Kandel (1985b) found that marijuana and other illegal drug use significantly decreased the odds that a subject was married⁵. The females in the sample who currently used marijuana were about two-thirds as likely as the females who had never used any illegal drugs to be married at each time t (each month). The concurrent use of other illegal drugs further decreased the odds that a subject was married by .40 at each time t compared to females who had never

⁵ The follow-up sample was weighted for analysis to provide estimates of the characteristics of the population of former New York State 10th and 11th graders in fall 1971 (Yamaguchi and Kandel 1985a).

used illegal drugs up to that point. The males who currently used marijuana also were about two-thirds as likely as the males who had not used illegal drugs to be married in any given month although concurrent use of illegal drugs other than marijuana did not have a significant effect on males' odds of being married. They found that age and current school enrollment had the strongest overall effect for the females and males in their sample, but current marijuana use had a substantive and significant effect on the marital timing of the males and females and the current use of other illegal drugs was important to the marital timing of the females.

Kaestner (1997) extended Yamaguchi and Kandel's (1985b) work by examining the effects of marijuana or cocaine use on marital status and the timing of first marriage in the NLSY79. Kaestner (1997) used a more extensive set of control variables than Yamaguchi and Kandel (1985b)⁶ and a logistic regression analysis. He found that (with the exception of black males) those who had used the most marijuana or cocaine up to the date of the 1991 interview (marijuana use=100 or more times; cocaine use=40 or more times) were significantly less likely than their respective non-users to have ever married by ages 23 to 30. The effect of marijuana use was not statistically significant and the effect of cocaine use was smaller four years later when the subjects were 27 to 34 years old. In both sets of estimates, the effects were larger for the females than the males and for the non-blacks than the blacks. Delayed marriage among marijuana or other illegal drug users also was found by Fu and Goldman (1996) in their study of marriage rates in the NLSY79. Bivariate and multivariate analyses (that controlled for the effects of alcohol and cigarette use) found that both the high frequency current users and the people with past use were significantly more likely than non-users to have never married by ages 26 to 33.

The research literature also suggests that marijuana and other illegal drug use is associated with early or teenage marriage. Statistically significant bivariate

⁶ Kaestner (1997) controlled for the same factors as Yamaguchi and Kandel (1985b) except for employment status and time spent with friends and also included health status, IQ, locus of control, self-esteem, frequency of church attendance, family structure, regional residence, and county level measures of population density, marriage and divorce rates, percent female, and percent of all births born to females under age 20.

associations have been found between high frequency marijuana or other illegal drug use or young age at first use (versus non-use) with relatively early exit from the parents' home (Krohn, Lizotte and Perez 1997), first marriage before age 20 (Martino, Collins and Ellickson 2004), and the likelihood that marriage was the first type of independent living arrangement (Newcomb and Bentler 1985). Martino, Collins and Ellickson (2004) also found that while 7th grade marijuana use predicted early first marriage, 10th grade use in the absence of 7th grade use did not, suggesting that it was the younger age at first marijuana use as opposed to use, *per se*, that was the characteristic of marijuana use important to predicting an early age at first marriage in the sample.

Illegal drug use and premarital parenthood

Youth who begin using illegal drugs at comparatively young ages may be the most likely of all adolescents to engage in sexual intercourse—risky or otherwise (Lowry, et al. 1994; Mott and Haurin 1988). They also may be taking more pregnancy-related risks than their non-using counterparts: In the 1990 Youth Risk Behavior Surveillance System, about .30 of the high school students who had ever used marijuana (but not other illegal drugs) and about .46 of those who had ever used other illegal drugs reported sexual intercourse with four or more partners. In contrast, only .04 of those who reported no substance use had sexual intercourse with four or more partners in that year. And about half of the marijuana users and two-thirds of the illegal drug users compared to .44 of the non-users reported that they had not used a condom at last sexual intercourse (Lowry et al. 1994). There also is evidence that as the number of types of drugs used in a certain period (polydrug use) by males and females increases, the likelihood of condom use decreases and the number of partners increases (Santelli, et al. 2001). Santelli, et al. (2001) also found that condom use was less likely and multiple partners were more likely the younger the age at illegal drug use initiation. However, in a recent examination of the effects of age trajectories of use in high school on the odds of risky sexual behavior in young adulthood, Guo, et al. (2002) found little difference in the numbers of sex partners of the early and late “onsetters” of marijuana or other illegal drug use and, moreover, inconsistent

condom use was more likely among those who first used at older than younger ages. These findings suggest that illegal drug use is more strongly associated with risky sexual behaviors when the illegal drug use and the risky sexual behaviors are concurrent but that teenage illegal drug use may have less influence on risky sexual behaviors that occur later.

Multivariate event history analyses were employed to investigate the relationship of illegal drug use to another precursor to pregnancy, early age at first sexual intercourse (Rosenbaum and Kandel 1990). The researchers employed the 14 to 15 year old respondents to the 1979 wave of the NLSY79 (N=2,711) and followed them from 1979 to 1984 (when they were 19 to 20 years old). Rosenbaum and Kandel (1990) examined the effects of concurrent polydrug use and escalated illegal drug use⁷ with a four-category “Guttman-like classification of use” indicator (p. 788) of the highest class of drugs the subject had used: (1) non-use, (2) alcohol and/or cigarette use, (3) marijuana use, and (4) use of illegal drugs other than marijuana. They also examined the effects of the subjects’ age at first use of the highest class of drugs they had used. Controlling for the effects of other substance use and 15 control variables in four domains, marijuana and/or other illegal drug use strongly predicted initiation of sexual intercourse by age 16 and, moreover, the younger the age at first use, the more likely that intercourse had been initiated by age 16.

Unique to this study was its separate modeling by gender and race/ethnicity. Females who previously had used marijuana were more than three times as likely and males who previously had used marijuana were about two and three-quarters times as likely as their non-using counterparts to have initiated intercourse by age 16. The effects of prior illegal drug use were even larger—females with prior use were almost five times as likely and males with prior use were about three and one-third times as likely as their non-using counterparts to have initiated sexual intercourse by age 16. Substance use exerted the greatest

⁷ Escalated illegal drug use refers to the patterned tendency of some adolescents to start their substance use by using illicit drugs (cigarettes or alcohol); after a period, adding common illegal drugs to their use of illicit drugs (marijuana and/or inhalants); and after a second period, adding less common and more dangerous drugs to their use of illicit and common illegal drugs (cocaine, heroin, etc.).

influence on the age of sexual initiation of Hispanics (especially the females), followed by non-Hispanic non-blacks (especially females), and blacks' age at first intercourse (especially the females) was the least influenced by their substance use⁸.

From the associations of illegal drug use with risky sexual behaviors and early age at first intercourse it follows that illegal drug use and premarital pregnancy would be significantly related. Yamaguchi and Kandel (1987) used the 683 females in Yamaguchi and Kandel's (1985a; 1985b) New York State sample to examine the relationship of illegal drug use to premarital pregnancy. Controlling for current cohabitation, age, and educational status, they found (in an event history analysis) that the females who reported both current and former illegal drug use (other than marijuana use) were twice as likely at each time t (each month) as the females with no drug use to experience a premarital pregnancy. Neither current nor former marijuana use increased the likelihood of premarital pregnancy.

In 1992, Mensch and Kandel extended the Yamaguchi and Kandel (1987) study of the effects of illegal drug use on premarital pregnancy in what they believed was the first study to address the question on a national level. They particularly wanted to include a measure of contraceptive use and some other presumed risk factors of premarital pregnancy with the measures of illegal drug use. They employed the NLSY79 white females who were 14 to 16 years old in 1979 who had engaged in sexual intercourse before age 19. Drug use was measured with the Guttman-like classification variable and the age at first use measure that were introduced by Rosenbaum and Kandel in 1990 (described above) and they also included the 15 control variables that were used in the Rosenbaum and Kandel (1990) study. By age 19, about one-third of the sample had experienced a premarital pregnancy. The most important net predictor in the models was contraceptive use and the effect of illegal drug use (other than marijuana) was next in importance—increasing the likelihood of premarital pregnancy by age 19 by a factor of about 4.0. Moreover, the effect of illegal drug

⁸ Hispanic females' substance use increased their odds of initiation of sexual intercourse by age 16 by eight to nine times that of Hispanic female non-users and black males' marijuana use increased the odds of their initiation by age 16 by about twice that of black male non-users; the other racial/ethnic/gender subgroup estimates were between these two estimates.

use on premarital pregnancy was virtually unchanged when the indicator of contraceptive use was omitted from the model. And for each year younger at first illegal drug use, the likelihood of premarital pregnancy increased by an estimated 28 percent.

Even though unmarried female marijuana and other illegal drug users may be significantly more likely than non-users to become pregnant, they also may be up to five or six times more likely to resolve their pregnancies by elective (clinical) abortion (Kandel et al. 1986; Mensch and Kandel 1992; Reardon, Coleman and Cogle 2004; Yamaguchi and Kandel 1987). The unmarried pregnant females in Yamaguchi and Kandel's New York State sample who were current users of illegal drugs were about six times as likely as the unmarried pregnant non-users to resolve their pregnancies via elective abortion (Yamaguchi and Kandel 1987). Mensch and Kandel (1992) made a similar finding among the NLSY79 14 to 16 year old white females: Those who used illegal drugs and then became pregnant before they were married were about five times as likely as the unmarried pregnant non-users to end their pregnancies with elective abortions.

Spontaneous abortions also may be more prevalent among pregnant users than non-users of illegal drugs. For instance, Ness et al. (1999) first interviewed 970 females who were 14 to 40 years old and eight to 12 weeks pregnant and then followed up with interviews at 16 to 22 weeks' gestation. Urine, blood, and hair samples were taken to test for the presence of cocaine, marijuana, amphetamines, and opiates. About .30 of the whole sample experienced spontaneous abortion. Of that proportion, .31 had used cocaine. The cocaine users had a 25 percent increased risk of experiencing spontaneous abortion compared to non-users of cocaine. Use of the other substances was not significantly related to spontaneous abortions in the sample.

Illegal drug use and premarital cohabitation

Yamaguchi and Kandel (1985a) assessed the effects of marijuana use as well as marijuana and other illegal drug use on the likelihood that cohabitation was the first union in an event history analysis of the illegal drug and union formation histories of their New York State sample. Retrospective data on cohabitation had

been gathered in 1980-81 when the subjects were about 24 years old. The males' and the females' current and prior marijuana use about doubled their odds that cohabitation was the first union. Males and females who had currently used other illegal drugs as well as marijuana were about two and one-half times and more than three times as likely as non-users that cohabitation was the first union type. Yamaguchi and Kandel (1985a) argued that illegal drug use associated with delayed marriage and role selection accounted for the high rate of premarital cohabitation among the female and male current and former users of marijuana and among the female current and former users of other illegal drugs (p. 542).

Few other studies have examined the likelihood that cohabitation was the first union type among illegal drug users. Newcomb and Bentler (1985) found that high school users of marijuana and other illegal drugs were more likely than non-users to cohabit than marry as a first union. However, most research has focused on describing the characteristics of people in different types of unions. Early studies characterized cohabitators as generally less traditional than married people because they exhibited less religiosity, poorer interpersonal relationships, and more mental illness along with their more frequent illegal drug use (Croake, Keller, and Markowski 1976; Henze and Hudson 1974; Newcomb, 1987). A recent study drawing on data from the Fragile Families and Child Wellbeing Study (DeKlyen, et al. 2006) found that, one year after the birth of the focal child, the cohabiting fathers were about three times as likely as the married fathers and the cohabiting mothers were about twice as likely as the married mothers to have used illegal drugs in the month before the interview⁹. These findings hint at the possibility that illegal drug use and cohabitation enjoy a compatibility that might encourage users to choose cohabitation over marriage as a first union type.

In sum, our knowledge of the relationship of illegal drug use to initial family formation rests on the findings of just a few studies. This modest body of research

⁹ Inconsistencies in cohabitation status self-reports in the Fragile Families and Child Wellbeing Study between the baseline interview and the one-year interview have suggested the presence of retrospective reporting bias. Mothers in particular may have projected their current status onto the past or may have altered their status when responding to the one-year follow-up question on cohabitation. Because the original question wording of the question asked at baseline underwent revisions to its response categories for the one-year follow-up it is not clear why baseline self-reported status and retrospective status are significantly different (Teitler, Reichman and Koball 2006).

presents a similar picture to what we see with respect to the relationship of alcohol use to family formation behavior. Like immoderate alcohol users, illegal drug users are more likely than non-users to marry later or earlier than usual. These effects tend to not be as large when use is limited to marijuana as when it involves other illegal drugs like cocaine, heroin, or amphetamines. It seems reasonable that cohabitation would be the more likely first union type among illegal drug users because descriptive data suggest that cohabitation has little effect on the frequency of illegal drug use. But only Yamaguchi and Kandel (1985a) provide evidence to support that idea. Although our knowledge is limited, illegal drug use has been associated with the greater likelihoods of multiple sex partners, inconsistent condom use, younger ages at first intercourse, and premarital pregnancy. Again, the effects are greater when the illegal drugs are “hard” drugs than when use is restricted to marijuana. The impact of the excess fetal loss and infant death experienced by pregnant illegal drug users versus pregnant non-users on the likelihood of parenthood is not known.

Concurrent polydrug use and initial family formation

Many people simultaneously or concurrently use more than one type of illegal drug or use illegal drugs with cigarettes and/or alcohol (Ives and Ghelani 2006; McCabe, et al. 2006; Kandel and Davies 1996). These polydrug users have different patterns of substance use, tend toward poorer mental and physical health, are less educationally successful, and live in different family, school, and neighborhood contexts than those who limit their use to one type of illicit or illegal substance (Ives and Ghelani 2006; McCabe et al. 2006; Wish et al. 2006). Additionally, the younger that an individual starts using an illicit or illegal substance, the more likely it is that multiple substances are used (Chen and Kandel 1995). Assessing the effects of the use of one type of substance on an outcome necessitates disentangling its relationship to the outcome from the effects of the other substances being used or running the risk of confounding the effects of different types of substances (Gouzoulis-Mayfrank and Daumann 2006).

Most research on the effects of alcohol or marijuana use on family formation behavior has not accounted for the effects of polydrug use. Rosenbaum and

Kandel (1990) and Mensch and Kandel (1992) categorized users by their types of substance use from the least to the most serious class of substance. Yamaguchi and Kandel (1985a; 1985b; 1987) and Kaestner (1992) are notable for their attempts to assess the effects of marijuana on family formation behavior net of the effects of other illegal drug use and vice versa. However, the vast majority of the studies herein reviewed, while focusing on a single type of substance, ignored Chen and Kandel's (1992) warnings that significant proportions of users quickly move from the use of a single substance to the use of multiple substances. As a result, the overall conclusions that emerged from this review about the associations of alcohol use or illegal drug use with initial family formation quite likely also speak to the association of polydrug use with initial family formation.

Gender Differences

Females and males differ in their patterns of family formation and substance use behaviors. Generally, females are more likely to marry and to marry younger, are less likely to cohabit as a first union, and are younger at first birth than males (Cooney and Hogan 1991; Goldscheider and Waite 1986; Mahaffy and Ward 2002; Oppenheimer 1994; 1997; Sassler and Goldscheider 2004; Waite and Spitze 1981). Males' alcohol and illegal drug use starts younger, is more frequent, tends more toward polydrug use, is more likely to accompany sexual intercourse, and results in more addiction problems than females' (Johnson and Kaplan 1990; Merline et al. 2004; Mott and Haurin 1988).

The ways that alcohol and illegal drug use relate to initial family formation also differ by gender. Male illegal drug users who delay marriage may be more likely to exhibit substance use disorders than female drug users who delay marriage (Forthofer et al. 1996). However, Yamaguchi and Kandel (1985b), Kaestner (1997), and Fu and Goldman (1996) found greater proportions of illegal drug-using females than males in their studies actually experienced delayed marriage. Perhaps male drug users' relatively greater likelihood that illegal drug use impedes health and well-being and females' relatively greater propensity to form unions leads to different family formation behavior—female drug users may be more likely than their male counterparts to cohabit than marry and the male drug

users may be more likely than their female counterparts to remain single than marry. Findings are limited, however, and conclusions are speculative. Perhaps males' different patterns of alcohol and illegal drug use account for some of the inconsistency in these findings.

Adolescents who use alcohol and/or illegal drugs generally seem to have a proclivity toward inconsistent condom use and multiple sex partners regardless of gender (Leigh and Stall 1993; Rosenbaum and Kandel 1990), but the likelihood of not using condoms may be greater among the males than the females and the likelihood of multiple sex partners may be greater among the females than the males (Rosenthal, Smith and deVisser 1999; Santelli, et al. 2001). The age at first intercourse tends to be younger among male than female alcohol and illegal drug users (Leigh and Stall 1993; Mott and Haurin 1988; Rosenthal, Smith and deVisser 1999) and males' relatively young age at first intercourse is significantly related to their relatively older age at first marriage (Miller and Heaton 1991). Krohn, Lizotte and Perez (1997) found a significantly larger effect of early age at first use on the likelihood of pregnancy or parenthood by age 20 among the male than female users. On the other hand, Pears et al. (2005) found no significant effect of substance use on the timing of first fatherhood in an event history analysis, controlling for common correlates of early parenthood. Thus, while the likelihood of pregnancy is greater among both female and male illegal drug users than non-users, differences in the likelihoods of parenthood are unclear.

Racial/ethnic Differences

African Americans

Initial family formation among blacks significantly differs from that of whites (Bramlett and Mosher 2002; Ventura and Bachrach 2000). Black girls may experience puberty at significantly younger ages than white girls (Haynie 2003) which may help explain why intercourse is initiated at younger ages among blacks (Abma et al. 1997) and why black girls may be more desirous than white girls of pursuing early and non-union parenthood (East 1998; Trent and Crowder 1997). Black girls also are more likely than white girls to shun elective abortion and bring a premarital pregnancy to term (Trent and Powell-Griner 1991). Relatively young

parenthood is significantly more prevalent among blacks than whites (Albrecht and Albrecht 2004; Bumpass and Lu 2000; Mahaffy 2003; Raley 1996; Rindfuss, Morgan and Swicegood 1984). However, marriage or cohabitation typically occurs at older ages among blacks than whites (Brien, Lillard and Waite 1999; Bumpass and Sweet 1989; Mahaffy 2003; Manning 2001; Raley 1996; Schoen and Kluegel 1988). A significantly higher proportion of blacks than whites never marry (Albrecht and Albrecht 2004), even when a variety of covariates are accounted for (Lichter et al. 1992).

The prevalence of alcohol and illegal drug use significantly differs by race (Johnston, O'Malley and Bachman 2003; Jones-Webb 1998). White youth tend to initiate use sooner and to use with more frequency and intensity than black youth (Johnston, O'Malley and Bachman 2003; NIDA Notes 2003; Wallace et al. 2003), a difference found in metro and nonmetro areas alike (Allen and Page 1994). White adolescents may experience greater drug dependency than black youth (Turner and Lloyd 2003) but young blacks may present significantly greater prevalence of co-morbidity with drug dependence (Jones-Webb 1998; Merline, et al. 2004). The etiology of these differences is elusive—few known risk and protective factors predicting the onset or escalation of substance use among whites seem to predict etiology among blacks (Wagner, Lloyd and Gil 2002; Wallace and Muroff 2002; Williams et al. 1999). The racial gap in alcohol and illegal drug use is largest at the youngest ages and narrows during young adulthood. At about ages 30 to 35, the prevalence of alcohol use of whites and blacks is similar and illegal drug use among blacks, particularly black men, exceeds that of whites (Merline et al. 2004).

Alcohol and illegal drug use may have less influence on blacks' than on whites' initial family formation, although evidence is scarce. Delayed marriage was much less evident among the black than the white illegal drug users in Kaestner's (1997) study. Rosenbaum and Kandel (1990) found blacks' age at first sexual intercourse was less influenced by substance use than the other race/ethnic groups they studied although black youth tend to be younger at first intercourse than white or Hispanic youth (Mott and Haurin 1988). These findings suggest that alcohol and illegal drug use may not be a very important explanatory factor of family formation behavior among blacks but this is, at best, mere speculation. Most

of what we know about blacks' atypical family formation is about black female fertility, most of what we know about black alcohol and illegal drug use is about black male addiction, and no specific research has yet addressed the relationship of the two phenomena.

Hispanics

A current picture of the under age 25 United States population shows a significantly higher proportion of Hispanics than whites or blacks are married and parents (Oropesa and Landale 2004). Young adult Hispanics cohabit at lower rates than whites but at higher rates than blacks (Bumpass and Lu 2000; Oropesa and Landale 2004). The relatively early and high fertility among Hispanics and their relatively younger ages at first marriage may reflect the combined influences of acculturation, socioeconomic status, and longstanding Hispanic family patterns (Bean, Swicegood, and Berg 2000; Forste and Tienda 1996; Manning and Landale 1996; Oropesa and Landale 2004; Raley, Durden and Wildsmith 2004).

American Hispanics are a socioeconomically and culturally diverse set of peoples bound together by language. The incidence, prevalence, and etiology of alcohol use and illegal drug use among the Hispanic subgroups are not well researched (Booth, Castro and Anglin 1990; Glick and Moore 1990; Vega et al. 1993). Johnston et al. (2007) reported that the prevalence of alcohol use and of most of the types of illegal drug use among high school seniors between 1992 and 2006 was about the same for Hispanics as whites and higher than blacks. Among eighth and tenth grade students, however, the prevalence among Hispanics was significantly greater than among whites or blacks. Data on adolescents' alcohol and illegal drug use generally are collected in high schools (as were the data used by Johnston, et al. (2007)); yet high school drop out rates among Hispanics (Greene 2002) may disproportionately exclude alcohol and illegal drug users from official estimates more than in other racial/ethnic groups. If older adolescent Hispanic alcohol users and illegal drug users are disproportionately unaccounted for, the higher prevalence among younger adolescents may be a more accurate representation of prevalence in the older adolescent Hispanic population.

Research on the association of alcohol use or illegal drug use with family formation behavior among Hispanics has not developed. Rosenbaum and Kandel (1990) found that the Hispanic females who had used alcohol/cigarettes or marijuana were two to three times more likely than their white or black counterparts and twice as likely as all the racial/ethnic groups of male substance users to initiate sexual intercourse before age 16. These findings hint at the possibility that female Hispanic illegal drug users experience early pregnancy and premarital parenthood more than other female drug users. However, the theory and research on Hispanics' tendency to cohabit or marry (particularly marry) prior to childbirth emphasize a strong culturally normative inclination toward marriage followed by children (Bean, Swicegood and Berg 2000; Mahaffy 2003; Oropesa 1996; Oropesa and Landale 2004). Alcohol and illegal drug use may increase the odds of premarital pregnancy but Hispanic cultural pressure to marry before the birth of a child may result in early marriage rather than premarital parenthood to resolve the pregnancy.

American Indians

We lack data on the family formation behavior of American Indians that can provide meaningful comparisons with other population subgroups (Ericksen 1997; Loh and George 2003; Sandefur and Liebler 1997; Snipp 1997). Using national data sets is problematic because Indians are a small proportion of the total population, oversampling is ineffective because they are not sufficiently geographically segregated, criteria for identification as an "American Indian" or "Native American" is vague, and there is significant enough tribal diversity to undercut the utility of overall estimates (Ericksen 1997). Even so, national census data together with Indian Health Service data fairly accurately capture the basic demographic features of the American Indian population (Passell 1997).

The likelihoods of current marriage or ever marrying among American Indians in 2004 contrasted to the other American racial/ethnic groups are quite similar to that of blacks (United States Census Bureau 2004) and the mean age at first marriage is significantly older among Indian females than among the females in any of the other racial/ethnic groups (Sandefur and Liebler 1997). The

prevalence of cohabitation among Indians is unknown although Snyder, McLaughlin and Findeis (2006) found unmarried Indian mothers were more likely than their white, Hispanic, or black counterparts to be cohabiting (according to the 2000 Census of Population and Housing 5% Public Use Microdata Sample). They found about .17 of the Indian mothers compared to .14 of the white, .14 of the Hispanic, and .08 of the black mothers were cohabiting in 2000.

Indian fertility patterns also are more similar to blacks than other racial/ethnic groups (Snipp 1997). According to the Indian Health Service, Indian females are significantly younger at first birth than white females, with about .45 versus .21, respectively, bearing their first children as teenagers (Snipp 1997). Indian females also tend to be unmarried at first birth and to remain unmarried as parents. Centers for Disease Control and Prevention data show that the proportion of live births to non-married (including never married, cohabiting, and divorced) Indian mothers in 2004 was .62, about twice that of their non-Hispanic white counterparts (Centers for Disease Control 2004). Close to half of Indian children live with a single mother; on some reservations, that proportion is closer to two-thirds (Sandefur and Liebler 1997). Delayed age at first marriage combined with early age at first birth has led demographers to suspect that the high proportions of children in single mother families are due to non-union childbearing rather than cohabitation or divorce (Cherlin 1992; Sandefur and Liebler 1997).

There is significant heterogeneity in and some confusion about the patterns of alcohol use and illegal drug use within the Indian community. Reservation Indians differ from off-reservation Indians in prevalence (for instance, some data show off-reservation Indians use alcohol with greater frequency while other data show less frequency than reservation Indians) and in the types of substances used. There also are significant differences in the patterns of substance use by geographic location, reservation, and tribal affiliation (Novins and Mitchell 1998; Weibel-Orlando 1990). However, there are important distinctions between Indians overall and other population subgroups.

Alcohol use is more prevalent and is used less moderately by Indians than non-Indians (Snipp 1992; Plunkett and Mitchell 2000; Whitesell, et al. 2007). Its tenacious reputation as a serious health and social problem among Indians has

earned it the rank of most important health issue facing them today (Kawamoto 2001; Pridemore 2004). Most of the immoderate alcohol consumption among Indians may be off-reservation among urban Indians who, it is surmised, use alcohol to ease the alienation and anomie that accompany the transition to urban life (Snipp 1992). Self-reports of alcohol use indicate, however, that reservation Indians are much more likely than off-reservation Indians to immoderately use, to combine immoderate use with risky sexual behavior, and to experience negative consequences associated with alcohol consumption (Beauvais 1992a; 1992b).

Data are limited but some types of illegal drug use may be less prevalent while other types may be more prevalent among Indian than non-Indian youth (Wallace, et al. 2003; Whitesell, et al. 2007). For instance, one study reported less inhalant use by Indian youth compared to their Mexican American and non-Hispanic white counterparts (Beauvais, et al. 2002). But most studies find that marijuana and cocaine are the most common drugs of choice among Indian youth (Plunkett and Mitchell 2000; Wallace and Bachman 1991), which also is true for non-Indian youth, although Indians' use may be much more common (Steinman and Hu 2007). One investigation found about .40 of Indian adolescents in grades 9 through 12 reported past month marijuana use—about three times that of non-Indians in the same age group (Novins and Mitchell 1998). In a comparison of the 1993 illegal drug use of about 500 Indian high school students to the 1993 illegal drug use of a demographically comparable group of 3,500 respondents to the Monitoring the Future Study, Plunkett and Mitchell (2000) found significantly higher prevalence of six illegal drugs, cigarettes, and alcohol among the Indians. About .42 of the Indians in this study had used marijuana compared to .15 of the non-Indians. In another study using Monitoring the Future Study data (1985-1989), Indians' past year cocaine use was, on average, .16 compared to .10 among whites, and compared to .08 or less among the other racial/ethnic groups (Wallace and Bachman 1991).

There is no known research on the association of alcohol and illegal drug use with the family formation behaviors of American Indians.

Residential Differences

The context in which family formation decisions in rural versus non-rural areas are made is associated with different family formation patterns by residence (Albrecht and Albrecht 2004; Bumpass and McLanahan 1989; Crockett and Bingham 2000; McLaughlin, Lichter and Johnston 1993; Snyder, Brown and Condo 2004). These differences seem to have been shrinking over the past two decades (Snyder 2006) but significant distinctions persist in marital timing, the likelihood of cohabitation, and premarital childbearing (Albrecht and Albrecht 2004). Many of these patterns seem particularly evident in the Southern region of the United States (Howell and Frese 1982).

Rural adolescents tend to expect earlier family formation than their non-rural counterparts (Crockett and Bingham 2000) and, historically, rural females are younger than non-rural females at first marriage (McLaughlin, Lichter and Johnston 1993; Snyder, Brown and Condo 2004). They also have been less likely than non-rural females to choose cohabitation as their first union (Snyder, Brown and Condo 2004). Childbearing before marriage also is persistently less common in rural than in non-rural areas (Albrecht and Albrecht 2004; Frenzen and Butler 1997). Snyder (2006) found that non-metro females who conceived outside of a union were more likely than metro or suburban pregnant females to marry before the birth than cohabit or remain single (Snyder 2006).

Alcohol traditionally has enjoyed greater social acceptability in rural than non-rural areas (Akers 1992; Peters, Oetting and Edwards 1992) although the prevalence of alcohol use among older adolescents and adults may have differed little by residence until the 1990s (Donnermeyer 1992). Recent evidence points to increasing differences in alcohol use in rural and non-rural areas over the past two decades (National Survey on Drug Use and Health 2004; Population Reference Bureau 2004), particularly among younger adolescents. Eighth and tenth grade students in rural areas have been more likely since at least about 1990 to use alcohol and to binge drink while their non-rural counterparts have been using alcohol less often and with more moderation (O'Malley, Johnston and Bachman 1998; Johnston et al. 2007). However, it is unclear whether these differences are

new or longstanding phenomena since data on eighth and tenth grade students' alcohol use was not collected until about 1990.

The traditional perception of the prevalence of illegal drug use in rural areas is that geographic isolation, informal social control, cultural abhorrence, and lack of money effectively combine to deter significant adolescent use. However, there is growing evidence that drug traffickers have made significant inroads in reaching rural illegal drug consumers (Sloboda, Rosenquist and Howard 1997; Conger 1997) and geographic isolation may create more problems for law enforcement than for drug dealers (Stoops et al. 2005). Non-rural adolescents were more likely than rural adolescents to have used illegal drugs in 2000, but it was rural adolescents who, in 1999, were more likely to report easy access to illegal drugs (United States Department of Education 2002). In 2006, rural adolescents used inhalants, marijuana, amphetamines, and "meth" more frequently than non-rural adolescents and they were just as likely as their non-rural counterparts to misuse prescription drugs (Johnston, et al. 2007). Jobli et al. (2002) and Atav and Spencer (2002) found rural youth at significantly greater risk than urban youth of both alcohol and illegal drug use.

Albrecht and Albrecht (2004) argued that social pressure to comply with normative prescriptions for family formation is historically stronger among rural residents than among their non-rural counterparts, although today that pressure apparently is weakening as premarital childbearing and cohabitation become somewhat more commonplace in some rural areas. During the time when the majority of the subjects of this study were forming their families (the 1980s) that pressure likely was stronger than it is today. Alcohol use historically has been more culturally accepted in rural areas and illegal drug use less prevalent than in non-rural areas. Thus, anticipated role strain between the spousal and substance user roles may not influence marital timing, premarital parenthood, or the likelihood of cohabitation as much among rural as non-rural residents. This is speculation, however, because there is no known research on residential differences in the effects of alcohol and illegal drug use on initial family formation.

Other Factors Associated with Initial Family Formation

Marital timing, premarital parenthood, and cohabitation are associated with other important social factors. There are physical characteristics related to development and puberty that signal social and physical readiness for adult sexual relationships. There also are family background factors reflecting early family context and experiences associated with the choices people make about when and how to form their families. People's attitudes and expectations for and about themselves and their future families also contribute to family formation decisions. And there are some behaviors that situate people in social contexts that encourage or discourage certain family formation behaviors. While the influences of these factors are, in themselves, important to understand, they are included in this analysis for the purpose of controlling for their effects on first family type so as to more clearly evaluate the effects of alcohol and illegal drug use.

Physical characteristics

There is social pressure to marry within a normative age range (Arnett 1997; Hogan and Astone 1986; Marini 1984; Settersten 2003) and age often is the strongest correlate of marital timing (Furstenberg, Rumbaut and Settersten 2005). Some scholars speculate that people who have yet to marry by the end of the normative range are likely to cohabit as a first union (Smock 2000). Age also drives the hormonal changes that are the foundation of libido. Udry (1988; 1995), Udry and Billy (1987), and Udry, et al. (1985) have convincingly linked the onset of puberty to the timing of first sexual intercourse. Hormonal changes also may be linked to a biological drive toward autonomy, risk-taking, or dominance (Haynie 2003). Thus, puberty tends to lead to sexual intercourse, pregnancy and union formation (Felson and Haynie 2002).

Health status may influence marital timing. Healthier people may be more likely than less healthy people to marry in the normative age range (Williams and Umberson 2004). Fu and Goldman (1996) found that average-looking people had better odds of timely marriage than those who were unusually short, tall, or obese. A less healthy person may choose to cohabit or parent as a way to start their adult

family life if time is slipping away and no viable marriage partner is in sight (Smock 2000).

Family background factors

Household/family income and/or parents' educational attainments generally influence children's later family formation behaviors, regardless of gender or race/ethnicity (Mahaffy 2003; Sum and Fogg 1991). Low family income and household or neighborhood poverty tend to predict older age at first marriage (Aassve 2003; Hogan and Kitagawa 1985) and younger age at first cohabitation (East 1998; Trent 1994). People from more educated backgrounds and higher incomes may be more likely to postpone any union formation (Goldscheider and Waite 1986; Heaton and Jacobson 1994; Oppenheimer 1994, 1997). Living in a context of poverty during childhood is associated with relatively young ages at initiation of sexual intercourse and the likelihood of not using contraceptives (Brewster 1994; Brewster, Billy and Grady 1993; Upchurch et al. 1999) and a greater likelihood of premarital birth (Axinn and Thornton 1992; Barber 2001a; Bumpass and McLanahan 1989; East 1998; Hogan and Kitagawa 1985; Trent 1994; Waite and Spitze 1981) regardless of childbearing intentions or race (Crane 1991; Trent and Crowder 1997).

Differences in childhood family structure (parental presence or number of siblings) are associated with later family formation behavior. Boys who lived with a single mother may marry at older ages than boys who lived with both parents (Sassler and Goldscheider 2004) although an older study found significant differences for females but not males (Kobrin and Waite 1984). Early premarital cohabitation may be more likely among females in single mother or step-parent than intact families (Teachman 2003). Parental absence also may be associated with an increased likelihood of premarital pregnancy and parenthood among girls (Heaton and Jacobson 1994; McLanahan and Bumpass 1988) but not boys (Dearden, Hale and Blankson 1994). While the family's structural context seems important, the *experience* of losing a parent through divorce net of the structural effect may increase the likelihood of early marriage (Kieman and Hobcraft 1997; Wolfinger 2003) or cohabitation (Teachman 2003; Thornton 1991). Parents'

resources are diluted by more children—the greater the number of children, the fewer the resources for each child, lowering each child’s socioeconomic prospects and increasing the likelihood of early marriage or parenthood (Becker 1991; Blake 1981; 1989; Blau and Duncan 1967; Michael and Tuma 1985; Steelman et al. 2002). It may be that, for overextended parents’, time and energy are diluted, social control is weak, and the monitoring of individual children is inadequate, which create a context in which adolescents have relative freedom to participate in behavior that increases the likelihood of early family formation (Becker 1991).

Attitudes

Adolescents’ attitudes toward marital timing, cohabitation, contraception, premarital pregnancy, abortion, and parenthood develop as they are exposed to the values, beliefs, and behaviors of the people who are important to them and the world around them (Brown and Witherspoon 2002). These attitudes often are associated with later family formation behavior (Barber 2001a; Barber and Axinn 1998; Crockett and Bingham 2000; East 1998; Trent 1994; Trent and Crowder 1997). Mother’s attitudes, often reflected in their religious affiliation and practice (Axinn and Thornton 1993; Barber 2001b; Heaton and Jacobson 1994; Thornton, Axinn and Hill 1992) may be particularly influential on the family formation behavior of their children (Axinn, Clarkberg and Thornton 1994). And mothers’ own family formation and fertility histories may affect the choices that their children make (Axinn and Thornton 1996; Kahn and Anderson 1992; Barber 2001b).

Adolescents with healthy self-esteem and a sense of mastery over their world or who aspire to a college education may be less likely to marry young or to become pregnant or impregnate someone before union formation and more likely to cohabit as a first union than adolescents who are less psychologically healthy or whose aspirations end with high school graduation (Kaestner 1997; Mensch and Kandel 1992; Rosenbaum and Kandel 1990). The consistently significant racial/ethnic differences in family formation behavior may be in part attributable to the different attitudinal contexts that are characteristic of the different sociocultural settings that racial/ethnic groups in America experience because of residential segregation (Furstenberg, Levine and Brooks-Gunn 1990; Horwitz, Klerman, Kuo

and Jekel 1991; Mahaffy 2003; Mahaffy and Ward 2002; Manning 2001; Manning and Landale 1996; Wallace and Bachman 1991).

Behaviors

Some behaviors increase the likelihood of typical family formation.

Engaging in sexual intercourse at early ages increases a female's odds of early marriage or cohabitation, premarital pregnancy, and premarital parenthood (Abrahamse, Morrison and Waite 1988; Kieman and Hobcraft 1997). First intercourse at ages younger than 16 years old increases the likelihood of delayed marriage and of premarital parenthood among males (Jaffee et al. 2001; Miller and Heaton 1991). Being involved in a delinquent or criminal lifestyle may increase the likelihood of bringing about a premarital pregnancy, teenage marriage, and/or cohabitation among young males (Knight, Osborn and West 1977) although the evidence is scarce. However, criminal involvement has been positively associated with early sexual intercourse for males and females (Rosenbaum and Kandel 1990).

Other behaviors tend to decrease the likelihood of atypical family formation.

Young people who are actively engaged in the labor force or who are full time students are less likely to marry young or to cohabit as a first union than high school drop-outs or high school graduates who are not enrolled or employed (Oppenheimer 1994; 1997; Thornton, Axinn and Teachman 1995). Young males who are students or are employed also are less likely to delay union formation (Sassler and Goldscheider 2004). Early marriage also is less likely among females who are fulltime students compared to those who are fulltime workers (Oppenheimer 1994; 1997).

Relatively more frequent religious behavior may have mixed effects on family formation (Abrahamse, Morrison and Waite 1988:36-37). It may encourage typical family formation by: (1) providing the usual proscriptions against premarital sexual intercourse thus lessening the likelihood of premarital pregnancy (Jensen, Newell and Holman 1990; McCabe and Collins 1983) and (2) prohibiting cohabitation which may encourage marriage. Religiosity also may encourage atypical family formation by: (1) discouraging contraception thus increasing the

likelihood of premarital pregnancy among those who are not married and sexually active (Rosenbaum and Kandel 1990), (2) directly encouraging early marriage for all adherents and indirectly encouraging early marriage for those who embrace sexual abstinence until marriage, and (3) prohibiting abortion thus increasing the likelihoods of premarital pregnancy, parenthood, and early marriage.

Hypotheses

There is remarkable consistency within the body of research on the effects of alcohol and illegal drug use on initial family formation even though few studies examined the effects of particular substances net of the effects of other substances and there is significant diversity in research design and sample size. Tables 2.1, 2.2, and 2.3 summarize the findings of the reviewed literature. With the exception of a couple of studies that found no significant differences in marital timing or risky sexual behaviors between users and non-users, alcohol use, marijuana use, other illegal drug use, and polydrug use significantly increased the likelihood of atypical family formation, particularly when used with great frequency and/or first use was younger than about age 15. It also was evident in the research by Kandel and colleagues that the effects were larger when the type of substance was an illegal drug other than marijuana than it was when the type of substance was marijuana. The effects of marijuana and alcohol use were somewhat similar but since none of the studies accounted for concurrent substance use, valid comparisons are difficult.

When the focus was on marital timing, immoderate use related to delayed marriage, at least to age 30, and to early marriage before ages 18 to 20. The most recent study of marital timing, by Martino, Collins, and Ellickson (2004), suggested that early marriage among substance users may be a response to premarital pregnancy rather than an indication of early maturity. When the interest was premarital parenthood, studies generally examined the associations of various types of substance use to inconsistent condom use, multiple sex partners, early age at first intercourse, and the likelihood of pregnancy. Where significant findings resulted, pregnancy and pregnancy-related risk behaviors were significantly more likely among the substance users than non-users. However, both elective and

Table 2.1. Summary of findings in the reviewed literature on the effects of alcohol use on initial family formation in the full samples or by gender^a

Alcohol use: Published studies in alphabetical order by author within nature of alcohol use	late marriage to age 33		early marriage before age 21		cohabitation		pregnancy or behaviors		abortion (elected/spont.)	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
Immoderate alcohol use including binge drinking, alcoholism, and/or high frequency										
Chilcoat and Breslau (1996)		ns								
Fu and Goldman (1996)		+								
Henriksen, et al. (2004)										+
Horwitz and White (1991)		+								
Horwitz and White (1998)					**	+				
Kesmodel, et al. (2002)										+
Power, Rodgers and Hope (1999)	**	+								
SAMHSA (2007)	**	+								
Early age at first alcohol use with or without high frequency or binge drinking										
Forthofer, et al. (1996)				+						
Horwitz and White (1998)					**	+				
Martino, Collins and Ellickson (2004)									+	
Newcomb and Bentler (1985)				+		+				
Power and Estaugh (1990)				+						
Santelli, et al. (2001)							+	ns		
Shrier, et al. (1996)							+	**		
Stueve and O'Donnell (2005)							+	+		

Key: + = more likely than lower level or non-users; - = less likely than lower level or non-users; ** or -* = gender differences were statistically significant and effects were larger for the indicated group; ns = differences were not statistically significant

^a Studies without separate cells by gender included but did not test for gender differences

Table 2.1. CONTINUED. Summary of findings in the reviewed literature on the effects of alcohol use on initial family formation in the full samples or by gender^a

Alcohol use: Published studies in alphabetical order by author within nature of alcohol use	late marriage to age 33		early marriage before age 21		cohabitation		pregnancy or behaviors		abortion (elected/spont.)	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
Teen/young adult use to moderate extent v. abstinence										
Abel (1997)										+
Coleman, et al. (2002)										+
Cooper (2002)								+		
Deardorff, et al. (2005)									+	
Donovan and McEwan (1995)								+		
Dorris (1989)										(anthropological)
Friend, Goodwin, and Lipsett (2004)										+
Grodstein, Goldman and Cramer (1994)										+
Guo, et al. (2002)								+		
Harlap and Shiono (1980)										+
Kline, et al. (1980)										+
Mott and Haurin (1988)								+	++	
Prager, et al. (2007)										+
The National Center of Addiction and Substance Abuse (2002)								+	+	

Key: + = more likely than lower level or non-users; - = less likely than lower level or non-users; ++ or -- = gender differences were statistically significant and effects were larger for the indicated group; ns = differences were not statistically significant

^a Studies without separate cells by gender included but did not test for gender differences

Table 2.2. Summary of findings in the reviewed literature on the effects of marijuana use on initial family formation in the full samples or by gender^a with findings of Kandel and colleagues highlighted in red

marijuana use: Published studies in alphabetical order by author within nature of use	late marriage to age 33		early marriage before age 21		cohabitation		pregnancy or behaviors		abortion (elected/spont.)	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
High frequency marijuana use										
Forthofer, et al. (1996)				+						
Fu and Goldman (1996)		+								
Guo, et al. (2002)								+		
Kaestner (1997)	+	++								
Martino, Collins and Ellickson (2004)				+						
Shrier, et al. (1996)								+		
Yamaguchi and Kandel (1985a)		+				+				
Yamaguchi and Kandel (1985b)		+								
Early age at first marijuana use with or without high frequency	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
Guo, et al. (2002)								ns		
Newcomb and Bentler (1985)				+		+				
Rosenbaum and Kandel (1990)								+		
Teen/young adult ever used marijuana										
Lowry, et al. (1994)								+		
Mensch and Kandel (1992)									ns	
Mott and Haurin (1988)							+		++	
Yamaguchi and Kandel (1987)										ns

Key: + = more likely than lower level or non-users; - = less likely than lower level or non-users; ++ or -- = gender differences were statistically significant and effects were larger for the indicated group; ns = differences were not statistically significant

^a Studies without separate cells by gender included but did not test for gender differences

Table 2.3. Summary of findings in the reviewed literature on the effects of illegal drug use other than marijuana use and polydrug use on initial family formation in the full samples or by gender ^a with findings of Kandel and colleagues highlighted in red

illegal drug use: Published studies in alphabetical order by author within nature of use	late marriage to age 33		early marriage before age 21		cohabitation		pregnancy or behaviors		abortion (elected/spont.)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Other illegal drug use										
Guo, et al. (2002)								ns		
Kaestner (1997)	+	***								
Lowry, et al. (1994)								+		
Mensch and Kandel (1992)										+
Ness, et al. (1999)										+
Newcomb and Bentler (1985)				+		+				
Shrier, et al. (1996)								+		
Yamaguchi and Kandel (1985b)	ns	+								
Yamaguchi and Kandel (1987)										+
Polydrug use ^b										
Krohn, Lizotte, and Perez (1997)		+								
Rosenbaum and Kandel (1990)								+		
Santelli, et al. (2001)								+		
Yamaguchi and Kandel (1985a)						+				
Yamaguchi and Kandel (1985b)		+								

Key: + = more likely than lower level or non-users; - = less likely than lower level or non-users; *** or ** = gender differences were statistically significant and effects were larger for the indicated group; ns = differences were not statistically significant

^a Studies without separate cells by gender included but did not test for gender differences

^b Polydrug use may include: cigarettes, alcohol, marijuana, other illegal drugs

spontaneous abortion were more evident among substance users than non-users, regardless of age, type of substance used, or the frequency or intensity of use. Four of the 13 studies on abortion that were reviewed included both males and females; each found a significantly higher risk of spontaneous abortion present among the pregnancies of the substance-using prospective fathers compared to the non-using prospective fathers.

The pattern of gender differences across the studies may be of particular interest. Alcohol use was found to have a stronger influence on males' than females' marital timing and likelihood of cohabitation while illegal drug use had a stronger influence on females' than males' marital timing. In many instances (including Kandel and colleagues' studies), gender was examined but apparent differences were not tested for statistical significance. Substance use was significantly more important to females' than males' proclivity toward risky sexual behaviors in two of the alcohol studies and a marijuana study but apparent differences generally were not tested for statistical significance (10 studies) and two studies found no significant gender differences. None of the reviewed research seriously considered racial/ethnic differences or variation in effects by residence.

The findings of this body of research make sense in light of the expectations derived from role strain theory as promulgated by Goode (1960) and employed by Kandel and colleagues: Faced with anticipated role conflict between marital/parental roles and substance use behaviors/lifestyle, individuals would anticipate role strain. Occasional users, experimenters, users of more socially accepted substances (i.e, alcohol) may not perceive much of a potential conflict and may be willing and able to adjust their substance use to accommodate the normative demands for spousal or parental behavior. But those who are unwilling or unable to change their drug-using lifestyle and behavior, who use illegal drugs other than marijuana, or whose use is immoderate were expected to take an atypical route to initial family formation. For those users, delayed marriage and cohabitation were expected outcomes. While a greater likelihood of pregnancy also would be expected, the evidence of excess abortion among substances users is unequivocal and; thus, a lower likelihood of parenthood was expected.

The current study employed data on 4,011 members of the National Longitudinal Survey of Youth 1979, a nationally representative sample of persons who were 14 to 16 years old in 1979 (the 1963 to 1965 birth cohort) who had yet to form their first adult families. Its aim was to assess the relationships of measures of adolescent alcohol use and illegal drug use to subsequent initial family formation. In 1979, the 1963 to 1965 birth cohort was just beginning to transition into adult family life—35 sample members initiated family formation in that year. In their socio-historical context, cohort members who used alcohol and illegal drugs and who anticipated family formation and who desired to maintain both roles would be expected to anticipate role strain. First, America was experiencing growing entrenchment of normative family values in response to the increasing incidence of divorce and the perceived threat of “free love” (Kingwood College Library 2006) Second, immoderate alcohol use and illegal substance use were strongly associated with a counter-cultural lifestyle that distained institutional conventions of any kind and had particularly rejected marriage and nuclear family parenthood. Moreover, the negative effects of illegal drug use were unclear and the beneficial mind-expanding properties were touted and hotly debated in academic and political circles (Robison 2002).

Because of the normative acceptance of cohabitation in the counter-cultural lifestyle that illegal drug users embraced and its growing acceptance in the conventional culture, sample members who were alcohol and illegal drug users who were unwilling (or unable) to relinquish their drug use and its associated lifestyle would likely delay marriage and/or choose cohabitation over marriage. Pregnancy among the alcohol and illegal drug users also would likely be more prevalent than among the non-users because of users’ rejection of contraception. However, pre-union parenthood among substance users in the sample would be less likely than among non-users because of the 1970s’ and 1980s’ counter-culture’s greater acceptance of abortion (which became more widely available with each passing year) as a means to resolve unwanted pregnancies.

Substance use was measured to assess the type of substance used, concurrent substance use, and the age at first use of alcohol, marijuana, and other illegal drugs. Frequency of use was measured for alcohol and marijuana use when

the subjects were 14 to 16 years old in 1979. Binge drinking and family alcoholism were additional measures of alcohol use. The outcome variable was a four category nominal indicator of the type of family that first was formed between 1979 (at ages 14 to 16) and 2004 (at ages 39 to 41) among marriage, cohabitation, or parenthood. A small group of subjects (about .10 of the study sample) had not formed one of these types of families by 2004 and “no family was formed” was included as the fourth possible outcome. Based on role strain theory, the prior research on the effects of alcohol and illegal drug use on family formation behavior; gender, racial/ethnic, and residential family formation and substance use patterns; and considering the sample members in their socio-historical context the following hypotheses were developed to address the four research questions that were enumerated in Chapter One.

Research Question 1

How does the use of alcohol, marijuana, or other illegal drugs alone or concurrently relate to the first type of family formed?

Hypothesis 1. The use of alcohol, marijuana, or other illegal drugs alone or concurrently is substantively and statistically related to the first type of family formed.

Hypothesis 1.1: No family was formed versus marriage as the first family type. The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, increases the odds that no family was formed.

Hypothesis 1.2: Parenthood versus marriage as the first family type. The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, decreases the odds that parenthood was the first type of family formed.

Hypothesis 1.3: Cohabitation versus marriage as the first family type The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, increases the odds that cohabitation was the first type of family formed.

Research Question 1a

How do the effects of alcohol and illegal drug use on the first type of family formed differ by gender?

Hypothesis 1a: The effects of alcohol and illegal drug use on initial family formation differ by gender such that:

The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, increases the odds that no family was formed and that cohabitation was the first family type for the males and the females; however, the effects are stronger among males than among the females.

The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, decreases the odds that parenthood was the first family type for the males and the females; however, the effects are stronger among females than among the males.

Research Question 1b

How do the effects of alcohol and illegal drug use on the first type of family formed differ by race/ethnicity?

Hypothesis 1b: The effects of alcohol and illegal drug use on the first type of family formed differ by race/ethnicity such that:

(1) among non-Hispanic whites, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed and that cohabitation was the first family type but decreases the odds that parenthood was the first family type;

(2) among blacks and American Indians, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed, that cohabitation was the first family type, and that parenthood was the first family type and the effects are larger than among non-Hispanic whites; and

(3) among Hispanics, alcohol and illegal drug use was not significantly related to the first type of family formed.

Research Question 1c

How do the effects of alcohol and illegal drug use on the first type of family formed differ by rural/non-rural and South regional residence?

Hypothesis 1c. The effects of alcohol and illegal drug use on the first type of family formed differed for residents of the rural South, rural non-South, non-rural South, and non-rural non-South such that:

(1) among residents of the non-rural non-South, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed and that cohabitation was the first family type but decreases the odds that parenthood was the first family type;

(2) among residents of the rural non-South, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed and that cohabitation was the first family type but decreases the odds that parenthood was the first family type and the effects are larger than among residents of the non-rural non-South;

(3) among residents of the non-rural South, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed, that cohabitation was the first family type, and that parenthood was the first family type and the effects are larger than among residents of the non-rural non-South and the rural non-South; and

(4) among residents of the rural South, alcohol and illegal drug use, alone or concurrently, increases the odds that no family was formed, that cohabitation was the first family type, and that parenthood was the first family type and the effects are larger than among residents of the non-rural non-South, the rural non-South, and the non-rural South.

Table 2.4 summarizes the expected findings with respect to Research Question 1.

Table 2.4. Summary of hypotheses: Research Question 1 (full sample), 1a (gender), 1b (race/ethnicity), and 1c (residential groups)

	no family formed	parenthood was first	cohabitation was first
full sample			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	+	-	+
other illegal drugs with alcohol and/or marijuana	+	-	+
alcohol, marijuana, and other illegal drugs	+	-	+
males			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	+*	-	+*
other illegal drugs with alcohol and/or marijuana	+*	-	+*
alcohol, marijuana, and other illegal drugs	+*	-	+*
females			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	+	-*	+
other illegal drugs with alcohol and/or marijuana	+	-*	+
alcohol, marijuana, and other illegal drugs	+	-*	+
non-Hispanic white			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	+	-	+
other illegal drugs with alcohol and/or marijuana	+	-	+
alcohol, marijuana, and other illegal drugs	+	-	+
black			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	+*	+*	+*
other illegal drugs with alcohol and/or marijuana	+*	+*	+*
alcohol, marijuana, and other illegal drugs	+*	+*	+*
Hispanic			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	ns	ns	ns
other illegal drugs with alcohol and/or marijuana	ns	ns	ns
alcohol, marijuana, and other illegal drugs	ns	ns	ns
American Indian			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	+*	+*	+*
other illegal drugs with alcohol and/or marijuana	+*	+*	+*
alcohol, marijuana, and other illegal drugs	+*	+*	+*

Key: + = more likely than lower level or non-users; - = less likely than lower level or non-users; +* or -* = differences were statistically significant and effects were larger for the indicated group; ns = differences were not statistically significant

Table 2.4. CONTINUED. Summary of hypotheses: Research Question 1c (residential groups)

	no family formed	parenthood was first	cohabitation was first
non-rural non-South			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	+	–	+
other illegal drugs with alcohol and/or marijuana	+	–	+
alcohol, marijuana, and other illegal drugs	+	–	+
rural non-South			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	+*	–	+*
other illegal drugs with alcohol and/or marijuana	+*	–	+*
alcohol, marijuana, and other illegal drugs	+*	–	+*
non-rural South			
alcohol only	ns	ns	ns
marijuana only	ns	ns	ns
alcohol and marijuana	+*	+*	+*
other illegal drugs with alcohol and/or marijuana	+*	+*	+*
alcohol, marijuana, and other illegal drugs	+*	+*	+*
rural South			
alcohol only	+*	+*	+*
marijuana only	+*	+*	+*
alcohol and marijuana	+*	+*	+*
other illegal drugs with alcohol and/or marijuana	+*	+*	+*
alcohol, marijuana, and other illegal drugs	+*	+*	+*

Key: + = more likely than lower level or non-users; – = less likely than lower level or non-users; +* or –* = differences were statistically significant and effects were larger for the indicated group; ns = differences were not statistically significant

Research Question 2

How do (a) the age at first monthly or more frequent alcohol use, (b) the frequency of alcohol use in 1979, (c) the occurrence of binge drinking, and (d) the type of problem drinker relative (if any) relate to the first type of family formed?

Hypothesis 2. The characteristics of alcohol use are related to the first type of family formed such that:

(1) first monthly or more frequent alcohol use younger than age 17 decreases the odds that no family was formed and increases the odds that parenthood was the first family type. Monthly or more frequent use increases the odds of cohabitation as the first family type regardless of age at first use;

(2) frequency of alcohol use greater than 10 times in 1979 (ages 14 to 16) decreases the odds that no family was formed and that parenthood was the first family type and increases the odds that cohabitation was the first family type;

(3) binge drinking increases the odds that parenthood was the first family type and that cohabitation was the first family type; and

(4) reporting a problem drinker biological dad and/or biological mom increases the odds that cohabitation was the first family type.

Research Question 3

How do (a) the age at first marijuana use and (b) the frequency of marijuana use in 1979 relate to the first type of family formed?

Hypothesis 3. The characteristics of marijuana use are related to the first type of family formed such that:

(1) first marijuana use younger than age 17 decreases the odds that no family was formed and increases the odds that parenthood was the first family type. Marijuana use increases the odds of cohabitation as the first family type regardless of age at first use; and

(2) frequency of marijuana use greater than 10 times in 1979 (ages 14 to 16) decreases the odds that no family was formed and that parenthood was the first family type. Marijuana use increases the odds that cohabitation was the first family type regardless of frequency of use.

Research Question 4

How does the age at first use of illegal drugs other than marijuana relate to the first type of family formed?

Hypothesis 4. The age at first use of illegal drugs other than marijuana is related to the first type of family formed such that first use younger than age 15 increases the odds that no family was formed and increases the odds that parenthood was the first family type. Illegal drug use other than marijuana

increases the odds of cohabitation as the first family type regardless of age at first use.

Table 2.5 summarizes the hypotheses with respect to Research Questions 2, 3, and 4.

Table 2.5. Summary of hypotheses: Research Questions 2 (alcohol use), 3 (marijuana use), and 4 (other illegal drug use)

	no family formed	parenthood was first	cohabitation was first
<u>used only alcohol and non-use</u>			
age at first monthly or more frequent use	< 17 –	< 17 +	+
frequency of use in 1979 at 14 to 16 years old	> 10 –	> 10 –	> 10 +
incidence of binge drinking	ns	+	+
type of problem drinker relative	ns	ns	+
<u>used only marijuana and non-use</u>			
age at first use	< 17 –	< 17 +	+
frequency of use at 14 to 16 years old	> 10 –	> 10 –	+
<u>used illegal drugs other than marijuana alone or concurrently with alcohol and/or marijuana</u>			
age at first use	< 15 +	< 15 +	+

Key: + = more likely than lower level or non-users; – = less likely than lower level or non-users; ns = differences were not statistically significant

CHAPTER THREE

METHODOLOGY

This chapter lays out the methodology that was used to test the hypotheses. First, the sample of 14 to 16 year old respondents to the National Longitudinal Survey of Youth 1979 (“NLSY79”) is described. That is followed by an explanation of the marital and fertility history variables and how they were used to create the four-category dependent variable “first family type.” Then, the key alcohol use and illegal drug use variables are specified after which the form of each variable in the four groups of control variables is defined. The chapter closes with an explanation of the multinomial logistic regression methods and modeling that were used to test the hypotheses.

The Sample

The data for this analysis were drawn from the National Longitudinal Survey of Youth 1979 maintained by the Center for Human Resource Research (CHRR) located at The Ohio State University. The NLSY79 is a national sample of young men and women living in the United States and born between January 1, 1957 and December 31, 1964. The NLSY79 is the compilation of three independent probability samples: (1) a cross-sectional sample designed to be representative of the non-institutionalized civilian population of the United States (N=6,111); (2) a military sample designed to represent the population born January 1, 1957 through December 31, 1961 serving in the military as of September 30, 1978 (N=1,280); and (3) a supplemental sample designed to over-sample economically disadvantaged black, Hispanic, and non-Hispanic white youth born in the same period (N=5,295). The sample composition of the NLSY79, its large size, the richness of its data, and its long life made it an excellent data set for the research questions addressed in this study.

Data were collected yearly from 1979 when the respondents were 14 to 22 years old until 1994 and biennially from 1996 to 2004 when they were 39 to 47 years old. Two groups of NLSY79 respondents were dropped from interviewing

during the study period. After the 1984 survey, 1,079 members of the 1,280-member military sample were dropped and after 1990 the 1,643 members of the supplemental economically disadvantaged sample who were non-Hispanic white were dropped.

The subjects of the current study were all of the male and female 1979 respondents who were 14 to 16 years old in 1979 who had not entered a marital or cohabiting union and who had not become a parent prior to 1979. Of the 4,074 respondents who were 14 to 16 years old in 1979, 63 had entered a union and/or had become a parent prior to 1979 (see Table 3.1)¹⁰. When these cases were dropped from the analysis, the sample was reduced to 4,011 cases. A sampling weight created by the CHRR was applied to account for the differential probability of selection into the original subsamples, differential response rates in the

Table 3.1. Proportions and numbers of cases (in parentheses) of the 14 to 16 year olds before and after dropping the cases where initial family formation events occurred before 1979 by age and gender, unweighted and weighted^a, NLSY79

	<i>Unweighted</i>			<i>Weighted</i>		
	Before (N=4,074)	Loss (N=63) ^b	After (N=4,011)	Before (N=4,056)	Loss (N=45) ^b	After (N=4,011)
Age						
14	.23 (950)	0	.24 (950)	.27 (1,082)	0	.27 (1,082)
15	.38 (1,563)	.01 (14)	.39 (1,549)	.38 (1,523)	.01 (12)	.38 (1,511)
16	.38 (1,561)	.03 (49)	.38 (1,512)	.36 (1,451)	.02 (33)	.35 (1,418)
	<i>Unweighted</i>			<i>Weighted</i>		
	Before (N=4,074)	Loss (N=63) ^b	After (N=4,011)	Before (N=4,056)	Loss (N=45) ^b	After (N=4,011)
Gender						
Male	.51 (2,095)	.01 (12)	.52 (2,038)	.51 (2,074)	.01 (8)	.52 (2,066)
Female	.49 (1,979)	.02 (51)	.48 (1,928)	.49 (1,982)	.02 (37)	.48 (1,945)

^a Some groups of proportions do not add to 1.0 due to computational rounding

^b The reported proportions lost to pre-existing events are of their respective subgroups and not of the entire sample

screening and subsequent interviews, and sample “undercoverage” and random variation associated with sampling (NLSY79 User’s Guide, 2004). To maintain the correct sample size and degrees of freedom, the weight was divided by the average weight for the sample for 1979 (see Carr, Wright, and Brody 1996; NLSY79 User’s Guide, 2004). This technique produced group estimates

¹⁰ The distribution of the sample by race/ethnicity and rural/non-rural and South regional residence both before and after dropping the cases where first family formation occurred before 1979 and both before and after weighting the sample are shown in Appendix A , Table A1.

demographically representative of the 1979 base year population when used in tabulations (NLS News 2006) and a sample size of 4,011 cases.

Unless otherwise indicated, all further references to the “sample” or “study sample” refer to the weighted 4,011 cases of 14 to 16 year olds in the NLSY79 whose first union formation and parenthood either occurred in or after 1979 or had not occurred by 2004.

Dependent Variable

First family type

The dependent variable was an indicator of the type of family the respondents first formed as their adult families. It was a nominal variable of four categories where: (1) first legal marriage occurred before first cohabitation and before first parenthood, (2) first cohabitation (co-residence with a romantic partner) occurred first, (3) first parenthood (bearing or fathering *and* co-residing with a first biological child) was first, and (4) no family (marriage, cohabitation, or parenthood) was formed by 2004.

To create this variable, the NLSY79 relationship and fertility histories created by the CHRR were used. These histories detail the marital status, dates of marriage(s), separation(s), and divorce(s) or widowhood, and ages at first marriage. There also is information on cohabitation status and the dates of entry into and exit from all cohabiting relationships. Respondents' ages when children were born and the dates of birth of every child born to every respondent are in fertility history files. Parent-child co-residence information is in household and child rosters. This information was gathered in the interviews with the respondents every time the survey was fielded and the relationship and fertility histories have been updated by the CHRR with each wave of data. This information was used to identify the years and months of first marriage, first cohabitation, and first parenthood of every respondent who was 14 to 16 years old in 1979.

Six variables were created from the history file information in the data set to indicate the year and month of the first events of each respondent: (1) year of first marriage, (2) month of first marriage, (3) year of first cohabitation, (4) month of first cohabitation, (5) year of first parenthood, and (6) month of first parenthood. Then

these six variables were used to determine which event among each respondent's first marriage, first cohabitation, and first parenthood occurred first. The six variables also were used to identify the cases where first marriage, first cohabitation, or first parenthood had occurred before 1979 in order to drop these cases from the sample.

First, the variables were created that identified: (1) the year of first marriage and (2) the month of first marriage. Information was used from the files on marital status, the respondent's age, the age at first marriage, and the year and month of first marriage that the respondents provided (1) in 1979 regarding events that had occurred prior to the beginning of the study period and (2) in every subsequent survey year from 1982 through 2004. The year of first marriage was identified for every respondent who was 14 to 16 years old in 1979 who had ever married through 2004 (when they were 39 to 41 years old). Those who had not married by 2004 were coded "0." The years of first marriage ranged from 1976 through 2004 and about .20 of the weighted sample of 14 to 16 year olds in 1979 had not married by 2004. Cases where the year of first marriage occurred before 1979 were dropped (weighted N=19).

Every respondent who had ever married had reported a corresponding month of first marriage. To create the measure of the month of first marriage, every respondent who was 14 to 16 years old in 1979 who had ever married by 2004 was assigned a number 1 through 12 that corresponded with the month of first marriage (for example, 6=June). Those who had not married by 2004 were coded "0." Table 3.2 shows the modal year and mean age of first marriage in the study sample overall and separately for males and females.

Second, the two variables were made that indicated: (1) the year of first cohabitation and (2) the month of first cohabitation. Three pieces of information that were gathered by the interviewers in every interview were used to determine the year of first cohabitation of all of the respondents who were 14 to 16 years old in 1979 who had ever cohabited. These were: (1) the interviewer's report of the relationship status of the current spouse/partner of every respondent on the day of the interview and the respondents' answers to the questions: (2) "Are you currently living as a partner with someone of the opposite sex?" and (3) "When did you and

Table 3.2. Weighted modes, means, or proportions and unweighted standard deviations (in parentheses) of first marriage in the ever-married portion of the study sample (N=3,221) and for ever-married males and females

Variables	Study sample	Males (N=1,565) ^a	Females (N=1,656) ^a
<i>First marriage (year)</i>	1987	1988	1986
Age at first marriage (among those ever married; ages 14 to 41) ^{***}	23.61 (5.14)	24.58 (5.09)	22.69 (5.03)
Never married ^{b ***}	.20	.24	.15
Marriage was first ^{***}	.51	.49	.52

^{***} $p < .001$, two-tailed tests of significance; males were significantly older than females at first marriage ($t=-10.904$), significantly more likely than females to never have married by 2004 (Chi-square=55.863), and significantly less likely that marriage was the first family type reported (Chi-square=4.516).

^a Numbers of cases of males and females are of those who had ever married by 2004.

^b There were 289 females and 501 males who had never married by 2004.

your partner begin living together?” The years of first cohabitation ranged from 1979 through 2004. About .58 had never cohabited by 2004, and there were no cases where first cohabitation occurred before 1979.

For first cohabitations that had first occurred in 1990 through 2004, the month of first cohabitation the responses to the question: “In what month . . . did you and your partner begin living together?” that the respondent had reported in the first year of first cohabitation was used. The CHRR did not collect data on the first month of cohabitation prior to 1990 and, to assign months of first cohabitations that had first occurred in 1979 through 1989, they recommend using the month of the respondent’s interview in the year of first cohabitation (see NLSY79 User’s Guide, 2004)¹¹. Months were assigned exactly like the months of first marriage with a number 1 through 12 that corresponded to the month of first cohabitation and those who had never cohabited were assigned “0.” Table 3.3 shows the modal year and the mean age at first cohabitation in the study sample and separately for females and males.

The third step was to create the two variables indicating: (1) the year and (2) the month that the respondent first became a parent. First, the CHRR’s fertility

¹¹ Between 1979 and 1989, the respondents were interviewed between January and May. Thus, there may be a few months slippage between the actual and the estimated months of first cohabitation for those whose first cohabitation occurred in those years. The extent of resultant misclassification of cohabitation as the first family type in the construction of the dependent variable categories seems to be minor because the vast majority of cases were classified into “first family type” using the year of first event and the use of months to classify occurred only in cases where two or three of the years were the same.

history files were used to assign to every respondent who was 14 to 16 years old in 1979 the year of first birth (for females) or fatherhood (for males) reported by all who became parents before the study period began. Then, for those who were 14 to 16 years old in 1979 who were not parents before 1979, the fertility history files were used to identify the year of first parenthood as that year in which a first birth

Table 3.3. Weighted modes, means, or proportions and unweighted standard deviations (in parentheses) of first cohabitation in the study sample among those who ever cohabited (N=1,694) and for ever-cohabiting males and females

Variables	Study sample	Males (N=850) ^a	Females (N=844) ^a
<i>First cohabitation (year)</i>	1989	1990	1988
Age at first cohabitation (among those ever cohabited; ages 16 to 41) ^{***}	24.96 (5.28)	25.98 (5.14)	23.93 (5.32)
Never cohabited ^b	.58	.60	.57
Cohabitation was first	.25	.24	.26

^{***} $p < .001$, two-tailed tests of significance; males were significantly older than females at first cohabitation ($t=-8.087$)

^a Numbers of cases of males and females are of those who ever cohabited by 2004.

^b There were 1,101 females and 1,216 males who had never cohabited by 2004.

or first fatherhood was first reported where the respondent also had co-resided with that child at the interview date of that year. All the respondents had co-resided with the first child in its first year. Respondents who had never had a child were coded "0." The years of first birth of all the 14 to 16 year old respondents ranged from 1977 through 2004 and about .27 had not had a child by 2004. All cases where parenthood occurred before 1979 were dropped from the sample (N=26).

The month of first parenthood was derived from the fertility histories and from information on the dates of first birth that were used to create the year of first parenthood variable. Each respondent was assigned a number 1 through 12 that corresponded to the month of first parenthood. Those who had never parented were coded "0." The years and months of first parenthood derived from the fertility history files were cross-checked against the CHRR child roster and responses to the questions: "Have you ever had a child?" and "When was your first child born?" Any respondent coded as a "non-parent" in the history files who had responded "yes" to the question about ever having a child and who provided dates to the question on date of birth or provided an age of oldest child and who had co-resided

with that child in its first year was assigned those dates as the year and month of first parenthood. Table 3.4 shows the modal years and mean ages at first parenthood of the study sample and separately for males and females.

Table 3.4. Weighted modes, means, or proportions and unweighted standard deviations (in parentheses) of first parenthood in the study sample among those who ever reported having a child (N=2,934) and separately for males and females

Variables	Study sample	Males (N=1,435) ^a	Females (N=1,499) ^a
<i>First parenthood (year)</i>	1989	1989	1988
Age at first parenthood (among parents; ages 14 to 40) ^{***}	24.72 (5.35)	25.67 (5.23)	23.81 (5.33)
Never parented ^b ^{***}	.27	.30	.23
Parenthood was first	.14	.13	.14

^{***} $p < .001$, two-tailed tests of significance; males were significantly older than females at first parenthood ($t=-9.492$) and were significantly more likely than females to never have parented by 2004 (Chi-square=29.239).

^a Numbers of cases of males and females are of those who ever parented by 2004.

^b There were 447 females and 631 males who had never parented by 2004.

Once the years and months of first marriage, first cohabitation, and first parenthood were identified and those who had initiated their first adult families before 1979 had been dropped from the sample and the sample members who had never married, cohabited, and/or become a parent had been identified, the indicator of first family type was created. First, every sample member was assigned a value indicating the family type (marriage, cohabitation, parenthood, or no family) that had occurred first by comparing the years and months of first marriage, first cohabitation, and first parenthood variables to determine the order in which they had occurred. The respondents were organized into four groups by coding them “1” when the year of first marriage occurred before the first year of the two other events, “2” when the year of first cohabitation was first, and “3” when the year of first parenthood occurred first. Events that had not occurred were always ordered as occurring after events that had occurred so that, for instance, a respondent who was a parent but had never married and had never cohabited by 2004 was assigned a “3.” Individuals who reported no marriage, no cohabitation, and no parenthood were coded “0.”

In some cases, events occurred in the same year. When the three years were the same, the order was determined by the order of the first months. When

the month of first marriage was first, the respondent was coded “1;” when the month of first cohabitation was first, the respondent was coded “2;” and when the month of first parenthood was first, the respondent was coded “3.” Sometimes events occurred in the same year and the same month. When the three years were the same and at least two of the three months were the same, first cohabitation was assumed to have occurred before first marriage (group “2”) and first parenthood was assumed to have occurred before both first marriage and first cohabitation (group “3”) ¹². The variable has the four categories: 0 = never married, never cohabited or had a child; 1 = first marriage occurred before first cohabitation and first parenthood; 2 = first cohabitation occurred before first marriage and first parenthood; and 3 = first parenthood occurred before first marriage and first cohabitation. In the multinomial logistic regression analysis, the reference group was category 1 = first marriage occurred first. Table 3.5 shows the age and gender distribution of cases across first family type. Males were about twice as likely as females not to have formed a first family by 2004 (Chi-square = 45.455, $p < .001$).

Table 3.5. Proportions and numbers of cases (in parentheses) of the study sample across the categories of the dependent variable (first family type) by age and gender^a

<i>Variables</i>	<i>Marriage was first</i>		<i>Cohabitation was first</i>		<i>Parenthood was first</i>		<i>No family formed</i>		<i>Total</i>
	<i>prop.</i>	<i>N</i>	<i>prop.</i>	<i>N</i>	<i>prop.</i>	<i>N</i>	<i>prop.</i>	<i>N</i>	
<i>Full sample</i>	.51	(2,031)	.25	(1,012)	.14	(554)	.10	(414)	4,011
<i>Age</i>	<i>prop.</i>	<i>N</i>	<i>prop.</i>	<i>N</i>	<i>prop.</i>	<i>N</i>	<i>prop.</i>	<i>N</i>	<i>N</i>
14	.49	(532)	.27	(288)	.13	(136)	.12	(126)	1,082
15	.49	(746)	.26	(391)	.15	(220)	.10	(154)	1,511
16	.53	(754)	.23	(333)	.14	(198)	.09	(134)	1,419
<i>Gender***</i>	<i>prop.</i>	<i>N</i>	<i>prop.</i>	<i>N</i>	<i>prop.</i>	<i>N</i>	<i>prop.</i>	<i>N</i>	<i>N</i>
Male	.49	(1,012)	.24	(203)	.13	(272)	.13	(278)	2,065
Female	.52	(1,019)	.26	(509)	.14	(282)	.07	(136)	1,946

*** $p < .001$, two-tailed tests of significance, data are weighted

^a Some groups do not exactly add to their respective totals and some groups of proportions do not exactly add to 1.0 due to computational rounding.

¹² The most reasonable assumption when individuals cohabited and married in the same month and year was that cohabitation preceded marriage to the same partner. When individuals cohabited or married and became parents in the same month and year ($N=7$ and $N=3$, respectively), cohabitation or marriage preceded the birth by no more than 4 weeks. Conversely, almost the entire pregnancy preceded union formation. Thus, parenthood was assumed to have occurred before union formation. In two cases, all three events occurred in the same year and month.

Key Independent Variables

The “Key Independent Variables” were the type of substance used at ages 14 to 16 in 1979 and measures of some characteristics of alcohol, marijuana, and other illegal drug use. There were three types of substance use that were measured: alcohol, marijuana or hashish, and illegal drugs other than marijuana or hashish. Eleven variables were made using the subjects’ responses to questions on substance use that were asked in 1979 through 1998. There were six measures of “alcohol use”: (1) age at first monthly or more frequent use, (2) monthly or more frequent use began before initial family formation, (3) frequency of use in 1979, (4) incidence of binge drinking, (5) type of problem drinker relatives, and (6) number of problem drinker relatives. There were three measures of “marijuana use”: (1) age at first use, (2) use began before initial family formation and (3) frequency of use in 1979. There was one measure of “illegal drug use other than marijuana or hashish”: (1) age at first use. There was one measure of concurrent polydrug use termed “type of user in 1979” that captured both: (1) whether alcohol, marijuana, or alcohol was used in 1979 and (2) whether one, two, or all three of these types of substances were used in 1979.

Alcohol use

Age at first monthly or more frequent use. In 1982, the respondents were asked: (1) “How old were you when you first started drinking . . . two or more drinks a week?” In 1983, respondents were asked the age they started drinking (2) “at least once or twice a month” and also were asked in 1983 when they started using alcohol (3) “at least once or twice a week.” Although the extent of use asked about in these three questions differs, they all encompass drinking “at least once or twice a month.” Each sample member’s age when alcohol first was used at least once a month was identified using the responses to these three questions. Auxiliary information on past month frequency of alcohol use in the 30 days prior to the interview date between 1982 and 2002 and the sample members’ ages were used to recode some of the missing data.

In all cases where an age was reported in response to the 1982 and 1983 questions, the youngest reported age was used as the age at first use. When data

were missing on one or two of the three questions (above) and age was reported in response to the third question, that age was used as the age at first use. There remained some cases with no direct information on age at first use. In some of these cases, the age at first use was identified using information found in auxiliary variables from 1982, 1983, 1984, 1985, 1988, 1989, 1994, and 2002. The respondents were asked in each of these years: "During the last 30 days, on how many days did you drink any alcoholic beverages, including beer, wine, or liquor?" Some missing ages at first monthly or more frequent use were coded as the age in the year the question was asked when the response to the question in that year was more than "once" in the month before the interview. Respondents also were asked in those years: "How often have you had 6 or more drinks on one occasion during the last 30 days?" Again, some missing data were recoded as the age in the year the question was asked when the response to the question was more than "once" in the month before the survey. Some subjects had reported monthly or more frequent alcohol use in 1979 and an age at first use that was older than their age in 1979. The ages in these cases were recoded to be the subjects' ages in 1979.

Sample members who reported "never" drinking alcohol to all of the questions on alcohol use that they had been asked were coded as "no age at first use" (N=219)¹³. Sample members who reported drinking but less frequently than once per month also were coded as "no age at first use" (N=152). Less than .01 (N=37) of the sample was missing information on alcohol use due to non-interview in all or almost all the years when the questions on alcohol use were asked. Ages at first monthly or more frequent use ranged from younger than 10 to 39 and the modal age was 16 (Table 3.6). About .09 (N=371) had reported never drinking at least monthly. In this linear variable, ages ranged from younger than age 10 to 39 years old.

Previous research suggests that the relationships of some measures of alcohol use to some outcomes are not linear. If the relationship of age at first

¹³ In some cases, subjects had answered "never" to questions asked in some of the years but had not been interviewed in other of the relevant years. When "non-interview" was the modal reason for a missing age at first use, the case was coded as "missing." When a response of "never" was the modal reason for a missing age at first use, the case was coded as "never."

alcohol use to first family type was not linear but the variable was tested in its linear form, the findings would not accurately be interpreted (Menard 1995). Menard (1995) suggests testing for nonlinearity in the logit (Y) using the Box-Tidwell transformation. With respect to the age at first alcohol use, two Box-Tidwell tests were performed to detect nonlinearity in the relationship between the dependent variable (first family type) and the measure of age at first alcohol use, one for all the subjects who had used alcohol in 1979 (N=2,508) and one for the subjects who had used alcohol in 1979 but no other substances (N=800). These two groups were tested separately because they were separately modeled in the analyses. The procedure in this and all following Box-Tidwell tests was that a term of the form “ $(X)\ln(X)$ ” was added to the equation as the sole independent variable

Table 3.6. ALCOHOL USE: AGE AT FIRST MONTHLY OR MORE FREQUENT USE Box-Tidwell test results, Likelihood Ratio Chi-Square test statistic, weighted means and unweighted standard deviations (in parentheses) or proportions and number of cases (in parentheses); all alcohol users and users of only alcohol in 1979

<u>Age at first monthly or more frequent alcohol use</u>				
<u>multinomial logistic regression of first family type on age at first use—all users (N=2,508)</u>				
Box-Tidwell test;	no family	first parenthood	first cohabitation	
unstandardized	was formed	was first	was first	
coefficient	ns	ns	b = -.027***, Exp(b) = .974	
	Likelihood Ratio Test Chi-Square (df)—all alcohol users (N=2,508) ^a		30.168*** (3)	
<u>multinomial logistic regression of first family type on age at first use—alcohol only (N=800)</u>				
Box-Tidwell test;	no family	first parenthood	first cohabitation	
unstandardized	was formed	was first	was first	
coefficient	ns	b = .025*, Exp(b) = .1025	ns	
	Likelihood Ratio Test Chi-Square (df)—only alcohol 1979 ^a		9.213* (3)	
<u>Age at first monthly or more frequent use (ref: non-user)</u>				
	<u>all alcohol users</u>		<u>used only alcohol</u>	
	<u>mean/proportion</u>		<u>mean/proportion</u>	
age at first use				
range: <10 to 39	16.01 (2.85) ^b		16.64 (2.91) ^b	
none or low frequency	.04 (91)		.06 (52)	
<10 to 13	.09 (235)		.06 (50)	
14 to 16	.60 (1,497)		.47 (377)	
17 to 19	.20 (498)		.29 (232)	
20 to 39	.07 (188)		.11 (90)	
Total	1.00 (2,508)		1.00 (800)	

* = p < .05, *** = p < .001, two-tailed tests of significance

^a The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^b Means are among all alcohol users in 1979 and for users of only alcohol in 1979

where “ X ” = the independent variable being tested for nonlinearity in the logit (in this case that is the measure of “age at first monthly or more frequent alcohol use”) and first family type was the dependent variable (“first marriage was first” was the omitted category). Menard (1995) states: “If the coefficient for this variable [the nonlinear form of the linear independent variable in question] is statistically significant, there is evidence of nonlinearity in the relationship between $\text{logit}(Y)$ and X (p. 61). In this case, the Likelihood Ratio Test Chi-Square statistics were statistically significant, indicating nonlinear relationships (see Table 3.6).

The measure of age at first alcohol use was transformed into a categorical variable. Based on previous research, theoretically meaningful cut-points for age categories would be (1) middle school ages, (2) high school ages, (3) college ages, and (4) older than traditional college age. A series of Chi-Square tests was performed testing for the statistical significance of the differences in the distributions of cases across first family type among pairs of all of the ages to determine where the most statistically meaningful cut-points for categories might be. The distribution of cases that had “no age at first use” across the categories of first family type was not significantly different from the distribution of cases with “less than monthly use” and these two groups were combined. The group of cases with missing data was significantly different from all ages and from the groups where there was no use and low frequency use. Since the proportion of the sample with missing data was very small (.01, $N=37$), and rule of thumb argues that the presence or absence of these cases would not influence analytical findings (Cohen and Cohen 1983), the group of cases with missing data was combined with the group that had never used or had used less often than monthly ($N=408$).

The ages were grouped to reflect both research precedence and the findings of the Chi-Square tests and dummy variables were made as follows: (1) 1 = monthly or more frequent use began younger than 10 to 13 years old, 0 = first used at older ages, no use, less than monthly use, or missing data; (2) 1 = monthly or more frequent use began at ages 14 to 16, 0 = first used at other ages, no use, less than monthly use, or missing data; (3) 1 = monthly or more frequent use began at ages 17 to 19, 0 = first used at other ages, no use, less than monthly use, or missing data; and (4) 1 = monthly or more frequent use began at ages 20 to 39,

0 = first used at younger ages, no use, less than monthly use, or missing data. In the analysis, the variables were analyzed as a set and “no use, less than monthly use, or missing data” was omitted as the reference category.

Frequency of use in 1979. The measure of the frequency of alcohol use in 1979 was derived from responses to the question asked in 1980¹⁴: “In the past year, how many times did you drink beer, wine, or liquor without your parents’ permission?” Responses were: (1) 0, (2) once, (3) twice, (4) 3 to 5 times, (5) 6 to 10 times, (6) 11 to 50 times, and (7) more than 50 times. There were 122 sample members who did not answer the question and 107 sample members who were not interviewed in 1980. Responses from the *age at first monthly or more frequent alcohol use* measure described above were cross-checked to responses to this question so that all the cases that reported an age at first monthly or more frequent use that was their age in 1979 also were coded to have a 1979 frequency of “11 to 50 times.” About .06 of the sample was missing data and about .32 did not use alcohol in 1979.

Crosstabulations with Chi-Square tests found no significant differences in the distributions of cases across first family type among the types of missing data (refusals and non-interviews) and no differences between any of the types of missing data and those who did not use alcohol in 1979. There also were no significant differences among those who reported using “once,” “twice,” and “3 to 5 times.” Those who reported using “6 to 10 times” were not significantly different from those who reported using “11 to 50 times” in 1979. However, those who had used “51 or more times” were significantly different from all the other groups. A dummy variable set was made where: (1) 1 = those who used once, twice, and three to five times, 0 = no use, missing data, and higher frequency users; (2) 1 = those who used 6 to 10 times and those who used 11 to 50 times, 0 = no use, missing data, lower frequency users, and higher frequency users; and (3) 1 = those who used 51 or more times in 1979, 0 = no use, missing data, and those

¹⁴ It is reasonable to characterize “past year use” as use in 1979 since all of the subjects were interviewed between January and March of 1980.

who used at lower frequencies. In the analysis, no use and missing data were omitted (Table 3.7).

Table 3.7. ALCOHOL USE: FREQUENCY OF USE IN 1979 Weighted mean and unweighted standard deviation (in parentheses) or proportions and numbers of cases in the study sample

<i>Frequency of alcohol use in 1979</i>	<i>Mean/proportion</i>	<i>Number of cases</i>
alcohol use in 1979; range: 1 to 6 ^a	3.55 (1.70)	2,508
once, twice, or 3 to 5 times	.31	1,247
6 to 10 or 11 to 50 times	.23	927
51 or more times	.08	334
none	.29	1,146
missing	.09	357
Total	1.00	4,011

^a Mean is among the 2,508 users in 1979 who used once, twice, 3-5 times, 6-10 times, 11-50 times, or 51 or more times and is about halfway between 3 to 5 times and 6 to 10 times.

Incidence of binge drinking. The incidence of binge drinking was a measure of whether the respondents had a binge drinking experience. The variable was measured using responses to the 1982 question: “How often have you had 6 or more drinks on one occasion in the last 30 days?” Responses ranged from “0” to “ten or more” times. Respondents who answered “one” to “ten or more” times were coded “1” and respondents who answered “0” times and “never” were coded “no.”

About .03 of the sample (N = 112) was not interviewed in 1982. Responses to these same questions on binge drinking asked in 1983 and in 1984 were used to recode 61 of these missing values, leaving about .01 (N = 51) of the sample with missing data. All of these 51 cases were not interviewed in 1982, 1983, and 1984, there was no reason to believe they had ever had a binge drinking experience by 1984, and they were coded “0.” About .38 of the sample had experienced binge drinking (Table 3.8).

Table 3.8. ALCOHOL USE: INCIDENCE OF BINGE DRINKING Proportions and numbers of cases in the study sample

<i>Incidence of binge drinking</i>	<i>Proportion</i>	<i>N</i>
experienced binge drinking by 1982	.38	1,534
did not experience binge drinking	.62	2,477
Total	1.00	4,011
proportion of binge drinkers before initial family formation	.99	4,003

Because of the timing of the questions about binge drinking after 1979-80, there was concern about the temporal order of binge drinking and initial family formation. The measure of binge drinking was crosstabulated with the variable of *monthly or more frequent alcohol use before family formation*. About .99 of the cases that had reported binge drinking also had reported monthly or more frequent alcohol use began before initial family formation. Since .90 of the alcohol users in the sample had used before initial family formation and substantially all the binge drinkers were in that group, the most reasonable conclusion would be that the proportion of the sample that had experienced binge drinking did so before initial family formation. In the analysis, a dichotomous indicator was used where 1 = yes and 0 = no binge drinking.

Type of problem drinker relatives. In 1988, the respondents were asked two questions about their exposure to the alcohol use of up to seven relatives. They were asked to respond “yes” or “no” to the question: “Have any of your relatives [from the 21 types of relatives listed on a card] been alcoholics or problem drinkers at any time in their lives?” Respondents who answered “yes” were asked: “Please tell me the relationship [from the options on the card] to you of your . . . relative who, in your judgment, has been an alcoholic or problem drinker at any time in their life.” The responses to these two questions were used to make a categorical variable indicating the type of relative that the respondent assessed as “an alcoholic or problem drinker.”

When these questions were asked in 1988, there were 332 cases (.08 of the sample) that were not interviewed. The CHRR “reason for non-interview” variable for the 1988 survey indicates that about one-half of these cases had refused further participation in the study and the other half were subjects who were deceased, not located, gave other reasons not to participate, or were hostile toward and terminated from participation by the interviewer¹⁵. The distribution of these cases with missing data across first family type was significantly different

¹⁵ There were 174 cases that refused to participate, 59 that could not be located, 48 deceased, 22 terminated by the interviewer, and 28 who did not participate for other reasons (see NLS News 2007).

from those who had at least one relative who was a problem drinker (Chi-Square = 224.028, $p < .001$) and from those who had no relatives who were problem drinkers (160.560, $p < .001$). Because these cases were missing for specific reasons that set them apart from the rest of the study sample (for example, they were uncooperative) and, indeed, their pattern of initial family formation was significantly different from the respondents, they could not be considered to be missing completely at random. Also, Little's MCAR (missing completely at random) test performed using SPSS 14.0 Missing Data Analysis was statistically significant (Chi-Square = 147.174, $df = 28$, $p < .001$), indicating that the missing data were not missing completely at random¹⁶.

In response to these findings, it seemed most reasonable to retain the missing data as a dummy variable (representing those not interviewed in 1988). Since it was unknown whether the data were missing for reasons related to first family type and/or any of the control variables or whether any of the sample members would have reported an alcoholic relative if asked, this approach may have underestimated the proportion of the sample with problem drinker fathers, mothers, or other relatives, resulting in misleading findings (Cohen and Cohen 1983:280). However, the alternative methods of dealing with these missing values—dropping the variable, dropping the cases, modal imputation, and expectation-maximization imputation—were less appealing.

To identify the types of problem drinker relatives for each case, responses to all seven questions were used. The relatives that were of particular interest were “biological father” and “biological mother.” Also of interest were cases where there were “other” relatives—which included step-parents, siblings and step-siblings, and extended family members. Table 3.9 shows the distribution of the sample in the categories that were used to make the five-variable set of dummy variables for the analysis: (1) 1 = the biological father but not the biological mother had been a problem drinker, 0 = all others; (2) 1 = the biological mother but not the biological father had been a problem drinker, 0 = all others; (3) 1 = both the biological father

¹⁶ Little's MCAR Test was performed on the variables regarding relatives 1 through 6 that indicated: “. . . the relationship . . . to you of your . . . relative who, in your judgment, has been an alcoholic or problem drinker at any time in their life.”

and biological mother had been problem drinkers, 0 = all others; (4) other relatives (but neither biological parent) had been problem drinkers, 0 = all others; and (5) 1 = not interviewed in 1988, 0 = respondents. The omitted category was “no relatives were problem drinkers.”

Table 3.9. ALCOHOL USE: TYPE OF PROBLEM DRINKER RELATIVES Proportions and number of cases in the study sample^a

<i>Type of problem drinker relatives (ref: no relatives were problem drinkers)</i>	<i>Proportion</i>	<i>Number of cases</i>
father but not mother was a problem drinker	.15	611
mother but not father was a problem drinker	.02	99
mother and father both were problem drinkers	.01	50
other relatives were problem drinkers	.27	1,080
no relatives were problem drinkers	.46	1,839
subject not interviewed in 1988	.08	332
Total	1.00	4,011

^aTotal does not add to 1.00 due to computational rounding

Number of problem drinker relatives. Subjects who indicated that none of their relatives were problem drinkers were identified using the “no” responses to the 1988 question: “Have any of your relatives . . . been problem drinkers or alcoholics at any time in their lives?” The number of problem drinker relatives among those who had responded “yes” to the above question was calculated by summing the number of times that any family member had been indicated in response to the question: “Please tell me the relationship . . . to you of your . . . relative who, in your judgment, has been an alcoholic or problem drinker at any time in their life.” Table 3.10 shows that about .46 of the sample had no relatives they believed to have been problem drinkers and about .08 of the sample was not interviewed in 1988. Of the remaining .46 of the sample, about .24 reported one family member, .12 reported two family members, .05 reported three family members, and .05 reported four or more family members were problem drinkers.

Box-Tidwell tests were performed to test for nonlinearity in the logit (see Menard 1995). The Likelihood Ratio statistic for the nonlinear term was statistically significant (see Table 3.10). These findings suggested that the relationship was not linear. A series of crosstabulations with Chi-Square tests were performed to assess the statistical significance of the differences among the groups across the

categories of first family type. No significant differences in first family type were found among the groups that had reported one, two, three, or four problem drinker relatives and these cases were combined into one group. There also were no significant difference between those with five and those with six problem drinker relatives and the two groups were combined. A dummy variable set was made to

Table 3.10. ALCOHOL USE: NUMBER OF PROBLEM DRINKER RELATIVES Box-Tidwell Test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic; proportions and number of cases in the study sample

<i>Number of problem drinker relatives</i>			
<i>multinomial logistic regression of first family type on number of problem drinker relatives</i>			
Box-Tidwell test;	no family	first parenthood	first cohabitation
unstandardized	<u>was formed</u>	<u>was first</u>	<u>was first</u>
coefficient	ns	b = .072**, Exp(b) = 1.074	b = .049*, Exp(b) = 1.050
Likelihood Ratio Test Chi-Square (df) ^a		17.757*** (3)	
<i>Number of problem drinker relatives</i>			
	<i>Proportion</i>	<i>Number of cases</i>	
no problem drinker relatives	.46	1,850	
one problem drinker relatives	.24	963	
two problem drinker relatives	.12	477	
three problem drinker relatives	.05	192	
four problem drinker relatives	.03	117	
five problem drinker relatives	.01	35	
six problem drinker relatives	.01	44	
subject not interviewed in 1988	.08	332	
Total^b	1.00	4,011	

* = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^b Totals do not add to 4,011 due to computational rounding.

reflect this categorization where: (1) 1 = one, two, three, or four relatives were problem drinkers, 0 = none, more than four, or missing data; (2) 1 = five or six relatives were problem drinkers, 0 = none, fewer than five, or missing data ; and (3) 1 = missing data, 0 = responses. In the analysis, “no relatives were problem drinkers” was the omitted category.

Marijuana use

Age at first use. In 1984, 1988, 1992, 1994, and 1998 the question was asked: “When [what year/age¹⁷] did you use marijuana or hashish for the first

¹⁷ In 1984, both the year at first use and the age at first use were asked; in subsequent years, the survey question asked only for the age at first use.

time?” The responses to these questions were used to identify the age at first marijuana use by assigning to each sample member the youngest age he/she had reported. If data were missing in one or more years, the youngest age reported among the responses provided in the other years was used. Some cases with missing data on all five questions were coded with auxiliary data on how recently marijuana had been used. For instance, if in 1984 the respondent had reported 1979 as the most recent year marijuana was used, that respondent’s age at first use was coded as that respondent’s age in 1979.

Also, data on the frequency of marijuana use in 1979, 1984, 1988, 1992, 1994, and 1998 were used to identify ages at first use in other cases with missing data—the youngest age when a frequency was reported was used as the proxy age at first use. The respondents also were asked in 1984, 1988, 1992, 1994 and 1998 to estimate the extent of their lifetime marijuana use. Some remaining cases with missing data that had reported lifetime use in 1984 were coded their ages in 1984, followed by 1988, 1992, 1994, and 1998. Individuals who had reported a “most recent” age and also a “frequency of use” were coded the age that was the younger of the two (or more) reports.

Sample members who had *in every relevant survey* reported “0” times, “never used,” or who had legitimately skipped the questions because of “non-use” in the screening question, were coded as “never used.” Those who were not interviewed *in every relevant survey* were coded as “missing.” Those who had reported “0,” “never,” or had legitimately skipped the questions in three or four of the surveys and were not interviewed in two or one of them were coded as “never used.” and those who were not interviewed in three or four of the surveys and had responded “never,” “0,” or had legitimately skipped the questions in two or one of the years were coded as “missing.” About .18 of the sample had never used and data were missing on about .04 of the sample. Ages ranged from under age 10 (88 cases) to age 35. The mean age at first use among those who had ever used was 14.73; the mode was 14 (see Table 3.11).

Table 3.11. MARIJUANA USE: AGE AT FIRST USE Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean^a and unweighted standard deviation (in parentheses) or proportions and numbers of cases in the sample

<u>Age at first marijuana use</u>			
<i>multinomial logistic regression of first family type on age at first marijuana use</i>			
Box-Tidwell test;	no family	first parenthood	first cohabitation
unstandardized coefficient	<u>was formed</u>	<u>was first</u>	<u>was first</u>
	ns	b = .011***, Exp(b) = 1.011	b = .014***, Exp(b) = 1.014
Likelihood Ratio Test Chi-Square (df) ^b = 50.753*** (3)			
<u>Age at first marijuana use (ref: non-user)</u>			
age at first use	<u>mean/proportion</u>		<u>Number of cases</u>
range: <10 to 35	14.73 (3.04)		3,085
never used	.18		749
<10 to 13	.22		906
14 to 16	.39		1,594
17 to 19	.11		455
20 to 35	.03		130
missing data	.04		176
Total^c	1.00		4,011

*** = $p < .001$, two-tailed tests of significance

^a The mean is among the .77 (N=3,085) of the sample that had ever used

^b The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^c Totals do not add to 1.00 or 4,011 due to computational rounding.

A Box-Tidwell test (Menard 1995) found evidence of nonlinearity in the logit (see Table 3.11). To retain in the analysis the .04 of the sample with missing data, account for the .18 of the sample with no marijuana use (i.e., no age at first use), and accommodate the apparent nonlinear relationship between the measure of age at first use and first family type, the measure was categorized and transformed into a dummy variable set (see Cohen and Cohen 1983). Cross-tabulations with Chi-Square tests found no significant differences among the ages across the categories of first family type. Cut-points for categorization were the same as the cut-points used to transform the age at first monthly or more frequent alcohol use measure described above in anticipation of interpretative comparability in the analysis. The set of dummy variables was: (1) 1 = under age 10 to age 13, 0 = all others; (2) 1 = ages 14 to 16, 0 = all others; (3) 1 = ages 17 to 19, 0 = all others; (4) 1 = ages 20 to 35, 0 = all others; and (5) 1 = cases with missing data, 0 = cases with data. These dummy variables were analyzed as a set and the category of “non-users” was omitted and used as the reference group.

Frequency of use in 1979. The frequency of marijuana use in 1979 was measured with responses to the 1980 question: “How many times did you smoke marijuana or hashish in the past year?” Response categories were: “0 = never,” “once,” “twice,” “3 to 5 times,” “6 to 10 times,” “11 to 50 times,” and “6 = more than 50 times.” About .02 of the study sample did not answer the question and about .03 was not interviewed in 1980. Information on marijuana use in 1979 that was gathered in subsequent interviews was used to recode some of the missing data due to refusal and non-interview in 1980 and some “never” responses. Subjects with missing data whose age at first marijuana use was their age in 1979 were assumed to have used at least once in 1979 and were coded “once.” Subjects with missing data who reported the most recent year of use was 1979 were coded “once.” Subjects with missing data who reported “never” or “0” times to questions about ever using consistently across the interviews were coded “0” times in 1979 and subjects who reported marijuana use only after 1979 were coded “0” times in 1979. Table 3.12 describes the distribution of the sample with respect to the 1979 frequency of marijuana use.

Table 3.12. MARIJUANA USE: FREQUENCY OF USE IN 1979 Weighted mean and unweighted standard deviation (in parentheses) or proportions and numbers of cases^a

<i>Frequency of marijuana use in 1979</i>	<i>Mean/Proportion</i>	<i>Number of cases</i>
marijuana use in 1979; range: 1 to 6 ^b	3.11 (2.01)	2,040
never used	.19	749
first used after 1979	.26	1,045
<i>Sub-total (non-users in 1979)</i>	<i>.45</i>	<i>1,794</i>
once	.20	787
twice	.04	146
3 to 5 times	.07	270
6 to 10 times	.04	152
11 to 50 times	.06	253
51 or more times	.11	432
<i>Sub-total (users in 1979)</i>	<i>.52</i>	<i>2,040</i>
<i>missing data</i>	<i>.04</i>	<i>176</i>
<i>Total</i>	<i>1.00</i>	<i>4,011</i>

^a Totals do not add to 1.00 or 4,011 due to computational rounding

^b The mean category is among the 2,040 users in 1979 and was about 3 to 5 times in 1979

Then, the adjacent categories of frequencies were tested for significant differences across the categories of first family type to determine if some groups of

frequencies could be combined for the analysis. Those who had used “twice” and “3 to 5 times” were combined and those who had used “11 to 50 times” and “51 or more times” were combined. The groups were then transformed into a dummy variable set, as follows: (1) 1 = used once in 1979, 0 = no use, used more than once, or missing data; (2) 1 = used twice to five times in 1979, 0 = used less than twice, more than five times, or missing data; (3) 1 = used 6 to 10 times in 1979, 0 = used less than 6 times, more than 10 times, or missing data; (4) 1 = used 11 to 51 or more times in 1979, 0 = used less than 11 times or missing data; and (5) 1 = missing data on frequency of marijuana use in 1979, 0 = used in 1979 or no use in 1979. In the final analysis, “no use” was omitted and used as the reference category.

Other illegal drug use

Age at first use. The age when any of 10 illegal drugs other than marijuana first was used was measured with responses to the questions asked in 1984¹⁸ about the illegal drugs listed on Table 3.13: “How old were you the first time you used [name of drug] on your own without a doctor telling you to take it?” The age at first use of cocaine also was asked in 1988, 1992, 1994, and 1998 and the age at first use of “crack” cocaine was asked in 1992, 1994, and 1998. The respondents also were asked about illegal drug use in 1979 and auxiliary variables provided some indirect information on the subjects’ age at first use. To identify the age at first use of any type of illegal drug other than marijuana, the youngest age that was reported with respect to all 10 illegal drugs was used.

¹⁸ Mensch and Kandel (1988) compared the quality of the 1984 NLSY79 reports of illegal drug use with reports in other national surveys. Their findings suggested underreporting of use of illegal drugs in the NLSY79 1984 survey. They suggested that familiarity with the interviewer (measured by the number of prior interviewer contacts) had depressed drug use reporting. The measure of “age at first use” of illegal drugs other than marijuana constructed for this study, while based on 1984 reports of use of illegal drugs, also used information from five other surveys, one of which was the first contact between interview and respondents (1979), to obtain the most accurate information possible.

Table 3.13. OTHER ILLEGAL DRUGS: TYPES OF ILLEGAL DRUGS USED IN 1979
Proportions and numbers of cases in the study sample^a

<i>Illegal drugs other than marijuana used in 1979</i>		
<i>Type of illegal drug</i>	<i>Proportion</i>	<i>Number of cases</i>
amphetamines or stimulants like uppers, speed, diet pills	.01	48
barbiturates (sedatives); e.g. downers, quaaludes, seconal	< .01	2
tranquilizers like Librium or Valium	< .01	3
psychedelics like LSD, PCP, mescaline, peyote, angel dust	< .01	10
heroin	< .01	0
cocaine	.01	41
“crack” (“rock”) cocaine	< .01	1
other narcotics; e.g., codeine, morphine, methadone, opium	< .01	1
inhalants like glue, aerosoles, or poppers	< .01	3
other illegal drugs	.16	660
non-user	.81	3,243
Total^b	1.00	4,011

^a Specific types of illegal drugs used in 1979 were retrospectively reported; “other illegal drugs” was reported as a general category of substance use in response to the question asked in 1980.

^b Total does not add to 4,011 due to computational rounding.

About .03 of the sample was missing data (N=137) and about .62 (N=2,479) had never used illegal drugs other than marijuana. The cases with missing data were significantly less likely than the respondents to marry or cohabit first and significantly more likely than the respondents that no family had been formed by 2004. As Table 3.14 shows, ages at first use ranged from younger than 10 to 34 years old among the .35 of the sample that had used at some point between 1979 and 1998 (the range of years for which data were available). The mean age at first use among users was 16.46.

A Box-Tidwell test for nonlinearity in the logit found that the nonlinear term made a statistically significant contribution to the model (see Table 3.14). The measure was transformed into a categorical variable with cut points as close as possible to those used for the age at first marijuana use and the age at first monthly or more frequent alcohol use. The dummy variable set was: (1) 1 = under age 10 through 14 years old, 0 = older ages at first use, no use, and missing data; (2) 1 = 15 and 16, 0 = younger ages, older ages, no use, and missing data; (3) 1 = 17 to 19, 0 = younger ages, older ages, no use, and missing data; (4) 1 = 20 to 35; 0 = younger ages, no use, and missing data; and (5) 1 = missing data, 0 = data. In the analysis, “no illegal drug use” was omitted as the reference group.

Table 3.14. OTHER ILLEGAL DRUG USE: AGE AT FIRST USE Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean^a and unweighted standard deviation (in parentheses) or proportions and numbers of cases

<i>Age at first use of illegal drugs other than marijuana</i>			
<i>multinomial logistic regression of first family type on age at first illegal drug use</i>			
Box-Tidwell:	<u>no family</u>	<u>first parenthood</u>	<u>first cohabitation</u>
coefficients;	<u>was formed</u>	<u>was first</u>	<u>was first</u>
odds ratios	b = .006*; Exp(b) = 1.006	b = .011***; Exp(b) = 1.011	b = .017***; Exp(b) = 1.017
Likelihood Ratio Test Chi-Square (df)^b = 102.195*** (3)			
<i>Age at first illegal drug use (ref: non-user)</i>			
	<u>mean/proportion</u>	<u>number of cases</u>	
age at first use; range: <10 to 34	16.46 (2.88)	1,394	
never used	.62	2,479	
<10 to 14	.05	187	
15 to 16	.18	713	
17 to 19	.09	355	
20 to 34	.03	139	
missing data	.03	137	
Total^c	1.00	4,011	

* = $p < .05$, *** = $p < .001$, two-tailed tests of significance

^a The mean is among the .35 (N=1,394) of the sample that had ever used these drugs

^b The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^c The total does not add to 4,011 due to computational rounding.

Concurrent polydrug use in 1979. The measure of concurrent polydrug use in 1979 was a categorical indicator of mutually exclusive categories termed “type of use in 1979” that identified a sample member as a user in 1979 of alcohol, marijuana, other illegal drugs, or combinations of these substances. Three variables were used to categorize the subjects by their type of use: (1) the frequency of alcohol use in 1979, (2) the frequency of marijuana use in 1979, and (3) whether use of any of the 10 illegal drugs other than marijuana had occurred in 1979. To identify the users of illegal drugs in 1979, all the respondents who had provided an age in response to the questions about the age at first illegal drug use that was their age in 1979 and the respondents who had responded “once” or more to the 1980 question: “How many times in the past year did you use any drugs or chemicals to get high or for kicks, except marijuana?” were coded “used in 1979 = 1.” About .19 of the sample had done so at least once.

This measure of illegal drug use in 1979 was then used with the measure of the frequency of alcohol use in 1979 and the measure of the frequency of marijuana use in 1979 to sort the sample into categories according to type of

substance(s) that were used in 1979. Table 3.15 shows the distribution of the sample both by the type of substance(s) used in 1979 and whether multiple types were used in 1979 in these categories: (1) non-use, (2) alcohol only use, (3) marijuana only use, (4) use of only other illegal drugs, (5) use of alcohol and marijuana, (6) use of other illegal drugs and alcohol, (7) use of other illegal drugs and marijuana, (8) use of alcohol, marijuana, and illegal drugs, and (9) too little information provided to code. In some cases, there was information on the substance use of one or two of the substances but not on the third or there was information on the use of one out of the three substances. In these cases, when

Table 3.15. OTHER ILLEGAL DRUGS: CONCURRENT POLYDRUG USE IN 1979 Type of use in 1979. Proportions and numbers of cases in the study sample that used alcohol, marijuana, and/or other illegal drugs in 1979

<i>Alcohol, marijuana, and other illegal drugs used in 1979</i>		
<i>Type of use</i>	<i>Proportion</i>	<i>Number of cases</i>
no alcohol, marijuana, or illegal drug(s)	.22	876
alcohol	.20	800
marijuana	.08	315
alcohol and marijuana	.26	1,025
illegal drug(s)^a	< .01	20
illegal drug(s) and alcohol^a	.01	48
illegal drug(s) and marijuana^a	.02	65
alcohol, marijuana, and other illegal drug(s)	.16	635
missing data	.06	227
Total	1.00	4,011
<i>Tests of differences in distributions of cases across the categories of first family type among three small groups of use of only illegal drugs, illegal drugs and alcohol, and illegal drugs and marijuana</i>		
	<i>Chi-Square</i>	<i>p-value</i>
alcohol and illegal drugs <i>by</i> marijuana and illegal drugs	4.600	.204
alcohol and illegal drugs <i>by</i> only illegal drugs	2.261	.520
marijuana and illegal drugs <i>by</i> only illegal drugs	6.242	.100
<i>between three small groups of use of illegal drugs and group that used all three substances</i>		
alcohol and other illegal drugs <i>by</i> use of all three substances	9.276	.026
marijuana and illegal drugs <i>by</i> use of all three substances	9.190	.027
only other illegal drugs <i>by</i> use of all three substances ^b	13.071	.004

^a In the analysis, all the users of illegal drugs other than marijuana except for users of all three substances (bolded) were combined into one group for analysis, about .02 of the sample (N=133)

the existing information was “no use” and two were missing, the case was coded as “missing” and when the existing information was “no use” on two and was missing on the third, the case was coded as “non-use.” When the existing

information was a frequency of use, the case was coded as though the missing information was “no use.” For instance, when there was marijuana use and alcohol use in 1979 but missing information on other illegal drug use, the case was coded as “use of alcohol and marijuana” (as though there was no illegal drug use) and when there was a frequency of illegal drug use with missing information on both alcohol and marijuana use the case was coded as “use of only other illegal drugs.”

Because three of the four groups that had used illegal drugs other than marijuana were too small for meaningful analysis (see Table 3.15), a series of crosstabulations with Chi-Square tests were performed to assess whether their distributions of cases across the categories of first family type were significantly different. Table 3.15 shows that there were no statistically significant differences among the three small groups of users that used (1) other illegal drugs and alcohol, (2) other illegal drugs and marijuana, and (3) only other illegal drugs. However, there were significant differences between each of these three groups and the group that had used all three types of substances in 1979. The most reasonable conclusion to draw from these findings would be that the three small groups were similar enough to be combined into one group but that the group that had used all three substances should stand alone. The three were then combined into a category of 133 cases, about .03 of the sample. The group of cases with missing data was significantly different from all other groups in its distribution across the dependent variable and was handled as a separate group (see Cohen and Cohen 1983).

The indicator was transformed into a set of six dummy variables: (1) 1 = used only alcohol in 1979, 0 = marijuana use, other illegal drug use, no use, missing data; (2) 1 = used only marijuana in 1979, 0 = alcohol use, other illegal drug use, no use, missing data; (3) 1 = used alcohol and marijuana in 1979, 0 = other illegal drug use, no use, missing data; (4) 1 = used illegal drugs alone or with alcohol or with marijuana but not with both in 1979, 0 = no illegal drug use, no use, missing data; (5) 1 = used alcohol, marijuana, and other illegal drugs in 1979, 0 = other combinations of use, no use, missing data; (6) 1 = missing data, 0 = data. In the analysis, “no use” was omitted and used as the reference category.

Control Variables

Prior research has established that individuals' paths into their first adult family roles depend on a complex of factors. To assess the influences that alcohol and illegal drug use may have had on the first family type, the effects of some of these factors were controlled: (1) two measures of "physical characteristics"; (2) six "family background factors"; (3) "rural and South regional residence"; (4) two "socio-cultural indicators"; (5) nine "attitudinal measures"; and (6) seven "behavioral measures."

Physical characteristics

Age. The respondents' ages at the 1979 interviews were measured in years by responses to the 1979 question: "Exactly how old are you as of today?" The proportional distribution and numbers of cases of 14, 15, and 16 year olds in the sample are shown in Table 3.16. For use in the analysis, two dummy variables were made: (1) 1 = age 14, 0 = ages 15 and 16 and (2) 1 = age 15, 0 = ages 14 and 16. The group of cases that were "age 16" was omitted and used as the reference category in the analysis.

Table 3.16. PHYSICAL CHARACTERISTICS: AGE Weighted mean and unweighted standard deviation (in parentheses) or proportions and numbers of cases in the sample

<i>Age (ref: age 16)</i>	<i>Mean/proportion</i>	<i>Number of cases</i>
age in 1979; range: 14 to 16	15.08 (.77)	
14	.27	1,082
15	.38	1,512
16	.35	1,418
<i>Total^a</i>	<i>1.00</i>	<i>4,011</i>

^a The total does not add to 4,011 due to computational rounding.

Body Mass Index (BMI). The measure of BMI was calculated using data gathered in the 1981, 1982, and 1983 interviews on: (1) the heights and weights of the respondents, (2) gender, and (3) age in 1979. Using the height and weight information, the American Heart Association BMI formula (American Heart Association Body Composition Tests, www.americanheart.org) was followed to calculate a BMI score for each sample member. BMI scores ranged from 13.48 to 37.56. A Box-Tidwell test for nonlinearity was performed and the nonlinear term

was statistically significant, indicating nonlinearity in the relationship of BMI and first family type (see Table 3.17).

Table 3.17. PHYSICAL CHARACTERISTICS: BODY MASS INDEX Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean and unweighted standard deviation (in parentheses) or proportions and numbers of cases

<u>Body Mass Index</u>				
<i>multinomial logistic regression of first family type on Body Mass Index</i>				
Box-Tidwell:	no family	first parenthood	first cohabitation	
coefficients;	was formed	was first	was first	
odds ratios	b = .017***; Exp(b) = 1.017	b = .011**; Exp(b) = 1.011	ns	
Likelihood Ratio Test (Chi-Square (df)) ^a = 29.605*** (3)				
<i>Body Mass Index (ref: healthy weight)</i>				
	<i>mean/proportion</i>		<i>number of cases</i>	
Body Mass Index; range: 13.48 to 37.56	21.78 (3.32)		4,011	
least healthy	.07		272	
less healthy	.16		646	
healthy	.77		3,093	
<i>age</i>	<i>healthy weight</i> <i>(5th to 85th ntiles)</i>	<i>less healthy</i> <i>(overweight)</i>	<i>least healthy</i> <i>(under and obese)</i>	<i>Total</i>
age 14	.74	.19	.07	1.00
age 15	.79	.15	.06	1.00
age 16	.78	.15	.07	1.00
Chi-Square (df) = 12.126* (4)				
<i>gender</i>				
male	.71	.21	.08	1.00
female	.83	.11	.06	1.00
Chi-Square (df) = 87.415*** (2)				

* = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance, weighted study sample

^a The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^c The total does not add to 4,011 due to computational rounding.

The CDC calculation of BMI for children and youth—calculating by gender and age—yields a more stable indicator than the height and weight BMI used for adults. Moreover, its wide healthy range (between the 5th and 85th percentiles) suggests that, while the 1981 measures of height and weight likely overestimated the 1979 height and weight of some respondents, a “healthy” BMI score in 1981 most likely indicates a “healthy” BMI in 1979. For the 37 cases with missing data, BMI scores were calculated identically to those with complete 1981 data but using 1982, 1983 and, in a few cases, 1985 data on height and weight. All of these BMI scores were in the “healthy” BMI percentile range on the “CDC BMI-for-Age Growth Charts for Males [or Females] Two to 20 Years Old” (Centers for Disease

Control and Prevention, www.cdc.gov) and they were recoded at the unweighted mean BMI score of the calculated scores (22.00), a “healthy” BMI.

Then, the Center for Disease Control (CDC) BMI-for-Age Growth Charts for Males and Females Two to 20 Years Old (www.cdc.gov) were applied to the calculated BMI scores to group them by age and gender. The BMI scores were categorized into four groups, each representing one of the CDC categories: (1) “underweight,” (2) “healthy weight,” (3) “overweight,” and (4) “obese.” There were only 46 cases in the “underweight” group. While the distribution of those cases across the categories of first family type was significantly different from those on the “healthy weight” group (Chi-square=8.908, $p=.031$), the distribution was not significantly different from the distribution of the “obese” group (Chi-square=3.764, $p=.228$). From a health perspective, it was reasonable to conclude that the cases in the bottom .05 and the top .05 of BMI scores represented the least healthy BMI. Based on that reasoning, these two groups, “underweight” and “obese,” were combined into one group.

The final three-category variable was transformed into a dummy variable set where: (1) 1 = least healthy BMI (lowest .05 and highest .05 of the scores), 0 = healthier and (2) 1 = less healthy (“overweight” group), 0 = least healthy or healthy. In the analysis, the “healthy weight” group was the reference category. Table 3.17 describes BMI by age and gender. The 14-year-olds were significantly less likely than the older sample members and the males were significantly less likely than females to have a healthy BMI. Males were about twice as likely as the females to be “less healthy” but there was little difference in “least healthy” by gender.

Family background factors

Two types of family background factors were controlled: (1) socioeconomic status and (2) family structure. The socioeconomic status variables were: (a) a dichotomous indicator of “family poverty status” in 1978 and (b) a Two-factor Social Status Index that combined educational attainment and occupational type of the subject’s mother in 1979, and (c) a Two-factor Social Status Index that combined educational attainment and occupational type of the subject’s father in 1979. The family structure variables were: (a) co-residence of the subject and her

or his biological mother as of the 1979 interview date, (b) co-residence of the subject and her or his biological father as of the 1979 interview date, and (c) the number of co-residential siblings as of the 1979 interview date.

Socioeconomic status: family poverty status in 1978. Family poverty status in 1978 was assessed by the CHRR. Respondents were identified as being in poverty when the total family income from all sources in calendar year 1978 was below the official poverty level using 1978 Poverty Income Guidelines (NLSY79 User's Guide, 2004). The CHRR did not calculate the poverty status of those respondents who lacked key income information on total net family income in 1978. Consequently, about .08 (N=310) of the sample was missing data on poverty status in 1978. Auxiliary variables on government subsidies received in that year were used to assess poverty status and recode the missing values¹⁹. Respondents who reported one or more such source of government support were placed "in poverty" while respondents who reported no subsidies were placed "not in poverty." No missing data remained. About .16 of the sample was "in poverty" in 1978 (see Table 3.18). The variable was coded 1 = in poverty, 0 = not in poverty.

Table 3.18. FAMILY BACKGROUND FACTORS: FAMILY POVERTY STATUS IN 1978
Proportions and numbers of cases in the sample

<i>Family poverty status in 1978 (ref: not in poverty)</i>		
	<u>Proportion</u>	<u>Number of cases</u>
in poverty 1978	.16	621
not in poverty	.84	3,390
Total	1.00	4,011

Socioeconomic status: mother's (and father's) Two-factor Social Status Index. The socioeconomic status of each of the subjects' parents was measured with a modified version of the Four-Factor Index of Social Status (Hollingshead 1975) that was termed the "Two-factor Social Status Index." Hollingshead's Index continues to be used either as it originally was formulated or

¹⁹ The types of public assistance were: "AFDC," food stamps, general assistance, housing or rent subsidies, Social Security, and "other" welfare.

in a modified form to assess the relationship of socioeconomic status to various outcomes among children and adolescents (Hanson and Chen 2007).

Hollingshead combined information on each parent's (1) gender, (2) marital status, (3) number of years of educational attainment, and (4) occupational prestige into one score. In this study, mother's and father's socioeconomic status was separately measured for two reasons. First, previous research has found that mothers and fathers have uniquely different effects on their children's socialization, attitudes, and behaviors relevant to family formation (Campa and Eckenrode 2006). Second, preliminary analysis found that many of the subjects' parents did not live together. About .28 of the sample did not live with the biological father in 1979 and .07 did not live with the mother in 1979. Yet, the marital status of the parents at the subjects' age 14 or in 1979 was not known. As a result, mothers' and fathers' Social Status Index scores were separately calculated using two factors: (1) number of years of educational attainment in 1979 and (2) occupational status in 1978. Described below are the measures of years of educational attainment, occupational status, and Two-factor Social Status Index of the subjects' mothers followed by a description of the measure that was made for the subjects' fathers²⁰.

The measure of mother's educational attainment was based on responses to the 1979 question: "What is the highest grade or year of regular school that your mother ever completed?" Responses ranged from zero to 20 years. All cases with responses where the mother had not co-resided with the subject in 1979 were identified and put into a separate category²¹. This categorization was based on previous research suggesting that the socioeconomic status of absent parents has less influence on their children's socialization and decision-making than does the socioeconomic status of their co-residential counterparts (Glick et al. 2006). By examining the effects of absent parents as a distinct category of socioeconomic

²⁰ Hollingshead's method was to identify the educational and occupational components of each parent, combine them into separate scores of each parent, and then average the parents' scores into one score. My method stops at the point where each parent's score has been calculated.

²¹ Co-residence was determined by using the 1979 "household roster" provided by the CHRR. At every interview, the interviewers construct a household roster by assembling information on a respondent's relationships with every household member (up to 15 household members). Those respondents who did not list a biological mother present in the household at the 1979 interview were deemed not to have a co-residential mother in 1979.

status, it was possible to assess whether there were significant differences in the effect of having an absent mother on first family type relative to having a co-residential upper class mother. About .05 of the sample (N=222) had provided a number of years of mother's educational attainment and did not co-reside with her in 1979. For the subjects with co-residential mothers in 1979, the responses were categorized following Hollingshead's seven educational categories. The variable was organized so as to rank the eight categories as follows:

- (1) absent mothers,
- (2) less than 7th grade,
- (3) 7th through 9th grade,
- (4) 10th through 11th grade,
- (5) high school graduate,
- (6) some college but no degree,
- (7) bachelor's degree from college or university,
- (8) some graduate or professional training.

There were missing data on mother's educational attainment that consisted of about .05 of the sample (N=220) that simply did not know mother's educational attainment. There were two types of these missing data: those with an absent mother in 1979 (about .01 of the sample, N=58) and those with a co-residential mother in 1979 (.05 of the sample, N=162). The 58 cases with missing data where the mother was absent in 1979 were grouped with the 222 cases with responses where the mother was absent in 1979, yielding 280 cases (about .07 of the sample) where the mother and subject did not co-reside in 1979.

Differences were tested for statistical significance in the distributions of cases across the categories of first family type between the 162 cases of missing data where the subject and mother co-resided in 1979 and each of the "Hollingshead" categories of years of attainment. The differences in the distributions were statistically significant in each test except for the test involving the subjects whose mothers had the lowest educational attainment. The 162 cases with missing data where the subject and mother co-resided in 1979 were combined with the category of cases where the subject and mother co-resided and the

mother had “less than 7th grade” education. Table 3.19 describes the distribution of cases among these categories of mother’s years of educational attainment.

Table 3.19. FAMILY BACKGROUND FACTORS: MOTHER’S TWO-FACTOR SOCIAL STATUS INDEX Weighted means and unweighted standard deviations (in parentheses) or proportions and numbers of cases^a; Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic

Components of mother’s Social Status Index	Mean/prop.	N
<i>Educational attainment</i>^b	11.63 (3.14)	3,569
1 = without co-resident mothers in 1979 ^c	.07	280
2 = less than 7 th grade ^d	.08	329
3 = 7 th through 9 th grade	.10	423
4 = 10 th through 11 th grade	.14	558
5 = high school graduate	.41	1,665
6 = partial college	.10	385
7 = college graduate	.07	280
8 = graduate or professional training	.02	92
Total	1.00	4,011
<i>Occupational status</i>	Proportion	N
1 = without co-resident mothers in 1979	.07	280
2 = not in the labor force (full time mothers)	.34	1,347
3 = farm laborers, menial service workers	.06	229
4 = unskilled workers	.10	386
5 = machine operators, semi-skilled workers	.11	430
6 = skilled workers, craftsmen	.04	175
7 = small farm and farm business, clerical, sales	.10	414
8 = technicians, semi-prof., small bus. owners	.09	343
9 = med. bus. owners, lg. farm owners, minor prof.	.06	244
10 = admin., lesser professionals, lg. bus. owners	.03	139
11 = executives, proprietors, major professionals	< .01	23
Total	1.00	4,011
<i>multinomial logistic regression of first family type on Two-factor Social Status Index</i>		
Box-Tidwell:	no family	first parenthood
coefficients;	<u>was formed</u>	<u>was first</u>
odds ratios	ns	$b = -.007^{***}$; $\text{Exp}(b) = .993$
		ns
<i>Likelihood Ratio Test Chi-Square (df) = 75.564^{***} (3)</i>		
<u>Mother’s Two-factor Social Status Index</u>	Mean /	Number
<u>(ref: high social status)</u>	proportion	of cases
Two-factor Social Status Index ^b ; range: 1 to 72	28.59 (15.99)	3,731
Absent parents	.07	280
Low social status	.31	1,264
Middle social status	.30	1,197
High social status	.32	1,270
Total	1.00	4,011

*** = $p < .001$, two-tailed tests of significance

^a All totals do not add to 1.00 due to computational rounding.

^b Mean is among the 3,569 cases with co-residential mothers in 1979 and information on attainment

^c Those with absent mothers includes 58 cases with absent mothers and missing data

^d Those with “less than 7th grade” includes 162 cases with co-residential mothers and missing data

^e Mean is among all 3,731 co-residential mothers

The second component of the Two-factor Social Status Index was occupational status in 1978. The measure of mother's occupational status was based on responses to two questions asked in 1979: (1) "Last year, that is, during 1978, did your mother work for pay all of the year, part of the year, or not at all?" and (2) "What kind of work was she doing?" First, all of the cases where the subject did not co-reside with the mother in 1979 were separately grouped, consisting of the same .07 of the sample (N=280) identified as having non-residential mothers in the measure of mother's years of educational attainment.

Then the occupational status of subjects' mothers among the subjects with co-residential mothers was coded. Those whose mothers were not in the labor force in 1978 were grouped together. To rank the type of occupation among subjects with co-residential employed mothers, the procedure used by the CHRR and Hollingshead was followed. Both used the occupation codes in the 1970 United States Census which was the most historically relevant data to the parents of this sample. Drawing directly from the Census, the CHRR had assigned one occupational type code to each mother. Hollingshead had generally relied on the 1970 Census but had somewhat departed from the 1970 codes because they were "not precise enough to delineate several occupational categories" (1975:4). Hollingshead was followed and that categorization was matched to the CHRR coding to by matching the CHRR occupational titles to the occupational titles in Hollingshead's nine ranked occupational status categories. Then, the same nine-category system that Hollingshead had devised when categorizing the variable was used to organize the occupational codes. No data were missing. When the group of respondents with absent mothers and the group with the mothers who were out of the labor force were included with the nine occupational status groups, there were the following 11 categories were created:

- (1) absent mothers;
- (2) not in the labor force—fulltime mothers;
- (3) farm laborers, menial service workers;
- (4) unskilled workers;
- (5) machine operators, semi-skilled workers;
- (6) skilled workers, craftsmen;

- (7) small farm and farm business/clerical;
- (8) technicians, semi-professionals, small business owners;
- (9) medium business owners, large farm owners, minor professionals;
- (10) administrators, lesser professionals, larger business owners;
- (11) executives, proprietors, major professionals

The measure of years of mother's educational attainment and the measure of mother's occupational type were used to compute the Two-factor Social Status Index score for each subject's mother using Hollingshead's formula: *The number of the occupation category multiplied by five was added to the number of the education category multiplied by three.* This calculation resulted in an index where the higher the score, the higher the social status. Absent mothers scored the lowest: $(1 \times 5) + (1 \times 3) = 8$. Then, seven points were subtracted from each score to change the scores to a range of 1 to 72. Mother's mean score (among the cases with co-residential mothers) was 28.59.

A Box-Tidwell test found evidence of nonlinearity (see Table 3.19) in the relationship between mother's Two-factor Social Status Index and first family type and the scores of those with co-residential mothers were categorized into thirds, yielding a four-category indicator of social status. The mean was close to the middle of the "middle social status" scores (see Table 3.19). The categorical variable was transformed into a dummy variable set, as follows: (1) 1 = subjects with absent mothers, 0 = co-residential mothers; (2) 1 = subjects with mothers of low social status (scores 9 to 19), 0 = higher status or absent mothers; and (3) 1 = subjects with mothers of middle social status (scores 20 to 37), 0 = other social status or absent mothers. In the analysis, the group of "subjects with mothers of high social status (scores 38 to 72)" was the reference category.

The Two-factor Social Status Index of each of the subject's fathers was identically calculated to the Two-factor Social Status Index of the subject's mothers. Table 3.20 provides the descriptive statistics of the Index and its components.

Table 3.20. FAMILY BACKGROUND FACTORS: FATHER'S TWO-FACTOR SOCIAL STATUS INDEX Weighted means and unweighted standard deviations (in parentheses) or proportions and numbers of cases ^a; Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic

Components of father's Social Status Index	Mean / prop.	N	
<i>Educational attainment</i> ^b	12.01 (3.94)	2,741	
1 = without co-resident fathers in 1979	.28	1,135	
2 = less than 7 th grade ^c	.07	293	
3 = 7 th through 9 th grade	.10	399	
4 = 10 th through 11 th grade	.08	321	
5 = high school graduate	.25	996	
6 = partial college	.08	328	
7 = college graduate	.08	319	
8 = graduate or professional training	.05	219	
Total	1.00	4,011	
<i>Occupational status</i>	Proportion	N	
1 = without co-resident fathers in 1979	.28	1,135	
2 = not in the labor force (full time fathers)	.04	146	
3 = farm laborers, menial service workers	.03	123	
4 = unskilled workers	.04	161	
5 = machine operators, semi-skilled workers	.12	466	
6 = skilled workers, craftsmen	.20	794	
7 = small farm and farm business, clerical, sales	.03	141	
8 = technicians, semi-prof., small bus. owners	.04	180	
9 = med. bus. owners, lg. farm owners, minor prof.	.13	532	
10 = admin., lesser professionals, lg. bus. owners	.04	162	
11 = executives, proprietors, major professionals	.04	171	
Total	1.00	4,011	
<i>multinomial logistic regression of first family type on Two-factor Social Status Index</i>			
Box-Tidwell:	no family	first parenthood	first cohabitation
coefficients;	<u>was formed</u>	<u>was first</u>	<u>was first</u>
odds ratios	ns	b = -.010***; Exp(b) = .990	ns
<i>Likelihood Ratio Test Chi-Square (df) = 107.815*** (3)</i>			
<u>Father's Two-factor Social Status Index</u>	Mean /	Number	
<u>(ref: high social status)</u>	proportion	of cases	
Two-factor Social Status Index ^d ; range: 1 to 72	40.85 (15.74)	2,876	
Absent parents	.28	1,135	
Low social status	.26	1,030	
Middle social status	.22	876	
High social status	.24	970	
Total	1.00	4,011	

*** = p < .001, two-tailed tests of significance

^a All totals do not add to 1.00 due to computational rounding.

^b Mean is among the 2,741 cases with co-residential fathers in 1979 and information

^c Proportion of those with "less than 7th grade" education includes 135 cases with co-residential fathers and missing data

^d Mean is among all 2,876 co-residential fathers

About .28 (N=1,135) of the sample did not co-reside with their fathers in 1979 and these cases formed a separate group. There were 135 cases where the subject

and father did co-reside and data were missing on educational attainment. Chi-Square tests of the statistical differences between the distributions of cases of missing data and each of the “Hollingshead” groups of years of attainment found statistically significant differences in all tests except between the missing cases and the group with the lowest level of attainment (“less than 7th grade”) and the missing cases were combined with that group.

The fathers’ types of occupations were grouped exactly the same way as was done with respect to the mothers’ occupational status and Hollingshead’s formula for calculating the Two-factor Social Status index score was applied, resulting in a range of 1 to 72 and a mean score among those with co-residential fathers of 40.85, about 12.26 points higher than the mean among the subjects’ mothers. It is likely that this difference was attributable to differences in occupational status; for instance, about .34 of the mothers while only .04 of the fathers were not in the labor force (full-time parents) which was ranked at “2,” likely lowering the mothers’ mean to a significant extent.

Findings from a Box-Tidwell test evidenced nonlinearity in the relationship of father’s Two-factor Social Status Index and first family type, with a Chi-Square that was somewhat larger than was found with respect to the subjects’ mothers’ test. The categories were transformed into a three-variable dummy variable set for analysis: (1) subjects with absent fathers, (2) those in the bottom third of scores (scores 9 to 33), and (3) those in the middle third (scores 34 to 47). The group in the top third, “subjects with fathers of high social status” with scores from 48 to 72 was the reference category.

Family structure: co-residence with mother (father) in 1979. The most often used indicator of family structure in studies of child and adolescent well-being is a categorical variable of the presence or absence of parent(s) in the household during childhood. The absence of a father has most often been scrutinized because single mother families tend to be viewed as families that are burdened by emotional, financial, and social stress and researchers often are interested in whether children or adolescents have less “successful” outcomes when the father is absent.

The dummy variable indicators of “co-residence with mother (or father) in 1979” that were part of the Social Status Indexes contrasted having an absent mother or father on first family type to having a co-residential “high social status” mother or father. While the effects of the “co-residence” indicators are interpreted relative to the effects of the group with high social status residential mothers (or fathers), they also speak to parental absence compared to presence. Unlike common indicators of parental absence that contrast a two-biological parent family (or “intact” family) to a single mother (or father) family regardless of social status, this contrast is more specific and contrasts subjects with absent fathers (or mothers) of unknown social status = 1 to subjects with co-residential upper class fathers (or mothers) = 0 (Table 3.21).

Table 3.21. FAMILY BACKGROUND FACTORS: CO-RESIDENCE WITH MOTHER or FATHER IN 1979 Proportions and numbers of cases

Co-residence with mother	Proportion	Number of cases
lived with mother in 1979	.93	3,731
did not live with mother in 1979	.07	280
Total	1.00	4,011
Co-residence with father	Proportion	Number of cases
lived with father in 1979	.72	2,876
did not live with father in 1979	.28	1,135
Total	1.00	4,011

Family structure: number of co-residential siblings in 1979. The 1979 CHRR household roster indicates the relationship to the respondent of every member of her/his household up to 15 household members. Respondents were shown a card with the following relationship types to identify a household member as a sibling: (1) brother, (2) step-brother, (3) foster brother, (4) adopted or step brother, (5) brother/cousin, (6) sister, (7) step-sister, (8) foster sister, (9) adopted or step sister, or (10) sister/cousin. No data were missing. For analysis, a dummy variable set was constructed: (1) 1 = zero co-residential siblings, 0 = siblings; (2) 1 = 1 co-residential sibling, 0 = zero, 2, or 3 or more co-residential siblings; and (3) 1 = 2 co-residential siblings, 0 = zero, 1, or 3 or more co-residential siblings. The group with “3 or more co-residential siblings” was the reference category in the

analysis. Table 3.22 shows the distribution in the sample of the number of co-residential siblings in 1979.

Table 3.22. FAMILY BACKGROUND FACTORS: FAMILY STRUCTURE: NUMBER OF CO-RESIDENTIAL SIBLINGS IN 1979 Weighted mean and unweighted standard deviation (in parentheses) or proportions and numbers of cases in the sample

Number of co-residential siblings in 1979 (ref: 3 or more)	Mean/prop.	N
Number of co-residential siblings in 1979; range: 0 to 3+	1.18 (1.12)	4,011
0 co-residential siblings	.32	1,286
1 co-residential sibling	.34	1,363
2 co-residential sibling	.17	703
3 or more co-residential siblings	.16	659
Total^a	1.00	4,011

^aTotal does not add to 1.00 due to computational rounding.

Residence at age 14

Residence at age 14 was derived from two components: (1) U. S. South regional residence at age 14 and (2) U. S. rural residence at age 14.

Residence at age 14: South region. United States South regional residence was identified using two pieces of information. First, U. S. residence at age 14 was identified in 1979. Then, a dichotomous indicator created by the CHRR based on the respondent's U. S. state of residence at age 14 was used to identify South regional residence: 1 = South = 1, 0 = non-South. There were 18 cases in the study sample living outside the United States in 1979 and about .01 (N=48) of the sample was missing data. All of the missing data were recoded by matching the sample members' states of residence provided in the GEOCODE file to the list of states in the South region²² and coded 1 = subjects whose state of residence at age 14 was in the South, 0 = subjects living outside of the U. S. at age 14 or those not living in the South at age 14. About .32 of the study sample lived in the U. S. South at age 14 (see Table 3.23).

Residence at age 14: rural residence. The measure of U. S. rural residence at age 14 was created with data gathered during the interviews in 1979.

²² States in the "South" were: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

Responses to the question: “Which . . . best describes where you (are/were) living when you were 14 years old” were used to identify rural residence. Subjects chose one of these types of residence: (1) in town or city, (2) in country—not farm, or (3) on farm or ranch. Sample members were coded 1 = “rural” if they chose living on a

Table 3.23. SOUTH REGIONAL AND RURAL RESIDENCE AT AGE 14. Proportions and numbers of cases in the South, in rural areas, and in the combined measure

<i>South regional residence</i>	Proportion	Number of cases
South	.32	1,298
non-South	.68	2,695
not in the U. S.	< .01	18
<i>Total</i>	<i>1.00</i>	<i>4,011</i>
<i>rural residence</i>	Proportion	Number of cases
farm	.04	176
country non-farm	.19	748
interviewer classification	.12	475
<i>sub-total: rural</i>	<i>.35</i>	<i>1,399</i>
<i>non-rural</i>	<i>.65</i>	<i>2,594</i>
<i>not in the U. S.</i>	<i>< .01</i>	<i>18</i>
<i>Total</i>	<i>1.00</i>	<i>4,011</i>
<i>South and rural residence</i>	Proportion	Number of cases
rural South	.15	596
rural non-South	.20	803
non-rural South	.17	702
non-rural non-South	.48	1,910
<i>Total</i>	<i>1.00</i>	<i>4,011</i>

farm or ranch at age 14 or living in the country—not on a farm at age 14. In 1979, the rural/urban status of each respondent also was assessed by the interviewers. This assessment was used to recode cases with missing values. Sample members with missing data who were (1) 15 or 16 in 1979, (2) reported living in a town in 1979, (3) were classified by the interviewer as living in a “rural” area in 1979, and (4) had not changed residence since age 14 were recoded as “rural.” About .35 of the study sample was identified as living in the rural United States at age 14 (see Table 3.23).

Residence at age 14: four-category South and rural indicator. The two variables, “South region” and “rural residence” were combined into a categorical variable of four groups that was transformed into a dummy variable set where: (1) 1 = rural South, 0 = all others; (2) 1 = non-rural South, 0 = all others;

and (3) 1 = rural non-South, 0 = all others. In the analysis, the group “non-rural non-South” was the reference group and all four groups were used in the subgroup analysis. Table 3.23 describes the variable.

Socio-cultural indicators

Gender. Gender was assessed by the interviewers at the initial screening interviews in 1978 (NLSY79 User’s Guide, 2004). It was coded 1 = male and 0 = female: .485 (N=1,945) of the sample was female and .515 (N=2,066) of the sample was male.

Race/ethnicity. At the 1978 screening interview, interviewers classified each interviewee as “Hispanic,” “black,” or “non-Hispanic/non-black” using the interviewer’s best guess (NLSY79 User’s Guide, 2004). The non-Hispanic/non-black group does not represent non-Hispanic whites. It is, in fact, a heterogeneous category that serves as a reference group when the group of interest is “black” or “Hispanic” but in this study the racial/ethnic groups were separately analyzed. To test the current study’s hypotheses regarding the racial/ethnic “non-Hispanic white” group, the non-Hispanic/non-black group, which included Asians, mixed race individuals, American Indians, and a sizable proportion of Hispanics who had been misidentified as non-Hispanic as well as non-Hispanic “whites,” was disaggregated.

The regrouping of the sample by race/ethnicity was accomplished using information gathered in 1979 and 2002. Respondents were asked during the 1979 interviews to name the racial/ethnic origins with which they most closely identified. The interviewers presented each respondent with a list of 29 racial/ethnic categories (for example, “Black,” “English,” “French,” “German,” “American Indian,” “Irish,” “Mexican,” “Mexican-American,” and “Puerto Rican”) on a Show Card. The respondents were asked to choose the “only or the first” through “sixth” racial/ethnic origin with which they identified and, when they identified more than one origin, the one with which they most closely identified. Using this information, five racial/ethnic groups were created: (1) non-Hispanic white, (2) non-Hispanic black (3) Hispanic, (4) American Indian, and (5) Asian, mixed race, and those who

were unsure²³. The 2002 survey asked specific questions about American Indian or Alaskan Native race and Hispanic, Latino, or Spanish ethnic origin. When subjects identified as non-Hispanic/non-black in 1979 had at all self-identified in 2002 as Native American or American Indian or Hispanic, they were placed into the American Indian or Hispanic groups, respectively.

About .01 of the sample (N=49) indicated the “only or first identification” as Asian and about .01 (N=40) self-identified as “don’t know.” Due to the small size of these groups, they were combined with the group that had indicated “American” or “mixed” as the “only or first identification.” The five racial/ethnic groups are described in Table 3.24. For the analysis, a dummy variable set was made as follows: (1) 1 = non-Hispanic black, 0 = all others; (2) 1 = Hispanic, 0 = all others; (3) 1 = American Indian, 0 = all others; and (4) 1 = “don’t know,” American, mixed race, “other” race/ethnicity, or Asian (“Other”), 0 = all others. The category of “non-Hispanic white” subjects was the reference group in the full sample analysis and was used as a group in the subgroup analyses.

Table 3.24. SOCIO-CULTURAL FACTORS: RACE/ETHNICITY Proportions and numbers of cases in the sample

<i>Race/ethnicity (ref: non-Hispanic white)</i>		
<i>Racial/ethnic group</i>	<i>Proportion</i>	<i>Number of cases</i>
non-Hispanic white	.58	2,329
non-Hispanic black	.13	531
Hispanic	.07	277
American Indian	.10	418
Other	.11	457
Total^a	1.00	4,011

^a Totals do not add to 1.00 or 4,011 due to computational rounding

Attitudinal measures

There were nine measures of attitudes that previous research has linked with union formation and childbearing behavior. The first three indicators measure the respondents’ “future expectations” about their future family and educational lives:

- (1) expected age at first birth,

²³ Appendix A, Table A1, shows the distribution in the sample of these racial/ethnic groups before and after dropping the cases where first family formation occurred prior to 1979, unweighted and weighted.

- (2) expected age at first marriage, and
- (3) expected years of educational attainment.

The fourth, fifth, and sixth measures focus on “childhood socialization” or the attitudinal context of the family in which the adolescents’ childbearing and marriage attitudes and behaviors were formed:

- (4) religious conservatism in childhood,
- (5) mother's age at respondent's birth, and
- (6) father's age at respondent's birth.

The extent of “self-regard,” or one’s attitude toward one’s self, tends to be associated with the likelihood of early and/or non-union pregnancy (Salazar, et al., 2005; Young, et al., 2001) and with the likelihood of pre-marital cohabitation (Marcussen, 2005). The seventh and eighth measures were:

- (7) self-esteem and
- (8) internal/external locus of control.

Lastly, individuals with attitudes favoring distinct and traditional “gender roles” tend to be less likely to cohabit before marriage and their parenthood is relatively more likely to occur within marriage (Clarkberg, Stolzenberg and Waite 1995). The ninth measure was:

- (9) attitude toward wives’ labor force participation.

Expected age at first birth. The measure of expected age at first birth was made with information from three sources: (1) responses to the 1979 question: “Altogether, how many (more) children do you expect to have?”; (2) responses to the 1979 question: “When do you expect to have your first [next] child—in how many years?”; and (3) pregnancy status in 1979. Since none of the respondents in the study sample had a child before the 1979 interview date, an answer of “0” children to the first question indicated the expectation of no children and, consequently, no expected age at first birth. These cases were coded “0.” The expected age at first birth was calculated by adding the number of years reported in response to the second question to the subject’s age in 1979 (Trent and Crowder 1997). Subjects who, in response to the second question, did not know when they wanted to have a first child were coded “don’t know.” The fertility

history files identified the female subjects who were pregnant in 1979 and these cases were coded their ages at the 1979 interview date.

About .07 (N=289) of the study sample expected zero children and about .01 (N=61) did not know when they would want to have a first child. There was no significant difference in the distribution of these two groups across the categories of the dependent variable (Chi-Square=.087, $p=.993$) and the two groups were combined.

About .01 (N=50) of the sample skipped the question. Chi-square tests found that there were no significant differences across first family type between the cases that skipped and the cases in the “don’t know” group (Chi-square=4.304, $p=.230$) or between those who skipped the question and those who expected zero children (Chi-square=6.444, $p=.092$). The cases that had skipped the question were then added to the group of those that did not want any children or know when they wanted to have a first child, increasing that category to about .10 (N=400) of the sample. The most common expected age at first birth among those who expected to have a first child was 21 (Table 3.25).

Table 3.25. ATTITUDINAL MEASURES: EXPECTED AGE AT FIRST BIRTH Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean and unweighted standard deviation^a (in parentheses) or proportions and number of cases

<u>Expected age at first birth</u>			
<u>multinomial logistic regression of first family type on expected age at first birth</u>			
Box-Tidwell test;	no family was formed	first parenthood was first	first cohabitation was first
unstandardized coefficient	$b = .010^{**}$ Exp(b) = 1.010	$b = -.035^{***}$ Exp(b) = .965	ns
Likelihood Ratio Test (Chi-Square (df)) ^b = 97.812 ^{***} (3)			
<u>Expected age at first birth (ref: ages 20 to 24)</u>			
expected age at first birth;	<u>mean / proportion</u>	<u>number of cases</u>	
range: 14 to 46	20.96 (3.55)	3,611	
don't want a child, don't know when, skipped ^c	.10	400	
14 to 19	.07	301	
20 to 24	.52	2,106	
25 to 29	.26	1,023	
30 to 46	.05	181	
Total	1.00	4,011	

** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a The mean is among the .90 (N=3,611) of the sample that ever expected to have a first child

^b The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^c There were 289 “don’t want,” 61 “don’t know when,” and 50 cases that “skipped” the question.

A Box-Tidwell test found evidence of nonlinearity in the relationship of the expected age at first birth (among those who expected to have a first child) and first family type (see Table 3.25). The linear variable was categorized and transformed into a five-variable dummy variable set where: (1) 1 = don't know, don't want children, skipped the question, 0 = an expected age at first birth; (2) 1 = expected age 14 to 19, 0 = all others; (3) 1 = expected age 25 to 29, 0 = all others; and (4) 1 = expected age 30 to 46, 0 = all others. The group whose expected age at first birth was "20 to 24" was omitted and used as the reference group in the analysis. The placement of the cut points of the categories was based on the variable construction of this measure in previous research. Table 3.25 shows the distribution of cases in the variable.

Expected age at first marriage. In 1979, the respondents were asked: "At what age would you like to marry?" Responses were: 1 = less than 20, 2 = 20 to 24, 3 = 25 to 29, 4 = 30 or older, and 5 = never. Less than .01 of the sample was missing data (N=20). Crosstabulation with a Chi-Square test between the group with missing data and each of the groups of data found the least statistical difference across the categories of first family type was between the cases with missing data and the group with expected age at first marriage of 25 to 29 (Chi-square=2.090, $p = .554$). The 20 cases with missing data were combined with that category. Table 3.26 describes the distribution of the sample across the categories of the measure of expected age at first marriage. The categorical variable was transformed into a set of four dummy variables for the analysis: (1) 1 = less than 20, 0 = older or never; (2) 1 = 25 to 29, 0 = younger, older, or never; (3) 1 = 30 or older, 0 = younger or never; and (4) 1 = never or missing data, 0 = less than 20 to 30 or older. In the analysis, ages 20 to 24 was the omitted group that was used as the reference group.

Expected number of years of educational attainment. Responses to the question asked in 1979: "As things now stand, what is the highest grade or year [of regular school] you think you will actually complete?" were used to measure the expected years of educational attainment. There were 19 "don't

know” responses. Sixteen of the “don’t know” cases were currently enrolled in school in 1979 and it seemed reasonable that these subjects expected at least to finish out the current year (all were interviewed in May and most grade terms end in June). These cases were coded at the number of years that most likely would be attained at the end of that current school year. The remaining three cases with missing values were currently not enrolled and they were coded at the highest grade that they had reported as completed by 1979. There were some cases

Table 3.26. ATTITUDINAL MEASURES: EXPECTED AGE AT FIRST MARRIAGE weighted mean and unweighted standard deviation^a (in parentheses) or proportions and number of cases in the sample

<i>Expected age at first marriage (ref: 20 to 24)</i>		
<i>expected age at first marriage;</i>	<i>mean / proportion</i>	<i>number of cases</i>
range: < 20 to 30+	2.36 (.72)	3,907
less than 20	.07	277
20 to 24	.54	2,175
25 to 29	.31	1,230
30 or older	.06	224
expects never to marry	.03	104
Total^b	1.00	4,011

^a Mean is among those who expect to ever marry (N=3,907) and falls between categories 2 (ages 20 to 24) and 3 (ages 25 to 29).

^b Totals do not add to 1.00 or 4,011 due to computational rounding.

where the expected number of years was less than the actual number of years that had already been completed. All cases where the expected number of years was less than the current number of years and the subjects were currently enrolled were recoded as equal to the number of years that most likely would be attained at the end of the current grade term.

A Box-Tidwell test found evidence of nonlinearity in the relationship of the measure of the expected number of years of educational attainment and first family type and the interval measure was categorized at meaningful cut points for interpretation and transformed into a four-variable dummy variable set for analysis (see Table 3.27). The dummy variables represented: (1) expected less than high school, (2) expected high school completion, (3) expected less than a four-year postsecondary degree, and (4) expected a four-year postsecondary degree. In the analysis, the group with the highest expectation for their education (“more than a four-year postsecondary degree”) was the reference group.

Table 3.27. ATTITUDINAL MEASURES: EXPECTED NUMBER OF YEARS OF EDUCATIONAL ATTAINMENT Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean and unweighted standard deviation (in parentheses) or proportions and number of cases

<i>Expected number of years of educational attainment</i>			
<i>multinomial logistic regression: first family type on expected number of years of educational attainment</i>			
Box-Tidwell test; unstandardized coefficient	no family was formed ns	first parenthood was first b = -.048*** Exp(b) = .953	first cohabitation was first ns
Likelihood Ratio Test Chi-Square (df) ^a = 66.719*** (3)			
<i>Expected age at first birth (ref: ages 20 to 24)</i>			
expected educational attainment; range: 1 to 18		<i>mean / proportion</i>	<i>number of cases</i>
less than high school		13.90 (2.31)	4,011
high school completion		.05	192
some college		.42	1,705
four-year college degree		.13	526
some graduate or professional training		.30	1,192
Total^b		1.00	4,011

*** = p < .001, two-tailed tests of significance

^a The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^b The total does not add up to 4,011 due to computational rounding.

Religious conservatism in childhood. The measure of religious conservatism in childhood was based on responses to the 1979 question: "In what religion were you raised?" Respondents were instructed to choose one of 10 categories and interviewers were instructed to probe for a denomination if "Christian" or "Protestant" was chosen. The response categories were ranked in a religious conservatism hierarchy according to their approximate locations on the tiers of religious conservatism suggested by Perrin (1989) and based on Greeley (1972). The scale of one to 10 ranges from very liberal to very conservative, as follows:

- (1) no religion,
- (2) Jewish,
- (3) Episcopalian,
- (4) Presbyterian,
- (5) Methodist,
- (6) Roman Catholic,
- (7) Other,

- (8) Lutheran,
- (9) Baptist, and
- (10) Protestant.

Following Perrin (1989), those who indicated “Other” were coded “7” and ranked in a neutral position between Roman Catholic and Lutheran. Less than .01 of the sample (N=17) was missing data and they were coded “other” since their religious conservatism in childhood was something other than one of the named categories.

The 10 categories were transformed into a dummy variable set: (1) 1 = liberal (categories 2 to 5), 0 = all others; (2) 1 = moderate (categories 6 to 8), 0 = all others; and (3) 1 = conservative (categories 9 and 10), 0 = all others. When the dummy variables were used in the analysis, “no religion” was the reference group (see Table 3.28).

Table 3.28. ATTITUDINAL MEASURES: RELIGIOUS CONSERVATISM IN CHILDHOOD
Proportions and number of cases in the sample

<i>Religious conservatism (ref: no religion)</i>	<i>proportion</i>	<i>number of cases</i>
1 no religion	.04	178
2 Jewish	.01	53
3 Episcopalian	.02	77
4 Presbyterian	.04	149
5 Methodist	.07	301
6 Roman Catholic	.33	1,295
7 other	.11	456
8 Lutheran	.08	320
9 Baptist	.24	948
10 Protestant (non-denominational Christian)	.06	234
<i>Total^a</i>	<i>1.00</i>	<i>4,011</i>
<i>liberal (2, 3, 4, 5)</i>	.15	580
<i>moderate (6, 7, 8)</i>	.52	2,072
<i>conservative (9, 10)</i>	.29	1,182
<i>none (1)</i>	.05	178
<i>Total^a</i>	<i>1.00</i>	<i>4,011</i>

^a All totals do not add to 1.00 or 4,011 due to computational rounding.

Mother's (father's) age at subject's birth. The age of each of the subjects' birth parents at the time of the subject's birth was identified using (1) information about each parent's age and date of birth gathered at the 1987 and 1988 interviews, (2) the 1979 Household Roster, and (3) the subjects' ages in

1979. Both mother's and father's ages at subject's birth were calculated following NLSY79 user guidelines (NLSY79 User's Guide, 2004).

First, mother's age in 1979 was identified. In some cases, responses to the questions in 1987 and 1988: "What is your mother's age?" were used to compute the 1979 age by subtracting "8" or "9" from the given age, depending on the year in which the response was provided. In other cases, ages were identified by subtracting the responses to the question: "When [the year] was your natural mother born?" from "1979." In still other cases, mothers' ages in 1979 were identified by using information on the ages of household members provided in the 1979 Household Roster.

The calculated mothers' ages in 1979 ranged from 1 to 65, which included unreasonably young and old ages²⁴. It seemed reasonable that the youngest age in 1979 that a subject's mother could be was 28 years old. There were 15 cases where the mother's age in 1979 was less than 28 years old. There also were unreasonably "old" mothers in 1979 based on females' biologically upper-limited age range in which they can bear children. There were 7 such cases. There also was about .02 (N=89) of the sample with missing data.

For all of the calculated subjects' mothers' ages in 1979 (ranging from ages 28 to 61), mother's age at subject's birth was calculated by subtracting the subject's age in 1979 from the mother's age in 1979, resulting in a measure of mother's age at subject's birth that ranged from age 14 to age 46 (see Table 3.29). A Chi-Square test of the difference between the two kinds of missing data on mother's age at subject's birth (the cases with missing data due to unknown ages (N=89) and the cases with "bad" information (N=15 and N=7)) in their distributions across the categories of first family type found no statistically significant difference (Chi-Square=5.543, p=.136). These cases were combined into a separate group.

A Box-Tidwell test found evidence of nonlinearity in the relationship of mother's age at subject's birth (among the 3,901 with ages at subject's birth) and first family type (Table 3.29). The variable was categorized and transformed into a dummy variable set. Cut points were based on (1) previous research suggesting

²⁴ While there certainly are mothers younger than 14 or older than 45 when they bear children, they are quite rare.

that childbearing under age 20 and over age 30 have significantly different impacts on children's outcomes than does childbearing between ages 20 and 30 (Barber 2001a) and (2) the desire to achieve measurement consistency among the variables which would potentially enhance the interpretation of the findings. The dummy variables in the set were: (1) 1 = the three types of missing data, 0 = data; (2) 1 = ages 14 to 19, 0 = all other values; (3) 1 = ages 25 to 29, 0 = all other values; and (4) 1 = ages 30 to 46, 0 = all other values. The group with the mothers in the modal age group when the subjects were born, "ages 20 to 24," was the reference group in the analysis.

Table 3.29. ATTITUDINAL MEASURES: MOTHER'S AGE AT SUBJECT'S BIRTH Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean^a and unweighted standard deviation (in parentheses) or proportions and numbers of cases in the sample

<i>Mother's age at subject's birth</i>			
<i>multinomial logistic regression of first family type on mother's age at subject's birth</i>			
Box-Tidwell test;	no family	first parenthood	first cohabitation
unstandardized	was formed	was first	was first
coefficient	b = .009*** Exp(b) = 1.009	ns	ns
Likelihood Ratio Test Chi-Square (df) ^b = 30.375*** (3)			
<i>Mother's age at subject's birth (ref: ages 20 to 24)</i>			
mother's age at subject's birth;	<i>mean/ proportion</i>	<i>number of cases</i>	
range: 14 to 46	26.40 (6.38)	3,901	
14 to 19	.10	404	
20 to 24	.34	1,368	
25 to 29	.26	1,045	
30 to 46	.27	1,083	
mother's age unknown	.03	110	
Total^c	1.00	4,011	

*** = $p < .001$, two-tailed tests of significance

^a The mean is among the .97 (N=3,901) of the sample with information on mother's age.

^b The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^c Total does not add to 4,011 due to computational rounding.

Father's age in 1979 was identified using responses to the 1987 and 1988 questions on father's age and date of birth and information on the ages of household members provided in the 1979 Household Roster exactly the way mother's age in 1979 was identified. Fathers' ages in 1979 ranged from 7 to 79. Ages in 1979 younger than 28 were considered to be unreasonable (N=22) but the oldest father's ages in 1979 seemed unlikely but not unreasonable. There also was

about .09 (N=355) of the sample that did not know father's age or date of birth in 1987 or 1988.

For all fathers' ages in 1979 from ages 28 to 79, father's age at subject's birth was calculated by subtracting the subject's age in 1979 from the father's age in 1979, resulting in an age range of age 14 to age 65 (see Table 3.30). A Box-Tidwell test found evidence of nonlinearity in the relationship of father's age at subject's birth (among the 3,656 with ages at subject's birth) and first family type (Table 3.30). The variable was categorized and transformed into a dummy variable set using the same cut points used in the measure of mother's age at subject's birth.

Table 3.30. ATTITUDINAL MEASURES: FATHER'S AGE AT SUBJECT'S BIRTH Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean^a and unweighted standard deviation (in parentheses) or proportions and numbers of cases in the sample

<i>Father's age at subject's birth</i>			
<i>multinomial logistic regression of first family type on father's age at subject's birth</i>			
Box-Tidwell test; unstandardized coefficient	<u>no family was formed</u>	<u>first parenthood was first</u>	<u>first cohabitation was first</u>
	b = .007*** Exp(b) = 1.007	ns	ns
Likelihood Ratio Test Chi-Square (df) ^b = 97.812*** (3)			
<i>Father's age at subject's birth (ref: ages 20 to 24)</i>			
father's age at subject's birth; range: 14 to 65	<u>mean/ proportion</u>	<u>number of cases</u>	
14 to 19	.03	3,656	
20 to 24	.21	105	
25 to 29	.27	845	
30 to 65	.40	1,082	
father's age unknown	.09	1,624	
Total	1.00	4,011	

*** = $p < .001$, two-tailed tests of significance

^a The mean is among the .91 (N=3,656) of the sample that ever expected to have a first child

^b The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

The dummy variables were: (1) 1 = age at subject's birth unknown, 0 = ages known; (2) 1 = ages 14 to 19, 0 = all other values; (3) 1 = ages 25 to 29, 0 = all other values; and (4) 1 = ages 30 to 65, 0 = all other values. A series of crosstabulations with Chi-Square tests between the group of 22 cases with "bad" ages and the categories of cases with ages ranging from 14 to 65 found the least statistical difference in the test with the group of fathers' ages 25 to 29 years old at

subject's birth and the 22 cases were combined with that group. The subjects with the fathers who were "ages 20 to 24" at the subject's birth constituted the reference group in the analysis.

Self-esteem. The Rosenberg Self-Esteem Scale was administered to the respondents in 1980. The scale, designed for adolescents and adults, measures the self-evaluation that an individual makes and customarily maintains. The Rosenberg scale is widely used and has accumulated evidence for internal consistency and reliability in the NLS samples (NLSY79 User's Guide, 2004). There are 10 items in the scale, five of which are positive and five of which are negative, presented as statements with which the respondents were asked to 1 = "strongly agree," 2 = "agree," 3 = "disagree," or 4 = "strongly disagree." A high score indicated higher self-esteem on all 10 items.

The positive items were:

- (1) I am a person of worth
- (2) I have a number of good qualities
- (3) I am able to do things as well as most other people
- (4) I take a positive attitude toward myself
- (5) On the whole, I am satisfied with myself

The negative items were:

- (1) I am inclined to feel that I am a failure
- (2) I feel I do not have much to be proud of
- (3) I wish I could have more respect for myself
- (4) I certainly feel useless at times
- (5) At times I think I am no good at all

About .03 of the sample (N=107) was not interviewed in 1980.

Crosstabulations with Chi-Square tests were performed to assess the statistical differences between the group of cases not interviewed in 1980 (N=107) and each of the categories of each of the positive and negative self-esteem items. In each case, there were statistically significant differences *except* in the tests that involved the groups with the lowest self-esteem. The 107 cases were combined with the category with the lowest self-esteem in all 10 of the items.

There were 32 cases that had refused to answer one or more of the questions. To recode these cases, the scores on all the remaining items were reviewed in each case and each case was coded at the mode of its remaining responses. With no missing data remaining, factor analysis of the 10 items using Principal Axis Extraction and varimax rotation was done. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy of the 10 items was .914, Bartlett's Test was statistically significant ($p < .001$), and Cronbach's alpha was .853, suggesting more than sufficient inter-item correlation and adequate compactness to justify a single construct measuring self-esteem. Then the scores of the 10 items were summed into a composite score for each sample member. The composite scores ranged from 10 to 40, from which "9" was subtracted from each score for a range of 1 to 31. Higher scores indicated higher self-esteem. The mean score was 20.75. Table 3.31 provides a description of the variable.

Table 3.31. ATTITUDINAL MEASURES: SELF-ESTEEM Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean and unweighted standard deviation (in parentheses) or proportions, and number of cases in the sample

<u>Self-esteem</u>			
<u>multinomial logistic regression of first family type on self-esteem</u>			
Box-Tidwell test	no family	first parenthood	first cohabitation
unstandardized	was formed	was first	was first
coefficient	b = -.008**; Exp(b) = .992	b = -.010***; Exp(b) = .990	ns
Likelihood Ratio Test Chi-Square (df) ^a = 31.924*** (3)			
<u>Self-esteem (ref: low self-esteem)</u>			
self-esteem;	<u>mean/ proportion</u>	<u>number of cases</u>	
range: 1 to 31	20.75 (4.76)	4,011	
low self-esteem (scores 1 to 18)	.23	941	
medium self-esteem (scores 19 to 23)	.50	2,018	
high self-esteem (scores 24 to 31)	.26	1,053	
Total^b	1.00	4,011	

** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^b Totals do not add to 1.00 or 4,011 due to computational rounding.

A Box-Tidwell test found evidence of nonlinearity in the relationship of self-esteem and first family type (Table 3.31). The cut points of the categorical variable were determined by dividing the scores as evenly as possible into thirds which then was transformed into a dummy variable set where: (1) 1 = medium self-esteem (scores 19 to 23), 0 = all other scores and (2) 1 = high self-esteem (scores

24 to 31), 0 = all other scores. In the analysis, “low self-esteem,” scores 1 to 18, was the reference group.

Locus of control. In 1979, the respondents completed a four-item abbreviated version of a 23-item questionnaire adapted from the 60-item Rotter I-E Scale. The four items were intended to measure “the extent to which individuals believe they have control over their lives through self-motivation or self-determination [internal control] as opposed to the extent that the environment (i.e. chance, fate, luck) controls their lives [external control]” (NLSY79 User’s Guide, 2004:107). The four items each consisted of a pair of statements. In each pair, one item was a general statement describing “internal control” and the other item was a general statement describing “external control” over life events. The respondents were first asked to choose the statement that was closest to their opinion of themselves and then to decide whether the statement they chose was “much closer” or “slightly closer” to their opinions. The four pairs of statements were:

(1) Overall Control: the internal control statement—“What happens to me is my own doing” and the external control statement—“Sometimes I feel that I don’t have enough control over the direction my life is taking”;

(2) Planning: the internal control statement—“When I make plans I am almost certain I can make them work” and the external control statement—“It is not always wise to plan too far ahead, because many things turn out to be a matter of good or bad fortune anyhow”;

(3) Luck: the internal control statement—“In my case, getting what I want has little or nothing to do with luck” and the external control statement—“Many times we might just as well decide what to do by flipping a coin”; and

(4) Personal Influence: the internal control statement—“It is impossible for me to believe that chance or luck plays an important role in my life” and the external control statement—“Many times I feel that I have little influence over the things that happen to me.”

Following the NLSY79 User’s Guide scoring procedure, a single four-point scale was made for each of the four items by combining the four pieces of information on internal and external control. Internal control was coded “1” or “2.”

When the internal control statement was much closer to the self-opinion, it was coded “1” and when the internal control statement that was slightly closer, it was coded “2.” The external control statements were coded “3” or “4.” When the external control statement was slightly closer to the subject’s self-opinion, it was coded “3” and the external control statement that was much closer was coded “4.” Thus, each of the four items was scored from 1 = high internal control to 4 = high external control for each four-point scale on: (1) Overall Control, (2) Planning, (3) Luck, and (4) Personal Influence with the following values:

- (1) high internal control,
- (2) low internal control,
- (3) low external control, and
- (4) high external control.

Missing data on the items amounted to less than .01 of the sample²⁵. On Overall Control, Planning, and Luck, cases with missing data were too few to reliably test the significance of the differences in the distribution of cases across first family type between the cases with missing values and the cases with scores. With respect to Personal Influence, there was no significant difference in the distribution across first family type between its modal category (“2—low internal control”) and the cases with missing values (N=21). The cases with missing data were retained in the sample by including them in the modal category of each of the four scales. Table 3.32 describes the four indicators of locus of control.

The NLSY79 User’s Guide (2004) recommends summing the scores of the four four-point scales into one measure but warns that the items have low internal consistency in the full sample. Factor analysis on the four-point scales of each of the items in this study sample also found internal reliability that was inadequate to justify a single factor. Cronbach’s alpha on the four items was just .268, the largest correlation coefficient among the items (between Overall Control and Luck) was .135. Based on these two findings, it seemed reasonable to conclude that the four items were distinct dimensions of locus of control.

²⁵ Overall Control was missing data on 13 cases, Planning was missing data on 14 cases, Luck was missing data on 18 cases, and Personal Influence was missing data on 21 cases.

Table 3.32. ATTITUDINAL MEASURES: LOCUS OF CONTROL Coefficients, odds ratios, and Likelihood Ratio Chi-Square test statistics; proportions and numbers of cases^a

<i>multinomial logistic regression^b of first family type on Overall Control; 1 = internal</i>			
<u>no family was formed</u>	<u>first parenthood was first</u>	<u>first cohabitation was first</u>	
ns	b = $-.398^{***}$; Exp(b) = .672	b = $-.211^{**}$; Exp(b) = .810	
<i>Likelihood Ratio Test Chi-Square (df)^c = 31.924^{***} (3)</i>			
<i>Overall Control</i>	<i>proportion</i>	<i>number of cases</i>	
high internal control	.33	1,338	
low internal control	.31	1,253	
low external control	.24	968	
high external control	.11	452	
Total	1.00	4,011	
<i>multinomial logistic regression^b of first family type on Planning; 1 = internal (N=1,734)</i>			
<u>no family was formed</u>	<u>first parenthood was first</u>	<u>first cohabitation was first</u>	
ns	b = $-.329^{**}$; Exp(b) = .720	ns	
<i>Likelihood Ratio Test Chi-Square (df)^c = 14.479^{**} (3)</i>			
<i>Planning</i>	<i>proportion</i>	<i>number of cases</i>	
high internal control	.25	1,012	
low internal control	.18	722	
low external control	.29	1,163	
high external control	.28	1,113	
Total	1.00	4,011	
<i>multinomial logistic regression^b of first family type on Luck; 1 = internal</i>			
<u>no family was formed</u>	<u>first parenthood was first</u>	<u>first cohabitation was first</u>	
ns	ns	ns	
<i>Likelihood Ratio Test Chi-Square (df)^c = 7.943* (3)</i>			
<i>Luck</i>	<i>proportion</i>	<i>number of cases</i>	
high internal control	.41	1,653	
low internal control	.39	1,583	
low external control	.14	545	
high external control	.06	229	
Total	1.00	4,011	
<i>multinomial logistic regression^b of first family type on Personal Influence; 1 = internal</i>			
<u>no family was formed</u>	<u>first parenthood was first</u>	<u>first cohabitation was first</u>	
ns	ns	ns	
<i>Likelihood Ratio Test Chi-Square (df)^c = 5.112 (3) ns</i>			
<i>Personal Influence</i>	<i>proportion</i>	<i>number of cases</i>	
high internal control	.21	843	
low internal control	.32	1,276	
low external control	.31	1,249	
high external control	.16	643	
Total	1.00	4,011	

* = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance.

^a Totals do not all add up to 1.00 or 4,011 due to computational rounding.

^b "first marriage was first" was the reference group; locus of control was the sole predictor variable.

^c The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

Each item then was transformed into a dummy variable where 1 = internal locus of control (categories 1 and 2) and 0 = external locus of control (categories 3 and 4). Four multinomial logistic regression tests were performed where first family type was the dependent variable and the dichotomous indicators of locus of control were separately tested. No other variables were included. As Table 3.32 shows, the Model Chi-Square in the test of the measure of Personal Influence indicated that this variable did not make a statistically significant contribution to predicting group membership into first family type and the Model Chi-Square in the test of the measure of Luck, although barely significant ($p=.047$), was not large enough to have a statistically significant influence on any of the three embedded logistic regressions. These two indicators of locus of control were not included in the analysis. Planning and Overall Control were included in the analysis as dichotomous indicators where 1 = internal control and 0 = external control.

Attitude toward wives' labor force participation. In 1979, the respondents were asked to read a series of statements about married women's employment and indicate whether they "strongly agree," "agree," "disagree," or "strongly disagree." The eight statements, coded so that a higher score indicated more agreement with wives' staying home and caring for their children and not working outside the home, were as follows:

- (1) a woman's place is in the home, not in the office or shop;
- (2) a wife who carries out her full family responsibilities doesn't have time for outside employment;
- (3) a working wife feels more useful than one who doesn't hold a job;
- (4) the employment of wives leads to more juvenile delinquency;
- (5) employment of both parents is necessary to keep up with the high cost of living;
- (6) it is much better for everyone concerned if the man is the achiever outside the home and the woman takes care of the home and family;
- (7) men should share the work around the house with women, such as doing dishes, cleaning and so forth; and

(8) women are much happier if they stay at home and take care of their children.

Factor analysis of the eight items using principal axis extraction and Varimax rotation supported the existence of a single factor for items 1, 2, 4, 6, and 8 (Cronbach's alpha = .757). Including any one of the other three items—items 3, 5, or 7—decreased the reliability of the factor (Cronbach's alpha) and these three items also did not form a separate factor. Conceptually, items 1, 2, 4, 6, and 8 were the items that most directly addressed the “normative” aspect of what wives “should do” with their time. A single score was constructed by summing the scores on the individual items yielding composite scores that ranged from 5 to 20 (see Table 3.33). Higher scores indicated greater agreement that wives’ should stay home caring for their children and should not work outside the home. A Box-Tidwell test found evidence of nonlinearity in the relationship of the composite measure of attitude toward wives’ working outside the home and first family type (see Table 3.33).

Table 3.33. ATTITUDINAL MEASURES: ATTITUDE TOWARD WIVES’ LABOR FORCE PARTICIPATION Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean and unweighted standard deviation (in parentheses) or proportions, and numbers of cases in the sample

<i>Attitude toward wives’ labor force participation</i>			
<i>multinomial logistic regression of first family type on attitude of wives’ LFP</i>			
Box-Tidwell test;	no family was formed	first parenthood was first	first cohabitation was first
unstandardized coefficient	ns	b = .021***; Exp(b) = 1.021	b = -.023***; Exp(b) = .977
Likelihood Ratio Test Chi-Square (df) ^a = 61.950*** (3)			
<i>Attitude toward wives’ labor force participation (ref: most favorable toward wives’ staying home and caring for the family)</i>			
attitude toward wives’ labor force participation; range: 5 to 20	<i>mean/ proportion</i>	<i>number of cases</i>	
least favorable toward staying home	.26	11.12 (2.84)	3,864
less favorable toward staying home	.31		1,037
favorable toward staying home	.21		1,259
most favorable toward staying home	.18		834
missing data	.04		733
Total^b	1.00		147
			4,011

*** = p < .001, two-tailed tests of significance

^a The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^b Total does not add to 4,011 due to computational rounding.

About .04 of the sample (N=147) had responded “don’t know” to one or more of the items and that proportion of the sample was not included in the factor analysis or the Box-Tidwell test and was separated into a distinct category of subjects. The 3,864 cases with scores then were categorized. Cut points of the categories were made so as to group the cases as proportionally equal as possible. The categorical variable and group of missing data were transformed into a four-variable dummy variable set: (1) 1 = attitude least favorable toward wives’ staying home and caring for the family (scores 5 through 9), 0 = all other scores; (2) 1 = attitude less favorable toward wives’ staying home and caring for the family (scores 10 and 11), 0 = all other scores; (3) 1 = attitude favorable toward wives’ staying home and caring for the family (scores 12 and 13), 0 = all other scores; and (4) 1 = missing data, 0 = data. The group with “attitude most favorable toward wives’ staying home and caring for the family” was the omitted category in the analysis.

Behavioral measures

There were seven measures of behaviors that previous research has linked with union formation and childbearing behavior. The first one measures behavior that directly leads to family formation:

- (1) age at first intercourse.

The second behavioral measure taps into behavior that reflects attitudes toward pre-union parenthood and cohabitation:

- (2) church attendance.

Third is a measure of the opportunity structure in which family formation may be more or less likely to occur:

- (3) “idle” in 1979.

The four final behavioral measures concerned the extent of juvenile crime/delinquency:

- (4) number of violent acts in the past year,
- (5) number of juvenile delinquent acts in the past year,
- (6) number of criminal acts in the past year, and
- (7) ever convicted of a crime.

Age at first intercourse. Two questions about sexual intercourse were asked in 1983, 1984, and 1985: (1) "Have you ever had sexual intercourse?" and (2) "At what age did you first have sexual intercourse?" Responses to the former question were used to identify those who had never had intercourse and responses to the latter question were used to identify the ages at first intercourse.

In 1983, the sample members were 18 to 21 years old and some of them reported they had never had intercourse or they skipped the question but then reported an age at first intercourse in 1984. Those subjects were coded at the age at first intercourse that they reported in 1984. If there was no age reported in 1983 and in 1984 but an age was reported in 1985, the subject was coded the age reported in 1985. If no age at first intercourse was reported in response to all three questions and there was no age at first birth in the Fertility History files, the case was coded "never had intercourse."

In a few cases (N=63), the reported age at first intercourse was older than the age at first birth. These cases were recoded as the age at first birth minus one year. Using the Marital and Fertility History files, an age at first intercourse was identified for all the remaining cases where an age at first marriage or an age at first cohabitation had occurred by coding the age at first intercourse as the age the subject was in the year the first union occurred. Thus, the age at first intercourse is coded in each case as occurring before or in the same year as first family formation. Only about .01 (N=47) of the sample was missing data on age at first intercourse. Since there were just a handful of cases with missing data, the standard unconditional imputation procedure of coding at a measure of central tendency was used and these cases were combined with ages 22 to 40 at first intercourse (Cohen and Cohen 1983). Table 3.34 describes the variable.

A Box-Tidwell test found evidence of nonlinearity in the relationship of the linear measure and first family type (see Table 3.34). The variable was categorized and transformed into a dummy variable set for analysis. Cut points were chosen based on previous research suggesting: (1) adolescents who first have sexual intercourse before the teen years are at greater risk of non-union pregnancy than other adolescents, (2) those who first have intercourse at the "average" age are behaving normatively and thus are less likely to face social deficits, and (3) those

who delay beyond the “average” age or who never engage in intercourse are relatively more likely than “average” people to have psycho-social problems that may interfere with family formation.

Table 3.34. BEHAVIORAL MEASURES: AGE AT FIRST INTERCOURSE Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean and unweighted standard deviation^a (in parentheses) or proportions, and numbers of cases

<u>Age at first intercourse</u>			
<i>multinomial logistic regression of first family type on age at first intercourse</i>			
Box-Tidwell test;	no family was formed	first parenthood was first	first cohabitation was first
unstandardized coefficient	b = -.047*** ; Exp(b) = .954	b = -.064*** ; Exp(b) = .938	b = -.011*** ; Exp(b) = .989
Likelihood Ratio Test Chi-Square (df) ^b = 296.596*** (3)			
<i>Age at first intercourse (ref: age 16)</i>			
age at first intercourse;	<i>mean/ proportion</i>	<i>number of cases</i>	
range: 4 to 40	17.84 (4.14)	3,896	
4 to 12	.03	140	
13 to 15	.18	707	
16	.20	788	
17 to 18	.33	1,315	
19 to 21	.13	505	
22 to 40	.11	443	
never	.03	114	
Total^c	1.00	4,011	

*** = $p < .001$, two-tailed tests of significance

^a The mean is among the .97 (N=3,896) of the sample with information on age at first intercourse.

^b The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^c Totals do not add to 1.00 or 4,011 due to computational rounding.

The five-variable dummy variable set used in the analysis was: (1) 1 = ages 4 to 12, 0 = all others; (2) 1 = ages 13 to 15, 0 = all others; (3) 1 = ages 17 and 18, 0 = all others; (4) 1 = 19 to 21, 0 = all others; and (5) 1 = ages 22 to 40 or never, 0 = all others. In the analysis, “first intercourse at age 16” was the reference group.

Church attendance. The frequency of church attendance in 1979 was measured by responses to the question: “In the past year, how often have you attended religious services?” Responses were: 1 = not at all, 2 = infrequently, 3 = once per month, 4 = 2 to 3 times per month, 5 = once per week and 6 = more than once per week. There were no missing data. Crosstabulations with Chi-Square tests found no significant differences in the distributions of cases across the

categories of the dependent variable among categories 2, 3, and 4 and these three groups were combined. The variable was categorized and transformed into the following dummy variable set for analysis: (1) 1 = not at all, 0 = infrequent to more than weekly attendance; (2) 1 = weekly church attendance, 0 = not at all, less frequent attendance, or more often than weekly week; and (3) 1 = more than once per week, 0 = once per week or less. The group that attended church “infrequently, once per month, or 2 to 3 times a month” was the reference group in the analysis. Table 3.35 describes the frequency of church attendance in 1979 in the study sample.

Table 3.35. BEHAVIORAL MEASURES: CHURCH ATTENDANCE Proportions and numbers of cases in the sample^a

Church attendance in 1979	proportion	number of cases
no church attendance in 1979	.16	653
infrequently	.22	891
once a month	.07	282
2 to 3 times a month	.12	481
once a week	.30	1,186
more than once a week	.13	518
Total	1.00	4,011

^a In the analysis, those who attended “infrequently,” “once a month,” or “2 to 3 times a month” were combined into one group that was about .41 of the sample (N=1,654).

Idle in 1979. In their study of the effects of neighborhood factors on adolescents’ sexual behaviors, Cubbin, Santelli, Brindis, and Braveman (2005) defined and measured “youth who were idle” as those who were “aged 16 -19 who were not in school or the armed forces, not high school graduates and not in the labor force” (p. 127). In this study, the measure of “idle in 1979” identified those subjects who met those four conditions in 1979. Three separate measures were made to identify those who in 1979: (1) were or were not enrolled in any school, (2) were or were not high school graduates, (3) were or were not currently working or holding a job, and (4) were or were not serving in the active armed forces. These variables then were combined to identify the subjects who were idle in 1979. As Table 3.36 shows, most of the sample members were enrolled in school in 1979; only 132 subjects were not enrolled and of those 132 cases, 60 were working. Thus, there was only a small proportion of the sample that could be considered “idle” in 1979.

Table 3.36. BEHAVIORAL MEASURES: IDLE IN 1979 Coefficients and odds ratios, and Likelihood Ratio Chi-Square test statistic; proportions and number of cases in the sample

<i>Idle in 1979</i>			
<i>multinomial logistic regression of first family type on idle in 1979</i>			
unstandardized coefficient and odds ratio	<u>no family was formed</u> ns	<u>first parenthood was first</u> b = 1.021***; Exp(b) = 2.775	<u>first cohabitation was first</u> ns
Likelihood Ratio Test Chi-Square (df)^a = 11.661 (3), p = .009			
<u>Idle in 1979</u>	<u>proportion</u>	<u>number of cases</u>	
idle (not working and not enrolled)	.02	72	
not idle	.98	3,939	
Total	1.00	4,011	

*** = p < .001, two-tailed tests of significance

^a The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

Hosmer and Lemeshow (1989) suggested as a guideline that the minimum number of cases per independent variable in a logistic regression analysis should be no fewer than 10. As Table 3.36 shows, there were 72 cases identified as idle in 1979. A Chi-Square test of the distribution of cases of the dummy variable where 1 = idle in 1979 and 0 = all others across the categories of the dependent variable found no cells with an expected count less than 5 and a statistically significant difference in the distribution of cases across first family type (Chi-Square=14,801, 3 degrees of freedom, p = .002). A multinomial logistic regression analysis where first family type was the dependent variable, “first marriage was first” was the reference group, and “idle in 1979” was the only independent variable produced a Model Chi-Square that was statistically significant (see Table 3.36) and a statistically significant coefficient with respect to the prediction of parenthood versus marriage as the first family type. The most reasonable conclusion from these findings would be that the measure made a significant contribution to the prediction of group membership into each of the four groups. In the analysis, the measure was tested as a dichotomous indicator where 1 = idle in 1979 and 0 = not idle in 1979.

Juvenile crime/delinquency indicators. There were four measures of juvenile crime/delinquency, all drawn from self-report data gathered from the subjects at the 1980 interview about the types and extent of criminal and

delinquent behavior in 1979 or up to the 1980 interview date (no later than May of 1980). The four variables were:

- (1) number of violent acts in the past year,
- (2) number of juvenile delinquent acts in the past year,
- (3) number of criminal acts in the past year, and
- (4) ever convicted of a crime.

The first measure was the measure of the “number of violent acts in the past year.” It was made using responses to four questions about violence during “the past year”:

- (1) “How many times did you fight at school or work?”
- (2) “How many times did you use force to obtain things?”
- (3) “How many times did you attack someone with the idea of seriously hurting or killing them?”; and
- (4) “How many times did you hit or seriously threaten to hit someone?”

About .03 of the sample (N=107) was not interviewed in 1980 and about .02 (N=73) skipped one or more of the questions. There was no statistically significant difference in the distributions of cases across the categories of the dependent variable between these two groups of missing data (Chi-Square=7.293, $p=.063$) and they were combined into one group.

Factor analysis using Principal Component Analysis and Varimax rotation was performed on the four items (about the number of times in a fight as school, using force to obtain things, attacking someone, and hitting someone), excluding the .04 (N=180) of the sample with missing data. A single factor was found; the reliability coefficient (Cronbach’s alpha) was .726. A single score was calculated by summing the scores on the four violent acts items yielding composite scores on the 3,831 cases with data on all four items, that ranged from 0 to 24 and a mode of “3” violent acts among those who had committed at least one (see Table 3.37). Higher scores indicated a higher “number of violent acts in the past year.”

A Box-Tidwell test found evidence of nonlinearity in the relationship of the composite measure of the number of violent acts in the past year to first family type (see Table 3.37). The scores were categorized into four groups and, along with the group of cases with missing data, were transformed into a dummy variable

Table 3.37. BEHAVIORAL MEASURES. JUVENILE CRIME/DELINQUENCY: NUMBER OF VIOLENT ACTS IN THE PAST YEAR Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean and unweighted standard deviation (in parentheses) or proportions, and numbers of cases in the sample

<i>Number of violent acts in the past year</i>			
<i>multinomial logistic regression of first family type on number of violent acts in the past year</i>			
Box-Tidwell test; unstandardized coefficient	<u>no family was formed</u> ns	<u>first parenthood was first</u> b = .019**; Exp(b) = 1.019	<u>first cohabitation was first</u> b = .010†; Exp(b) = 1.010
Likelihood Ratio Test Chi-Square (df) ^a = 11.340 (3), p = .010			
<i>Number of violent acts in the past year (ref: none or one violent act)</i>			
number of violent acts in the past year	<i>mean/ proportion</i>	<i>number of cases</i>	
range: 0 to 24	2.41 (3.19)	3,831	
0 to 1 acts	.51	2,030	
2 to 5	.30	1,204	
6 to 10	.13	504	
11 to 24	.03	94	
missing data	.04	180	
Total^b	1.00	4,011	

† = p < .10, ** = p < .01, two-tailed tests of significance

^a The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^b Totals do not add to 1.00 or 4,011 due to computational rounding.

set: (1) 1 = two to five violent acts in the past year, 0 = fewer than two, more than five, none, or missing data; (2) 1 = six to 10 violent acts in the past year, 0 = fewer than six, more than 10, none, or missing; (3) 1 = 11 to 24 violent acts, 0 = fewer than 11, none, or missing data; and (4) 1 = missing data, 0 = data on violent acts. The cut points of the categories were chosen based on the results of preliminary tests of no statistically significant differences across the categories of first family type between those who had not been violent and those who had reported only one act of violence and few significant differences among the other scores. In the analysis, the group with “none or one act of violence in the past year” was the omitted category²⁶.

Then the measures of “number of juvenile delinquent acts in the past year” and “number of criminal acts in the past year” were made using responses to a group of questions asked in 1980 about criminal and delinquent behavior

²⁶ Multinomial logistic regression analysis found that when the four-variable dummy variable set was the sole predictor of first family type, those with two or more acts of violence were about twice as likely not to form a family than marry as a first family type, were about twice as likely to parent before a first marriage, and were about .30 as likely to cohabit before first marriage as those with none or one act of violence.

committed but not necessarily arrested for in the past year. The respondents were asked how many times in the past year they had:

- (1) "taken something from a store without paying for it";
- (2) "other than from a store, taken something not belonging to you worth under \$50";
- (3) "other than from a store, taken something not belonging to you worth \$50 or more";
- (4) "taken a vehicle for a ride or drive without the owner's permission";
- (5) "tried to get something by lying to a person about what you would do for him, that is, try to con someone";
- (6) "broken into a building or vehicle to steal something or just to look around";
- (7) "knowingly sold or held stolen goods";
- (8) "helped in a gambling operation, like running numbers or policy or books";
- (9) "sold marijuana or hashish"; and
- (10) "sold hard drugs such as heroin, cocaine, or LSD."

There were 107 cases not interviewed in 1980 and 127 cases with incomplete data on the 10 items. The two groups with missing data were significantly different in their distributions across the categories of the dependent variable (Chi-Square=13.061, $p=.005$).

Factor analysis using Principal Component Analysis and Varimax rotation was performed on the 3,778 cases with data on all 10 items. Two factors were identified. The first factor, termed "number of juvenile delinquent acts," focused on stealing and delinquency and included the first four of the 10 items (taking something from a store, taking something not belonging to you worth less than \$50, taking something not belonging to you worth more than \$50, and taking a vehicle); Cronbach's $\alpha=.882$. The second factor (Cronbach's $\alpha=.706$) was termed "number of criminal acts" because it included the other six items that concerned more seriously criminal behaviors. For each set of items, a single score was calculated by summing the scores on the individual items.

The composite scores on the number of juvenile delinquent acts included the 3,826 cases with data on all four items, ranged from 0 to 24, had a mode of “4” acts among those who had committed at least one act, and a higher score indicated a higher “number of juvenile delinquent acts in the past year” (see Table 3.38). A Box-Tidwell test performed with the nonlinear form of the variable “number of juvenile delinquent acts in the past year” found evidence of nonlinearity in the relationship between the measure (excluding the 185 cases with missing values) and first family type (Table 3.38). The scores were collapsed into categories that were transformed into a dummy variable set. There were too few cases with one,

Table 3.38. BEHAVIORAL MEASURES. JUVENILE CRIME/DELINQUENCY: NUMBER OF JUVENILE DELINQUENT ACTS IN THE PAST YEAR Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean and unweighted standard deviation (in parentheses) or proportions, and numbers of cases

<i>Number of juvenile delinquent acts in the past year</i>			
<i>multinomial logistic regression of first family type on number of juvenile delinquent acts</i>			
Box-Tidwell test; unstandardized coefficient	no family was formed	first parenthood was first	first cohabitation was first
	b = .019*; Exp(b) 1.019	b = .022***; Exp(b) = 1.022	b = .035***; Exp(b) = 1.035
Likelihood Ratio Test Chi-Square (df) ^a = 45.164*** (3)			
<i>Number of juvenile delinquent acts in the past year (ref: none or one violent act)</i>			
number of juvenile delinquent acts in the past year; range 0 to 24	<i>mean/proportion</i>	<i>number of cases</i>	
0 acts	2.40 (3.20)	3,826	
1 to 4	.54	2,154	
5 to 10	.19	781	
11 to 24	.20	804	
missing data	.02	87	
<i>Total</i>	.05	185	
	<i>1.00</i>	<i>4,011</i>	

* = $p < .05$, *** = $p \leq .001$, two-tailed tests of significance

^aThe Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

two, or three acts to adequately distribute their cases across the dependent variable and they were combined. Once combined, there was no statistically significant difference in distribution across the dependent variable between the group with one, two, or three delinquent acts and the category with “four” delinquent acts and the two groups were combined. Those with five through 10 acts formed a group and those with 11 through 24 acts formed a group. The resultant dummy variable set was: (1) 1 = one to four acts in the past year, 0 =

more than four, none, or missing data; (2) 1 = five to 10 acts in the past year, 0 = fewer than five, more than 10, none, or missing; (3) 1 = 11 to 24 acts, 0 = fewer than 11, none, or missing data; and (4) 1 = missing data, 0 = data on juvenile delinquent acts. In the analysis, the group with “no juvenile delinquency in the past year” was the omitted category.

The second factor derived from the 10 items was the “number of criminal acts in the past year,” and is shown on Table 3.39. The composite scores included the 3,791 cases with data on the six remaining items (try to con someone, break

Table 3.39. BEHAVIORAL MEASURES. JUVENILE CRIME/DELINQUENCY: NUMBER OF CRIMINAL ACTS IN THE PAST YEAR Box-Tidwell test coefficients and odds ratios, Likelihood Ratio Chi-Square test statistic, weighted mean and unweighted standard deviation (in parentheses) or proportions, and numbers of cases

<i>Number of criminal acts in the past year</i>			
<i>multinomial logistic regression of first family type on number of criminal acts</i>			
Box-Tidwell test; unstandardized coefficient	no family was formed	first parenthood was first	first cohabitation was first
	b = .016*; Exp(b) 1.016	b = .018**; Exp(b) = 1.018	b = .021***; Exp(b) = 1.022
Likelihood Ratio Test Chi-Square (df) ^a = 24.381*** (3)			
<i>Number of criminal acts in the past year (ref: none or one violent act)</i>			
number of criminal acts in the past year; range: 0 to 36	<i>mean/proportion</i>	<i>number of cases</i>	
0 acts	2.20 (3.12)	3,791	
one	.33	1,329	
two	.13	528	
3 to 36	.23	929	
missing data	.25	1,005	
Total^b	1.00	4,011	

* = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance

^a The Chi-Square statistic is the difference in -2 Log Likelihoods between the final model and a reduced model formed by omitting the effect from the final model.

^b Total does not add to 1.00 due to computational rounding.

into a building or car to steal something, sold or held stolen goods, running numbers, selling marijuana, and selling hard drugs), ranged from 0 to 36, had a mode of “2” among those who had committed at least one act, and a higher score indicated a higher “number of criminal acts in the past year.” A Box-Tidwell test revealed a statistically significant nonlinear association between the number of criminal acts and the dependent variable and the measure, including the 220 cases with missing data, was categorized and then transformed into a dummy variable set (see Table 3.39). The dummy variables in the set were: (1) 1 = one

criminal act, 0 = more than one, none, or missing data; (2) 1 = two criminal acts, 0 = one act, more than two acts, none, or missing data; (3) 1 = three or more criminal acts, 0 = fewer than three, none, or missing data; and (4) 1 = missing data, 0 = data on criminal acts. In the analysis, the category of “no criminal acts in the past year” was the omitted category.

The fourth measure of juvenile crime/delinquency indicated whether the subject was “ever convicted of a crime” (Table 3.40). It was based on responses to four general questions about convictions asked in 1980:

(1) “Have you ever been convicted of any charges other than a minor traffic violation?” Responses were “yes” or “no.”

(2) “How many times have you ever been convicted of something?” Responses ranged from 0 to 21.

(3) “How old were you [the first time/when] this happened?” Responses ranged from 7 to 17.

(4) “What was the year of the most recent conviction [except for a minor traffic violation]?” Responses ranged from 1971 to 1980.

It also was based on information about specific convictions in response to the 1980 question: “What charges have you ever been convicted of?” The respondents were asked to indicate “yes” in the box next to any of the following: (1) assault, (2) robbery, (3) theft, (4) theft by deception, (5) receiving or possessing or selling stolen property, (6) destruction of property, (7) other property offense, (8) gambling, (9) commercial vice, (10) possession or use of marijuana or hashish, (11) selling marijuana or hashish, (12) possession or use of other illicit drugs, (13) sale/manufacture of other illicit drugs, (14) major traffic offense, (15) drinking or purchasing alcohol under [legal age in respondent’s state], and (16) any other offense. Responses to two additional questions were used to indicate conviction: (1) “Have you ever been on probation?” and (2) “Have you ever been sentenced to spend time in a corrections institution, like a jail, prison, or youth institution like a training school or reform school?” Responses to both questions were “yes” or “no.”

Table 3.40. BEHAVIORAL MEASURES. JUVENILE CRIME/DELINQUENCY: EVER CONVICTED OF A CRIME Proportions^a and numbers of cases in the study sample and by gender, race/ethnicity, and rural/South residence

<i><u>Ever convicted of a crime (ref: no)</u></i>	<i><u>Proportion</u></i>	<i><u>Number of cases</u></i>
yes	.06	240
no	.94	3,771
Total	1.00	4,011
<i><u>Ever convicted of a crime (ref: no)</u></i>	<i><u>Proportion "yes"</u></i>	<i><u>Number of cases</u></i>
male	.10	202
female	.02	38
Chi-Square (df) = 109.006*** (1)		
<i><u>Ever convicted of a crime (ref: no)</u></i>	<i><u>Proportion "yes"</u></i>	<i><u>Number of cases</u></i>
non-Hispanic white	.05	128
black	.04	21
Hispanic	.06	17
Native American	.08	34
Other	.08	39
Chi-Square (df) = 13.666** (4)		
<i><u>Ever convicted of a crime (ref: no)</u></i>	<i><u>Proportion "yes"</u></i>	<i><u>Number of cases</u></i>
rural South	.04	27
rural non-South	.05	41
non-rural South	.05	36
non-rural non-South	.07	136
Chi-Square (df) = 8.658* (3)		

* = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Proportions within the subgroups are of the specific group (e.g., .10 of the males and .02 of the females were ever convicted of a crime)

The subjects who responded “yes,” who reported a number greater than zero, or who provided an age or year of conviction to the first four questions were coded 1 = at least one conviction. Subjects who indicated “yes” next to any of the 16 specific offenses listed above were coded 1 = at least one conviction. Finally, subjects who responded “yes” they had ever been on probation or, “yes” to the questions about sentencing to a corrections institution were coded 1 = at least one conviction. In the analysis, the measure was tested as dichotomous indicator where 1 = at least one conviction, 0 = no convictions. Table 3.40 shows that about .06 of the sample (N=240) had been convicted at least one time before May of 1980 and describes the distribution of the indicator by age, gender, race/ethnicity, and residence.

Statistical Methods

Multinomial logistic regression compares multiple groups through a combination of binary logistic regressions. It was chosen as the most appropriate statistical tool to use to address the research questions and test the hypotheses because the overarching interest of the study was to predict group membership into the type of family that first was formed among four possibilities—marriage, cohabitation, parenthood, or not forming a family. The extension of binomial logistic regression to multinomial logistic regression is to designate one category as the reference group and the probability of membership in the other categories is compared with the probability of membership in the reference group (Menard 1995). The dependent variable in this analysis was a four-category nominal indicator (“first family type”) and the reference category was “first marriage was first.”

Research Question 1 was addressed with the entire sample of 4,011 cases in a two nested-model approach. The effects of gender, race/ethnicity, and residence were assessed for statistical significance between (or among) subgroups and then separate subgroup analyses were performed on groups where the differences in the effects of the type of substance used in 1979 were statistically significant. Thus, if appropriate, separate multinomial logistic regressions were performed on the 2,066 males and 1,945 females using the same two nested-model approach used on the full sample. That was followed by separate analyses, if appropriate, on: (1) 2,329 non-Hispanic whites, (2) 531 blacks, (3) 277 Hispanics, (4) 418 American Indians, and (5) 457 Others and separate analyses, if appropriate, on: (1) 596 rural South residents, (2) 803 rural non-South residents, (3) 702 non-rural South residents, and (4) 1,910 non-rural non-South residents. To focus on the net effects of substance use on first family type, the analyses of the racial/ethnic groups and residential groups were restricted to Model 2.

Research Question 2 was addressed with an analysis of the subjects who had used alcohol but no other substances in 1979 (N=800) and Research Question 3 was addressed with an analysis of the subjects who had used marijuana but no other substances in 1979 (N=315). The same two nested-model

approach that was used to address Research Question 1 was used for these two analyses. In both of these analyses, the effects of the characteristics of alcohol or marijuana on first family type were contrasted to the effects of non-use on first family type by including in the analyses the 876 subjects who had not reported any substance use in 1979.

The final analysis addressed Research Question 4 and was of the subjects who had used other illegal drugs in 1979. A few (N=20) had used only illegal drugs other than marijuana but most had concurrently used illegal drugs with alcohol (N=48) or marijuana (N=65) or with both alcohol and marijuana (N=635) in 1979. A four-model approach was used to assess the effects of illegal drug use on the first family types of these subjects. This analysis also included the 876 subjects who had not reported substance use in 1979.

The analyses were run using the SPSS 15.0 Multinomial Logistic Regression function. It aimed to determine the influence that the measures of alcohol and illegal drug use had on the probability that a sample member was a member of a group or category of the dependent variable over and above the influence of a core group of control factors. The analyses proceeded in an order that progressively addressed the research questions. For each analysis, summary statistics for evaluating the multinomial logistic regression model and a set of coefficients and odds ratios were generated for each of three comparisons: (1) those who had not formed a family by 2004 were compared to those whose first family type was marriage, (2) those who had entered parenthood first were compared to those who had married first, and (3) those who had cohabited first were compared to those who had married first.

Research Question 1

How does the use of alcohol, marijuana, or other illegal drugs alone or concurrently relate to the first type of family formed?

To assess the effects of alcohol and illegal drug use on first family type, all of the subjects (N=4,011) were analyzed with two nested models. Table 3.41 shows the structure of the models and the specific variables that were included in

Table 3.41. STATISTICAL METHODS: Multinomial logistic regression analysis^a: Models 1 and 2 used to analyze the entire sample (N=4,011) and the sample subgroups

Variables as entered in Models 1 and 2	
Model 1 (N = 4,011)	Model 2 (N = 4,011)
<p><u>Key independent variables</u></p> <p>1 Type of user in 1979^b</p> <p>(a) alcohol only</p> <p>(b) marijuana only</p> <p>(c) alcohol and marijuana</p> <p>(d) illegal drugs^c</p> <p>(e) all three types</p>	<p><u>Key independent variables</u></p> <p>1 Type of user in 1979^b</p> <p>(a) alcohol only</p> <p>(b) marijuana only</p> <p>(c) alcohol and marijuana</p> <p>(d) illegal drugs^c</p> <p>(e) all three types</p> <p><u>Physical characteristics</u></p> <p>2 Age</p> <p>3 Body Mass Index (BMI)</p> <p><u>Family background factors</u></p> <p>4 Family poverty status</p> <p>5 Mother's Two-factor SSI</p> <p>6 Father's Two-factor SSI</p> <p>7 Lived with mother</p> <p>8 Lived with father</p> <p>9 Number of siblings</p> <p>10 Rural and South regional residence (at age 14)</p> <p><u>Socio-cultural indicators</u></p> <p>11 Gender</p> <p>12 Race/ethnicity</p> <p><u>Attitudinal measures</u></p> <p>13 Expected age at first birth</p> <p>14 Expected age first marriage</p> <p>15 Expected educational attain</p> <p>16 Religious conservatism</p> <p>17 Mother's age at Ss birth</p> <p>17 Father's age at Ss birth</p> <p>18 Self-esteem</p> <p>20 Locus of control</p> <p>21 Gender attitudes</p> <p><u>Behavioral measures</u></p> <p>22 Age at first intercourse</p> <p>23 church attendance</p> <p>24 Idle</p> <p>25 Number of violence acts</p> <p>26 Number of delinquent acts</p> <p>27 Number of criminal acts</p> <p>28 Ever convicted of a crime</p>

^a "first family type" was the dependent variable and "first marriage was first" was the reference category.

^b The reference group was "no use in 1979."

^c The "Illegal drugs" category includes the use of illegal drugs alone (N=20), with alcohol (N=48), or with marijuana (N=65).

the analysis. In Model 1, the effects of the use of alcohol and/or illegal drugs on first family type were assessed with the indicators of “type of substance use in 1979” as the only independent variables. In Model 2, the measures of Physical Characteristics, Family Background Factors, rural and South regional residence, gender, race/ethnicity, the Attitudinal variables, and the Behavioral measures were included with the indicators of the type of substances used in 1979.

The effects of the type of substance use in 1979 on first family type were assessed across the models. The increase in the predictive power of the indicators of the type of substance use in 1979 from Model 1 to Model 2 was assessed. The net effects of the indicators of the type of substance use in 1979 for predicting the probability that a subject would be a member of each of the four first family types were determined.

Research Question 1a

How do the effects of alcohol and illegal drug use on the first type of family formed differ by gender?

To assess gender differences in the effects of substance use in 1979 on the first type of family that was formed, separate effects for males and females were evaluated. First, the effects of gender in the full sample analysis were evaluated by determining the statistical significance in Model 2 of apparent gender differences in the effects of the type of substance use in 1979 on first family type. This was accomplished by estimating the effects of interactive terms between gender and all the type of substance use indicators on first family type and evaluating the findings for statistical significance. Then, if statistically significant, Models 1 and 2 were separately performed on the samples of males and females. The two nested-model approach used for the full sample analysis was employed. The variables in each of Models 1 and 2 were the same as in Models 1 and 2 of the full sample analysis (Table 3.41). Then, the effects of the type of substance use in 1979 on first family type were assessed across the two models separately for males and females. The increases in the predictive power of the indicators of the type of substance use in 1979 from Model 1 to Model 2 were assessed separately for

males and females and compared. The net effects of the indicators of the type of substance use in 1979 for predicting the probability that a subject would be a member of each of the four first family types were assessed for males and females separately and compared.

Research Question 1b

How do the effects of alcohol and illegal drug use on the first type of family formed differ by race/ethnicity?

The analysis of racial/ethnic differences in the effects of substance use in 1979 on the first type of family that was formed was performed first by evaluating the effects of race/ethnicity in the full model analysis. Statistical significance of apparent differences among the racial/ethnic groups was determined with the procedure used to assess gender differences (described above). To focus on the net effects of substance use on first family type, separate analyses of the racial and ethnic groups that evidenced statistically significant differences were performed using Model 2 (and Model 1 was not included). The variables in Model 2 were the same as in Model 2 of the full sample analysis (see Table 3.41). The effects of the type of substance use in 1979 on first family type were assessed separately for the racial/ethnic groups and compared. The net effects of the indicators of the type of substance use in 1979 for predicting the probability that a subject would be a member of each of the four first family types were assessed for each racial/ethnic group separately and compared.

Research Question 1c

How do the effects of alcohol and illegal drug use on the first type of family formed differ by rural/non-rural and South regional residence?

Residential differences in the effects of substance use in 1979 on the first type of family that was formed were assessed with the same procedure and modeling approach that was used for the analysis of race/ethnicity. The effects of residence in the full sample analysis were evaluated followed by an evaluation of

the effects of the types of substances used in 1979 on first family type in Model 2 separately for the residential groups. The net effects of the indicators of the type of substance use in 1979 for predicting the probability that a subject would be a member of each of the four first family types were separately assessed for the residential groups and compared.

Research Question 2

How do (a) the age at first monthly or more frequent alcohol use, (b) the frequency of alcohol use in 1979, (c) the occurrence of binge drinking, and (d) the type of problem drinker relative (if any) relate to the first type of family that subsequently was formed?

The effects of four characteristics of alcohol use on first family type were assessed on the 800 subjects who were in the “alcohol only” group of the substance use in 1979 indicators and the 876 subjects who had not used any substances in 1979 and who were the reference group of the substance use in 1979 indicators in Models 1 and 2 (full sample and subgroup analyses). The two nested-model approach was used to assess the effects of the measures of alcohol use on first family type. Table 3.42 shows the structure of the models, the alcohol use variables, and the category titles of the control variables that were included in the models. The control variables in Model 2 were the same control variables that were used in the analysis of the full sample. In Model 1, the effects of the four measures of alcohol use or exposure to alcohol use on first family type were assessed as the only independent variables. In Model 2, the measures of Physical Characteristics, Family Background Factors, the Socio-cultural indicators, the Attitude variables, and the Behavior measures were included with the indicators of the type of substance use in 1979. The effects of the five alcohol use variables on first family type were assessed across the two models. The increase in the predictive power of the alcohol use measures from Model 1 to Model 2 was evaluated. The net effects of each alcohol use variable for predicting the probability that a subject would be a member of each of the four first family types were evaluated.

Table 3.42. STATISTICAL METHODS ALCOHOL USE: Multinomial logistic regression analysis^a variables in Models 1 and 2 (N=1,676)

Variables as entered in Models 1 and 2	
Model 1 (N = 1,676)	Model 2 (N = 1,676)
<u>Alcohol use variables</u>	<u>Alcohol use variables</u>
1 Age at first use	1 Age at first use
2 Frequency of use	2 Frequency of use
3 Binge drinking	3 Binge drinking
4 Type of problem drinker relative	4 Type of problem drinker relative
	<u>Physical Characteristics</u>
	<u>Family Background Factors</u>
	<u>Socio-cultural Indicators</u>
	<u>Attitude Measures</u>
	<u>Behavior Measures</u>

^a“first family type” was the dependent variable and “first marriage was first” was the reference category.

Research Question 3

How do (a) the age at first marijuana use and (b) the frequency of marijuana use in 1979 relate to the first type of family formed?

The analysis of the effects of characteristics of marijuana use on first family type was performed with the same two nested-model approach as the analysis of the effects of characteristics of alcohol use on first family type. The analysis was done on the 315 subjects who were in the “marijuana only” group of the substance use in 1979 indicators and the 876 subjects who had not used any substances in 1979 and who were the reference group of the substance use in 1979 indicators in Models 1 and 2 described above. Table 3.43 shows the structure of the models, the marijuana use variables, and the category titles of the control variables that were included in the models. The control variables in Model 2 were the same control variables that were used in the analysis of the full sample. In Model 1, the effects of the two measures of marijuana use on first family type were evaluated as the only independent variables. In Model 2, all the control variables were included with the two marijuana use variables. The effects of the two measures of marijuana use on first family type were assessed from Model 1 to Model 2. The increase in the predictive power of the variables and the net effects of each marijuana use variable for predicting the probability that a subject would be classified into each of the four first family types were determined.

Table 3.43. STATISTICAL METHODS: MARIJUANA USE: Multinomial logistic regression analysis^a variables in Models 1 and 2 (N=1,191)

Model 1 (N = 1,191)	Model 2 (N = 1,191)
<i>Marijuana use variables</i>	<i>Marijuana use variables</i>
1 Age at first use	1 Age at first use
2 Frequency of use	2 Frequency of use
	<i>Physical Characteristics</i>
	<i>Family Background Factors</i>
	<i>Socio-cultural Indicators</i>
	<i>Attitudinal Measures</i>
	<i>Behavioral Measures</i>

^a“first family type” was the dependent variable and “first marriage was first” was the reference category.

Research Question 4

How does the age at first use of illegal drugs other than marijuana relate to the first type of family formed?

The subjects who had only used illegal drugs in 1979, or had concurrently used illegal drugs with alcohol, with marijuana, or with both alcohol and marijuana in 1979 (N = 768) and the non-users of any substances in 1979 (N = 876) were the subjects of this analysis. Four models were used to evaluate the effects of the age at first use of illegal drugs on first family type. In Model 1, only the dummy variable set of indicators of age at first illegal drug use was included. Model 2 added the four alcohol use variables and the two marijuana use variables. Model 3 removed the alcohol and marijuana use measures and replaced them with the five groups of control variables. Model 4 added the alcohol and marijuana use variables to Model 3. Table 3.44 shows the structure of the models, the substance use variables in Models 1 to 4, and the category titles of the control variables that were included in Models 3 and 4. In Model 1, the effects of age at first illegal drug use on first family type were ascertained. Then, the effects of age at first illegal drug use on first family type were assessed across the four models. The increase in the predictive power of the variables from Models 1 to 4 was determined. The net effects of the age at first illegal drug use variable for predicting the probability that a subject would be a member of each of the four first family types were evaluated.

Table 3.44. STATISTICAL METHODS OTHER ILLEGAL DRUG USE: Multinomial logistic regression analysis^a variables in Models 1 to 4 (N=1,644)

Variables as entered in Models 1 to 4			
Model 1	Model 2	Model 3	Model 4
<i>Illegal drug use</i>	<i>Illegal drug use</i>	<i>Illegal drug use</i>	<i>Illegal drug use</i>
1 Age at first use	1 Age at first use	1 Age at first use	1 Age at first use
	<i>Alcohol use</i>	<i>Physical Char</i>	<i>Alcohol use</i>
	1 Age at first use	<i>Family Background</i>	1 Age at first use
	2 Frequency of use	<i>Socio-cultural</i>	2 Frequency of use
	3 Binge drinking	<i>Attitudes</i>	3 Binge drinking
	4 Type of relative	<i>Behaviors</i>	4 Type of relative
	<i>Marijuana use</i>		<i>Marijuana use</i>
	1 Age at first use		1 Age at first use
	2 Frequency of use		2 Frequency of use
			<i>Physical Char</i>
			<i>Family Background</i>
			<i>Socio-cultural</i>
			<i>Attitudes</i>
			<i>Behaviors</i>

Evaluation of the Effects of the Control Variables

The goal of this study was to assess the influence of alcohol and illegal drug use on the first type of family formed. The analyses of Research Questions 1 through 4 considered the effects of the type of substance use, concurrent substance use, and the influence of characteristics of substance use on atypical versus typical family formation. An important feature of the analyses was the accounting for the effects of other possible explanations of differences in family formation behavior by including 24 control variables in four domains²⁷. Yet, the Research Questions did not address the effects that these variables had on first family type.

While the effects of the control variables were not of primary importance to this study, their influence is important to understanding both family formation behavior and the net influence of substance use on the choices that people make. Accordingly, the effects of these variables on first family type in the full sample analysis (Research Question 1) are briefly presented and discussed in Appendix B.

²⁷ The socio-cultural indicators of gender, race/ethnicity, and residence were specifically analyzed.

CHAPTER FOUR

ANALYSIS

The purpose of this analysis was to assess the relationship of alcohol and illegal drug use to initial family formation. The sample consisted of the respondents to the NLSY79 who were 14 to 16 years old in 1979 who had never married, cohabited, or parented. Data collected from 1979 to 2004 on initial family formation, substance use, and other factors were used to address the research questions.

Addressing the Research Questions

The criteria used to assess the utility of the multinomial logistic regression models and the contributions of the measures of alcohol and illegal drug use to predicting first family type were summary statistics and the substantive and statistical significance of the logistic regression parameter estimates (Menard 1995). The summary statistics consisted of: (1) goodness of fit of the overall model using (a) the Model Chi-Square and (b) the “group” Likelihood Ratio Test Chi-Square; (2) predictive efficiency evaluated by (a) the pseudo R^2 (Nagelkerke’s R^2) and (b) a comparison of the predicted group membership to the known group membership (overall Classification Accuracy Rate); and (3) overall importance of the individual indicators of alcohol and illegal drug use to predicting classification of a subject assessed by the Likelihood Ratio Test Chi-Square. Substantive and statistical significance of the specific types of substance use to predicting the first type of family formed was assessed with (1) parameter estimates (coefficients, standard errors, and odds ratios) and (2) statistical significance (p-value).

Goodness of fit

The Model Chi-Square considers all of the variables in the model in its assessment of goodness of fit. To assess the goodness of fit of the key alcohol and illegal drug use variables that are sets of indicators when they are in models with other independent variables, “group” Likelihood Ratio Tests were computed.

To obtain these statistics, a stepwise multinomial logistic regression procedure was performed. Step 1 was Model 2 without the set of substance use indicators and Step 2 was Model 2 with the set of indicators. The differences between the two Model Chi-Square statistics of the two regressions were computed and the statistical significance of each was calculated using an on-line calculator, the “Chi-Square to P Calculator” at <http://faculty.vassar.edu/lowry/tabs.html#csq>.

Predictive efficiency

The utility or strength of a multinomial logistic regression model may cautiously be estimated by a pseudo R^2 that is analogous to the Coefficient of Determination in linear regression. In logistic regression, the pseudo R^2 indicates the extent to which the inclusion of the independent variables in the model reduces the “badness of fit” or “error Chi-Square” statistic, the Deviance statistic. Nagelkerke’s R^2 varies between 0 and 1. A second way to assess a model’s predictive efficiency is by its Classification Accuracy Rate (CAR). A model is considered useful for predicting classification into the categories of the dependent variable when its CAR is a .25 improvement over the rate of accuracy that is achievable by chance alone (www.utexas.edu). The CAR was generated with the other summary statistics in the SPSS nominal regression output data. The “by chance” accuracy rate was estimated for each model as the “proportional by chance accuracy rate” which was computed by summing the squared proportions of cases in the categories of the dependent variable (www.utexas.edu).

Overall importance of the individual substance use indicators to the model

An independent variable’s Likelihood Ratio Test statistic is the difference between the Model Chi-Square that includes the variable and the Model Chi-Square that excludes the variable. It evaluates the overall relationship of one independent variable to the dependent variable. In these multinomial logistic regression models, a Likelihood Ratio Test statistic represents the combined effects of an independent variable on the three embedded logistic regressions that constitute the multinomial logistic regression. Its statistical significance indicates that its predictive utility for classifying a subject into each of the four categories of

the dependent variable is more than coincidence or random variation in the sample. Because the Likelihood Ratio Test statistic represents the effect of an independent variable on the dependent variable as a whole it may be statistically significant overall but may not be statistically significant in differentiating between all three pairs of groups defined by the dependent variable.

Substantive and statistical significance

Parameter estimates provide information about the effects of an independent variable on the three embedded logistic regressions in the multinomial logistic regression analysis. When independent variables are linear or ordinal, the effects may best be interpreted when the coefficients have been standardized so that the differences in the magnitude of the coefficients of the independent variables can be meaningfully compared. In these multinomial logistic regression models, the alcohol and illegal drug use variables are dummy variable sets and using the *un*standardized coefficients for interpretation is the more meaningful approach to take (Menard 1995:49). Moreover, the same information provided by the unstandardized coefficients is available in the form of odds ratios which may be the most meaningful way to interpret the effects of nominal indicators on a nominal dependent variable because both are relative to a reference group. In these analyses, the odds ratios that were derived from the unstandardized coefficients were used to interpret the net substantive contributions of the alcohol and illegal drug use variables to predicting first family type and the p-values of the coefficients were used to evaluate their statistical contributions.

Research Question 1

How does the use of alcohol, marijuana, or other illegal drugs alone or concurrently relate to the first type of family formed?

The analysis that addressed this question was carried out on the study sample of 4,011 subjects who were 14 to 16 years old and who had never married, cohabited, or parented in 1979. The findings are presented in Table 4.1. A

multinomial logistic regression analysis was employed in the two nested-model approach described in Chapter Four. In Model 1, the dummy variable set of indicators of type of substance use at ages 14 to 16 (in 1979) was tested for substantive and statistical significance (no use in 1979 was the reference category). In Model 2, the control variables (age, BMI, family poverty, mother's (father's) Two-factor Social Status Index, number of siblings, residence, gender, race/ethnicity, expected age at first birth (marriage), years of expected educational attainment, religious conservatism in childhood, mother's (father's) age at subject's birth, self-esteem, two measures of locus of control, attitudes toward working wives, age at first intercourse, church attendance, "idle" status, and four measures of crime/delinquency) were included with the indicators of the type of substance use in 1979. The dependent variable was "first family type" and "first marriage was first" was the omitted category.

Hypothesis 1 [*The use of alcohol, marijuana, or other illegal drugs alone or concurrently is substantively and statistically related to the first type of family formed.*] was fully supported by the analysis (see Table 4.1). The null hypothesis that there was no difference between the model with no independent variables and the model with the type of substance use in 1979 set of indicators was rejected. The Model 1 Model Chi-Square of 253.028 was statistically significant at the $p < .001$ level of significance. The Group Likelihood Ratio Test statistic of the set of indicators was statistically significant in Model 2 ($p < .001$), suggesting that a relationship existed between the type of substance used in 1979 and the dependent variable when accounting for the effects of the control variables above and beyond what can be attributed to random variation in the sample. Nagelkerke's R^2 was quite modest (.067) but exceeded Menard's (1995:19) threshold for substantive significance in linear regression ($R^2 = .005$) and thus provided some evidence of an actual relationship between the type of substance use in 1979 and first family type. The "by chance" Classification Accuracy Rate was .350. A .25 improvement yielded a classification accuracy rate of .437. The Model 1 predicted CAR (.506) more than satisfied the criteria of adequate

Table 4.1. FULL SAMPLE ANALYSIS: Summary and independent variable statistics of multinomial logistic regression analysis of the relationship of type of substance use in 1979 (ref: no use) to first family type (ref: first marriage was first); N=4,011

SUMMARY STATISTICS				
Goodness of Fit		MODEL 1^a	MODEL 2^b	
Model Chi-Square ^c		253.028***	1720.399***	
(pseudo R ²) Nagelkerke R ²		.067	.384	
proportional by chance accuracy rate		.350	.350	
1.25 x by chance accuracy		.437	.437	
Classification Accuracy Rate		.506	.579	
Likelihood Ratio Test Statistics		Chi-Square	Chi-Square	
Alcohol only		28.058***	7.377†	
Marijuana only		30.532***	9.210*	
Other only or with alcohol or marijuana		18.369***	8.551*	
Alcohol and marijuana		33.794***	9.017*	
All three types		92.477***	15.962***	
“group” Likelihood Ratio Test			46.598***	
PARAMETER ESTIMATES AND ODDS RATIOS				
<i>no family was formed by 2004 versus first marriage</i>				
		MODEL 1^a	MODEL 2^b	
Type of Use	B	Exp(b)	B	Exp(b)
Alcohol only	-.191	(.826)	-.109	(.897)
Marijuana only	-.877**	(.416)	-.860**	(.423)
Other illegal drugs ^d	.741**	(2.099)	.651*	(1.917)
Alcohol and marijuana	-.461**	(.631)	-.417*	(.659)
All three types	-.238	(.788)	-.290	(.748)
Intercept	-1.493***		-2.346***	
<i>first parenthood occurred first versus first marriage</i>				
		MODEL 1^a	MODEL 2^b	
Type of Use	B	Exp(b)	B	Exp(b)
Alcohol only	-.484**	(.616)	-.361†	(.697)
Marijuana only	.602***	(1.826)	-.034	(.967)
Other illegal drugs ^d	.389	(1.476)	-1.931	(.824)
Alcohol and marijuana	-.088	(.916)	-.325†	(.723)
All three types	.397*	(1.487)	.067	(1.069)
Intercept	-1.340***		-1.093*	
<i>first cohabitation occurred first versus first marriage</i>				
		MODEL 1^a	MODEL 2^b	
Type of Use	B	Exp(b)	B	Exp(b)
Alcohol only	.414***	(1.513)	.206	(1.228)
Marijuana only	.325†	(1.384)	.051	(1.053)
Other illegal drugs ^d	.938***	(2.554)	.509*	(1.664)
Alcohol and marijuana	.492***	(1.635)	.119	(1.126)
All three types	1.133***	(3.106)	.585***	(1.794)
Intercept	1.158***		-.361	

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Included only the variable indicating type of substance use in 1979

^b Added to Model 1 were the measures of physical characteristics, family background factors, socio-cultural indicators, the attitudinal measures, and the behavioral measures.

^c Model Chi-Square is the difference between the Intercept Only -2LL and the Final Model -2LL

^d “other illegal drugs” is a category consisting of the three types of use of illegal drugs other than marijuana: (1) only, or concurrently with (2) alcohol or (3) marijuana.

classification accuracy. The Likelihood Ratio Chi-Square statistics of the separate indicators of the type of substance use show that each indicator of a type of substance use in 1979 made a statistically significant contribution to the model (compared to non-use) in Model 1; those statistics somewhat declined in Model 2, but maintained statistical significance. Among the types of substance use, the indicator of concurrent use of all three types of substances made the largest contribution to the classification of subjects into first family type in both Models 1 and 2.

No family was formed versus marriage as the first family type

Hypothesis 1.1 [*The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, increases the odds that no family was formed*] was not supported (Table 4.1).

The singular use of a substance was expected to make no significant impact on not forming a family but concurrent use of substances was expected to increase the odds that marriage was delayed and no other family type was formed by 2004 when the subjects were ages 39 to 41. The use of other illegal drugs alone or concurrently with alcohol or marijuana almost doubled the odds of non-users that no family was formed than a first marriage by 2004, which lost little of its substantive or statistical significance across the models. However, the use of only marijuana or of marijuana concurrently used with alcohol significantly decreased the odds that no family was formed even controlling for factors known to predict some aspects of family formation.

Parenthood versus marriage as the first family type

Hypothesis 1.2 [*The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, decreases the odds that parenthood was the first type of family formed*] was not supported (Table 4.1).

It was expected that singular use would not significantly influence the odds but that concurrent use would decrease the odds of parenthood versus marriage

as the first family type. In Model 1, the effect of substance use on parenthood as the first family type appeared to depend on the type of substance that was used—the singular use of alcohol decreased the odds while the use of marijuana only or concurrent use of all three types increased the odds. Controlling for the other factors in Model 2, the use of alcohol either alone or concurrently with marijuana decreased the odds of parenthood but, generally, substance use made just a marginal contribution to predicting first parenthood versus first marriage as the first family type ($p < .10$).

Cohabitation versus marriage as the first family type

Hypothesis 1.3 [*The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, increases the odds that cohabitation was the first type of family formed*] received limited support (Table 4.1).

Concurrent use was expected to increase the odds of cohabitation. However, in Model 1, *every* type of substance use, used alone or concurrently, was associated with a significant increase in the odds that cohabitation occurred prior to marriage as the first family type. Moreover, the odds that cohabitation preceded marriage increased as the number of substances that were used in 1979 increased and with “escalated” use from alcohol to marijuana to other illegal drugs (see Chen and Kandel 1995). The inclusion of the control variables in Model 2 diminished to statistical non-significance the effects of all the indicators except the two indicators that included use of other illegal drugs, which maintained substantive and statistical significance and increased the odds of cohabitation over marriage as the first family type between about .70 and .80 compared to non-use.

To summarize, singular use was not expected to significantly contribute to predicting first family type. This aspect of the hypotheses was fairly well-supported as there was just one significant relationship found between singular use and first family type—the use of only marijuana decreased the odds that no family was formed versus marriage by 2004 ($p < .01$). On the other hand, concurrent use was expected to increase the odds of not forming a family and of cohabitation and to decrease the odds of parenthood as the first family type. However, the concurrent

use of alcohol and marijuana decreased the odds of atypical family formation (not forming a family by 2004 or parenthood). And the use of other illegal drugs alone or concurrently with either alcohol or marijuana increased the odds of delayed marriage with no family formation and of cohabitation. The concurrent use of all three types of substances had no significant effect on not forming a family by 2004 or on parenthood as the first family type but increased the odds of cohabitation versus marriage by about .80 over non-use. Other illegal drug use, alone or concurrently used with alcohol and/or marijuana made the largest contribution to predicting first family type and was the only significant substance use contributor to predicting cohabitation as the first family type.

Research Question 1a

How do the effects of alcohol and illegal drug use on the first type of family formed differ by gender?

Differences between females and males in first family type were statistically significant ($p < .001$) but substantively quite similar when observed in a cross-tabulation (Table 4.2). Females were just one, two, or three percentage points

Table 4.2. GENDER DIFFERENCES: Proportional differences between males and females in the distribution of cases across first family type and type of substance use in 1979; proportions with numbers of cases in parentheses

		First family type						
<u>gender</u>	<u>no family was formed</u>	<u>parenthood was first</u>	<u>cohabitation was first</u>	<u>marriage was first</u>	<u>Total</u>			
male	.13 (278)	.13 (272)	.24 (503)	.49 (1,012)	1.00 (2,066)			
female	.07 (136)	.14 (282)	.26 (509)	.52 (1,019)	1.00 (1,945)			
Pearson Chi-Square (df) = 45.455*** (3)								
		Type of substance use in 1979						
<u>gender</u>	<u>alcohol only</u>	<u>mar only</u>	<u>other</u>	<u>alcohol and mar</u>	<u>all three types</u>	<u>none</u>	<u>unknown</u>	<u>Total</u>
male	.20 (420)	.09 (183)	.04 (82)	.27 (565)	.16 (323)	.19 (393)	.05 (100)	1.00 (2,066)
female	.19 (380)	.07 (132)	.03 (51)	.24 (460)	.16 (312)	.25 (484)	.06 (127)	1.00 (1,945)
Pearson Chi-Square (df) = 37.528*** (6)								

*** = $p < .001$, two-tailed tests of significance

higher than males in the proportions of first parenthood, first cohabitation, or first marriage. However, males were almost twice as likely as females not to have formed a family by 2004 (.13 v .07). There also were differences between males and females in the types of substances that were used in 1979, shown on Table 4.2. Females were less likely than males to have used substances at all in 1979, a difference most evident with respect to concurrent use of alcohol and marijuana in 1979 (.24 v .27, respectively). It is important to note that there was no difference in the proportions that concurrently used all three types of substances in 1979.

In the full sample analysis of Model 2 (see Table 4.3), gender was a dichotomous indicator that had a substantively and statistically significant

Table 4.3. GENDER DIFFERENCES: Effects of gender on first family type; Likelihood Ratio Test statistics and odds ratios in Model 2 of the full sample analysis (N=4,011)

<i>EFFECTS OF GENDER ON FIRST FAMILY TYPE IN THE FULL SAMPLE ANALYSIS</i>						
gender (male=1)	Model 2^a Chi-Square (df)					
Likelihood Ratio Test	64.583*** (3)					
	<i>no family formed by 2004</i>		<i>first parenthood was first</i>		<i>first cohabitation was first</i>	
gender	B	Exp(b)	B	Exp(b)	B	Exp(b)
male = 1	.710***	(2.034)	-.694***	(.500)	-.108	(.897)

*** = $p < .001$, two-tailed tests of significance

^a Included were the measures of type of substance use in 1979, physical characteristics, family background factors, socio-cultural indicators, the attitudinal measures, and the behavioral measures

Likelihood Ratio Test statistic, suggesting that “gender” made a significant contribution to classifying the subjects into the first family types (see Table 4.3). Table 4.3 also shows that males were about twice as likely as females not to have formed a family by 2004 than a first marriage ($p < .001$) and about half as likely as females that parenthood was their first family type ($p < .001$) net of the effects of the control variables. The statistically significant Likelihood Ratio Test suggested a moderately strong relationship of gender to first family type.

Interaction terms between gender and each of the types of substance use indicators (alcohol only, marijuana only, alcohol and marijuana, other illegal drug use alone or with either alcohol or marijuana, and all three types of substances) were created and were tested for statistical significance in the full sample Model 2, results of which are shown in Table 4.4. The relationship of the type of substance

use in 1979 to first family type depended on gender—was significantly different for males and females—with respect to the singular use of marijuana.

Table 4.4. GENDER DIFFERENCES: Likelihood Ratio Test statistics, coefficients, and odds ratios of the effects of interaction terms between gender and the type of substance use indicators, full sample Model 2 analysis (N=4,011)

<i>interaction term</i>	<i>Likelihood Ratio Test</i>	<i>no family formed by 2004</i>		<i>parenthood was first</i>		<i>cohabitation was first</i>	
		<i>B</i>	<i>Exp(b)</i>	<i>B</i>	<i>Exp(b)</i>	<i>B</i>	<i>Exp(b)</i>
		gender <i>by</i> alcohol only	ns	ns	ns	ns	ns
gender <i>by</i> marijuana only	8.149*	ns	ns	ns	.778*	(2.177)	
gender <i>by</i> alc and mar	ns	ns	ns	ns	ns	ns	
gender <i>by</i> other illegal drug	ns	ns	ns	ns	ns	ns	
gender <i>by</i> all three types	ns	ns	ns	ns	ns	ns	

* = $p < .05$, two-tailed tests of significance

Separate Models 1 and 2 were run on the male (N=2,066) and the female (N=1,945) portions of the sample and the summary statistics were compared (see Table 4.5). For both groups, the null hypothesis that there was no difference between the model with no independent variables and the model with the independent variables was rejected. The Model 1 Model Chi-Square statistics were statistically significant ($p < .001$) for the males and for the females and the “group” Likelihood Ratio Test statistics in Model 2 were statistically significant for both genders. Nagelkerke’s R^2 in both analyses were modest and males’ R^2 was slightly smaller than for the overall sample (.063 v .067) but both were large enough to provide evidence that Model 1 had adequate predictive efficiency. The predicted CAR of the males’ and of the females’ Model 1 each satisfied the criteria for adequate classification accuracy.

The Likelihood Ratio Test statistics of the individual indicators lost substantive and statistical significance from Model 1 to Model 2 for both males and females. In Model 2, concurrent use of alcohol and marijuana and of all three types and the singular use of marijuana remained important to predicting first family type among the males. Illegal drug use other than marijuana mattered to females’ first family type whether used alone or concurrently with alcohol and/or marijuana. These summary statistics suggested that substance use was important to predicting first family type differently for males and females.

Table 4.5. **GENDER DIFFERENCES: MODELS 1 and 2:** Summary statistics and Likelihood Ratio Test statistics of multinomial logistic regression analysis of the relationship of type of substance use in 1979 (ref: no use) to first family type (ref: first marriage was first) for males (N=2,066) and females (N=1,945)

SUMMARY STATISTICS				
	MODEL 1^a		MODEL 2^b	
Goodness of Fit	male	female	male	female
Model Chi-Square ^c	122.473***	159.741***	932.742***	1103.105***
Nagelkerke R ²	.063	.088	.397	.480
by chance CAR	.335	.369	.335	.369
1.25 X by chance CAR	.419	.461	.419	.461
CAR	.490	.528	.572	.625
Likelihood Ratio Test—MALES			Model 1^a	Model 2^b
Alcohol only			10.803*	4.245
Marijuana only			29.637***	13.764**
Other only or with alcohol or marijuana			11.738**	4.520
Alcohol and marijuana			22.974***	7.263†
All three types			42.460***	8.691**
“group” Likelihood Ratio Test				38.717***
Likelihood Ratio Test—FEMALES			Model 1^a	Model 2^b
Alcohol only			20.065***	5.055
Marijuana only			9.664*	3.178
Other only or with alcohol or marijuana			7.855*	6.743†
Alcohol and marijuana			20.116***	5.732
All three types			58.261***	9.044*
“group” Likelihood Ratio Test				29.830*

† = p < .10, * = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance

^a Included only the variable indicating type of substance use in 1979

^b Added to Model 1 were the measures of physical characteristics, family background factors, socio-cultural indicators, the attitudinal measures, and the behavioral measures.

^c Model Chi-Square is the difference between the Intercept Only -2LL and the Final Model -2LL; all Model Chi-Square statistics are statistically significant at the p < .001 level of significance

Hypothesis 1a [*The effects of alcohol and illegal drug use on initial family formation differ by gender such that:*

The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, increases the odds that no family was formed and that cohabitation was the first family type for the males and the females; however, the effects are stronger among males than among the females.

The concurrent use of alcohol and marijuana or the use of illegal drugs other than marijuana, alone or concurrently with alcohol and/or marijuana, decreases the odds that parenthood was the first family type for the males and the

females; however, the effects are stronger among females than among the males] was not supported (see Tables 4.6 and 4.7).

It was expected that concurrent substance use would increase males' and females' odds that no family was formed rather than first marriage by 2004 and

Table 4.6. GENDER DIFFERENCES: MODELS 1 and 2. Coefficients and odds ratios of multinomial logistic regression analysis of the relationship of type of substance use in 1979 (ref: no use) to first family type (ref: first marriage was first)

PARAMETER ESTIMATES				
<i>no family was formed by 2004 versus first marriage</i>				
MALES (N=2,066)	Model 1^a		Model 2^b	
Type of Use	B	Exp(b)	B	Exp(b)
Alcohol only	-.199	(.819)	-.161	(.851)
Marijuana only	-.991**	(.371)	-.971*	(.379)
Other illegal drugs	.656*	(1.926)	.624	(1.865)
Alcohol and marijuana	-.406*	(.666)	-.343	(.709)
All three types	-.077	(.926)	-.108	(.898)
Intercept	-1.196***		-1.114	
FEMALES (N=1,945)	Model 1^a		Model 2^b	
Type of Use	B	Exp(b)	B	Exp(b)
Alcohol only	-.297	(.743)	-.004	(.996)
Marijuana only	-.838†	(.433)	-.467	(.627)
Other illegal drugs	.661	(1.937)	1.319*	(3.741)
Alcohol and marijuana	-.748**	(.473)	-.456	(.634)
All three types	-.823*	(.439)	-.983†	(.374)
Intercept	-1.824***		-3.689***	
PARAMETER ESTIMATES				
<i>first cohabitation versus first marriage</i>				
MALES (N=2,066)	Model 1^a		Model 2^b	
Type of Use	B	Exp(b)	B	Exp(b)
Alcohol only	.468*	(1.597)	.318	(1.375)
Marijuana only	.632**	(1.880)	.484†	(1.623)
Other illegal drugs	1.005***	(2.733)	.685†	(1.984)
Alcohol and marijuana	.638***	(1.893)	.404†	(1.498)
All three types	1.149***	(3.155)	.684**	(1.981)
Intercept	-1.276***		-.845	
FEMALES (N=1,945)	Model 1^a		Model 2^b	
Type of Use	B	Exp(b)	B	Exp(b)
Alcohol only	.391*	(1.479)	.060	(1.062)
Marijuana only	-.062	(.940)	-.499†	(.607)
Other illegal drugs	.919**	(2.506)	.389	(1.475)
Alcohol and marijuana	.373*	(1.452)	-.177	(.838)
All three types	1.143***	(3.135)	.477*	(1.612)
Intercept	-1.070***		.024	

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Included only the variable indicating type of substance use in 1979

^b Added to Model 1 were the measures of physical characteristics, family background factors, rural/South residence, race/ethnicity, the attitudinal measures, and the behavioral measures

that concurrent but not singular substance use would increase the odds that cohabitation was first, with larger effects among the males than the females. Table 4.6 shows that concurrent substance use was not significantly important to males' not forming families by 2004 while the singular use of marijuana was. Concurrent use increased the odds that no family was formed among the females but only when that use included illegal drugs other than marijuana. Concurrent use of all three types increased the odds that cohabitation was the first family type for both males and the females (see Table 4.6) and the effect was larger for the males, as expected. However, contrary to expectations, concurrent use of alcohol and marijuana was not significantly important to cohabitation as the first family type for the females and only marginally important to cohabitation for the males.

The odds that parenthood was the first family type were expected to be decreased by concurrent substance use for both the males and the females and the effect was expected to be larger among the females. Table 4.7 shows that

Table 4.7. GENDER DIFFERENCES: MODELS 1 and 2. Coefficients and odds ratios of multinomial logistic regression analysis of the relationship of type of substance use in 1979 (ref: no use) to first family type (ref: first marriage was first)

PARAMETER ESTIMATES				
<i>first parenthood versus first marriage</i>				
MALES (N=2,066)	Model 1^a		Model 2^b	
	B	Exp(b)	B	Exp(b)
Alcohol only	-.248	(.781)	-.220	(.803)
Marijuana only	.762**	(2.144)	.281	(1.325)
Other illegal drugs	.720†	(2.055)	.255	(1.291)
Alcohol and marijuana	.230	(1.258)	-.001	(1.001)
All three types	.590*	(1.804)	.445	(1.560)
Intercept	-1.546***		-2.279**	
<i>first parenthood versus first marriage</i>				
FEMALES (N=1,945)	Model 1^a		Model 2^b	
	B	Exp(b)	B	Exp(b)
Alcohol only	-.659**	(.518)	-.610*	(.543)
Marijuana only	.515*	(1.674)	-.176	(.839)
Other illegal drugs	.035	(1.036)	-.506	(.603)
Alcohol and marijuana	-.357†	(.692)	-.602*	(.542)
All three types	.269	(1.308)	-.123	(.884)
Intercept	-1.199***		-1.318	

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Included only the variable indicating type of substance use in 1979

^b Added to Model 1 were the measures of physical characteristics, family background factors, rural/South residence, race/ethnicity, the attitudinal measures, and the behavioral measures

there was no evidence of an effect of substance use on parenthood among the males in Model 2. Among the females, alcohol used alone or concurrently with marijuana decreased the odds of parenthood versus marriage but there was no evidence of an effect of illegal drug use other than marijuana, alone or concurrently with other substance use. Thus, while the effect among females was to decrease the odds of parenthood (as anticipated) and that effect was larger than the effect among the males (also anticipated), the influence apparently centered on alcohol use rather than on concurrent substance use.

In sum, although the males in the sample were about twice as likely as the females not to have formed a family by 2004, substance use in 1979 apparently had little to do with that excess. Test results of the interaction effects of gender and substance use showed the effects of types of substance use on first family type were different by gender only with respect to the singular use of marijuana. Moreover, while males who used only marijuana were significantly different from non-users, the effect of marijuana use was to *decrease*, not increase, the odds that no family had been formed by 2004. On the other hand, females who used other illegal drugs were more likely than female non-users that no family was formed. Substance use had even less to do with males' odds that parenthood was first since males who used any of the types of substances in 1979 were just as likely as male non-users that parenthood was first. The likelihood that parenthood was first was different for females who used alcohol alone or concurrently with marijuana than female non-users—they were less likely that parenthood was first. Substance use was important to the likelihood that males' and females' first family type was cohabitation and the effects were larger among the males than females. Perhaps the effect of substance use about equally delayed marriage for males and females but male substance users were more likely to cohabit and female substance users were more likely to remain single during the period of delay.

Research Question 1b

How do the effects of alcohol and illegal drug use on the first type of family formed differ by race/ethnicity?

There was some similarity among most of the groups²⁸ in family formation behavior, but marked difference between the non-black groups and the black group (Table 4.8). The non-Hispanic white, American Indian, and Other groups were most likely to either marry or cohabit and least likely to parent as the first family type. Non-Hispanic whites were about twice as likely to marry or to cohabit as blacks. Parenthood was the conspicuous first family type among blacks (.47). Hispanics followed with about .20 entering parenthood first, while only .13 of American Indians and only .07 of non-Hispanic whites or Others began their adult family life as parents.

Table 4.8. RACIAL/ETHNIC DIFFERENCES: Proportional differences in the distribution of cases across first family type and type of substance use in 1979, proportions with numbers of cases in parentheses

<u>Race/ethnicity</u>	<u>First family type</u>						
	<u>no family was formed</u>	<u>parenthood was first</u>	<u>cohabitation was first</u>	<u>marriage was first</u>			
non-Hispanic white (N=2,328)	.10 (225)	.07 (162)	.29 (674)	.54 (1,267)			
black (N=531)	.13 (68)	.47 (252)	.15 (79)	.25 (132)			
American Indian (N=418)	.09 (36)	.13 (53)	.24 (102)	.54 (227)			
Hispanic (N=278)	.10 (27)	.20 (56)	.19 (52)	.51 (143)			
Other (N=457)	.13 (58)	.07 (31)	.23 (106)	.57 (262)			
Pearson Chi-Square (df) = 669.577*** (12)							
<u>Race/ethnicity</u>	<u>Type of substance use in 1979</u>						
	<u>alc only</u>	<u>mar only</u>	<u>other</u>	<u>alc and mar</u>	<u>all three types</u>	<u>none</u>	<u>unknown</u>
non-Hispanic white (N=2,328)	.22 (511)	.06 (139)	.04 (84)	.28 (642)	.18 (423)	.18 (419)	.05 (109)
black (N=531)	.16 (83)	.14 (77)	.03 (18)	.21 (110)	.05 (25)	.34 (183)	.07 (35)
American Indian (N=418)	.18 (77)	.11 (45)	.03 (14)	.27 (113)	.19 (78)	.16 (65)	.06 (25)
Hispanic (N=278)	.13 (37)	.10 (29)	.04 (12)	.25 (68)	.12 (34)	.28 (77)	.07 (19)
Other (n=457)	.20 (91)	.05 (23)	.01 (6)	.20 (92)	.16 (75)	.29 (132)	.08 (.39)
Pearson Chi-Square (df) = 232.721*** (24)							

*** = p < .001, two-tailed tests of significance

²⁸ While there was some similarity among the non-black racial/ethnic groups in first family type, preliminary Chi-Square for contingency tests found statistically significant differences between all possible 2 X 2 combinations.

Table 4.8 also shows the distribution of the racial/ethnic groups across the types of substances use in 1979. American Indians were the most likely to have used and to have concurrently used all three types of substances. They were closely followed in both those respects by non-Hispanic whites, who also were the most likely to have used only alcohol or alcohol concurrently with marijuana. Although least likely to have used at all in 1979 (one-third reported use of any substance), blacks were the most likely to have used only marijuana and just about as likely as the other groups to have used illegal drugs other than marijuana. Hispanics tended to be less likely to use than American Indians or non-Hispanic whites but more likely to use than blacks (except in the “only” categories). Non-Hispanic white and American Indian subjects were much more likely to have concurrently used substances than blacks, Hispanics, or Others.

In the multinomial logistic regression Model 2 of the full sample, race/ethnicity was included as a control variable. It was a four-variable set of indicators and non-Hispanic white was omitted as the reference group. To assess the overall contribution that race/ethnicity made to predicting a subject’s first family type, “group” Likelihood Ratio Test Chi-Square statistics of race/ethnicity were calculated and parameter estimates were generated for the full sample Model 2. Table 4.9 shows that race/ethnicity was a major contributor to predicting first family type, evidenced by the large and statistically significant group Likelihood Ratio Test Chi-Square statistics. Blacks were most different from non-Hispanic whites and were significantly more likely that family formation was atypical. Blacks were more than three and half times more likely not to have formed a family, nine times more likely that parenthood was first, and about .40 more likely that cohabitation was the first family type compared to marriage. Hispanics were more likely than non-Hispanic whites that parenthood was the first family type and Hispanics also were more likely than non-Hispanic whites that cohabitation was first.

Interaction terms between each indicator of race/ethnicity and each indicator of the type of substance use (alcohol only, marijuana only, alcohol and marijuana, other illegal drug use alone or with either alcohol or marijuana, and all three types of substances) were created and were tested for statistical significance in the full sample Model 2, results of which are shown in Table 4.10.

Table 4.9. RACIAL/ETHNIC DIFFERENCES: Effects of race/ethnicity in the full sample analysis of the effects of type of substance use in 1979 on first family type; Likelihood Ratio Test statistics and odds ratios in Model 2 (N=4,011)

<i>EFFECTS OF RACE/ETHNICITY ON FIRST FAMILY TYPE IN THE FULL SAMPLE</i>			
<u>race/ethnicity</u>	<u>Chi-Square (df)</u>	<u>(separate) Likelihood Ratio Tests Model 2</u>	
"group" Likelihood Ratio Test	214.190*** (12)	non-Hispanic white	45.876***
		black	5.900
		Hispanic	5.883
		American Indian	27.905***
		Other	26.461**
<i>no family was formed by 2004 versus first marriage</i>			
<u>Model 2</u>			
<u>race/ethnicity</u>	<u>B</u>	<u>Exp(b)</u>	
black	1.353***	(3.867)	
Hispanic	-.004	(.996)	
American Indian	.165	(1.179)	
Other	.167	(1.182)	
<i>first parenthood occurred first versus first marriage</i>			
<u>Model 2</u>			
<u>race/ethnicity</u>	<u>B</u>	<u>Exp(b)</u>	
black	2.223***	(9.330)	
Hispanic	.525*	(1.691)	
American Indian	.165	(1.214)	
Other	-.263	(.769)	
<i>first cohabitation occurred first versus first marriage</i>			
<u>Model 2</u>			
<u>race/ethnicity</u>	<u>B</u>	<u>Exp(b)</u>	
black	.317†	(1.373)	
Hispanic	-.509**	(.601)	
American Indian	-.134	(.874)	
Other	-.149	(.862)	

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Included were the measures of type of substance use in 1979, physical characteristics, family background factors, socio-cultural indicators, the attitudinal measures, and the behavioral measures

The interactive effects of the type of substance use in 1979 on first family type and non-Hispanic whites, American Indians, or Others was statistically significant with respect to the concurrent use of all three types of substances. However, the effects of the type of substance use on first family type were not significantly different between blacks or Hispanics and the other racial/ethnic groups. Separate analyses of American Indians, Others, and non-Hispanic whites were performed.

Table 4.10. RACIAL/ETHNIC DIFFERENCES: Statistically significant Likelihood Ratio Test statistics^a or indication of non-significance of the effects of interaction terms between racial/ethnic groups and the type of substance use indicators, full sample Model 2 analysis (N=4,011)

<i>racial/ethnic and substance use interactions</i>	<i>Likelihood Ratio Test statistics</i>				
	<i>alcohol only</i>	<i>marijuana only</i>	<i>other illegal drugs</i>	<i>alcohol and marijuana</i>	<i>all three types</i>
black	ns	ns	ns	ns	ns
Hispanic	ns	ns	ns	ns	ns
American Indian	ns	ns	ns	ns	12.121 (p=.007)
Other	ns	ns	ns	ns	12.845 (p=.005)
non-Hispanic white	ns				8.547 (p=.036)

^a coefficients and odds ratios were not reported

Preliminary analysis revealed small cell sizes in some substance use categories in some racial/ethnic groups. These cell sizes were so small as to pose potential problems in the multinomial logistic regression parameter estimates, particularly by generating unreasonably large standard errors. The problem was circumvented by reorganizing the type of substance use categories as follows: (1) no use; (2) used “one type”—alcohol, marijuana, or other illegal drugs; (3) used “two types”—alcohol, marijuana, or other illegal drugs in a paired combination; and (4) used “three types” of substances²⁹. This variable was transformed into a dummy variable set for the separate analyses by race/ethnicity and “no use” was the reference group. Table 4.11 shows the distribution of cases across these four types of substance use by racial/ethnic group.

Table 4.11. Proportions and numbers of cases (in parentheses) of substance use in 1979 by race/ethnicity^a in revised substance use categories

Substance use type	Race/ethnicity		
	non-Hispanic white	Indian	Other
none	.23 (528)	.21 (90)	.37 (171)
one type	.28 (663)	.30 (125)	.25 (114)
two types	.31 (714)	.30 (125)	.21 (98)
three types	.18 (423)	.19 (78)	.16 (75)
Total	1.00 (2,328)	1.00 (418)	1.00 (457)

^a All totals do not add to 1.00 due to computational rounding

²⁹ In the “one type” group, about .70 used alcohol, .28 used marijuana, and .02 used illegal drugs; in the “two types” group, .90 used alcohol and marijuana, .04 used alcohol and other illegal drugs, and .06 used marijuana and other illegal drugs; the “three types” group was unchanged and about .16 of the 4,011 subjects used alcohol, marijuana, and other illegal drugs in 1979.

Using the reorganized substance use indicators, Model 2 was separately generated for the three racial/ethnic groups and the summary statistics of these analyses of the non-Hispanic white, American Indian, and Other groups are shown in Table 4.12. Type of substance use in 1979 made a statistically significant contribution to predicting first family type in each of these three groups and it was the largest in the non-Hispanic white group (see “group” Likelihood Ratio Test statistics). Nagelkerke’s R^2 was about twice as large in the American Indian and Other groups as the Non-Hispanic whites, suggesting that Model 2 was a significantly better fit for the minority groups than the non-Hispanic whites. There are two CARs presented on Table 4.12. The first represents the Model 2 CAR with the control variables; the “group” CAR below it represents the CAR achieved when the type of substance use indicators were the only independent variables in the models. In all cases, the criterion for adequate classification accuracy was met. All the Likelihood Ratio Test statistics of the separate indicators of type of substance use (in this analysis: one type, two types, or three types) in the non-Hispanic white and American Indian groups were statistically significant and the use of one type or two types was statistically significant in the Other group.

Hypothesis 1b [*The effects of alcohol and illegal drug use on the first type of family formed differ by race/ethnicity such that:*

(1) among non-Hispanic whites, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed and that cohabitation was the first family type but decreases the odds that parenthood was the first family type;

(2) among blacks and American Indians, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed, that cohabitation was the first family type, and that parenthood was the first family type and the effects are larger than among non-Hispanic whites; and

(3) among Hispanics, alcohol and illegal drug use was not significantly related to the first type of family formed] was not supported (see Table 4.12).

Table 4.12. RACIAL/ETHNIC DIFFERENCES: MODEL 2^a. Summary statistics and parameter estimates of the relationship of substance use in 1979 (ref: no use) to first family type (ref: first marriage was first) by race/ethnicity

Summary Statistics and Parameter Estimates Model 2						
Non-Hispanic white (N = 2,328)						
Summary Statistics			Likelihood Ratio Test -Chi-Square			
Model Chi-Square	776.356***		"group" LRT (df)		45.876 (9), p < .001	
Nagelkerke's R ²	.319		one type		17.388***	
1.25 X chance CAR	.492		two types		18.041***	
Model CAR	.598		three types		33.048***	
"group" CAR	.549					
	no family was formed by 2004		parenthood was first		cohabitation was first	
Type of Use	B	Exp(b)	B	Exp(b)	B	Exp(b)
one type	-.688***	.502	-.416	.659	.254	1.289
two types	-.830***	.436	-.256	.774	.259	1.296
three types	-.864**	.421	.278	1.321	.894***	2.444
Intercept	-2.122**		-2.850***		-1.046*	
American Indian (N = 418)						
Summary Statistics			Likelihood Ratio Test -Chi-Square			
Model Chi-Square	396.962***		"group" LRT (df)		27.905 (9), p < .001	
Nagelkerke's R ²	.682		one type		16.941***	
1.25 X chance CAR	.471		two types		21.458***	
Model CAR	.780		three types		14.128**	
"group" CAR	.543					
	no family was formed by 2004		parenthood was first		cohabitation was first	
Type of Use	B	Exp(b)	B	Exp(b)	B	Exp(b)
one type	.372	1.450	.563	1.756	2.367***	10.663
two types	-.022	.978	-.952	.386	2.353***	10.515
three types	-.614	.541	-1.064	.345	2.367**	10.665
Intercept	-8.800*		-1.349		-1.582	
Other (N = 457)						
Summary Statistics			Likelihood Ratio Test -Chi-Square			
Model Chi-Square	433.580***		"group" LRT (df)		26.461 (9), p < .001	
Nagelkerke's R ²	.689		one type		10.567*	
1.25 X chance CAR	.504		two types		10.221*	
Model CAR	.767		three types		4.471	
"group" CAR	.584					
	no family was formed by 2004		parenthood was first		cohabitation was first	
Type of Use	B	Exp(b)	B	Exp(b)	B	Exp(b)
one type	-1.374*	.253	-1.966	.140	-1.208*	.299
two types	-1.435*	.238	-4.176*	.015	-.959†	.383
three types	-1.914†	.147	-1.060	2.886	.211	1.235
Intercept	-3.622†		-9.413*		1.105	

† = p < .10, * = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance

^a Included the indicators of type of substance use in 1979, the measures of physical characteristics, family background factors, gender, rural/South residence, the attitudinal measures, and the behavioral measures.

While the type of substance use was important to first family type in each of the three groups, the hypothesized nature of the effects was not supported in these data. Among non-Hispanic whites, singular use was not expected to have any significant influence on first family type but “one type” of substance decreased the odds of not forming a family by 2004 by about half that of non-use. Concurrent use in this group was expected to increase the odds that no family was formed but use of two or three types decreased the odds. The odds that cohabitation was first also were expected to be increased by concurrent use and that was supported with respect to use of three types but not two types of substances. Contrary to expectations, substance use had no significant effect on parenthood as the first family type, net of the effects of the control variables.

Concurrent use was expected to increase the odds of all three atypical family forms as the first family type among American Indians. Yet substance use only influenced cohabitation versus marriage as the first family type. Moreover, there was little difference in the effect sizes among one, two, or three types of substances used, all of which increased the odds of cohabitation over marriage by about 10 times that of non-use. Importantly, the effects of substance use were substantially larger when the effects of other factors were controlled (see Table 4.13). The odds that cohabitation was the first family type in Model 1 more than doubled when the effects of these factors were accounted for in Model 2.

Table 4.13. Coefficients, odds ratios, and standard errors of Models 1 and 2 multinomial logistic regression of type of substance use on first family type among American Indians

<i>American Indians (N=418)</i>							
	<i>no family was formed by 2004</i>			<i>parenthood was first</i>		<i>cohabitation was first</i>	
<i>MODEL 1</i>	<i>B</i>	<i>SE</i>	<i>Exp(b)</i>	<i>B</i>	<i>Exp(b)</i>	<i>B</i>	<i>Exp(b)</i>
one type	-.192	.482	.826	.538	1.713	1.430***	4.180
two types	-.483	.521	.617	.335	1.398	1.614***	5.040
three types	.353	.490	1.423	.505	1.657	1.431**	4.184
<i>MODEL 2</i>	<i>B</i>	<i>SE</i>	<i>Exp(b)</i>	<i>B</i>	<i>Exp(b)</i>	<i>B</i>	<i>Exp(b)</i>
one type	.372	.937	1.450	.563	1.756	2.367***	10.663
two types	-.022	1.052	.978	-.952	.386	2.353***	10.515
three types	-.614	1.605	.541	-1.064	.345	2.367**	10.665

** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

Blacks were expected to experience similar effects as American Indians but substance use was not significantly related to first family type among blacks in Model 1 (Likelihood Ratio Test Chi-Square = 14.187, $p = .116$) or in Model 2 (Likelihood Ratio Test Chi-square = 5.900, $p = .749$). There also was no significant effect of substance use on first family type among Hispanics (Model 2 Likelihood Ratio Test Chi-square = 5.883, $p = .752$), which was anticipated. There was no hypothesis with respect to the Other group. In this group, substance use increased the odds of typical family formation—that marriage was first. The effects were larger in Model 1 than Model 2 and the effects were larger for one type or two types than for three types used in 1979.

To summarize, substance use did not delay family formation for any racial/ethnic group; it had either no significant effect or significantly decreased the odds that no family was formed by 2004. However, substance use had an important influence on the first union type among the non-Hispanic whites and American Indians. The odds that cohabitation was the first family type were greatly increased by substance use among American Indians in all categories of substance use and among those non-Hispanic whites who used three types of substances in 1979.

Research Question 1c

How do the effects of alcohol and illegal drug use on the first type of family formed differ by rural/non-rural and South regional residence?

There were statistically significant differences among the residence categories across first family type and across the categories of substance use in 1979 (see Table 4.14). Those in the two South groups evidenced the most typical marital formation behavior. The rural South was the most likely that marriage and the least likely that cohabitation was the first family type, followed by the non-rural South. Parental timing after marriage or cohabitation was most common in the two rural groups. The rural non-South was least likely that parenthood was first, followed by the rural South. The non-rural non-South group was the most likely to cohabit and least likely to marry as the first family type. Although the four groups

were different from each other in some respects, the two South groups and the two non-South groups were the most similar to each other³⁰.

Table 4.14. RESIDENTIAL DIFFERENCES: Proportional differences in the distribution of cases across first family type and type of substance use in 1979, proportions with numbers of cases in parentheses

<u>Residence</u>	<u>First family type</u>						
	<u>no family was formed</u>	<u>parenthood was first</u>	<u>cohabitation was first</u>	<u>marriage was first</u>			
rural South N=596	.09 (55)	.13 (79)	.14 (84)	.63 (378)			
rural non-South (N=803)	.11 (87)	.09 (74)	.25 (205)	.54 (437)			
non-rural South (N=702)	.08 (60)	.19 (131)	.18 (124)	.55 (387)			
non-rural non-South (N=1,910)	.11 (212)	.14 (270)	.31 (599)	.43 (828)			
Pearson Chi-Square (df) = 146.723*** (9)							
<u>Residence</u>	<u>Type of substance use in 1979</u>						
	<u>alc only</u>	<u>mar only</u>	<u>other</u>	<u>alc and mar</u>	<u>all three types</u>	<u>none</u>	<u>unknown</u>
rural South (N=596)	.21 (125)	.08 (48)	.03 (18)	.20 (119)	.09 (51)	.31 (186)	.08 (49)
rural non-South (N=803)	.28 (229)	.06 (51)	.03 (23)	.27 (220)	.12 (96)	.18 (148)	.04 (36)
non-rural South (N=702)	.16 (114)	.10 (69)	.03 (22)	.25 (174)	.13 (90)	.27 (188)	.06 (45)
non-rural non-South (N=1,910)	.17 (331)	.18 (147)	.04 (70)	.27 (512)	.21 (398)	.19 (355)	.05 (97)
Pearson Chi-Square (df) = 176.119*** (18)							

*** = p < .001, two-tailed tests of significance

With respect to the types of substances used in 1979 (Table 4.14), use of any of the types of substances was least likely in the rural South followed by the non-rural South. Use restricted to alcohol was most common in the rural groups, use restricted to marijuana was most common in the non-rural groups, and the concurrent use of alcohol and marijuana was most common in the non-South groups. The non-rural non-South group had the largest proportion that used illegal drugs other than marijuana (.21) alone or concurrently with alcohol and/or marijuana. The concurrent use of all three types in the non-rural South and rural non-South was eight and seven percentage points lower, respectively. Only .09 of

³⁰ Preliminary Chi-Square for Contingency tests found statistically significant differences between the two rural groups (Chi-Square=32.387, p<.001), the two South groups (Chi-Square=12.318, p=.006), the two non-rural groups (Chi-Square=60.145, p<.001), and the two non-South groups (Chi-Square=32.171, p<.001) in the distribution of their cases across first family type.

the subjects in the rural South group concurrently used alcohol, marijuana, and other illegal drugs in 1979³¹.

The Model 1 and 2 analysis of the full sample included the three-variable dummy set of residence indicators (non-rural non-South was omitted). To assess whether the residence variable made a meaningful contribution to the classification of the subjects into the four first family types in the full sample, “group” Likelihood Ratio Test statistics and parameter estimates representing the contributions of the residence dummy indicator set were obtained for Model 2 (N=4,011). Table 4.15 shows that the “group” Likelihood Ratio Test of Model 2 was statistically significant, suggesting that the contribution made by the group of residence

Table 4.15. RESIDENTIAL DIFFERENCES: Effects of residence in the full sample analysis of the effects of type of substance use in 1979 on first family type; Likelihood Ratio Test statistics and odds ratios in Model 2 (N=4,011)

<i>EFFECTS OF RESIDENCE ON FIRST FAMILY TYPE IN THE FULL SAMPLE</i>		
residence	Model 2^a Chi-Square (df)	
Likelihood Ratio Test	80.613*** (9)	
<i>no family was formed by 2004 versus first marriage</i>		
Model 2^a		
residence	B	Exp(b)
rural South	-.691***	(.501)
non-rural South	-.671***	(.511)
rural non-South	-.113	(.893)
<i>first parenthood occurred first versus first marriage</i>		
Model 2^a		
residence	B	Exp(b)
rural South	-.917***	(.400)
non-rural South	-.583***	(.558)
rural non-South	-.202	(.817)
<i>first cohabitation occurred first versus first marriage</i>		
Model 2^a		
residence	B	Exp(b)
rural South	-.947***	(.388)
non-rural South	-.724***	(.485)
rural non-South	-.327**	(.721)

** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Included were the measures of type of substance use in 1979, physical characteristics, family background factors, socio-cultural indicators, the attitudinal measures, and the behavioral measures.

³¹ Preliminary Chi-Square for Contingency tests found statistically significant differences between the two rural groups (Chi-Square=51.942, $p < .001$), the two South groups (Chi-Square=17.428, $p = .008$), the two non-rural groups (Chi-Square=40.305, $p < .001$), and the two non-South groups (Chi-Square=61.727, $p < .001$) in the distribution of their cases across the categories of substance use in 1979.

indicators was more than coincidence or what may be attributed to random variation in the sample. Compared to the non-rural non-South, the two South groups were significantly less likely to form an atypical first family via parenthood or cohabitation and were significantly less likely than the non-rural non-South group not to form a family by 2004 than a first marriage. The rural non-South group also was less likely than the non-rural non-South that cohabitation was the first family type (compared to marriage).

Interaction terms between the indicators of each of the four residential groups and the indicators of each of the types of substance use (alcohol only, marijuana only, alcohol and marijuana, other illegal drug use alone or with either alcohol or marijuana, and all three types of substances) were created and were tested for statistical significance in the full sample Model 2, results of which are shown in Table 4.16. The effects of concurrent alcohol and marijuana use in 1979 on first family type was different for those in the rural South than in other

Table 4.16. RESIDENTIAL DIFFERENCES: Statistically significant Likelihood Ratio Test statistics^a or indication of non-significance of the effects of interaction terms between residential groups and the type of substance use indicators, full sample Model 2 analysis (N=4,011)

<i>Likelihood Ratio Test statistics</i>					
<i><u>residence by type of use interactions</u></i>	<i><u>alcohol only</u></i>	<i><u>marijuana only</u></i>	<i><u>other illegal drugs</u></i>	<i><u>alcohol and marijuana</u></i>	<i><u>all three types</u></i>
rural South	ns	ns	ns	6.821 (p=.078)	ns
rural non-South	ns	ns	ns	8.589 (p=.035)	ns
non-rural South	ns	ns	ns	ns	ns
non-rural non-South	ns	ns	8.006 (p=.046)	ns	ns

^a coefficients and odds ratios were not reported

residential groups and was different for those in the rural non-South than in other residential groups. The effect of other illegal drug use on first family type was different for those in the non-rural non-South than those in other residential groups. Separate analyses of those three residential groups were performed.

Because the numbers of cases in two of the residential groups were relatively small, cross-tabulations between the categorical variables of the types of substances used in 1979 and first family type were examined for each of the

groups. The goal was to identify and correct any zero or very small cell sizes in the associations between those two variables. According to Menard (1995:68), there are three resolutions to problems in logistic regression of zero cell count for categorical predictors: (1) accept the inefficiency of the parameter estimates of the problem indicators, (2) combine some of the categories of the independent variable or the dependent variable to eliminate the offending cell(s), or (3) add a constant.

The contingency tables revealed two problems. First, there were both zero and very small cell sizes in two substance use categories (marijuana use only and illegal drug use only or concurrently with alcohol or marijuana) in both of the rural residential groups. This problem was resolved by combining those two substance use categories into one category. The new category was transformed into a dummy variable and was used in place of its two component indicators in the separate multinomial logistic regression analyses of the three groups.

The second problem revealed by the cross-tabulations was that the category of the dependent variable indicating that “no family was formed by 2004” was small in proportion and number in the two rural residential groups. Only about .10 of the whole sample had not formed a family by 2004 and about .09 (N=55) of the rural South and .11 (N=87) of the rural non-South had not formed a family by 2004. The distribution of the types of substance use in 1979 across that category yielded very small cell sizes in the two rural groups. Menard’s (1995:68) concern was that zero cell sizes will result in very high estimated standard errors and inflated parameter estimates for coefficients associated with those categories (Menard 1995:70). Although none of the cells in this analysis were zero, some had fewer than five cases. The SPSS nominal regression program did not reject the indicators representing those categories and preliminary regressions yielded no standard errors greater than 1.0. The potential problem was resolved with Menard’s (1995) first solution: No material change was made. Uncertainty about some of the values of the logistic regressions with respect to that category of the dependent variable was acknowledged, the standard errors were reported with their coefficients on the table (see below), and the findings were cautiously interpreted.

Separate multinomial logistic regressions of Model 2³² were performed on the three residential groups. Types of substances used in 1979 made a statistically significant contribution to Model 2 in each of the three groups (see the “group” Likelihood Ratio Test statistics on Table 4.17). Model 2 best fit the rural South group based on the Model Chi-Square statistics, “group” Likelihood Ratio Chi-Squares, Nagelkerke’s R^2 statistics, and CARs, which were the largest in the rural South. Because all of the control variables were in Model 2, it was difficult to discern from these statistics whether the better fit in the rural South was attributable to the contribution of control variables or the type of substance use indicators. However, the Likelihood Ratio Test statistics of the separate type of substance use indicators suggested that the type of substance use was more important to first family type in the rural South than the rural non-South or non-rural non-South. Three of the four types of substances used in 1979 made statistically significant contributions to the model in the rural South while only the concurrent use of all three types made a significant contribution in the rural non-South, and only the concurrent use of alcohol and marijuana made a significant contribution in the non-rural non-South.

Hypothesis 1c [*The effects of alcohol and illegal drug use on the first type of family formed differed for residents of the rural South, rural non-South, non-rural South, and non-rural non-South such that:*

(1) among residents of the non-rural non-South, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed and that cohabitation was the first family type but decreases the odds that parenthood was the first family type;

(2) among residents of the rural non-South, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed and that cohabitation was the first family type but

³² Unexpected singularities in the Hessian matrix were encountered and were resolved by merging some categories of some of the control variables. All adjustments that were made to the control variables were consistently made across the residential groups.

Table 4.17. RESIDENTIAL DIFFERENCES: MODEL 2^a. Summary statistics and parameter estimates of the relationship of substance use in 1979 (ref: no use) to first family type (ref: first marriage was first) in the rural South, rural non-South, and non-rural non-South

Summary Statistics and Parameter Estimates Model 2							
RURAL SOUTH (N = 596)							
Summary Statistics				Likelihood Ratio Test -Chi-Square			
Model Chi-Square	476.157***			Alcohol only	8.787*		
Nagelkerke's R ²	.626			Alcohol and marijuana	14.031**		
1.25 X chance CAR	.560			Marijuana only or other	6.007		
CAR	.751			All three types	17.460***		
"group" Likelihood Ratio Test statistic	33.103 (12), p = .0006						
Type of Use	no family was formed			parenthood first		cohabitation first	
	B	SE	Exp(b)	B	Exp(b)	B	Exp(b)
Alcohol only	-.008	.648	.992	1.053*	2.866	1.203*	3.332
Alcohol and marijuana	-1.201	.764	.301	.184	1.202	1.471**	4.352
Marijuana or other	-1.134	.869	.322	-.498	.609	.933†	2.542
All three types	1.080	.918	2.946	2.150**	8.583	2.523***	12.468
Intercept	-3.341			-3.540		-2.907†	
RURAL NON-SOUTH (N = 803)							
Summary Statistics				Likelihood Ratio Test -Chi-Square			
Model Chi-Square	495.404***			Alcohol only	4.779		
Nagelkerke's R ²	.513			Alcohol and marijuana	5.785		
1.25 X chance CAR	.478			Marijuana only or other	.663		
CAR	.639			All three types	12.207**		
"group" Likelihood Ratio Test statistic	30.269 (12), p = .0025						
Type of Use	no family was formed			parenthood first		cohabitation first	
	B	SE	Exp(b)	B	Exp(b)	B	Exp(b)
Alcohol only	-.108	.540	.897	-.556	.574	.588†	1.747
Alcohol and marijuana	.577	.591	1.782	-.471	.624	.673†	1.960
Marijuana or other	.333	.710	1.395	.470	1.599	.062	1.063
All three types	-2.059*	.954	.128	.347	1.414	.969*	2.636
Intercept	-3.725*			-4.936**		-1.196	
NON-RURAL NON-SOUTH (N = 1,910)							
Summary Statistics				Likelihood Ratio Test -Chi-Square			
Model Chi-Square	905.276***			Alcohol only	5.029		
Nagelkerke's R ²	.412			Alcohol and marijuana	10.905*		
1.25 X chance CAR	.397			Marijuana only or other	1.099		
CAR	.557			All three types	6.089		
"group" Likelihood Ratio Test statistic	30.932 (12), p = .0020						
Type of Use	no family was formed			parenthood first		cohabitation first	
	B	SE	Exp(b)	B	Exp(b)	B	Exp(b)
Alcohol only	-.173	.276	.841	-.755*	.470	-.055	.788
Alcohol and marijuana	-.798**	.294	.450	-.566†	.568	-.432*	.649
Marijuana or other	-.269	.348	.764	.005	1.005	.105	1.111
All three types	-.527	.361	.591	-.368	.692	.251	1.285
Intercept	-4.066***			-2.641**		-1.901***	

† = p < .10, * = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance

^a Included the indicators of type of substance use in 1979, the measures of physical characteristics, family background factors, gender, race/ethnicity, the attitudinal measures, and the behavioral measures

decreases the odds that parenthood was the first family type and the effects are larger than among residents of the non-rural non-South;

(3) among residents of the non-rural South, concurrent use of alcohol and marijuana or of alcohol, marijuana, and other illegal drugs increases the odds that no family was formed, that cohabitation was the first family type, and that parenthood was the first family type and the effects are larger than among residents of the non-rural non-South and the rural non-South; and

(4) among residents of the rural South, alcohol and illegal drug use, alone or concurrently, increases the odds that no family was formed, that cohabitation was the first family type, and that parenthood was the first family type and the effects are larger than among residents of the non-rural non-South, the rural non-South, and the non-rural South.] was not supported (see Table 4.17).

Concurrent but not singular use was expected to increase the odds of delayed marriage with no family formed by 2004 or cohabitation and to decrease the odds of parenthood as the first family type in the non-rural non-South. Concurrent use of alcohol and marijuana was important but it decreased rather than increased the odds of atypical family formation and the concurrent use of illegal drugs with alcohol and/or marijuana was not a significant factor. Moreover, singular alcohol use significantly decreased the odds of parenthood as the first family type.

The same pattern of effects was anticipated in the rural non-South but they were expected to be larger than in the non-rural non-South. There was no support for this aspect of the hypothesis; only the use of all three types was significantly related to first family type and while it increased the odds of cohabitation as the first family type, it decreased the odds that no family was formed by 2004. Moreover, the group Likelihood Ratio Test was minimally smaller than in the non-rural non-South group.

The non-rural South group was expected to evidence larger effects than the two non-South groups and to predict atypical family formation with respect to not forming a family, cohabitation, and parenthood. However, type of substance use in 1979 was not significantly related to first family type (group Likelihood Ratio Test Chi-Square = 10.370, $p = .583$).

The largest influence of substance use on first family type was expected to be in the rural South and its group Likelihood Ratio Chi-Square was larger than in the other two groups that were analyzed. In this residential group, atypical family formation was expected to be predicted by both singular and concurrent substance use. Substance use was not significantly predictive of not forming a family by 2004 versus marriage. However, while only singular alcohol use and the use of all three types of substances predicted parenthood was the first family type, the effects were large—alcohol use increased the odds more than two and one-half times those of non-users and the use of all three types increased the odds about eight and one-half times those of non-users that parenthood was the first type of family formed. The odds that cohabitation was the first family type were increased by all the types of substance use and the effects were larger for concurrent than singular use. Use of all three types increased the odds that cohabitation was the first family type about 12 and one-half times that of non-use.

To summarize, the effects of the types of substances used in 1979 were significantly different in different residential contexts. There was no significant effect in the non-rural South while the largest influence was in the rural South. The singular use of alcohol significantly increased the odds that parenthood or cohabitation was first in the rural South but significantly decreased the odds that parenthood was first in the non-rural non-South. There was little influence of the singular use of marijuana or other illegal drugs, regardless of the residential context.

As anticipated, concurrent use was more important than singular use to predicting first family type, particularly in the rural South and the non-rural non-South. Concurrent alcohol and marijuana use increased the odds of cohabitation about four times that of non-use in the rural South but decreased the odds of all three types of atypical family formation in the non-rural non-South. The concurrent use of all three types was not significantly important to the first family type of those in the non-rural non-South group and, while it did matter in the two rural groups, the nature of the effects differed. Use of all three types significantly decreased the odds that no family was formed and increased the odds that cohabitation was first in the rural non-South but had no significant effect on parenthood as the first family

type. In the rural South group, the odds of parenthood and cohabitation were increased by eight and one-half and 12 and one-half times that of non-use, respectively.

These different patterns of effects of substance use in the residential groups are net of the effects of the control variables but do not take into account rural or regional differences in the effects of the age at first use or the frequency with which these substances were used. Some of the differences in effects may be related to these variables. Even so, substance use increased the odds of atypical family formation in the rural South to a significantly greater extent than in other areas of the continental United States.

Research Question 2

How do (a) the age at first monthly or more frequent alcohol use, (b) the frequency of alcohol use in 1979, (c) the occurrence of binge drinking, and (d) the type of problem drinker relative (if any) relate to the first type of family formed?

In response to this research question, the portion of the sample that had used alcohol in 1979 but had not used marijuana or other illegal drugs was employed. These were the subjects in the “used only alcohol” category of the type of substance use measure used in Models 1 and 2 discussed above. These subjects were analyzed together with the 876 non-users of any substance. About .20 (N=800) of the sample had used only alcohol in 1979.

Subjects who had used only alcohol were significantly different from subjects who had concurrently used alcohol with other substances in 1979. Preliminary cross-tabulations found that they were significantly more likely to marry or not form a family by 2004 and less likely to parent as a first family type than those who concurrently used alcohol and marijuana (Chi-Square=10.315, $p=.016$). They were likelier still than those who had used alcohol concurrently with *both* marijuana and other illegal drugs to marry or not form a family and were half as likely that parenthood was the first family type (Chi-Square=51.332, $p<.001$). Having used only alcohol in 1979 made a significant contribution to Model 2 in the

overall analysis (Chi-Square=7.364, $p < .10$), particularly with respect to parenthood as the first family type.

Four measures of characteristics of alcohol use were tested: (1) the age at first monthly or more frequent use (mean age was 16), (2) the frequency of use in 1979 (modal frequency was 3 to 5 times), (3) whether the subject had experienced binge drinking (about .48 had), and (4) whether there were specific family members with drinking problems (about .44 had none). All the measures were sets of dummy variable indicators and non-use was the reference category. The analysis proceeded as two nested models: (1) Model 1 included the measures of the characteristics of alcohol use and (2) Model 2 added the Physical Characteristics, Family Background Factors, gender, residence, race/ethnicity, the Attitudinal Measures, and the Behavioral Measures³³.

As a preliminary step, the measures of age at first monthly or more frequent use and frequency of use in 1979 were checked for zero and very small cell sizes in the categories of the dependent variable by cross-tabulating the categorical variables with the dependent variable. There were no problems with small cell sizes in the age at first use variable; however, the frequency of use variable had some small cell sizes. Only about .02 of the sample (N=20) had used alcohol as frequently as 51 or more times in 1979 and half of them (N=10) had married first, resulting in small or zero cell sizes across the rest of the categories of first family type³⁴. To resolve the problem, the categories of the measure of frequency of use in 1979 were reorganized into the following set of dummy variables: (1) used once, (2) used twice, (3) used three to 5 times, (4) used 6 to 10 times, (5) used 11 to 50 or used 51 or more times. Table 4.18 shows the distribution of the 1,676 cases in this analysis across these categories of frequency of alcohol use in 1979. A recheck of the cell sizes found no zero cells and none so small as to pose a statistical problem in the multinomial logistic regression.

³³ Unexpected singularities in the Hessian matrix were encountered and were resolved by merging some categories of some of the control variables.

³⁴ Most of the high frequency users of alcohol had used concurrently with marijuana and/or other illegal drugs.

Table 4.18. ALCOHOL USE: MODELS 1 and 2. Proportions and numbers of cases (in parentheses) across the frequency of alcohol use among alcohol only users and non-users in 1979 (N=1,676)

Frequency of alcohol use in 1979		
<u>frequency</u>	<u>proportion</u>	<u>number of cases</u>
once	.14	227
twice	.08	138
three to five times	.12	206
six to 10 times	.07	123
11 to 50 or 51 or more times	.06	105
<i>Subtotal</i>	<i>.48</i>	<i>800</i>
none	.52	876
<i>Total^a</i>	<i>1.00</i>	<i>1,676</i>

^a Total does not add to 1.00 due to computational rounding

About .20 of the sample first used alcohol after 1979 and the indicator of binge drinking was measured in 1982. Because the temporal order of the alcohol use variables and dependent variable was important, an assessment was made of the proportion of the study sample that began monthly or more frequent alcohol use before initial family formation. A variable was made that assigned to each sample member a code indicating whether alcohol use first occurred before or after initial family formation. To identify the order of alcohol use and family formation for each subject, the interval variable *age at first monthly or more frequent alcohol use* was used as well as the measures of the year of first marriage, the year of first cohabitation, and the year of first parenthood.

Each sample member's year of first use was compared to his or her year of first marriage, year of first cohabitation, and year of first parenthood. When the year that alcohol first was used occurred prior to the first year that the first family was formed through marriage, cohabitation, or parenthood, the case was coded "alcohol use was first." When the year of first alcohol use came after any one of the three first family types, the case was coded "alcohol use was after." In cases where there had been alcohol use and no family had been formed by 2004, alcohol use was coded "alcohol use was first." Cases that had low frequency or no alcohol use were coded as low or non-use.

As Table 4.19 shows, about .90 of the sample had used monthly or more often at some point; only about .05 of the sample had first used after forming a family. About .05 had never used, another .05 had used less often than monthly.

About three-quarters of the subjects had used alcohol monthly or more frequently before initial family formation and about .08 had used to that extent but had not formed families by 2004. These findings suggested that the proportion of the sample that first used after initial family formation (.05) was likely so small as not to bias any findings in the analysis (Cohen and Cohen 1983). Moreover, the subjects selected for this aspect of the analysis were those who had used alcohol or no substances in 1979. Those who used in 1979 obviously were 14 to 16 or younger when they first used so those who may have first used after family formation would necessarily be among the 876 1979 non-users in the sample.

Table 4.19. ALCOHOL USE: MONTHLY OR MORE FREQUENT USE BEGAN BEFORE INITIAL FAMILY FORMATION Proportions and numbers of cases

<i>Used before or after family formation or never used</i>	<i>Proportion</i>	<i>N</i>
<i>Used monthly or more frequently</i>		
monthly or more frequent use began <i>before</i> initial family formation	.76	3,051
monthly or more frequent use began and no family was formed	.08	337
monthly or more frequent use began <i>after</i> initial family formation	.05	215
<i>Total^a</i>	<i>.89</i>	<i>3,602</i>
<i>Never used</i>		
never used and formed a family by 2004	.04	181
never used and never formed a family by 2004	.01	39
<i>Total</i>	<i>.05</i>	<i>220</i>
<i>Used less frequently than monthly</i>		
used less frequently than once a month and no family was formed	<.01	15
used less frequently than once a month and formed a family	.03	137
<i>Total</i>	<i>.05</i>	<i>152</i>
<i>missing data on alcohol use</i>	<i>.01</i>	<i>37</i>
<i>Total</i>	<i>1.00</i>	<i>4,011</i>
<i>Dichotomous variable used in analysis</i>		
used monthly or more frequently before family formation or used at least monthly and no family was formed = 1	.84	3,388
used after family formation, less than monthly, never used, missing	.16	623
<i>Total</i>	<i>1.00</i>	<i>4,011</i>

^aTotal does not add to 3,602 due to computational rounding

Both the number of problem drinker relatives and the type of relative with a drinking problem may be important indicators of exposure to alcohol use influencing the choices people make when first forming their families. The question is important to this analysis because the measure of type of relative and the measure of number of relatives, drawn from the same data, cannot both be included in the analysis. To compare the utility of the two measures, two

multinomial logistic regression analyses were performed on first family type with “first marriage was first” as the reference group (see Table 4.20). The analyses were limited to that portion of the sample that had only used alcohol or used alcohol concurrently with marijuana and/or other illegal drugs in 1979 (N=2,508). The sample was limited this way because, even though some subjects

Table 4.20. Comparison of the association of the number of problem drinker relatives with first family type to the association of the type of problem drinker relatives with first family type for subjects who only used alcohol or with marijuana and/or other illegal drugs in 1979 (N=2,508); Likelihood Ratio Test Chi-Square statistics, Classification Accuracy Ratios, -2 Log Likelihood statistics, and statistically significant parameter estimates

<i>Panel 1: Effects of number of problem drinker relatives^b on first family type</i>			
<u>Number of Problem Drinker Relatives</u>		<u>Likelihood Ratio</u>	
<u>(ref: none, N=1,095)</u>		<u>Chi-Square</u>	
one problem drinker relative (N=644)		2.739	
two problem drinker relatives (N=336)		6.004	
three to six problem drinker relatives (N=268)		4.218	
Don't know (N=165)		57.702***	
-2 Log Likelihood (df)		84.825***(12)	
Classification Accuracy		.500	
<u>no family was formed</u>	<u>first parenthood was first</u>	<u>first cohabitation was first</u>	
<u>Don't know</u>	<u>Two relatives</u>	<u>ns</u>	
b = 1.700***, Exp(b) 5.476	b = .429*; Exp(b) = 1.536		
<i>Panel 2: Effects of type of problem drinker relative on first family type</i>			
<u>Type of Problem Drinker Relative(s)</u>		<u>Likelihood Ratio</u>	
<u>(ref: none, N=1,095)</u>		<u>Chi-Square</u>	
mom or mom and dad (N=80 and N=32)		1.303	
only dad was a problem drinker (N=431)		17.249**	
relatives not mom or dad (N=705)		.811	
Don't know (N=165)		16.831**	
-2 Log Likelihood (df)		82.932***(12)	
Classification Accuracy		.500	
<u>no family was formed</u>	<u>first parenthood was first</u>	<u>first cohabitation was first</u>	
<u>Don't know</u>	<u>Only dad</u>	<u>Only dad</u>	
b = 1.689***, Exp(b) 5.414	b = .627***; Exp(b) = 1.872	b = .420**; Exp(b) = 1.522	

** = p < .01, *** = p < .001, two-tailed tests of significance

who did not use alcohol in 1979 reported having problem drinker relatives, these measures of relatives' alcohol use were used only in the models limited to the subjects who used alcohol. The first regression included the dummy variable set of categories of the number of problem drinker relatives (with none as the reference group) as the only independent variable. The second analysis was identical to the first except that the dummy variable set of categories of the number of problem

drinker relatives was replaced with the dummy variable indicators of the type of problem drinker relative. Then, the findings of these two analyses were compared to assess their relative contributions.

Panel 1 of Table 4.20 presents the findings of the first analysis and Panel 2 presents the findings of the second analysis. A comparison of the findings suggested that the effects of the two variables on first family type were somewhat similar in the nature and the strength of their effects. In both cases, those who did not know about their relatives' drinking habits were about five times as likely as those with no problem drinker relatives not to have formed a family by 2004 than to have entered a first marriage. Those with two problem drinker relatives and those with a problem drinker biological father were between one and one-half and twice as likely as those with no problem drinker relatives that first parenthood occurred before first marriage. However, those who reported a problem drinker dad also were significantly more likely than those with no problem drinker relatives to have experienced first cohabitation before a marriage. Because of the life course perspective that this study takes with its emphasis on family background factors and because the measure of the type of relative provides somewhat more precise information than the measure of the number of relatives, the dummy variable set indicating the type of problem drinker relative was retained in the final analysis and the measure of the number of problem drinker relatives was dropped.

The multinomial logistic regression analysis then proceeded with the measures of (1) age at first monthly or more frequent use, (2) frequency of alcohol use in 1979 (as modified), (3) incidence of binge drinking, and (4) the indicators of the type of problem drinker relative. The two nested models were performed. Table 4.21 shows the summary statistics of Models 1 and 2. The Model Chi-Square was statistically significant in Model 1 and the "group" Model Chi-Square statistic was statistically significant in Model 2 (Table 4.21). The Model 1 Nagelkerke's R^2 was modest but indicated sufficient substantive significance (Menard 1995:19). The CAR in Model 1 met the criteria for adequate classification accuracy of the cases into the categories of the dependent variable. Thus, there was adequate goodness of fit and predictive efficiency to reject the null hypothesis that the measures of alcohol use were not related to first family type.

Table 4.21. ALCOHOL USE: MODELS 1 and 2. Summary statistics of multinomial logistic regression analysis of the relationship of alcohol use in 1979 (ref: no use) to first family type (ref: first marriage was first) among the alcohol only users and non-users of any substance in 1979 in the sample (N=1,676)

SUMMARY STATISTICS		
Goodness of Fit and Predictive Efficiency	MODEL 1^b	MODEL 2^c
Model Chi-Square ^a	179.697***	981.319***
“group” Model Chi-Square	n/a	119.053***
(pseudo R ²) Nagelkerke R ²	.113	.492
proportional by chance accuracy rate	.378	.378
1.25 x by chance accuracy rate	.473	.472
CAR	.553	.660
Likelihood Ratio Test Statistics^d	Chi-Square	Chi-Square
<u>age at first use “group” Chi-Square</u>	49.968***	43.504***
monthly use began ages 3 to 13	14.047***	9.761*
monthly use began ages 14 to 16	15.437***	14.290**
monthly use began ages 17 to 19	24.615***	22.835***
monthly use began ages 20 to 39	6.163	7.658*
<u>frequency of use “group” Chi-Square</u>	56.113***	33.129**
used once	.178	1.335
used twice	18.352***	6.473†
used three to five times	5.561	1.358
used six to 10 times	18.242***	12.442**
used 11 to 51 or more than 51 times	24.238***	16.567***
<u>type of problem drinker relative “group”</u>	37.236***	13.277
biological father	18.709***	4.771
biological mother or mother and father	1.064	3.581
other relatives	4.630	4.740
binge drinking	9.563*	6.088

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Model Chi-Square is the difference between the Intercept Only -2LL and the Final Model -2LL.

^b Included only the indicators of age at first monthly or more frequent use and frequency in 1979

^c Added to Model 1 were the measures of physical characteristics, family background factors, gender, race/ethnicity, rural/South residence, the attitudinal measures, and the behavioral measures.

^d Not shown: control variable for missing data

Likelihood Ratio Chi-Square statistics of each of the dummy variable sets were generated in each of the models. The four measures of characteristics of alcohol use made statistically significant contributions in Model 1. In Model 2, the age at first use and frequency of use measures lost some statistical power but maintained significance. The statistically significant findings with respect to the measures of age at first monthly or more frequent use and frequency of use in

1979 lead to the rejection of the null hypothesis that these variables are not related to first family type.

Neither the indicator of binge drinking nor the measure of type of problem drinker relative was significant in Model 2, suggesting that the contributions of these two variables to the prediction of first family type were not important to predicting first family type. Because the indicator of binge drinking and the set of indicators of type of problem drinker relative did not make a statistically significant contribution, the parameter estimates of those variables are not discussed in the text or reported in the tables. Menard's (1995:59) concern about including irrelevant independent variables in a logistic regression model is that their presence may inflate the standard errors of the relevant independent variables. The extent of an "inflation effect" caused by including these irrelevant measures in the models was assessed using a stepwise procedure similar to the procedure used to compute the "group" Chi-Square statistics. Some inflation of the standard errors did occur by including the irrelevant variables but it was not so large as to cause concern that the efficiency of the estimates was significantly influenced.

Hypothesis 2. [The characteristics of alcohol use are related to the first type of family formed such that:

(1) first monthly or more frequent alcohol use younger than age 17 decreases the odds that no family was formed and increases the odds that parenthood was the first family type. Monthly or more frequent use increases the odds of cohabitation as the first family type regardless of age at first use;

(2) frequency of alcohol use greater than 10 times in 1979 (ages 14 to 16) decreases the odds that no family was formed and that parenthood was the first family type and increases the odds that cohabitation was the first family type;

(3) binge drinking increases the odds that parenthood was the first family type and that cohabitation was the first family type; and

(4) reporting a problem drinker biological dad and/or biological mom increases the odds that cohabitation was the first family type.] was not supported (see Table 4.22).

Table 4.22. ALCOHOL USE: MODELS 1 and 2. Parameter estimates of multinomial logistic regression of the relationship of alcohol use in 1979 (ref: no use) to first family type (ref: first marriage was first)^c among those who used only alcohol and non-users in the sample (N=1,676)

PARAMETER ESTIMATES				
<i>no family was formed by 2004 versus first marriage</i>				
	Model 1^a		Model 2^b	
	B	Exp(b)	B	Exp(b)
age at first use				
ages 3 to 13	.211	(1.235)	.206	(1.229)
ages 14 to 16	.813*	(2.255)	1.094*	(2.985)
ages 17 to 19	.987*	(2.684)	1.364*	(3.922)
ages 20 to 39	.775	(1.271)	.951	(2.118)
frequency of use				
used once	.079	(1.082)	.090	(1.094)
used twice	-.161	(.851)	-.103	(.902)
used three to five times	-.101	(.904)	-.066	(.936)
used six to 10 times	-.969*	(.379)	-1.080*	(.340)
used 11 to 51+ times	-1.241**	(.289)	-1.483**	(.227)
Intercept	-2.193***		-3.523***	
<i>first parenthood occurred first versus first marriage</i>				
	B	Exp(b)	B	Exp(b)
Age at first use				
ages 3 to 13	.852†	(2.344)	1.081†	(2.946)
ages 14 to 16	.121	(1.129)	.490	(1.632)
ages 17 to 19	-.484	(.616)	.046	(1.047)
ages 20 to 39	.085	(1.088)	.707	(2.028)
frequency of use				
used once	.042	(1.043)	-.135	(.847)
used twice	-.644†	(.525)	-.292	(.747)
used three to five times	-.601*	(.549)	-.430	(.650)
used six to 10 times	-1.444**	(.236)	-1.162*	(.313)
used 11 to 51+ times	-2.129***	(.119)	-2.023**	(.132)
Intercept	-1.353***		-2.691*	
<i>first cohabitation occurred first versus first marriage</i>				
	B	Exp(b)	B	Exp(b)
age at first use				
ages 3 to 13	1.604***	(4.975)	1.481**	(4.398)
ages 14 to 16	1.320***	(3.744)	1.400**	(4.057)
ages 17 to 19	1.444***	(4.238)	1.673***	(5.327)
ages 20 to 39	.883†	(2.419)	1.118*	(3.058)
frequency of use				
used once	.067	(1.070)	.211	(1.235)
used twice	.696**	(2.006)	.565*	(1.759)
used three to five times	.070	(1.072)	-.096	(.908)
used six to 10 times	-.027	(.974)	.170	(1.185)
used 11 to 51+ times	-.241	(.785)	-.211	(.870)
Intercept	-2.332***		-1.800*	

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Included only the indicators of age at first monthly or more frequent use and frequency in 1979

^b Added to Model 1 were the measures of physical characteristics, family background factors, gender, race/ethnicity, rural/South residence, the attitudinal measures, and the behavioral measures.

^c Not shown: control variable for missing data

The younger ages (younger than age 17) at first alcohol use were generally expected to increase the odds of family formation; thus, it was anticipated that first use at ages up to age 17 would decrease the odds of not forming a family by 2004 and increase the odds of parenthood as the first family type but neither of these expectations were supported in the data. Alcohol that was first used in the “normative” age range—14 to 19—increased the odds of not forming a family by 2004 and the effect size was larger for the 17 to 19 year old group than 14 to 16 year old group age. Age at first use was not significantly related to parenthood as the first family type. All the ages at first use also were expected to increase the odds of cohabitation as the first union, which was supported, and the largest effect was among those who first used at ages 17 to 19.

The expectation that “regular use,” or monthly or more frequent use in 1979, would decrease the odds that no family was formed by 2004 and decrease the odds that parenthood was first was supported. However, less frequent alcohol use—six to 10 times in 1979—also decreased the odds that no family was formed by 2004 and that parenthood was first, although the effects were not as large as for more frequent use. Monthly or more frequent alcohol use also was expected to increase the odds of cohabitation as the first union but frequency of use was not related to cohabitation versus marriage as the first family type.

Both binge drinking and reporting a problem drinker biological father and/or mother were expected to increase the odds of atypical family formation but neither of these measures was significantly related to first family type.

In sum, young age at first regular use, high frequency of use at ages 14 to 16, binge drinking, and parental alcoholism were expected to increase the odds of atypical family formation. While relatively higher frequency of use was related to not forming a family and premarital parenthood, young age at first use only modestly predicted not forming a family and parenthood as the first family type. Conversely, age at first use but not frequency of use predicted cohabitation as the first union type. Binge drinking and parental alcoholism were unrelated to first family type.

Research Question 3

How do (a) the age at first marijuana use and (b) the frequency of marijuana use in 1979 relate to the first type of family formed?

About .08 (N=315) of the sample used only marijuana in 1979. Use of only marijuana was the most likely of all the types of substance use where parenthood was the first family type and the least likely where no family was formed by 2004 (Chi-Square=267.998, $p < .001$). The use of marijuana but no other substances in 1979 also made a statistically significant contribution to the analysis of the whole sample in Models 1 and 2, suggesting that differences between those who used only marijuana and non-users predicted a subject's membership into the four first family types over and above what could be attributed to chance alone³⁵. To address this research question, the subjects who had used only marijuana in 1979 (N=315)³⁶ and the non-users in 1979 (N=876) were analyzed in Models 1 and 2. A preliminary cross-tabulation found no zero or too small cell sizes in the bivariate relationship of age at first marijuana use and first family type. For consistency, the adjustments made to the control variables in the analysis of those who used only alcohol (and non-users) due to unexpected singularities in the Hessian matrix in the analysis were duplicated in this analysis.

As a preliminary step, the temporal order of the age at first marijuana use and age at first family formation was checked, Table 4.23. An indicator of marijuana use before family formation was made identically to the way that the indicator of alcohol use before family formation was made. The ages at first marijuana use variable were compared to the ages at first marriage, cohabitation, and parenthood. About .06 of the sample had used marijuana but not formed a family by 2004. Only .01 of the sample (N=54) first used marijuana after initial family formation.

³⁵ In Model 1, the Likelihood Ratio Test statistic for marijuana use only was 30.532 ($p < .001$) and in Model 2 it was 9.210 ($p < .05$).

³⁶ These were the same subjects that made up the "marijuana alone" category of the type of substance use in 1979 variable.

Table 4.23. MARIJUANA USE: USE BEGAN BEFORE INITIAL FAMILY FORMATION
Proportions and numbers of cases in the sample^a

<i>Used before or after family formation or never used</i>	<i>Proportion</i>	<i>Number</i>
use began before initial family formation	.69	2,772
use began and no family was formed	.06	260
<i>Sub-total (marijuana use before family formation)</i>	<i>.75</i>	<i>3,031</i>
use began after initial family formation	.01	54
<i>Sub-total (all marijuana use)</i>	<i>.76</i>	<i>3,086</i>
no marijuana use and family was formed	.17	671
no marijuana use and no family was formed by 2004	.02	79
<i>Sub-total (no marijuana use)</i>	<i>.19</i>	<i>749</i>
<i>missing data</i>	<i>.04</i>	<i>176</i>
<i>Total</i>	<i>1.00</i>	<i>4,011</i>
<i>Dichotomous variable used in preliminary analysis</i>	<i>Proportion</i>	<i>Number</i>
first used before family formation or no family formed = 1	.76	3,031
used after family formation, never used, missing	.24	980
<i>Total</i>	<i>1.00</i>	<i>4,011</i>

^a All sub-totals and totals do not add to 1.00 and 4,011 due to computational rounding

Table 4.24 shows the summary statistics of the multinomial logistic regression analysis Models 1 and 2. The Model Chi-Square (Model 1) and “group” Model Chi-Square (Model 2) were statistically significant, leading to the rejection of the null hypothesis that the joint effects of the two measures were not related to first family type. The pseudo R^2 in Model 1 was .089 and the predicted CAR was .540 (the threshold for adequacy was .457), suggesting more than adequate predictive efficiency.

Group Likelihood Ratio Test Chi-Square statistics for Model 2 were computed for each of the two marijuana use variables using the two-step procedure described above. The age at first marijuana use variable made a statistically significant contribution to both models ($p < .001$) and all the separate indicators of ages at first use made significant contributions to Models 1. In Model 2, only first use at ages 10 to 13 was not statistically significant. Moreover, in Model 2, the extent of the contribution made by the separate indicators increased with age.

The frequency of marijuana use in 1979 variable did not significantly predict first family type—the p-values of the variable’s group Likelihood Ratio Test statistic were greater than .10 in both models. An indicator of marijuana use in 1979 (used to any extent = 1) was included in the models in replacement of the categorical

measure of the frequency of use to assess whether use in 1979 *at all* was important. It also made no significant contribution. Because there was no relationship between frequency of marijuana use and first family type, parameter estimates and odds

Table 4.24. MARIJUANA USE: MODELS 1 and 2. Summary statistics of multinomial logistic regression analysis of the relationship of marijuana use in 1979 (ref: no use) to first family type (ref: first marriage was first) among the marijuana only users and non-users of any substance in the sample (N=1,191)

<i>SUMMARY STATISTICS</i>		
Goodness of Fit and Predictive Efficiency	MODEL 1^b	MODEL 2^c
Model Chi-Square ^a	100.707***	766.690***
“group” Model Chi-Square	n/a	54.807***
(pseudo R ²) Nagelkerke R ²	.089	.524
proportional by chance accuracy rate	.366	.366
1.25 x by chance accuracy	.457	.457
predicted CAR	.540	.647
<i>SUBSTANTIVE AND STATISTICAL SIGNIFICANCE</i>		
Likelihood Ratio Test Statistics	Chi-Square	Chi-Square
<u>age at first use “group” Chi-Square</u>	62.566***	45.348***
use began ages 10 to 13	23.311***	5.708
use began ages 14 to 16	26.291***	7.387†
use began ages 17 to 19	18.413***	20.351***
use began ages 20 to 35	25.658***	24.012***
<u>frequency of use “group” Chi-Square</u>	13.405	7.778
used once	7.852*	6.666†
used two to five times	1.910	.373
used six to 51 or more times	1.921	.566
used at all in 1979 = 1 ^e	5.750	5.125

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Model Chi-Square is the difference between the Intercept Only -2LL and the Final Model -2LL.

^b Included only the indicators of age at first monthly or more frequent use and frequency in 1979

^c Added to Model 1 were the measures of physical characteristics, family background factors, gender, race/ethnicity, rural/South residence, the attitudinal measures, and the behavioral measures.

^d an indicator that marijuana was used “at all in 1979” (in a separate analysis but shown here)

ratios are not reported in the text or on the tables. However, the frequency of marijuana use in 1979 variable was retained in the models. The extent of an “inflation effect” caused by including this mostly irrelevant measure in the models was assessed using a stepwise procedure (Menard 1995:59). Some inflation of the standard errors did occur by including the irrelevant variable but it was not so large as to cause concern that the efficiency of the relevant estimates was significantly

influenced. The analysis proceeded with the age at first marijuana use as the sole remaining measure of marijuana use in the analysis.

Hypothesis 3. [*The characteristics of marijuana use are related to the first type of family formed such that:*

(1) first marijuana use younger than age 17 decreases the odds that no family was formed and increases the odds that parenthood was the first family type. Marijuana use increases the odds of cohabitation as the first family type regardless of age at first use; and

(2) frequency of marijuana use greater than 10 times in 1979 (ages 14 to 16) decreases the odds that no family was formed and that parenthood was the first family type. Marijuana use increases the odds that cohabitation was the first family type regardless of frequency of use] was not supported (Table 4.25).

Table 4.25. MARIJUANA USE: MODELS 1 and 2. Parameter estimates of multinomial logistic regression analysis of the relationship of marijuana use in 1979 (ref: no use) to first family type (ref: marriage was first) marijuana only users and non-users (N=1,191)

PARAMETER ESTIMATES				
<i>no family was formed by 2004 versus first marriage</i>				
	Model 1^a		Model 2^b	
age at first use	B	Exp(b)	B	Exp(b)
ages 10 to 13	.026	(1.027)	-.106	(.899)
ages 14 to 16	.459	(1.583)	.626	(1.870)
ages 17 to 19	.763**	(2.145)	1.176***	(3.240)
ages 20 to 35	.949*	(2.582)	1.249**	(3.486)
Intercept	-1.784***		-3.742**	
<i>first parenthood occurred first versus first marriage</i>				
Age at first use	B	Exp(b)	B	Exp(b)
ages 10 to 13	1.200***	(3.320)	.597	(1.816)
ages 14 to 16	1.193***	(3.643)	.844*	(2.326)
ages 17 to 19	.530†	(1.699)	.254	(1.289)
ages 20 to 35	1.189***	(3.285)	1.528**	(4.607)
Intercept	-1.791***		-1.321	
<i>first cohabitation occurred first versus first marriage</i>				
age at first use	B	Exp(b)	B	Exp(b)
ages 10 to 13	1.256***	(3.510)	.825*	(2.282)
ages 14 to 16	.789**	(2.201)	.564†	(1.758)
ages 17 to 19	.868***	(2.382)	.931***	(2.538)
ages 20 to 35	1.517***	(4.559)	1.629***	(5.085)
Intercept	-1.640***		-.738	

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Included only the variable indicating type of substance use in 1979

^b Added to Model 1 were the measures of physical characteristics, family background factors, socio-cultural indicators, the attitudinal measures, and the behavioral measures.

Use that began at younger ages was expected to have more of an influence on first family type than use that began at older ages; indeed, it was anticipated that first use at ages 17 and older would not be significantly related to not forming a family by 2004 or to parenthood as the first family type. However, the reverse effect was evident in these data. The odds of not forming a family by 2004 and of parenthood versus marriage as the first family type were not significantly different between those whose first use was younger than age 17 and non-users; however, first use at age 17 or older increased the odds that no family was formed. The effect size was largest for first use at ages 20 to 35. Also, the odds that parenthood was the first family type also were increased by first use occurring at ages 20 to 35 and at ages 14 to 16 and, again, the effect size was largest for first use at ages 20 to 35. These marijuana users were more than four and one-half times as likely as non-users that parenthood preceded first marriage.

It was anticipated that age at first use would increase the odds of cohabitation as the first family type for all the ages at first use and that aspect of the hypothesis was supported. In Model 1, all ages at first use increased the odds of cohabitation. The largest effects were again for those who started at the oldest ages. In Model 2, the effects were somewhat diminished in the two younger age groups but the effect sizes in the two older age groups increased when accounting for the effects of the control variables.

Frequency of marijuana use that was monthly or more often was expected to contribute to atypical family formation. In these data, the frequency of marijuana use did not significantly add to Model 1 (group Likelihood Ratio Chi-Square = 5.750, $p > .10$) or Model 2 (group Likelihood Ratio Chi-Square = 5.125, $p > .10$).

In summary, the frequency of marijuana use in 1979 did not particularly matter to the type of family that was first formed but the age at first marijuana use was important. In each of the relationships examined, the age at first use increased the odds of unconventional family formation. Those who first used at ages 20 to 35 were most influenced and were more than three times as likely as non-users not to form a family, more than four times as likely as non-users that parenthood was first, and about five times as likely as non-users that cohabitation was the first family type when compared to marriage. While not all ages at first use

were significant predictors, those that made significant contributions were relatively large.

Research Question 4

How does the age at first use of illegal drugs other than marijuana relate to the first type of family formed?

In the sample, there were 768 subjects who used illegal drugs other than marijuana in 1979. Some of this use was limited to other illegal drugs and some of it was concurrent with alcohol and/or marijuana. As Table 4.26 shows, most of the illegal drug use in 1979 was concurrent with both alcohol and marijuana (.83). The top panel of Table 4.26 describes the composition of the group of illegal drug users and, in the bottom panel, shows how these constituents were distributed in the

Table 4.26. ILLEGAL DRUG USE. Proportions of types of illegal substance users in 1979 with numbers of cases (in parentheses) and distribution of types of substance use in 1979 across first family type (N=4,011)^a

<u>Types of illegal drug use</u>				
<u>sub-types of illegal drug use</u>	<u>proportion</u>	<u>number of cases</u>		
illegal drugs	.03	(20)		
illegal drugs with alcohol	.06	(48)		
illegal drugs with marijuana	.08	(65)		
all three types	.83	(635)		
Total	1.00	(768)		
<u>First family type</u>				
<u>types of substance use</u>	<u>no family was formed</u>	<u>parenthood was first</u>	<u>cohabitation was first</u>	<u>marriage was first</u>
none (N=876)	.12 (109)	.14 (127)	.17 (153)	.56 (487)
alcohol (N=800)	.10 (82)	.09 (71)	.26 (209)	.55 (439)
marijuana (N=315)	.05 (15)	.24 (75)	.22 (68)	.50 (157)
alcohol and marijuana (N=1,025)	.07 (77)	.13 (130)	.27 (278)	.53 (541)
all three types (N=768)	.09 (68)	.15 (117)	.37 (284)	.39 (300)
missing (N=227)	.28 (64)	.15 (35)	.08 (20)	.48 (108)
Pearson Chi-Square (df) = 251.772*** (15)				

*** = $p < .001$, two-tailed tests of significance

^a All totals do not add to 1.00 or to line totals due to computational rounding

categories of the dependent variable. This group of illegal drug users was the least likely among those who used and the non-users to marry first and the most likely that cohabitation was their first family type (Chi-Square=251.772, $p < .001$). These

768 subjects, together with the 876 non-users in 1979, were employed to address Research Question 4 (N=1,644).

Research Question 4 was addressed by assessing the substantive and statistical significance of the set of indicators of age at first use of illegal drugs other than marijuana in four multinomial logistic regression models. None of the subjects had first used other illegal drugs after their initial family formation had occurred. Preliminary analysis found small cell sizes in the cross-tabulation between the age at first use variable and the dependent variable. To resolve this problem, the ages at first use were regrouped as follows: (1) age 14 and younger (N=187)³⁷, (2) age 15 (N=321), (3) age 16 (N=391), and (4) ages 17 to 35 (N=494). No illegal drug use was the omitted group.

The subjects were analyzed in a four nested model approach. In Model 1, first family type was regressed on the dummy variable set of indicators of age at first use. Model 2 assessed the effects of the age at first use while controlling for the effects of alcohol and marijuana use by adding the following variables: (1) age at first monthly or more frequent alcohol use, (2) frequency of alcohol use in 1979, (3) binge drinking, (4) type of problem drinker relative, (5) age at first marijuana use, and (6) frequency of marijuana use in 1979. Model 3 removed the measures of alcohol and marijuana use and replaced them with the control variables. The final model, Model 4, combined Models 2 and 3 so that all the measures of substance use and the control variables were included.

The summary statistics are shown in Table 4.27. In Model 1, the Model Chi-Square was statistically significant ($p < .001$) when age at first use was the only independent variable. The “group” Model Chi-Square Test statistics indicating the contributions of the age at first use variable to the three additional models were significant, suggesting that age at first use made a meaningful contribution to the prediction of a subject’s first family type net of the effects of the measures of the characteristics of alcohol and marijuana use and the control variables. The pseudo R^2 was modest but adequate in Model 1 (.074) and the CAR met the criterion for adequate classification of the cases. All of the Likelihood Ratio Test statistics of

³⁷ In this age group, 145 cases were age 14 at first use, 17 were age 13, 13 were age 12 at first use, and the remaining 12 cases were age 11 or younger at first use.

Table 4.27. ILLEGAL DRUG USE: MODELS 1 TO 4. Summary statistics and parameter estimates of multinomial logistic regression analysis of the relationship of age at first use of illegal drugs other than marijuana (ref: no use in 1979) to first family type (ref: first marriage was first) among users of illegal drugs and non-users in the sample (N=1,644)

SUMMARY STATISTICS								
Model Fit	MODEL 1^a		MODEL 2^b		MODEL 3^c		MODEL 4^d	
Model Chi-Square ^e	115.088***		331.755***		903.992***		1084.142***	
“group” Chi-Square	n/a		35.267***		35.304***		32.723***	
(pseudo R ²) Nagelkerke R ²	.074		.200		.463		.528	
by chance CAR	.333		.333		.333		.333	
1.25 x by chance CAR	.416		.416		.416		.416	
CAR	.495		.522		.590		.628	
Likelihood Ratio Test	Chi-Square		Chi-Square		Chi-Square		Chi-Square	
age 14 and younger	48.457***		20.325***		18.867***		18.562***	
age 15	71.523***		8.786*		12.976**		7.190†	
age 16	38.584***		6.611†		2.417		4.834	
ages 17 to 35	14.059**		6.273†		11.255**		5.804	
PARAMETER ESTIMATES								
<i>no family was formed by 2004 versus first marriage</i>								
	Model 1^a		Model 2^b		Model 3^c		Model 4^d	
age at first use	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)
<= age 14	.601*	(1.825)	2.217***	(9.181)	.593	(1.810)	2.573***	(13.129)
age 15	.143	(1.154)	1.468**	(4.341)	-.240	(.787)	1.405	(4.074)
age 16	-.208	(.813)	1.213*	(3.363)	-.258	(.772)	1.309	(3.702)
ages 17 to 35	.877*	(2.404)	.784†	(2.190)	.906*	(2.474)	.666	(1.946)
Intercept	-1.559***		-1.866***		-3.154***		-3.080**	
<i>first parenthood occurred first versus first marriage</i>								
age at first use	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)
<= age 14	.428	(1.535)	-.148	(.863)	.303	(1.353)	.113	(1.120)
age 15	.631**	(1.880)	.111	(1.117)	.006	(1.006)	-.313	(.732)
age 16	.309	(1.362)	-.201	(.818)	.207	(1.231)	-.055	(.946)
ages 17 to 35	.568	(1.765)	.150	(1.161)	.453	(1.573)	-.075	(.927)
Intercept	-1.382***		-1.575***		-.852		-1.621†	
<i>first cohabitation occurred first versus first marriage</i>								
age at first use	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)
<= age 14	1.505***	(4.506)	.896†	(2.451)	1.313***	(3.717)	1.290*	(3.632)
age 15	1.380***	(3.975)	.542	(1.719)	.883***	(2.418)	.690	(1.994)
age 16	.928***	(2.529)	.112	(1.119)	.320	(.377)	.054	(1.055)
ages 17 to 35	1.190***	(3.286)	.741*	(2.099)	1.212***	(3.359)	.826*	(2.285)
Intercept	-1.255***		-2.354***		.465		-.813	

† = p < .10, * = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance

^a Model 1 included only the indicators of age at first use.

^b Model 2 added to Model 1 the four alcohol use and two marijuana use measures.

^c Model 3 added to Model 1 the 27 control variables.

^d Model 4 added to Model 2 the 27 control variables.

^e Model Chi-Square is the difference between the Intercept Only -2LL and the Final Model -2LL

the separate indicators of age at first use were statistically significant in Model 1. Their substantive and statistical significance decreased when other factors were accounted for and, in Model 4, the two older age groups were no longer important,

first use at age 15 was marginally significant ($p < .10$), and first use at age 14 or younger remained both substantively and statistically significant (Chi-Square=18.562, $p < .001$). These summary statistics suggested that age at first illegal drug use was important to the type of family that was first formed and that there were significant differences in first family type by the age at first use. Table 4.27 shows the summary statistics.

Hypothesis 4. [*The age at first use of illegal drugs other than marijuana is related to the first type of family formed such that first use younger than age 15 increases the odds that no family was formed and increases the odds that parenthood was the first family type. Illegal drug use other than marijuana increases the odds of cohabitation as the first family type regardless of age at first use.*] was supported (see Table 4.27).

Illegal drug use started at the youngest ages—14 or younger—was expected to increase the odds that no family was formed. In Model 1, the odds of not forming a family by 2004 were increased about .82 by first use at the youngest ages. Controlling for the nature of alcohol and marijuana use, the odds of not forming a family jumped to more than nine times that of non-use (Model 2) and when all the measures of substance use and the control variables were in the model (Model 4), age 14 or younger at first illegal drug use increased the odds that no family was formed more than 13 times that of non-use. In Model 4, no other age at first use was significantly related to first family type.

The youngest ages at first use also were expected to increase the odds of parenthood as the first family type but there were no significant differences in the odds of parenthood as the first family type between any of the ages at first use and non-use in the sample.

All the ages at first use were expected to increase the odds that cohabitation was the first family type. In Model 1, this pattern was evident and the youngest ages at first use were the most likely that cohabitation preceded marriage as the first family type. However, controlling for the effects of the characteristics of alcohol and marijuana use, these effects diminished by about half and mostly to statistical non-significance, suggesting that much of the effect of age at first illegal drug use in Model 1 may have been the effects of the

characteristics of other substances used by the subjects who had concurrently used alcohol and/or marijuana with illegal drugs in 1979. Even so, in Model 2, ages 14 or younger at first use and ages 17 to 35 at first use still increased the odds of cohabitation about twice that of non-use. In Model 3, the control variables apparently accounted for some of the effect of age at first illegal drug use (not as much as was accounted for by the measures of substance use in Model 2) but the youngest and oldest ages at first use remained substantively and statistically significant. In Model 4, when all the measures of substance use and the control variables were included with the age at first illegal drug use, first use at ages 14 or younger increased the odds of cohabitation more than three and one-half times that of non-use and first use at ages 17 to 35 increased the odds of cohabitation about two and one-quarter times that of non-use.

To summarize these findings, age 14 or younger at first illegal drug use was anticipated to be the largest contributor to predicting atypical family formation among those who use illegal drugs other than marijuana at ages 14 to 16. Use began at this young age was the only age group that increased the odds that no family was formed by 2004 and increased the odds that cohabitation was first four-fold. The odds that no family was formed by 2004 and that cohabitation was first also were increased by ages at first use between 17 and 35 in Models 1 through 3 and Models 1 through 4, respectively.

CHAPTER FIVE

SUMMARY AND DISCUSSION

This chapter is organized into two parts. The first part is a summary of the study consisting of a statement of the research problem, the research questions, the methods used to address them, and the results of the analyses. The second part is a discussion of how these findings bear upon initial family formation behavior. The discussion section highlights the most important findings of the study and evaluates the study's success as an extension of Kandel and colleagues' foundational research. It considers how well the findings support Goode's Role Strain Theory. The implications of the results for the full sample, the population subgroups, and users of different types of substances are discussed. Implications for public policy are suggested, the study's limitations are identified, and directions for future research are proposed at the end of the chapter.

Summary

Research problem

When and in what order people marry and have children and whether they cohabit before or instead of marriage have both an immediate and a lasting impact on the nature and direction of their lives and the lives of their children (Brown 2000; Fussell and Furstenberg 2005; Mouw 2005). Teenage marriages are more likely than later marriages to end in divorce; cohabitation (particularly teenage cohabitation) also tends to be short-lived with most ending in separation rather than marriage (Cherlin 2005). Non-union or teenage childbearing tends to truncate or delay educational attainment and to delay marriage and is associated with subsequent poverty (Cherlin 2005; Furstenberg, Levine, and Brooks-Gunn 1990; Smock 2000). Patterned family formation behavior influences societal level social change in the economy, the age structure of the population, and social equality (Dickson 1993; Hacker 2003; MacMillan 2005).

During the last quarter of the twentieth century to the present, family formation has become increasingly diverse—some reports indicate that half or more

of young adults cohabit before ever marrying (Cherlin 2005) and growing proportions of children, currently almost .40 of all children, are born to single or cohabiting women (Child Trends Data Bank 2008). There is growing social acceptance of different choices; yet the majority of Americans highly value marriage, perhaps more so than in the past, in its traditional idealized form (Thornton and Young-DeMarco 2001).

The likelihood that the typical family form—marriage followed by children—will be taken is affected by a variety of things because people's family formation decisions and behaviors occur in and are influenced by the conditions in the multidimensional contexts of their lives. Early or delayed physical maturity influences the timing of union formation and the initiation of sexual intercourse (Lanza and Collins 2002). Childhood and adolescent socioeconomic conditions—poverty, middle class, or affluence—affect the quantity and quality of potential marriage partners (Lichter et al. 1992) and attitudes toward marriage and parenthood (Taylor 1991). Some family formation behavior is intergenerationally reproduced—both sons and daughters tend to form their families in ways that are similar to their parents (Axinn, Clarkberg and Thornton 1994).

Some attitudes and types of behavior may hasten or delay marriage or may influence whether an atypical choice is made. For instance, religious influences affect attitudes that affect the timing and likelihood of premarital pregnancy, age at first marriage, and the likelihood of cohabitation (Barber 2001a; 2001b; Thornton, Axinn and Hill 1992). An early age at first sexual intercourse increases the risk of premarital pregnancy, early marriage, and the likelihood of cohabitation (Abrahamse, Morrison and Waite 1988). Atypical family formation during the 1980s (when most of the subjects formed their first families) may be part of the counter-cultural lifestyle of the period that included criminality and other risk-taking behaviors (King, Massoglia and MacMillan 2007).

Alcohol and illegal drug use may influence marital timing and the likelihood of cohabitation (Newcomb and Bentler 1985) and it may influence the likelihood of non-union parenthood through its effects on sexual risk-taking (Jaffee et al. 2001; Kieman and Hobcraft 1997). Particularly when immoderately used or used at very young ages, substance use may be an important predictor of poorly planned—even

ill-fated—family formation because alcohol and illegal drug use often are associated with poor planning, impulsivity, and risk-taking (Hawkins, Catalano and Miller 1992). Yamaguchi and Kandel (1985a; 1985b; 1987), Rosenbaum and Kandel (1990), and Mensch and Kandel (1992) investigated the effects of illegal drug use on marital timing, the likelihood of cohabitation as a first union, age at first intercourse, the likelihood of premarital pregnancy, and abortion. Kaestner (1997) alone has revisited the question of illegal drug use and marital timing but not cohabitation. Some scholars have examined the relationship of alcohol use to marital timing or precursors to parenthood (Chilcoat and Breslau 1996; Cooper 2002; Horwitz and White 1991; Mott and Haurin 1988). But no extension or replication of Kandel and colleagues' research was found even though their studies' limitations welcomed such an effort.

Research questions

The small body of previous research that addressed these questions has added little to what Kandel and colleagues already found about the importance of illegal drug use to family-related behavior. This is partly because controlling for other possible explanations of atypical family formation has been unusual and partly because either union formation or pregnancy has been focused on without considering the relationship these two outcomes have to each other. For instance, Brien, Lillard, and Waite (1999) demonstrated that cohabitation is significantly more likely to occur among females who are pregnant than females who are not pregnant. No studies have explored the effects of substance use on the likelihoods of cohabitation or parenthood as the first type of family formed although research informs us that the likelihoods of those states are increased by delayed marriage (which is associated with substance use) and that substance use increases the likelihood of premarital pregnancy.

The main goal of this study was to build on the research of Kandel and colleagues by asking similar research questions, addressing some of the limitations of their studies, and extending their work. Specifically, three of Kandel and colleagues' five studies: (1) employed a regional sample that was not representative of a population beyond New York State, (2) used a sample size that

precluded separate analyses by gender and race/ethnicity, (3) examined subjects who were too young at the time of their studies to have completed initial family formation (age 24), and (4) were unable to control for other important factors that might have explained atypical family formation behavior. Their other two studies used subjects in the NLSY79 in 1984 but limited the analysis to females who were 19 or 24 years old, depending on the study. These limitations were addressed in the current study by using nationally representative data with a sample size that was large enough to accommodate subgroup analyses, that offered a wealth of variables to control for other explanations of atypical family formation, and that had followed the subjects to an age where initial family formation was virtually complete (at ages 39 to 41).

Kandel and colleagues' research also was extended in four ways: (1) the measures of substance use in the current study included alcohol use along with marijuana and other illegal drug use, (2) it used a refined measure of polydrug use that incorporated both the use of multiple types of substances and the notion that substance use escalates from alcohol to marijuana to "hard" drugs, (3) it responded to an unanswered question in their research about the impact of substance use on premarital parenthood by considering actual parenthood rather than pregnancy, and (4) it added an examination of important characteristics of alcohol, marijuana, and other illegal drug use on first family type among the users of those substances in the sample.

The specific research questions addressed in this study were:

1. How does the use of alcohol, marijuana, or other illegal drugs alone or concurrently ("polydrug use") relate to the first type of family formed?
 - a. How do the effects of alcohol and illegal drug use on the first type of family formed differ by gender?
 - b. How do the effects of alcohol and illegal drug use on the first type of family formed differ by race/ethnicity?
 - c. How do the effects of alcohol and illegal drug use on the first type of family formed differ by rural/non-rural and South regional residence?
2. How do (a) the age at first monthly or more frequent alcohol use, (b) the frequency of alcohol use at 14 to 16 years old, (c) the occurrence of binge drinking,

and (d) the type of problem drinker relative (if any) relate to the first type of family formed?

3. How do (a) the age at first marijuana use and (b) the frequency of marijuana use at 14 to 16 years old relate to the first type of family formed?

4. How does the age at first use of illegal drugs other than marijuana relate to the first type of family formed?

Methodology

To address the research questions, respondents to the NLSY79 who were 14 to 16 years old in 1979 and who had not married, cohabited, or parented a birth child before 1979 were analyzed (N = 4,011). Marital and fertility history files in the data set spanning 1979 to 2004 were used to construct a four-category dependent variable that indicated the family type that first was formed: (1) marriage, (2) cohabitation, (3) parenthood, or (4) no family was formed by 2004. Using self-reported information about alcohol and illegal drug use across the 25 waves of data, measures of alcohol, marijuana, and other illegal drug use were constructed. Control variables in five domains were included in the models.

The data were analyzed in a competing risks framework using multinomial logistic regression. Three embedded binary logistic regressions assessed the likelihoods that the first type of family formed was parenthood, cohabitation, or that no family was formed by 2004 versus marriage. The full sample was analyzed at the outset to determine the effects of singly or concurrently used alcohol, marijuana, and/or other illegal drugs in 1979 (before family formation occurred) on first family type. That was followed by separate analyses by gender, race/ethnicity, and rural/non-rural and South regional residence.

Then, those who had used only alcohol in 1979 (N=800) were analyzed to ascertain the effects of four measures of characteristics of alcohol use (age at first use, frequency of use at ages 14 to 16, binge drinking, and family alcoholism) on their family formation behavior compared to those who used no substances in 1979 (N=876). That analysis was followed by an analysis of the effects of two measures of characteristics of marijuana use (age at first use and frequency of use at ages 14 to 16) on the first family type of those who had used only marijuana in

1979 (N=315) compared to non-users in 1979 (N=876). About .19 of the sample (N=768) had used other illegal drugs alone or concurrently with alcohol and/or marijuana in 1979. This group was similarly analyzed to assess the effects of the age at first use of illegal drugs other than marijuana on first family type, net of the effects of the measures of other substance use, and net of the effects of the control variables.

Results

Just over half of the subjects' first family type was marriage. One-quarter of the sample cohabited as the first family type, about one in seven subjects in the sample experienced first parenthood as their first family type, and just .10 of the sample had not formed a family by 2004 at ages 39 to 41. Most of the subjects (.96) had reported some extent of alcohol use in 1979, a smaller proportion had used marijuana in 1979 (.82), and about .19 had used other illegal drugs in 1979. Those who had used any type of substance in 1979 tended to have used other types as well. The most common concurrent use during 1979 was alcohol and marijuana use (about .26 of the full sample) but .16 of the sample reported that they had concurrently used alcohol, marijuana, and other illegal drugs in 1979.

Table 5.1 presents an overview of the statistically significant findings of the full sample analysis, by gender, residential group, and race/ethnicity. In the full sample analysis, the significance of effects seemed to depend on the type of substance that was used. Alcohol decreased the odds of parenthood but that effect was marginal ($p < .10$). When concurrently used with marijuana, alcohol and marijuana use decreased the odds that no family was formed and that parenthood was first but again the coefficients were not particularly large and appeared to be limited to subjects in the non-rural non-South; these users were about one-third less likely than non-users that no family was formed and about .25 less likely that parenthood was first. Exclusive use of marijuana in 1979 decreased the likelihood that no family was formed (versus marriage) but the effect seemed to be limited to males and the influence of marijuana use mostly was when it was concurrently

Table 5.1. Summary of results of multinomial logistic regression analyses of relationship of “type of substance use in 1979” (ref: no use in 1979) to “first family type” (ref: marriage was first) in the full sample, by gender, rural/non-rural and South regional residence, and race/ethnicity (N=4,011)

<i>Relationship of the type of substance use in 1979 to first family type, Model 2</i>										
<i>no family was formed by 2004 versus marriage as the first type of family formed</i>										
<i>Type of substance use in 1979</i>	<i>full sample</i>	<i>males</i>	<i>females</i>	<i>rural South</i>	<i>rural n-South</i>	<i>non-rural non-South</i>	<i>no family was formed by 2004</i>			
							<i>type of use</i>	<i>white</i>	<i>Indian</i>	<i>Other</i>
alcohol only										
marijuana only	-**	-*		⊗	⊗	⊗				
alcohol and marijuana	-*									
other illegal drugs	++		++	⊗	⊗	⊗	1 type	-***		-*
marijuana or other illegal drugs	⊗	⊗	⊗				2 types	-***		-*
all 3 types			-†		-*		3 types	-**		-†
<i>parenthood was the first type of family formed versus marriage</i>							<i>parenthood was first</i>			
alcohol only	-†		-*	++		-*	<i>type of use</i>	<i>white</i>	<i>Indian</i>	<i>Other</i>
marijuana only				⊗	⊗	⊗				
alcohol and marijuana	-†		-*							
other illegal drugs				⊗	⊗	⊗	1 type			
marijuana or other illegal drugs	⊗	⊗	⊗				2 types			-*
all 3 types				++			3 types			
<i>cohabitation was the first type of family formed versus marriage</i>							<i>cohabitation was first</i>			
alcohol only				++	++		<i>type of use</i>	<i>white</i>	<i>Indian</i>	<i>Other</i>
marijuana only		++	-†	⊗	⊗	⊗				
alcohol and marijuana		++		+++	++	-*				
other illegal drugs	++	++		⊗	⊗	⊗	1 type		+++	-*
marijuana or other illegal drugs	⊗	⊗	⊗	++			2 types		+++	-†
all 3 types	+++	+++	++	+++	++		3 types	+++	+++	

† = p < .10, * = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance

++ = the likelihood was greater that parenthood or cohabitation was first versus marriage

- = parenthood or cohabitation was less likely than marriage as the first family type

⊗ = variable was not tested in that group

empty cells = no statistically significant relationship

used with alcohol and/or other illegal drugs. The use of illegal drugs other than marijuana increased the likelihood of prolonged “singlehood” and of cohabitation. While the largest effect was for the use of all three types of substances in 1979, the effect was limited to increasing the odds that cohabitation was first.

Males were more likely than females not to have formed a family by 2004 and to have used substances in 1979; however, the effect of substance use on first family type was only significantly different by gender with respect to the singular use of marijuana³⁸. The use of marijuana alone in 1979 decreased males’ odds that no family was formed by 2004 and increased their odds that cohabitation was first but had no significant effect on females’ first family type. Females’ odds that parenthood was first were decreased by their singular use of alcohol or concurrent use of alcohol and marijuana in 1979 to about half that of female non-users and the use of other illegal drugs alone or concurrently used with alcohol or marijuana increased their odds that no family was formed—use of all three types increased the odds that cohabitation was first (see Table 5.1). None of these effects of substance use on females’ first family type were particularly large.

The focus of the analysis of racial/ethnic groups was not the “type” of substance as much as the use of one, two, or three substances in 1979, regardless of type. There were large and significant differences among the groups in the type of family that first was formed and in the extent of their self-reported substance use. However, preliminary analysis found that the effects of substance use on first family type were not different between blacks or Hispanics and the other groups (see Table 4.10). Detailed analyses of the effects of substance use on first family type among the blacks and Hispanics in the sample were not performed. Preliminary testing also found that statistically significant differences among the other racial/ethnic groups were limited to the use of all three substances in 1979 (see Table 4.10). Thus, while the racial/ethnic groups were quite distinct in their family formation and substance use behaviors, substance use only modestly contributed to an explanation of said differences.

³⁸ The interaction term “gender by marijuana only” was the only gender by type of substance use interaction that made a statistically significant contribution to the full sample Model 2 in preliminary tests ($p < .05$, see Table 4.4).

Table 5.1 shows that singly used substances decreased the odds that no family was formed among whites and Others³⁹, increased the odds that cohabitation was first among American Indians, and decreased the odds of cohabitation among Others. Singly used substances, regardless of type of substance, had no significant effect on the odds that parenthood was first. The concurrent use of two or three substances mirrored the effects of singly used substances, except that the effect sizes increased as the number of substances used increased. Concurrent use of two types of substances also decreased the odds that parenthood was first among Others and the concurrent use of three types increased the odds that cohabitation was first among whites.

Substance use appeared to make little contribution to explaining atypical family formation among non-Hispanic whites. The largest effect was on not forming a family versus marriage and substance use actually decreased the odds of remaining single by 2004. In other words, non-Hispanic whites who used one, two, or three types of substances were more likely than non-users to have married than to have remained single by 2004. The odds that parenthood was first were not significantly influenced by substance use and the odds that cohabitation was first were increased only by the concurrent use of all three types of substances.

The effect of substance use on American Indians' family formation was large but confined to cohabitation—singly used substances and concurrent use of two or three types all increased Indians' likelihood that cohabitation was the first family type, effects that increased (although not dramatically) with the extent of use. Those who concurrently used alcohol, marijuana, and other illegal drugs in 1979 were 10 times as likely as non-users that cohabitation was the first type of family formed compared to marriage yet substance use did not significantly influence the odds of remaining single or of pre-union parenthood (see Table 5.1).

The subjects in the "Other" racial/ethnic category were arguably the most social "minority" of the groups. Unable or unwilling to choose group membership and physically ambiguous (according to the interviewers), these subjects were more likely than all of the other groups to take the typical route (marriage first

³⁹ This racial/ethnic category consists of those who "don't know," chose "American," chose "mixed race," and/or whose racial/ethnic identification was not identifiable by the interviewers in 1979.

followed by children) into adult family life. Substance use increased the odds of typical family formation in this group: one, two, or three types decreased the odds that no family was formed by 2004, two types decreased the odds that parenthood was first, and one or two types decreased the odds that cohabitation was first.

There also were some important residential differences in family formation and substance use that were masked in the full sample analysis. The effects of concurrent alcohol and marijuana use on first family type were significantly different between the rural and non-rural and between the two rural groups ($p < .05$, see Table 4.16) and the effects of illegal drug use other than marijuana on first family type were different for the non-rural non-South group and the other residential groups ($p < .05$). Generally, substance use had the greatest impact in the rural South and the least impact in the non-rural South (where there were no significant differences between users and non-users in the odds of first family type).

The rural South group consisted of 596 subjects (about .15 of the sample) while the non-rural non-South group contained 1,910 subjects (almost half the sample). Generally, the effects of substance use in the non-rural non-South group mirrored those of the full sample analysis. However, the picture that emerged in the rural South was significantly different from the other groups (see Table 5.1). In the rural South, substance use had no significant influence on the odds that no family was formed by 2004 but concurrent use decreased the odds that no family was formed in the other two residential groups that were examined. The odds that parenthood was the first family type were significantly increased in the rural South by the singular use of alcohol or the concurrent use of all three types of substances in 1979 while there were no significant differences in the rural non-South and alcohol use alone or concurrently used with marijuana had the opposite effect in the non-rural non-South. While substance use influenced the odds that cohabitation was the first family type in each of the three residential groups that were analyzed, the effects were more generalized and larger in the rural South than in the other groups. All the substance use categories increased the odds that cohabitation was first in the rural South—the concurrent use of all three types of substances increased the odds that cohabitation was first about 12 and one-half

times that of non-users. In the rural non-South, only the use of all three types increased the odds that cohabitation was first⁴⁰ (by about 2.5 times) and in the non-rural non-South only the concurrent use of alcohol and marijuana affected the odds that cohabitation was first, again in the opposite direction of the effect in the rural South, decreasing the odds by about .40. Thus, substance use increased the odds of atypical family formation in the rural South and decreased the odds of atypical family formation in the non-rural non-South. Substance use had only minimal influence on initial family formation in the other two residential groups.

In the analyses of the characteristics of alcohol, marijuana, and other illegal drug use, every statistically significant relationship between the age at first use (of alcohol, marijuana, or other illegal drugs) and first family type increased the likelihood of atypical family formation (Table 5.2). The odds that cohabitation was the first family type were influenced the most and the effects were greatest among those whose first use was in the oldest age groups. The youngest ages at first use were important to the effects on those who used illegal drugs other than marijuana. Frequency of alcohol use in 1979 also was important to the first type of family formed. Those who used more often were significantly less likely than non-users that no family was formed by 2004 and that parenthood was first, effects that were larger among those who had used the most often in 1979. While the likelihood of cohabitation was decreased among those who used twice in 1979, the substantive and statistical significance of that effect merely bordered statistical significance.

Among monthly or more frequent alcohol users, the “normative” ages at first use—14 to 19—increased the odds that no family was formed, the youngest ages increased the odds that parenthood was first (although modestly), and all ages increased the odds that cohabitation was first, suggesting that adolescent alcohol use (particularly when first used at early or the modal ages) is related to atypical family formation. Those who first used alcohol on a regular basis between ages 17 and 19 were more than five times as likely as non-users that cohabitation was their first family type.

⁴⁰ Alcohol use alone or concurrently with marijuana increased the odds of cohabitation over marriage in this group but the effect was marginal ($p < .10$)

Table 5.2. Summary of results of multinomial logistic regression analyses of relationships of “age at first use”^a of alcohol (monthly or more often), marijuana, or illegal drugs other than marijuana and of frequency of alcohol use in 1979 to “first family type” (ref: marriage was first) net of the effects of the control variables (ref: “no use in 1979” in all measures)

<i>Relationship of age at first alcohol, marijuana, or other illegal drug use to first family type</i>					
<i>no family was formed by 2004 versus marriage as the first type of family formed</i>					
<i>used only</i>		<i>used only</i>		<i>used other</i>	
<i>alcohol (N=800)</i>		<i>marijuana (N=315)</i>		<i>illegal drugs (N=768)</i>	
<i>age at first use</i>	<i>effect</i>	<i>age at first use</i>	<i>effect</i>	<i>age at first use</i>	<i>effect</i>
<= age 13		<= age 13		<= age 14	****
14 to 16	**	14 to 16		15	
17 to 19	**	17 to 19	****	16	
20 to 39		20 to 35	**	17 to 35	
<i>parenthood was the first type of family formed versus marriage</i>					
<i>age at first use</i>		<i>age at first use</i>		<i>age at first use</i>	
<= age 13	†	<= age 13		<= age 14	
14 to 16		14 to 16	**	15	
17 to 19		17 to 19		16	
20 to 39		20 to 35	**	17 to 35	
<i>cohabitation was the first type of family formed versus marriage</i>					
<i>age at first use</i>		<i>age at first use</i>		<i>age at first use</i>	
<= age 13	**	<= age 13	**	<= age 14	**
14 to 16	**	14 to 16	†	15	
17 to 19	****	17 to 19	****	16	
20 to 39	**	20 to 35	****	17 to 35	**
<i>relationship of frequency of alcohol use in 1979 to first family type</i>					
<i>frequency of alcohol use</i>	<i>no family was formed by 2004</i>	<i>parenthood was first</i>	<i>cohabitation was first</i>		
used once					
used twice				**	
used 3 to 5 times					
used 6 to 10 times	-*	-*			
used 11 to 51+	-**	-**			

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

+ = the likelihood was greater that parenthood or cohabitation was first versus marriage

- = parenthood or cohabitation was less likely than marriage as the first family type

empty cells = no statistically significant relationship)

The frequency of alcohol use in 1979 had the opposite effect. Bimonthly or more frequent use significantly decreased the odds that no family was formed and that parenthood was the first family type, suggesting that while the age at first use may be associated with a context in which risky sexual behaviors and/or early romantic relationships are customary (as prior research tends to suggest), the frequency of alcohol use influences the way these relationships (or pregnancies) are negotiated.

The most important ages at first marijuana use to first family type were the oldest ages, a finding completely contrary to previous empirical findings and current theory. Generally, the older the age at first marijuana use, the greater the odds that first family type was atypical. Those who were over 20 when they first used marijuana were 3.5 times as likely as non-users that no family was formed by 2004, 4.6 times as likely as non-users that parenthood was first, and 5.1 times as likely as non-users that cohabitation was the first family type.

Table 5.2 also shows that the age at first illegal drug use was not as important to predicting illegal drug users' first family type as age at first alcohol or marijuana use was to predicting those users' first family type. However, the significant findings with respect to the analysis of this group of users were remarkably large (while standard errors in the regression analysis remained small). The most important finding among the users of other illegal drugs was that use that first began at age 14 or younger increased the odds that no family was formed by age 39 to 41 more than 13 times the odds of non-use and increased the odds that cohabitation was first more than three and one-half times that of non-use. However, age at first illegal drug use was not significantly related to parenthood as the first family type. Most previous research has found significant excess pregnancy among single illegal drug users as well as a higher likelihood of abortion. These findings suggest that the two phenomena may have offset each other resulting in what appears to be no "real" relationship between age at first illegal drug use and non-union parenthood beyond random fluctuation or coincidence in the sample.

Discussion

The current study loosely replicated and then extended research from the mid-1980s that examined the relationship of substance use to initial family formation behavior. The following discussion elaborates on the extent that it achieved its goals. It considers how well the results support the argument of role strain theory. Then it discusses the contributions that the study made, the implications of the results for public policy, and its limitations. The discussion concludes with some suggestions for future research.

Replication and extension

This study aimed to extend Kandel and colleagues' research on the relationship of substance use to family formation behavior that was published between 1985 and 1992. In five studies focusing on the effects of marijuana and other illegal drug use, these researchers found that substance users were significantly more likely than non-users to cohabit than marry as a first union, to become sexually active before age 16, to become pregnant, and to resolve a pregnancy with an elective abortion. There were limitations, however, to the conclusions that could be drawn from their findings.

This study successfully overcame the limitations of their studies and extended their work. Kandel and colleagues' sample in three of their studies was not representative beyond New York State, was racially and ethnically homogeneous, lacked measures of factors to control for other explanations of atypical family formation, and followed the subjects only to age 24. The other two studies employed the NLSY79 but only through the 1984 wave when the subjects were in their early twenties. The current study successfully employed the 14 to 16 year old respondents to the 1979 NLSY79 (the same subjects that Kandel and colleagues used in two of their studies). It addressed similar questions but overcame the limitations of the previous research by exploiting the large sample size, its racial/ethnic heterogeneity, and the richness of the data of the NLSY79 through the 2004 wave.

Moreover, the current study extended Kandel and colleagues' research by including measures of alcohol use along with measures of marijuana and other illegal drug use. It improved on Kandel and colleagues' measure of polydrug use by organizing the categories of substance use to permit an assessment of the effects of the different types of substances and of polydrug use on the first type of family that was formed. Where Kandel and colleagues focused on pregnancy and abortion to address the question of premarital childbearing, the current study directly assessed the effects of substance use on actual parenthood prior to union formation. Moreover, the current study examined the effects of the nature of substance use (namely, age at first use and frequency of use) on initial family formation.

The results of the current study generally supported Kandel and colleagues' findings regarding cohabitation. Substance users were significantly more likely than non-users to cohabit before ever marrying. However, substance users were not more likely than non-users to remain single into middle age. Overall, substance use either had no effect on not forming a family by 2004 or decreased the odds of singlehood versus marriage. Perhaps the current study's ability to assess first family type in middle age instead of young adulthood contributed to the differences in the results.

Kandel and colleagues also uncovered greater likelihoods of pregnancy-related behavior, pregnancy, and elective abortion among substance-using than non-using females and suggested that these two behaviors may offset each other. The current study's results also supported these findings, with two important differences. First, there were significant subgroup differences. Second, among females and the non-rural non-South, singular alcohol use or concurrent alcohol and marijuana use significantly decreased the odds of parenthood as the first family type, suggesting that Kandel and colleagues may have overestimated the difference in the odds of pregnancy and/or underestimated the odds of abortion between the two groups. When their studies were published, the significantly greater risk of spontaneous abortion experienced by women and girls who use alcohol, marijuana, "hard" drugs, and many prescription medications, even when use is low dose and infrequent, was unknown. The current study's focus on the odds of parenthood—bearing or fathering a co-residential child—puts their pieces of the puzzle together and confirms their hunches.

Role strain theory

Goode's (1960) theory was applied by Kandel and colleagues to the role decisions that are made when people are preparing to begin their adult family life. The theory argues that anticipated incompatibility between drug user and spousal roles leads to the anticipation of role strain—the perception of an inability to simultaneously perform both roles well. Kandel and colleagues argued that all drug users would respond to anticipated role strain with delayed marriage. Some would simply remain single. Those who wanted to form a union would cohabit instead of

marry. Pregnant drug users would elect to abort the fetus, cohabit, or remain single rather than marry in response to the pregnancy. The investigators reasoned that during the 1980s when their subjects were forming their first adult families there was significant social pressure to choose between illegal drug use behavior and marrying or becoming a parent. They believed the social climate of the time would create the dilemma—anticipatory role strain—for illegal drug-using people who wanted to start families.

The subjects of the current study also were forming their adult families during the 1980s (the modal year of first marriage was 1986) and the data were analyzed to assess the differential odds of atypical family formation—parenthood, cohabitation, or remaining single—versus marriage as the first type of family that was formed. It was expected that, if Kandel and colleagues' application of Goode's theory were appropriate, the odds that marriage was the first family type would be lower among substance users than among non-users. Substance users would be more likely than non-users to remain single, to parent before forming a union, or to cohabit as a first union.

In the current study's analysis, the general expectation of role strain theory was not well-supported. In the full sample analysis, singular alcohol use in 1979 had no significant influence on the first type of family that subsequently was formed. Increased odds of atypical family formation was experienced only among residents of the rural South, where parenthood was significantly more likely than among non-users. Moreover, contrary to expectations, the odds that parenthood was first were decreased by singular alcohol use among the females and residents of the non-rural non-South region. Singular marijuana use also had little influence on the odds of atypical family formation, actually decreasing the odds of remaining single versus marriage in the full sample and among the males.

Concurrent use of alcohol and marijuana was the most common type of substance use in the sample—about .41 (N=1,025) of the full sample used both types of substances in 1979. This type of use was somewhat more important than singular substance use to predicting first family type but it did not generally increase the odds that family formation was atypical. Specifically, the odds of remaining single were decreased in the overall sample and in the non-rural non-

South subgroup, the odds of pre-union parenthood were decreased among the females, and the odds of cohabitation were decreased in the non-rural non-South residential group. Concurrent alcohol and marijuana use increased the odds of atypical family formation only with respect to cohabitation in the rural South.

It was anticipated that users of all three types of substances would have the greatest odds of atypical family formation relative to non-users. Yet, neither remaining single nor parenthood as the first family type was significantly influenced by this type of substance use. Only the odds that cohabitation was first were significantly increased by concurrent use of all three types; that effect was evident in the full sample, among males and females, in the two rural residential groups, and among non-Hispanic whites and American Indians.

Thus, the effects of substance use on the odds that marriage was first depended on gender, race/ethnicity, and residence and were not simply a matter of rejecting marriage in favor of drug use. The odds that cohabitation was the first family type was significantly more likely than marriage among all types of substance users than among non-users (except in the non-rural non-South group), but substance use had little impact on remaining single or on parenthood versus marriage. When it was significantly predictive of either of these family types, it had the opposite effect of what had been expected, decreasing the odds of atypical family formation. Furthermore, substance use did not appear to be a major contributor to atypical family formation because the overall statistical contribution of the type of substance use indicators to predicting first family type was not impressive. Substance use likely is one of many factors that combine to influence the choice to cohabit before marriage but, contrary to the expectation put forth by role strain theory, it was not an important predictor of premarital parenthood or prolonged singlehood for this cohort.

Contributions

There were several important overall findings of this study:

1. Substance use, regardless of the type of use, significantly influenced family formation behavior net of other important factors (Tables 5.1 and 5.2). In some subgroups, alcohol or marijuana used alone or concurrently with each other

influenced the odds of parenthood, cohabitation, or of remaining single.

Concurrent use of illegal drugs with alcohol and/or marijuana increased the odds that cohabitation was first in the overall sample and in most of the subsamples that were examined. Some of the effects on cohabitation as the first family type were very large, particularly among American Indians and residents of the rural South.

2. Overall, however, the effects of substance use were not particularly impressive. In Model 1 of the full sample analysis, when the “type of substance use” indicators were the only independent variables, Nagelkerke’s R^2 was just .067. The Likelihood Ratio Test Chi-Square statistics of the separate indicators were modest (between 18.369 ($p < .001$) and 33.794 ($p < .001$)) except for the indicator of concurrent use of all three types (Chi-Square = 92.477, $p < .001$). When the control variables were included in Model 2, the “group” Likelihood Ratio Test Chi-Square, representing the overall contribution of the “type of substance use” to the model was just 46.598 ($p < .001$) and the contributions to the model made by the separate indicators of substance use bordered statistical non-significance. The subjects whose family formation behavior was most influenced were the “unusual” substance users who started using younger than age 15 or older than age 20, used at least weekly in 1979, and concurrently used two or more types of substances in 1979. This was most evident in the three analyses of the characteristics of use that addressed Research Questions 2 through 4 (see Table 5.2).

3. The current study distinguished between the effects of types of substances singly or concurrently used and was able to separate, to some extent, these effects on the first type of family that was formed. This was important because most prior research does not account for the fact that many substance users’ typical pattern is to concurrently use substances after a short period of experimentation. Thus, past findings have tended to confound the effects of different types of substances on their outcomes of interest. Generally, singular use was relatively less important to family formation than concurrent use and illegal drug use was more important than alcohol. The results point to the importance of distinguishing among types of users when researching marital and fertility outcomes.

4. Most of the effect of substance use on first family type was on the odds that cohabitation was the first family type. Prior to this study, there was almost no research (with the exception of Kandel and colleagues' studies) on the effects of illegal drug use on the likelihood of cohabitation and no studies had investigated the relationship of alcohol use to cohabitation as the first union. These findings unequivocally demonstrated that substance use significantly increases the odds of cohabitation, particularly among males, residents of the rural South, American Indians, and those who used substances concurrently during early adolescence.

5. This was the first study to consider the influence of substance use on parenthood rather than pregnancy and to compare females to males. Previous research suggested that substance use has a large influence on the odds of pregnancy-related behavior among both males and females and on pregnancy among females. At the same time, a distinct medical research literature has found excess spontaneous and elective abortion among female substance users than female non-users. Kandel and colleagues' research showed that, while pregnancy was more likely among female illegal drug users than non-users, abortion also was more likely. They suggested that these two phenomena offset each other resulting in no significant differences between illegal drug users and non-users in childbearing. The current study's results supported this notion, finding either no significant difference between users and non-users in the odds that parenthood was the first family type or substance users (of alcohol only or alcohol and marijuana) were less likely than non-users that parenthood was first.

6. Substance use was not a statistically significant factor in predicting first family type for blacks or Hispanics. Much previous research on the effects of substance use on premarital pregnancy has been motivated by policy interests to decrease premarital births, most of which have been assumed to be black or Hispanic. In this sample, .47 of blacks, .20 of Hispanics, .13 of American Indians, .07 of Others, and .07 of non-Hispanic whites entered parenthood as their first family type. That substance use was not significantly related to premarital parenthood among these two minority groups is an important finding to policy makers as they formulate programs to help young women make informed choices.

7. The results revealed important residential subgroup differences were masked in the full sample analysis. The fact that family formation behavior differed during the latter half of the 20th century in the conservative rural South compared to other parts of the continental United States has been well-established. However, understanding the mechanisms that were (and are) driving those different patterns of behavior has been more challenging to uncover. These findings highlight the markedly different way that substance use influences individual family formation behavior in the rural South and other regions of the country. The results of the residential subgroup analyses suggested that there are important cultural differences with respect to marriage and childbearing and alcohol and illegal drug use in different parts of the country.

8. The subjects' initial family type was ascertained at ages 39 to 41, when family formation was virtually complete. While initial family formation generally occurs during the middle to late twenties, many people are older when they start their families. Previous studies have not followed subjects beyond age 33. The subjects of Kandel and colleagues' studies were 24 or 30 years old at the time of the follow-up interviews. The current study's results were enhanced by its ability to study a sample of individuals with first family formation between the ages of 16 and 40.

Public policy implications

There are many public policies and programs aiming to reduce or eliminate alcohol and illegal drug use because it is a public health problem. There also are policy concerns about fertility-related behaviors, especially those that lead to teenage premarital pregnancy and parenthood. Policies tend to focus on changing either fertility-related or substance use behaviors.

However, the results of this study hold few implications for adjusted or new public policies regarding substance use and family formation. First, there was little indication that substance use was preventing people from forming families by middle age and, in fact, substance users were significantly more likely than non-users to marry than remain single by midlife. Nor was substance use highly important to premarital parenthood as a first family type. If the outcome were

pregnancy instead of parenthood and significant excess pregnancies among substance users had been found, increased efforts toward educating young people about the pregnancy risks of casual, unprotected sexual intercourse might be suggested. If there had been findings that abortion was intervening between pregnancy and parenthood and that abortion had negative effects on health or well-being, then educational programs about the linkages among substance use, risky sexual behavior, and abortion targeted at young women might be suggested. Further, if it had been established that abortion was not an available, affordable, or welcomed remedy for substance-using pregnant women in the rural South resulting in unwanted children with substance use related problems, strong suggestions might be made to sensitively provide education and health services to the vulnerable population. But substance use generally decreased the odds that parenthood was the first family type. Substance use did increase the odds of cohabitation as the first family type and, to the extent that cohabitation is an unstable and/or unhappy arrangement for adults and children compared to marriage, marriage may seem to be a better choice. But policies that pressure people to marry seem misplaced, fraught with unintended consequences, and bound to fail.

Thus, the sole policy suggestion of this study is to evaluate existing drug use prevention programs to discourage early and frequent substance use and the escalation of singular use to concurrent use. Role strain theory, previous research, and the within findings suggest that substance users may be narrowing their marital prospects to the pool of single substance users, relying on abortion to fix a pregnancy that could have been dealt with preventively, and are choosing cohabitation over marriage because marriage is incompatible with substance use. The goal of policy should be to open up the family formation options that people have for their future.

Limitations of the study

Although its results arguably made a meaningful contribution to existing knowledge about the association of substance use with family formation behavior, this study presented three limitations that may restrict the clarity of its findings:

1. While the number of cases was adequate to assess the effects of substance use in the full sample, some of the subgroups were not large enough to analyze without sacrificing efficient estimation of the parameters or adjusting the key alcohol and illegal drug use variables. In some cases, small cell sizes inflated the parameter estimates, casting doubt on their validity. In the case of the analysis by race/ethnicity, the key measure of substance use was necessarily reorganized to the point where comparisons of racial/ethnic groups to the findings of the full sample and the other subgroups were inferential at best.

2. A particular effort was made to control for factors that prior research has found to be important to differences in marital timing and the likelihood of premarital parenthood. However, there were no data on at least three factors that may be important both to family formation behavior and the types and extent of substances that adolescents use. Girls tend to mimic the timing and nature of their sisters' sexual and illegal drug use behaviors and are significantly more likely to parent before marriage if at least one sister did so but the NLSY79 had no information on sibling fertility. Contraceptive use is the strongest predictor of pregnancy but questions about contraception were not included in the interviews for the first ten waves of the study. Third, conditions in the local economy such as the unemployment rate, the percentage of female heads of household, or the percentage of managerial jobs within a 10 mile radius tend to have been found predictive of marital timing and premarital parenthood. The lack of measures of these factors may have led to biases in the effects of substance use on first family type.

3. The analytical plan was careful to temporally order substance use before initial family formation. Generally, substance use was set in time in 1979. The dependent variable was constructed from the full 25 years of marital and fertility histories and the year at first family formation in the sample ranged from 1979 to 2004. The modal years of first marriage, cohabitation, and parenthood were 1985 to 1987. The analysis found that substance use in 1979 was important to the type of family first formed but changes in substance use behavior between 1979 and the year of initial family formation were unknown. Yamaguchi and Kandel (1985a; 1985; 1987) used event history analysis to address that concern which

would be the better way to respond to these questions as well. However, there are too few waves of the NLSY79 where substance use data were collected for the NLSY79 to be employed in an event history analysis of substance use change and family formation.

Suggestions for future research

Clearly, additional research is needed before the ways that substance use influences family formation behavior are well-understood. Some of these are hinted at in the discussion of the limitations of this study. Some would extend the work already done.

1. The current analysis of the racial/ethnic subgroups found that substance use was not related to the first family type of blacks and Hispanics. That finding may have been more of an artifact than empirical reality because the control variables did a poor job of accounting for the effects of other important factors in both groups and may have deflated the effects of substance use. Culturally specific factors that matter to family formation in these groups need to be accounted for in models that are constructed with consideration of the unique features of these groups. Effects of substance use on family formation in these groups may emerge.

2. Family formation behavior occurs not only in structural contexts in which certain attitudes and behaviors develop but in contexts of power. The subjects of this study were born between 1963 and 1965 when there was considerable familial and societal pressure to conform to the normative order and timing of family formation. "Shotgun" weddings were not uncommon. This study could not account for the effects of societal, parental, or peer pressures; but, it is reasonable that these factors mattered to the subjects' choices and actions. Future research should attempt to account for the effects of the attitudes of significant others and the cultural-historical context on the actions people take when they form their families.

3. The current study only hinted at the part that abortion may play in the family formation behavior of substance users. Its role may be integral to understanding the differences in the likelihood of parenthood and parental timing

between substance users and non-users. The extent to which abortion differently intervenes between pregnancy and parenthood for substance users and non-users has yet to be established. There may be patterned differences in attitudes toward abortion and its utility. Until questions about the part that abortion plays are answered, the effects of substance use on premarital parenthood will be unknown.

4. Alcohol was regularly used at some point by about .90 of the subjects of this study. Some of the use was restricted to alcohol, some was concurrent with marijuana, and some was concurrent with marijuana and other illegal drugs (primarily cocaine or amphetamines). Family formation behavior was quite different among these different types of alcohol users. They also differed with respect to their frequency of use and the age they first used and other factors. Most research categorizes substance use by type without considering other substance use behaviors that are present. When this is done, it is impossible to distinguish between the effects of one type of substance and another on an outcome. Careful discrimination would help to clarify the specific types of substances that are important to particular aspects of the family formation process.

APPENDIX A

Table A1. Proportions and numbers of cases (in parentheses) of the 14 to 16 year olds before and after dropping the cases where initial family formation events occurred before 1979 by race/ethnicity and rural/non-rural and South regional residence, unweighted and weighted^a, NLSY79

<i>Race/ ethnicity</i>	<i>Unweighted</i>			<i>Weighted</i>		
	Before (N=4,074)	Loss (N=63) ^b	After (N=4011)	Before (N=4,056)	Loss (N=45) ^b	After (N=4,011)
white	.40 (1,621)	.01 (11)	.40 (1,610)	.58 (2,343)	.01 (14)	.58 (2,329)
black	.25 (1,005)	.02 (23)	.25 (982)	.13 (543)	.02 (12)	.13 (531)
Hispanic	.17 (707)	.01 (9)	.17 (598)	.07 (279)	.01 (2)	.07 (277)
Indian	.09 (383)	.02 (9)	.09 (374)	.10 (427)	.02 (9)	.10 (418)
"Other" ^c	.09 (358)	.03 (11)	.09 (347)	.11 (464)	.01 (7)	.11 (457)
<i>Rural</i>						
Rural	.36 (1,488)	.01 (17)	.37 (1,471)	.40 (1,622)	.01 (12)	.40 (1,610)
Non-rural	.64 (2,586)	.02 (46)	.63 (2,540)	.60 (2,433)	.01 (32)	.60 (2,401)
<i>Region</i>						
South	.37 (1,501)	.02 (32)	.36 (1,496)	.33 (1,320)	.02 (22)	.32 (1,298)
Non-South	.63 (2,573)	.01 (31)	.64 (2,542)	.67 (2,736)	.01 (23)	.68 (2,713)

^a All weighted totals do not add to 4,011 due to computational rounding

^b The reported proportions lost to pre-existing events are of their respective subgroups and not of the entire sample

^c Asian, "American," "don't know," and "mixed race" identifications

APPENDIX B

The changing nature of the American family has captivated significant and multi-disciplinary research attention. Among other topics, large research literatures address questions related to early and delayed marital timing, the function and structure of cohabitation, and changing fertility patterns. Certain factors consistently have been found to predict greater or lesser odds of, for instance, premarital parenthood or early marriage and have stood out as indicators of typical or atypical family formation.

This study included measures of 27 such factors, in five domains, for the purpose of controlling for their effects on family formation behavior to better understand the influence that alcohol and illegal drug use had on the first type of family that was formed. The effects of gender, race/ethnicity, and residence on first family type were controlled in the analysis of the full sample and then these population sub-groups were more closely examined in separate analyses. However, the current study paid little attention to the remaining 24 factors that were included as control variables in the analyses even though, net of the effect of the type of substance use in 1979, some of these factors were important predictors of not forming a family by 2004 or of parenthood or cohabitation as the first family type (when statistically compared to marriage).

Appendix B presents information on the effects of these control variables in the analysis that was performed on the full study sample of 4,011 subjects. As a group, the control variables made a substantial contribution to the classification of the subjects into first family types. When the type of substance use was not included, the Model Chi-Square was 1615.514 ($p < .001$). Nagelkerke's R^2 was .365 and the Classification Accuracy Rate exceeded the standard for adequate classification (.437) at .570. The effects of the control variables on first family type are individually shown by domain in Tables B1 through B4 and are discussed in the text below. Table B1 presents the coefficients and odds ratios of the effects of the measures of Physical Characteristics on first family type in Model 2 of the full sample. Tables B2 through B4 show the Model 2 parameter estimates of the

measures of Family Background Factors, Attitudinal Measures, and Behavioral Measures. Each table is accompanied by a discussion of what the results may mean to the family formation behavior of the study sample.

The Effects of Physical Characteristics on First Family Type

The subject's age was controlled for in the analysis because (1) physical developmental differences between ages 14, 15, and 16 were expected to influence the likelihood of substance use and the timing of family formation (namely, it was anticipated that older subjects would be more likely to have used substances in 1979 and to have formed families sooner than younger subjects) and (2) cohabitation was expected to be a more likely first family type for the younger than the older subjects due to period effects. Body Mass Index (BMI) was included because previous research has found that unusually large or small people are significantly less likely than "average" sized people to ever marry.

Table B1 shows the parameter estimates of the effects of age and BMI on first family type. The subjects who were 14 years old in 1979 were more likely than

Table B1. Parameter estimates of the effects of measures of Physical Characteristics on first family type in Model 2 of the full sample, net of the effects of the type of substance use in 1979 (N=4,011)

<i>PARAMETER ESTIMATES</i>						
Physical Characteristics "group" Likelihood Ratio Test = 30.377, 12df (p = .0024)						
VARIABLE	no family was formed by 2004^a		parenthood was first^a		cohabitation was first^a	
	B	Exp(b)	B	Exp(b)	B	Exp(b)
age (ref: 16)						
14	.303†	(1.355)	-.081	(.922)	.350**	(1.420)
15	.223	(1.250)	.047	(1.049)	.219*	(1.244)
BMI (ref: healthy weight)						
least healthy	.680***	(1.974)	.327	(1.387)	.214	(1.239)
less healthy	.111	(1.118)	-.268	(.765)	-.010	(.990)

† = p < .10, * = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance

^a Multinomial logistic regression analysis (ref: first marriage was first)

those who were 16 years olds that no family was formed by 2004, although only marginally (p < .10). The subjects who were 14 or 15 were more likely than those who were 16 in 1979 that cohabitation was the first family type (compared to marriage). The effects were larger for those who were 14 than 15 years old in 1979. Perhaps the rapidly increasing prevalence and social acceptability of

cohabitation coupled with rapidly increasing social changes in gender equity contributed to increasingly greater odds of cohabitation as a first family type across the ages in the cohort (period effects).

As anticipated, BMI had a significant effect on not forming a family by 2004 such that the subjects who were in the least healthy range at the lowest and highest ends of BMI (according to the Center for Disease Control and Prevention) were significantly more likely than those in the healthy range that no family had been formed by 2004. The least healthy group also was more likely than the healthy group to cohabit or parent than marry as a first family type but these differences were not statistically significant. These findings suggest that least healthy people may be less able than healthier people to find a marriage partner and that health differences may be important to patterns of marital timing and to understanding the mechanisms of assortative mating.

The Effects of Family Background Factors on First Family Type

Childhood family socioeconomic status and family structure are commonly featured contextual factors in studies about family formation behavior. Low income, poverty, living with a single mother, and having more than three siblings tend to contribute to early marriage or to increase the odds of cohabitation and premarital pregnancy. Comparative studies have found that mothers' and fathers' social status (i.e., educational attainment) also likely make independent contributions to the family formation outcomes of their co-residential children. The current study controlled for: (1) family-level poverty (at subjects' ages 13 to 15); (2) mother's and (3) father's socioeconomic status as computed indexes of educational attainment and occupational prestige; (4) mother's and (5) father's absence (at subjects' ages 14 to 16) compared to high social status parental presence; and (6) the numbers of co-residential siblings (at subjects' ages 14 to 16).

Table B2 shows the coefficients and odds ratios associated with the effects of the family background factors in Model 2 of the full sample analysis. AS a group, the Family Background Factors were important (see "group" Likelihood Ratio Test statistic). Generally, relatively lower social status, parental absence, and fewer

siblings increased the odds of atypical family formation and the effects were most evident with respect to increased odds that parenthood was the first family type.

It was expected that family poverty status increased the odds of not forming a family or cohabitation as the first family type because prior research has found a greater prevalence of delayed marriage and/or cohabitation in contexts of family or neighborhood poverty but there was almost no difference at all in the odds of cohabitation between the poor and non-poor in this sample and while the poor were about .35 more likely than the non-poor not to have formed a family by 2004, the difference was not statistically significant ($p=.107$). Only non-union parenthood was significantly more likely as the first family type among the poor than non-poor.

Table B2. Parameter estimates of the effects of measures of Family Background Factors on first family type in Model 2 of the full sample, net of the effects of the type of substance use in 1979 (N=4,011)

<i>PARAMETER ESTIMATES</i>						
Family Background Factors “group” Likelihood Ratio Test = 97.978, 20df ($p < .0001$)						
VARIABLE	no family was formed by 2004^a		parenthood was first^a		cohabitation was first^a	
family poverty in 1978=1	.303	(1.354)	.449**	(1.567)	.034	(1.035)
mother’s Social Status Index (ref: high)						
low	-.042	(.959)	.480**	(1.616)	.093	(1.097)
medium	-.237	(.789)	.324†	(1.382)	.192†	(1.212)
co-residence with mother	.041	(1.042)	.219	(1.245)	.091	(1.096)
father’s Social Status Index (ref: high)						
low	-.085	(.918)	.921***	(2.511)	.211	(1.235)
medium	.045	(1.046)	.636**	(1.889)	-.135	(.874)
co-residence with father	-.045	(.956)	.944***	(2.570)	.589***	(1.803)
co-residential siblings (ref: 3 or more)						
no siblings	.480*	(1.616)	.141	(1.152)	.101	(1.107)
one sibling	.376†	(1.456)	-.080	(.923)	.074	(1.074)
two siblings	.170	(1.185)	.014	(1.014)	.031	(1.031)

† = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$, two-tailed tests of significance

^a Multinomial logistic regression analysis (ref: first marriage was first)

Both mother’s and father’s socioeconomic status (measured by the Two-factor Social Status Index) significantly predicted parenthood as a first family type, with a larger effect of father’s status. Those whose fathers were of low social status were about two and one-half times more likely and those whose fathers were of medium social status were almost twice as likely as those whose fathers were of high social status to parent as their first family type. The relative effects of mother’s low and medium social status on parenthood as the first family type were similar

but smaller. Additionally, those with mothers of medium social status were marginally more likely than those with high social status mothers to cohabit first. These findings conform to the bulk of previous research suggesting a higher prevalence of premarital childbearing in low income contexts. However, increased odds of cohabitation also had been expected because of the historically higher prevalence of cohabitation in low than high income contexts but this expectation was not realized in this study.

Co-residence with the biological mother at ages 14 to 16 was not important to first family type but those with absent fathers were about two and one-half times more likely than those with high status resident fathers to parent as the first family type and the odds of cohabitation as the first family type was increased by about .80. Bearing in mind that these effects were net of the effects of family poverty (which was not highly correlated with father's absence ($r = .304$)), the large effect of father's absence on atypical family formation suggested that a lack of paternal monitoring or paternal social control may contribute to increased adolescent behaviors that lead to atypical family formation. In fact, a sizable research literature has developed the idea that single mother families are deficient not only in financial but in these social resources as a result of the lack of two present and engaged parents as an explanation for deviant adolescent behavior.

Those with none or one co-residential sibling were more likely than those with three or more co-residential siblings at ages 14 to 16 not to have formed a family than marry by 2004. Economic theories on the effects of family size on educational attainment have suggested that fewer siblings are associated with higher levels of educational attainment (especially for females) which, in turn, are related to delayed marriage and a lower likelihood of premarital pregnancy. There also is the possibility that parents with fewer than more children are better able to monitor and control their children's sexual behavior which may delay cohabitation or premarital pregnancy. These findings seem to support those ideas but further investigation is necessary to determine the factors that are correlated with higher odds of not forming a family among those with one or no siblings compared to those with three or more siblings.

The Effects of Attitudes on First Family Type

What adolescents expect will happen to them and what they want to happen have long been suspected by researchers to be a driving force for what actually occurs in their futures. Attitudes toward one's future that influence future events also may subtly develop from religious teaching, mimicking parental behavior, beliefs about one's ability to direct one's future outcome, and internalized cultural beliefs about normative role behavior. This study included nine attitudinal measures to control for the effects of attitudes on family formation behavior. To a greater or lesser extent, each of these variables previously has been found to influence early or delayed marital timing or the likelihood of premarital pregnancy.

Table B3 presents the findings from Model 2 of the full sample analysis of these variables on first family type and shows the complexity of the effects of adolescents' attitudes on family formation behavior. It was anticipated that the expectation of teenage childbearing or marriage would increase the odds of premarital parenthood and that the expectation of "over 30" first birth or marriage would increase the odds of cohabitation as the first family type (compared to an expectation of ages 20 to 24 at first birth or marriage) but none of those effects were statistically significant. Instead, the expectation of an older age at first birth or marriage increased the odds of atypical family formation or not forming a family by 2004.

High educational aspirations usually are associated with females' delayed marriage, a greater likelihood of cohabitation as a first union, and lower odds of premarital pregnancy. It was not anticipated that those with the highest aspirations would not have formed families by 2004 but that delayed marriage accompanied by cohabitation would be significantly more likely among them than among the groups with lower aspirations. However, in these data, those who aspired to relatively low levels of education were as likely as those who aspired to more than a four-year college degree that parenthood or cohabitation was the first type of family formed. And although lower aspirations increased the odds of not forming a family versus a marriage by 2004 by a factor of about 2.0 among those with the lowest educational goals, statistical significance was marginal ($p < .10$).

Table B3. Parameter estimates of the Attitudinal Measures on first family type in Model 2 of the full sample, net of the effects of the type of substance use in 1979 (N=4,011)

PARAMETER ESTIMATES						
VARIABLE	no family was formed by 2004^a		parenthood was first^a		cohabitation was first^a	
expected age at first birth (ref: ages 20 to 24)						
expects no children	-.452†	(.636)	-.303	(.739)	.322*	(1.380)
14 to 19	.103	(1.108)	.140	(1.151)	-.224	(.800)
25 to 29	.305*	(1.356)	-.238	(.788)	.314**	(1.370)
30 to 46	.269	(1.309)	-.124	(.883)	.385†	(1.470)
expected age at first marriage (ref: ages 20 to 24)						
expects to never marry	.517	(1.678)	.225	(1.252)	-.643*	(.526)
14 to 19	-.600†	(.549)	-.121	(.886)	-.290	(.748)
25 to 29	.313*	(1.368)	.402**	(1.495)	-.124	(.883)
30 or older	.725**	(2.064)	.598*	(1.818)	-.238	(.788)
expected educational attainment (ref: more than four-year college degree)						
less than high school	.692†	(1.999)	.085	(1.089)	.180	(1.197)
high school diploma	.395†	(1.484)	.231	(1.259)	-.206	(.814)
some college	.294	(1.341)	.181	(1.198)	-.202	(.817)
four-year college degree	.375†	(1.456)	.115	(1.122)	-.232	(.793)
religious conservatism in childhood (ref: no childhood religion)						
liberal	-.410	(.663)	-.754*	(.470)	-.617**	(.540)
moderate	-.161	(.851)	-.688*	(.503)	-.480*	(.619)
conservative	-.126	(.882)	-.665*	(.514)	-.624**	(.536)
mother's age at subject's birth (ref: ages 20 to 24)^b						
14 to 19	-.374	(.688)	-.011	(.989)	-.089	(.915)
25 to 29	.453**	(1.572)	.181	(1.199)	.299*	(1.348)
30 to 46	.537**	(1.745)	.085	(1.088)	.151	(1.163)
father's age at subject's birth (ref: ages 20 to 24)						
14 to 19	-.790	(.454)	.045	(1.046)	.123	(1.131)
25 to 29	.003	(1.003)	-.227	(.797)	-.057	(.945)
30 to 65	-.242	(.785)	-.241	(.786)	-.050	(.951)
self-esteem (ref: low self-esteem)						
middle	-.265†	(.767)	-.266†	(.766)	-.117	(.890)
high	-.261	(.770)	-.332†	(.718)	-.178	(.837)
locus of control						
internal control = 1	-.121	(.886)	-.248*	(.780)	-.264**	(.768)
planning = 1	-.120	(.887)	-.107	(.898)	.091	(1.096)
gender role ideology (ref: conservative--wives should not be in the labor force)						
most liberal	.323†	(1.381)	-.231	(.794)	.437**	(1.548)
somewhat liberal	.183	(1.201)	-.084	(.919)	.319*	(1.376)
somewhat conservative	-.082	(.921)	-.089	(.915)	.196	(1.216)

† = p < .10, * = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance

^a Multinomial logistic regression analysis (ref: first marriage was first)

^b "Unknown" mother's age at subject's birth increased the odds that parenthood was the first family type versus marriage by a factor of about 3.0.

Some attitudes arise in the context of childhood socialization. Religion, for instance, often has been found to play a significant role in shaping attitudes toward and behavior regarding family formation. In this study, a religious upbringing was expected to exert an influence that decreased the odds of delayed marriage, cohabitation, or parenthood as the first family type compared to those with no religious upbringing. The research literature also suggests that the effects would be larger among the more conservative religions. This analysis found that any religious training in childhood—liberal, moderate, or conservative—lowered the odds of atypical family formation via parenthood or cohabitation by about half that of those who had no religious training in childhood. Since the subjects were overwhelming Christian and Christianity as a whole encourages marriage and discourages premarital sexual intercourse (both outside of and within a cohabiting union), the similarities in the effects among the graded categories of conservatism may be a reflection of the Christian training that eschews liberal family formation and that overarches denominational distinctions.

Young adults also may mimic the family formation behavior of their parents and there was the expectation that those whose mothers or fathers were unusually young or old at their birth would be more likely than those whose parents had been 20 to 24 years old when they were born to have experienced atypical family formation themselves. Because the research literature focuses on the intergenerational transmission of teenage childbearing it was anticipated that those whose mothers had borne them as teens compared to the modal age (20 to 24) would have increased odds that premarital parenthood was the first family type. That effect was not found. Instead, those whose mothers were age 25 to 29 or over age 30 when they were born had the largest significant influence on family formation, increasing the odds that no family was formed by 2004. It may be that these mothers also had higher educations (which delayed their childbearing) and perhaps modeled and encouraged educational attainment and career advancement over early family formation. Father's age at subject's birth had no significant effect on first family type.

Self-esteem, locus of control, and attitudes toward wives' labor force participation were expected to impact the choice that a subject made for his or her

first family. Little previous research has considered these factors as the focus of a study but, rather, includes them as control variables. Even so, the previous findings suggested that atypical family formation may be more likely among adolescents and young adults with very high or very low self-esteem, who believe in luck or chance, and who hold the most liberal views on gender roles. There was some support for these ideas in this study. Relatively higher self-esteem and a greater sense of personal control (as opposed to luck) decreased the odds of atypical family formation by about a third. Liberal attitudes towards wives' labor force participation increased the odds of cohabitation.

With the exception of father's age at subject's birth, each of the attitudinal measures made a contribution to classifying a subject into the first family types. Some of the effects, such as religious conservatism in childhood, seemed straightforward while others, such as expected age at first marriage, seemed more complex and mysterious. While each of these measures made a net contribution, it is important to remember that people hold all these attitudes simultaneously and that the influences of these attitudes on behavior are not static but change from day to day and with the circumstances at hand. Thus, it is overly simplistic and misleading simply to assess the statistical influence of an attitudinal variable net of other factors and conclude that it is important to the choices people make and the actions that they take. To gain a better understanding of the effects of these attitudes on family formation behavior, more research is needed.

The Effects of Behaviors on First Family Type

Seven behaviors were expected to contribute to classifying a subject into first family type. The first three (age at first intercourse, church attendance, and "idle" status) focused on compliance with social norms regarding "appropriate" timing of initiation into sexual activity and the extent of integration in the community. The other four measured the extent of anti-social behavior with the number of violent acts, delinquent acts, or criminal acts committed at ages 14 to 16 and whether the subject had ever been convicted of a crime by 1980 (ages 15 to 17). Table B4 shows the parameter estimates of these variables on first family type.

It was anticipated that age at first intercourse would make a significant contribution to classifying a subject into first family type. Younger ages at first intercourse (compared to the modal age of 16) were expected to increase the odds

Table B4. Parameter estimates of the Behavioral Measures^b on first family type in Model 2 of the full sample, net of the effects of the type of substance use in 1979 (N=4,011)

PARAMETER ESTIMATES						
VARIABLE	no family was formed by 2004^a		parenthood was first^a		cohabitation was first^a	
age at first intercourse (ref: age 16)						
4 to 12	-.655†	(.519)	.536†	(1.710)	.040	(1.041)
13 to 15	-.655**	(.519)	.430**	(1.537)	.265†	(1.303)
17 to 18	-.619***	(.539)	-.527***	(.590)	.008	(1.008)
19 to 21	-.803***	(.448)	-.949***	(.387)	-.113	(.893)
22 to 40 or never	.366†	(1.441)	-1.585***	(.205)	-.489**	(.613)
church attendance (ref: infrequently through once a month)						
never	-.078	(.925)	-.265	(.767)	.179	(1.195)
once a week	-.367*	(.693)	-.280*	(.756)	-.373***	(.689)
more than once a week	-.817***	(.442)	-.556**	(.547)	-.519***	(.600)
"idle" in 1979 = 1	.338	(1.402)	.267	(1.307)	-.136	(.873)
number of violent acts in the past year (ref: none)						
2 to 5	.475*	(1.609)	.325†	(1.384)	.077	(1.080)
6 to 24	.385	(1.470)	.165	(1.180)	-.215	(.807)
number of juvenile delinquent acts in the past year (ref: none)						
1 to 4	-.301†	(.740)	.242	(1.274)	.013	(1.013)
5 to 10	.065	(1.067)	.329†	(1.390)	.329	(1.269)
11 to 24	.599	(1.819)	.166	(1.181)	.503	(1.653)
number of criminal acts in the past year (ref: none)						
one	.026	(1.026)	.097	(1.102)	-.169	(.845)
two	-.130	(.878)	-.074	(.929)	.031	(1.031)
3 to 36	-.318	(.728)	-.069	(.933)	.006	(1.006)
ever convicted = 1	.681**	(1.975)	1.056***	(2.875)	.443*	(1.558)

† = p < .10, * = p < .05, ** = p < .01, *** = p < .001, two-tailed tests of significance

^a Multinomial logistic regression analysis (ref: first marriage was first)

^b Some categories of some variables were combined for analysis due to large standard errors

of parenthood or cohabitation as the first family type because previous research suggests that younger adolescents who are sexually active are less likely to use contraceptives and more likely to form early unions than adolescents who are not sexually active until age 16 or older. The greater likelihood of premarital pregnancy among these sexually "precocious" subjects also was expected to lead to early marriage so the odds of not forming a family by 2004 were expected to be decreased. The effects with respect to the younger ages at first intercourse compared to age 16 generally were as anticipated with the exception that the

effects on cohabitation as the first family type were marginal and the effects overall were not as large as anticipated.

Older ages at first intercourse also were expected to increase the odds that no family was formed due to a smaller pool of potential partners for people who delay sexual activity. Older ages at first intercourse also were expected to increase the odds that parenthood or cohabitation was the first family type—reasoning that the pool of marriageable partners would be smaller while the interest in family formation may be stronger among older subjects who were late to initiate sexual activity. However, older ages at first intercourse decreased the odds of atypical family formation, particularly among those who initiated at ages 22 to 40 or who had never had intercourse.

Compared to infrequent church attendance, weekly or more often attendance was expected to decrease the odds of atypical family formation and a larger effect for the most frequent attendance was anticipated. This notion was fully supported in the data. Frequent attendance decreased the odds of not forming a family and of parenthood and cohabitation as the first family type. The effects were moderately large, decreasing the odds from about .25 to .60.

Only .018 (N = 72) of the sample was “idle” in 1979 because most of the subjects were in middle or high school at ages 14 to 16. The small proportion of cases being evaluated may have been the reason that there were no statistically significant effects of “idle” on first family type in Model 2. However, when the variable was tested in a multinomial logistic regression where it was the sole independent variable, it made a statistically significant impact (Likelihood Ratio Chi-Square = 11.661, $p = .009$). The parameter estimates of “no family formed by 2004 versus marriage” and “cohabitation versus marriage as the first family type” in this “bivariate” examination were not statistically or substantively significant; however, those who were idle in 1979 were about two and three-quarters times as likely than those who were not idle that parenthood was the first family type ($\text{Exp}(b) = 2.775$; $p < .001$) and the standard error was not particularly large (.293). Thus, the lack of significant findings was most likely due to the effects of one or more of the other variables in Model 2.

The lack of significant relationships in the group of delinquent and criminal measures was unexpected. Anti-social behavior (broadly defined) was expected to predict atypical family formation behavior and, at its most frequent, was expected to predict not forming a family by 2004 because previous research has found that delinquent and criminal behavior correlated with other atypical behaviors. Illegal drug use, petty crime, juvenile delinquency, “precocious” sexual intercourse, and lack of contraception seem to be a bundle of behaviors that co-occur. However, these data did not support that prior research. Low frequency violence increased the odds of not forming a family and of parenthood as the first family type but the effect was not particularly large. Infrequent juvenile delinquency decreased the odds of not forming a family and increased the odds of parenthood as the first family type but its influence was even smaller.

The only one of these four measures that was important was the indicator of a conviction. About .06 (N = 240) of the sample had reported a conviction or a status that required a conviction (namely, having served time in a correctional facility). Subjects who had been convicted were twice as likely not to have formed a family, almost three times as likely that parenthood was first, and about .50 as likely that cohabitation was first as those who had not been convicted. It is possible that something about the incarceration experience *per se* explains the difference between the effects of conviction and the effects of the other measures of anti-social behavior. It also is possible that the type of offense may be important. Further investigation of the factors that distinguish the group of cases with a conviction would help to uncover the underlying mechanisms involved in the greater odds of atypical family formation in this group of subjects.

Summary

To summarize, while the control variables were included for the sole purpose of revealing the net relationships of the substance use measures to first family type, they made an important contribution to the model and to classifying the subjects into first family type. Only “father’s age at subject’s birth” and “idle in 1979” were not significant contributors. Family socioeconomic status, age at first intercourse, and religion were greatly important which was not surprising

considering the consistent body of prior research suggesting that poverty, ideology, and unprotected intercourse among adolescents are very important to the timing and structure of their initial families. The largest single contribution was made by the indicator of conviction of a crime. While there is growing interest in the effects of entry into marriage on criminal behavior (it declines) and recidivism (it is less likely to occur), no research since Knight, Osborn and West (1977) was found that focused on the family formation behavior of anti-social individuals, even in the marital homophily literature.

Most of the extant research about how these 24 control factors influence family formation behavior does not consider the interrelationships among the contexts or domains in which individuals' family formation decisions are made and carried out. Most do not consider the effects of other behavior such as criminality or health status. Progress toward clarity regarding the process of family formation can be gained by accounting for the complexity of people's lives when addressing the differences in family formation behavior.

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Education

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Professional Employment

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Selected Publications

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Ryan, Andrea Kay. 2008. "The lasting effects of marijuana use on educational attainment in midlife." *Substance Use & Misuse*, 44.

Grants and Fellowships

National Institutes of Health. National Institute on Drug Abuse. \$54000; Grant Number 1R36DA021318-01 (03/06 through 03/08) funded under *Drug Abuse Dissertation Research: Epidemiology, Prevention, Treatment, Services, and Women and Sex/Gender Differences* dissertation grant program

Selected Awards and Honors

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Graduate School Teaching Certificate, Schreyer Institute for Teaching Excellence, The Pennsylvania State University, 2006
The Pennsylvania State University Commission for Women Achieving Woman Award (graduate category), 2005
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Thomas C. and Jackie M. Floore Memorial Scholarship Fund in Agricultural Economics and Rural Sociology, 2003
Wilson A. and Mae C. Cease Memorial Scholarship in Rural Sociology, 2001
Kenneth P. Wilkinson Memorial Scholarship in Rural Sociology, 2001
Occidental College, Sociology Comprehensive Exam Pass with Distinction, 2000

Selected Presentations

Ryan, Andrea Kay. 2007. "The effects of adolescent exposure to alcohol use on initial family formation: Does rural residence matter?" at the Annual Meeting of the Rural Sociological Society, Santa Clara, California