

ABSTRACT

Title of Thesis: SCHOOL DROPOUT AND SUBSEQUENT OFFENDING:
DISTINGUISHING SELECTION FROM CAUSATION

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Past research on the relationship between school dropout and offending is inconclusive. In explaining their findings, researchers have focused on strain and control theories, and have been unable to rule out selection effects. A key advance in understanding the effect of high school dropout is disaggregation by reason for dropout.

Waves one through five of the National Longitudinal Survey of Youth 1997 is used to answer the question: Does dropout have a causal impact on offending? Dropouts are divided into four groups depending on reason given for dropout: personal, school, economic and other. Estimation of a random effects model indicates that dropout for school reasons and “other” reasons causes a small temporary increase in the frequency of offending whereas dropout for personal or economic reasons does not affect frequency of offending. It also shows that youths who drop out for school reasons have higher rates of offending across all five waves compared to non-dropouts.

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DISTINGUISHING SELECTION FROM CAUSATION

By

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INTRODUCTION

This study identifies the effects of high school dropout on delinquent or criminal behavior. It addresses the question: Does dropout from school have a causal impact on offending? Although there is a long history of debate on the issue, no consensus has been reached concerning the causal nature of this relationship. Many researchers have associated dropout with negative outcomes, but their ability to identify dropout as causal is undermined by methodological problems, the most important of which is the inability to account for selection processes.

Chapter I reports the theoretical explanations for the dropout-delinquency link. Past studies have pitted strain theory against social control theory when examining this problem, to the exclusion of other equally plausible explanations. Alternate theoretical perspectives will be explored in this chapter, the most challenging of which is Gottfredson and Hirschi's general theory of crime, which gives expression to selection effects. In order to rule out the selection explanation, the causes of dropout must be identified; an extensive review of the literature on determinants of educational attainment, and causes of dropout in particular, will reveal key causes of dropout. In addition, a review of studies assessing the impact of dropout on delinquency will identify deficiencies in the literature as it stands. The chapter concludes with an outline of the steps to remedy these deficiencies.

Chapter II begins with a discussion of the random effects model, which will be used to answer the research question. This discussion will be followed by an evaluation of the strengths and weaknesses of this model compared to the models commonly used in

dropout research. This model will be applied to waves one through five of the National Longitudinal Survey of Youth 1997 cohort (NLSY97). The NLSY97, which is a nationally-representative sample of 12 to 16 year-olds in 1996, is described, with special attention to its information on dropouts and crime. Finally, the chapter addresses attrition and sampling issues and makes predictions for two-wave dropout-delinquency models (Jarjoura, 1993) and random effects models.

Chapter III reviews the results of the two-wave dropout delinquency models and the random effects models. The two-wave models confirm that dropout for school-related or other reasons increases involvement in delinquency. Contrary to expectations, however, this relationship held when controlling for criminal propensity with the random effects model. Dropout for school or other reasons has a criminogenic effect on males already involved in crime, but does not cause those previously uninvolved in crime to begin offending. Furthermore, the criminogenic effect of dropout appears to decay in about two years. No criminogenic effects of dropout emerge for females.

Chapter IV offers a discussion of the results and how they fit into the literature in general. Strengths and weaknesses of the study are identified. The chapter closes with a discussion of the limitations of the study, as well as directions for future research.

CHAPTER I: REVIEW OF THE LITERATURE

School dropout is widely recognized as a negative life event which is often followed by further problems. According to the most recent National Adult Literacy Survey, 63 percent of the inmate population never received a high school diploma (U.S. Department of Education, 1994). In comparison, only 13 percent of 25 to 34-year-olds nationwide are dropouts (United States Department of Education, 2001). If there is no causal link between dropout and crime, then there is, at the minimum, a strong positive correlation. Dropping out of high school also has negative consequences for earnings. According to the 2002 Current Population Survey, median annual earnings for individuals at least 25 years of age with no high school was \$15,800. Median annual earnings for high school dropouts was \$18,445. For high school graduates, including GED holders, the median annual income was \$24,656 (U.S. Census Bureau, 2002). School dropout has drawn attention because of these and other negative outcomes.

Theoretical Explanations and Causes of Dropout

There are numerous theoretical explanations for the delinquency-dropout relationship. Previous studies on dropout and delinquency have limited their theoretical discussion to classical strain theory and social control theory, but neither of these perspectives adequately explains the expected relationship between dropout and delinquency. In fact, Jarjoura (1993, 1996) has noted that both classical strain and social control theory can lead to conflicting predictions of the effect of dropout on delinquency. Therefore, numerous theoretical explanations will be reviewed in this chapter. The

primary focus of this review is to identify the theoretically predicted relationships between dropout and delinquency.

Until Thornberry et al.'s (1985) exploration of the dropout-delinquency relationship, classical strain was the dominant theoretical explanation for the effect of dropout on delinquency. Several studies of dropout and delinquency before Thornberry's had concluded that dropping out of high school actually *reduced* delinquency (Elliott, 1966; Elliott & Voss, 1974; Mukherjee, 1971)—an effect which classical strain theory can predict. Classical strain theory states that delinquency is a subcultural group solution to strain induced by the inability to achieve middle class status, especially in the school context (Cohen, 1955; Cloward and Ohlin, 1960). According to this formulation, school is a source of frustration, primarily for lower-class youth. In response to school-induced frustrations, students seek out solutions. One of these is to commit delinquent acts, another is dropout. Therefore, if one leaves the school context, strain should be reduced, and delinquency will consequently decrease.

Despite early promise, classical strain theory is no longer useful in explaining the dropout-delinquency relationship. While several pre-1980 studies found that dropout was indeed followed by a decrease in delinquency (Elliott & Voss, 1974; Mukherjee, 1971), most of the post-1980 studies found the opposite relationship (Thornberry et al., 1985; Jarjoura, 1993, 1996). There are at least two possible explanations for this discrepancy: methodological shortcomings of past research or changing significance of dropout over time. Thornberry et al. (1985) noted that previous research had not controlled for the effect of age, and had concluded that leaving school caused less crime because dropouts had committed more crime while in school. This finding was highly influenced by the

age-crime curve, which peaks at around the same age that youths typically drop out of school. Controlling for age, Thornberry et al. (1985) found that dropping out increased criminal involvement relative to those who stayed in school. The second explanation concerns the changing social meaning of dropout over time. The high school non-completion rate for those 25 to 34 years old was over 60 percent in the 1940s, over 40 percent in the 1960s, and had dropped to its current level of 13 percent by 1985 (U.S. Census Bureau, 2003). In the 1940s, high school dropout was normative, whereas today it marks a select group at risk for a number of negative outcomes. Due simply to its prevalence, dropping out of high school has different consequences now than it did in the 1940s or even the 1960s.

Agnew's (1992) general strain theory proposes three types of strain within the context of individual relationships: prevention from achieving positively-valued goals, removal (actual or threatened) of positively-valued stimuli, and presentation of negatively-valued stimuli. According to this theory, the effect of dropout on offending depends on how an individual values education, the reason for his or her dropping out of school, and how he or she values the post-school situation. For example, if a young woman disdained education, and desired to start a family, one would expect dropout due to pregnancy to reduce her strain, and thereby reduce the probability of her involvement in delinquency. If, on the other hand, a young woman valued education and desired a college education, but was unable to complete high school because of financial difficulties at home, general strain theory would predict that both her strain and her probability of offending would increase. General strain theory does not allow for a simple analysis of the dropout-delinquency relationship. Rather, it requires measurement

of individual educational, vocational, and relational goals and stimuli. Due to its complexity, this theoretical perspective is difficult to test, and does not provide satisfying predictions of the relationship between dropout and delinquency.

The most popular explanation for the dropout-delinquency relationship derives from social control theory. In essence, Hirschi's (1969) social control theory states that a youth's delinquency is inversely proportional to his or her social bonds. Social bonds in school are characterized by attachment to teachers, commitment to education, involvement in school-related activities and belief in the legitimacy of school rules. Dropout from school entails a loss of all school-related social bonds. To the extent that school-related social bonds are present before dropout, social control theory predicts that dropout leads to decreased social bonds and increased probability of offending. However, if an individual had no social bonds to school before dropout, the dropout event would have no effect on delinquency.

Jarjoura (1993) noted that these interpretations of classical strain and social control theory, often used by researchers to set up a simple test of the two theories, are not the only possible interpretations. For example, if youths drop out in order to get a job, get married, or have a baby, the strength of their social bonds in sum may increase (Jarjoura, 1993). This prompted Jarjoura to divide dropouts by stated reason for dropping out. Farnworth and Lieber (1989) suggest that today's youth, recognizing the need for a good education in order to achieve financial success, should experience the greatest strain when the disjunction between their economic aspirations and educational expectations are the greatest. This gap may increase after dropout as youths adjust their educational expectations downwards. This interpretation of strain theory predicts that involvement in

delinquency may increase after dropout. While strain theory has been pitted against control theory in past studies, this may not be an appropriate test of the theories, as multiple predictions can be derived from both.

Rational choice theory, which has not been considered in past research on the dropout-delinquency relationship, assumes 1) that people are rational, 2) that people maximize their benefits, and 3) that they minimize their costs (Becker, 1968). The probability of a person's criminal involvement can be estimated, therefore, from his or her expected costs and benefits from committing crime. Dropout alters this calculus by reducing the costs associated with crime, making criminal involvement more likely. Consider the difference between a 20-year-old unemployed dropout, and a 20-year-old college student. Assuming the two individuals differ only in terms of education, the potential costs associated with committing crime are much greater for the college student than the dropout because of the possibility of losing the opportunity of a college degree and the increased income associated therewith. Rational choice theory provides a much more straightforward explanation for increased delinquency following dropout. In order to test it directly, the individual cost/benefit assessments would have to be measured.

Status attainment models seek to describe and predict patterns of status attainment of individuals and to model the stratification of societies. While status attainment research emphasizes empirical evidence over theoretical elaboration, its major conclusions outline a compelling intergenerational link in educational and occupational attainment. Blau and Duncan presented a model of occupational stratification which posited that father's education directly affects father's occupation which in turn affects

son's education. The son's education affects his first job, which finally has an effect on his eventual occupational attainment (Blau & Duncan, 1967).

Subsequent studies in the status attainment tradition confirm the importance of educational attainment for occupational status attainment (Sewell et al., 1970; Sewell et al., 1980; Warren et al., 2002; Kerckhoff, 1993). Another major contribution of this literature is its recognition of intergenerational continuity in educational and occupational attainment. Parental measures of status attainment are important predictors of their children's educational and occupational attainment. Although most of the studies in this tradition omit dropouts from their sampling frame, the logical implications of the model would indicate that those who fail to complete high school experience lower occupational attainment, unemployment, and develop poor parenting skills, thereby increasing the probability of criminal involvement for both themselves and their children.

Although this type of causal argument has some face validity, researchers must be aware of the possibility of spurious associations between crime and risk factors in general, highlighted by Gottfredson and Hirschi's (1990) general theory of crime. This theory states that lack of self-control, developed early in life through ineffective parenting, is responsible for all subsequent deviant acts. Those with low self-control would be less likely to invest in school, more likely to drop out of school, and more likely to engage in delinquent behavior. Rather than a causal chain of events, Gottfredson and Hirschi would posit that all of these outcomes are related because they are caused by low self-control. Therefore, any apparent school effects are interpreted as manifestations of low self-control, denying the existence of independent school effects on later behavior.

The general theory of crime gives theoretical expression to the problem of selection effects. Because dropout is not a randomly-assigned condition, there may be important pre-existing differences between those who drop out and those who complete school. Therefore, those youths who eventually drop out of school may be self-selecting themselves into more delinquent conduct, making any correlation between the two spurious rather than causal. This is an important issue which past research has failed to account for. Any future research on the dropout-delinquency relationship must address this alternate explanation for apparent criminogenic effects of dropout. In order to address selection processes, dropout-delinquency research must take into account the causes of dropout and educational attainment in general.

Sampson and Laub's (1993) position is more flexible than Gottfredson and Hirschi, because while they agree that early experiences are important for later life outcomes, they submit that later experiences can have an independent causal impact as well (Sampson & Laub, 1993). Therefore, in order to assess the causal impact of dropout, if any, it is necessary to account for early experiences as well as later experiences.

From the life-course perspective, school dropout is the culmination of a long process of disengagement from school, which can be identified very early in the school career (Stroup & Robins, 1972; Finn, 1989; Ensminger & Slusarick, 1992; Alexander et al., 2001). Stroup and Robins (1972), for example, identified six pre-high school predictors—grade retention, truancy, early alcohol use (i.e. before age 15), parental social status, number of elementary schools attended, and record of police contacts—which explained 64 percent of the variance in number of high school years completed.

Ensminger and Slusarick (1992) conducted a prospective longitudinal study on a cohort of Black first-graders from a poor neighborhood in Chicago. Over half of the sample did not complete high school. They discovered strong predictors of dropout from first grade measures. For example, males who received As or Bs in first grade were twice as likely to complete high school as those who received Cs or Ds. In a more finely-grained analysis of a sample representative of all Baltimore first-graders in 1982, Alexander et al. (2001) found that family socioeconomic status, family composition, student engagement in school, retention, and age of mother at child's birth all predicted dropout. In fact, these measures taken in first grade were nearly as accurate as the same measures taken in ninth grade in predicting dropout. In addition, future dropouts had significantly more absences *in first grade* than future graduates.

Life-course research suggests that dropout itself may not be an important event. Rather, it “may be just one more event, albeit a conspicuous one, in a chain that may have begun years before” (Finn 1989:118). The majority of studies of dropout do not include measures that span the life-course leading to high school. These studies risk attributing significance to risk factors which are themselves the results of a long process of disengagement. Alexander et al. (2001) note: “behaviors proved consequential as early in the process as we were able to measure them” (p. 801). The implication is that pre-first grade measures may be able to predict dropout as well as the first grade measures did. Further, whatever the research design, pre-existing differences among the subjects must be addressed.

Several factors associated with dropout have been identified by past research. Rumberger (1987), in a review of the dropout literature, identified low socioeconomic

status, low parental educational or occupational attainment, low family income, non English-speaking homes, single-parent families, and lack of learning materials in the home as predictive of dropout. Other factors were suggested, for which there was less evidence: peers' attitudes and behaviors, inadequacy of school facilities and resources, and economic factors (Rumberger 1987). In a recent review of the dropout literature, Jimerson et al. (2002) assert that grade retention is the strongest predictor of dropout. In general, status attainment and dropout literature points to three main factors predictive of school success: parental educational attainment (Blau & Duncan, 1967; Robinson & Garnier, 1985; Carr et al., 1996), intelligence (Sewell et al., 1969; Quay, 1987) and socioeconomic status (Jencks et al., 1972; Clausen, 1991; Bynner & Joshi, 2002). Researchers should assess the importance of all of these factors and the extent to which they cause both dropout and delinquency.

The preceding discussion of theoretical explanations for the dropout-delinquency relationship yields several conclusions. First, the traditional strategy of pitting strain theory against social control theory is inappropriate and unfruitful without more detailed contextual information, such as reasons for dropout and changing educational expectations and economic aspirations. Second, the conclusions of past delinquency-dropout studies are called into question by their inability to rule out selection effects. In order to effectively rule out selection effects in the dropout-delinquency relationship, it is necessary to control for those factors which predict dropout.

The goal of this type of analysis is to assess whether dropping out of school has an effect on later outcomes *independent* of those factors which lead to dropout. Life course research reveals a long history of disengagement from school which precedes

dropout. Status attainment models show that this history extends back to parental educational and occupational attainment. It is possible that dropout itself has no additional effect on subsequent outcomes when those factors leading up to dropout are controlled. In order to assess the independent effects of dropout, these antecedent factors must be controlled for. Otherwise, the effect of dropout is confounded with the omitted variables. By including those variables which precede dropout in a model designed to assess the effect of dropout on delinquency, one attempts to rule out the selection processes posited by Gottfredson and Hirschi (1990) and, perhaps, identify dropout as an event which, although preceded by a number of factors, is also independently predictive of subsequent outcomes (Sampson & Laub, 1993). On the other hand, inclusion of variables which predict dropout may reveal that dropout has no additional causal impact on delinquency.

Consequences of Dropout

The state of the literature on the consequences of dropout by the late 1970s is represented by an article by Phillips and Kelly (1979) which addresses causal ordering between school failure and delinquency. The authors assert that if school status causes delinquency, leaving school would decrease delinquency. On the other hand, if delinquency causes school status, then leaving school should have no effect on delinquency. The hypothesis of school failure leading to greater delinquency is not considered. A review of the literature revealed that most evidence supports the notion that dropout leads to decreased delinquency. The strongest support for this conclusion was drawn from cross-sectional studies which compared crime rates of youths before and

after they dropped out of high school (Elliott, 1966; Elliott & Voss, 1974; Mukherjee, 1971).

Thornberry et al. (1985) pitted strain theory and social control theory against one another in assessing the dropout-delinquency relationship. The authors assumed that strain theory would predict less delinquency after dropout and that social control theory would predict more delinquency after dropout. They note that studies assessing longer-term consequences of dropout find criminogenic effects. Extending the follow-up period to age 25, and controlling specifically for age at dropout, they find criminogenic effects of dropout. However, only social status of family and race were included as control variables, leaving the study vulnerable to considerable omitted variable bias.

Prior to Jarjoura's (1993) research, studies on dropout had treated the effect of dropout as identical for all kinds of dropouts. Jarjoura recognized the unlikelihood that dropping out because one dislikes school has the same effect as dropping out because of pregnancy or in order to work. In light of this, he introduced a key methodological advance over previous studies. Using the National Longitudinal Survey of Youth 1979 cohort (NLSY79) to assess the dropout-delinquency relationship, he separated dropouts according to the reason they gave for dropping out: to get married, pregnancy, poor grades, dislike of school, problems at home, financial reasons, expelled from school, or other reasons. In addition, he modeled three different dependent variables: violence, theft and selling drugs. Finally, he introduced more control variables than previous studies, including previous arrests, years of sexual activity, school suspensions, grade point average, and school track.

Jarjoura (1993) found that dropout because of dislike for school or for “other” reasons led to higher levels of crime across all three models. Dropout because of expulsion led to increased thefts and selling drugs, but had no effect on violent offenses. Dropout to get married or because of pregnancy resulted in more violent offenses, but had no effect on theft or selling drugs. Dropout because of poor grades or financial reasons had weak positive effects on thefts only. For no category did dropout lead to decreased offending, and in no category did dropout lack some criminogenic effect. Jarjoura focused attention on those youths who drop out because of school reasons, as these youths exhibit the most detrimental consequences due to dropout.

Although Jarjoura’s study was a major step forward, it suffered from several methodological problems. First of all, his sampling frame made interpretation of his findings difficult. His sample consisted of “all individuals who either dropped out or graduated from high school as of the 1979 interview” (Jarjoura 1993:154). Those below 18 were only included in the study if they had dropped out of school, whereas nearly all the 20-year-olds were included in the study. Second, although he included more control variables than past studies, he did not include the strongest predictors of dropout: grade retention, highest grade completed by parent, and intelligence. His study is vulnerable to both omitted variable bias, and the possibility that his results are driven by selection effects. Finally, he includes a variable representing “months since dropping out” without separating it into types of dropout. This is problematic because it averages the effect of time since dropout for all types of dropout. Take, for example, the effect of dropout on selling drugs. The coefficient for months since dropout is negative and significant while the coefficient for dropping out because of dislike for school is positive and significant.

This implies that the effect of dropping out because of dislike for school decays over time, and, in fact, disappears after six months. The coefficient for dropout because of pregnancy on the other hand, is negative. Combined with the time since dropout coefficient, this implies that dropping out because of pregnancy decreases crime, and that this effect increases with time. The same coefficient implies a decaying criminogenic effect in one case and an increasing non-criminogenic effect in another.

Jarjoura's 1996 research further advanced the literature on dropouts, examining the dropout-delinquency relationship by social class. He also collapsed reasons for dropout to four: school, economic, personal and other. He found in this study that dropout for school reasons increased violent offenses for non-poverty youth only. Also, the effect of dropout for school-related and economic reasons was significantly different for poverty-status and non-poverty-status youths. In fact, dropout for economic reasons appeared to reduce theft among poverty-status youths. This paper advanced the research by showing that the dropout-delinquency relationship may be conditional on social class. However, this was not a surprising finding, given the importance of socioeconomic status in predicting dropout. Furthermore, Jarjoura did not remedy any of the methodological problems associated with his first study.

Using waves one through seven of the Rochester Youth Development Survey, Krohn et al. (1995) determined that dropout had either a small effect or no effect on drug use and serious delinquency independent of other school measures. Their dropout measure was assessed during waves four through six. At wave six, the youths in the sample were in either 9th or 10th grades. Therefore, Krohn et al (1995) assessed the effect of early school dropout relative to those still in school in 9th or 10th grades. Those still in

school included both future dropouts and future graduates. This study is distinguished from others because of its focus on testing control theory and strain theory. Measures of family and school attachment, and educational expectations were included in the OLS regressions on drug use and delinquency alongside dropout, prior drug use and prior delinquency. In an attempt to account for selection processes, the authors included a lagged dependent variable in the model. However, does not rule out bias in the results due to selection effects. The results were more supportive of control theory than strain theory, but the percent of variance explained by their models was particularly low considering the inclusion of lagged dependent variables. Analysis on subsequent waves of this survey will be better able to assess the effects of dropout as the number of dropouts in the study increases.

Assessment of the Literature

As it stands today, no clear conclusions can be drawn from the criminological literature on the dropout-delinquency relationship. Thornberry et al. (1985) appeared to resolve conflicting results by noting that short-term follow-up periods tended to produce results in line with strain explanations while long-term follow-up periods produced results corresponding with control theory. Jarjoura (1993, 1996) presented a more nuanced approach to the problem, disaggregating the dropout effect by reasons stated for dropout. However, none of these studies adequately account for selection effects

The importance of controlling for pre-existing differences when assessing the dropout-delinquency relationship cannot be stressed enough. Status attainment literature implies that dropout can be predicted from parental occupational and educational

attainment (Sewell et al., 1969; Warren et al., 2002). Studies which omit measures of parental attainment mis-specify the dropout-delinquency relationship. Life course research shows that dropout is the end result of a long process of disengagement from school (Stroup & Robins 1972; Finn 1989; Ensminger & Slusarick 1992; Alexander et al 2001). Dropout-delinquency studies which omit factors identified by life course researchers as predictive of dropout are open to omitted variable bias. Gottfredson and Hirschi's general theory of crime, which states that lack of self-control, developed early in life through ineffective parenting, is responsible for all subsequent deviant acts (Gottfredson & Hirschi, 1990), challenges the notion that dropout has an independent effect on delinquency. Rather, this theory emphasizes the primacy of selection effects. The existing literature does not adequately control for pre-existing factors when assessing the effect of dropout on delinquency. Therefore, the conclusions of the existing literature are called into question due to non-specification of selection effects which may bias findings.

There are several ways to advance the literature on this topic. First, a simpler sampling frame must be drawn—all youths within a certain age range, for example. This will allow for clear inferences. Second, dropout should be disaggregated into the four types identified by Jarjoura (1996) (personal, school, economic, other), but time since dropout must be disaggregated in the same way, testing the assumption that the effect of time since dropout is the same for all kinds of dropout. Third, pre-existing differences in criminal propensity must be better controlled for. Controlling for selection effects is a common problem in social science inquiry, and has been dealt with effectively in a number of studies (for example: Sampson & Laub, 1993; Nagin & Paternoster, 1993;

Horney, Osgood, & Marshall, 1995; Wells & Horney, 2002). This has been approached in two ways: including as many pertinent control variables as allowed by the data set, and employing a model that controls for unobserved population heterogeneity. The random effects model is uniquely suited to this problem because it statistically controls for unmeasured differences between individuals. This model is necessary because it is not possible to rule out omitted variable bias by including control variables in a statistical model. Finally, initiation of delinquency should be distinguished from increased frequency. Previous studies confounded the two effects by using frequency of offending as the only dependent variable. This implied an assumption that the magnitude of the dropout effect was the same for both offenders and non-offenders. Thus if dropout had a positive and significant effect on dropout, one would assume that a previously non-offending youth who dropped out would start offending, and a previously offending youth would increase their involvement. There is no reason to believe that the effect of dropout would be the same for both cases.

While this study will tackle several of the methodological shortcomings of past research, theoretical shortcomings fall outside its scope. None of the theories reviewed in this section provide a satisfying framework from which to launch empirical studies of the dropout-delinquency relationship. Classical strain theory, general strain theory, social control theory, and rational choice theory all require the measurement of mediating variables in order to predict the effect of dropout on delinquency. Depending on the configuration of these mediating variables, they can predict divergent outcomes for dropout. While any of these theoretical frameworks can provide an explanation for divergent dropout-delinquency outcomes, none of them provide a clear advantage over

the other. Therefore, rather than test any one particular theory, this study focuses on replicating and improving upon the empirical approaches taken in past research, with particular focus on assessing the selection issue in order to determine whether dropping out of school has a causal impact on subsequent behavior over and above the factors which lead to dropping out itself.

CHAPTER II. DATA AND METHODS

Model Estimation

The current research seeks to answer the question: Does dropout from school have a causal impact on delinquent or criminal behavior? As discussed in chapter I, previous studies have neither been able to confirm or deny the causal nature of this relationship due to methodological problems. The most intractable of these problems is their vulnerability to the charge of omitted variable bias, or more specifically, bias due to the effects of persistent pre-existing differences in the sample.

This study will model the dropout-delinquency relationship using several different statistical models. The first set of models will use the standard statistical techniques commonly applied to the problem. This set of models can be viewed most simply as a modified replication of Jarjoura (1993) on the newest NLSY cohort. The second set of models will advance the research by applying random effects models to the dropout-delinquency relationship. Jarjoura (1993, 1996) used ordinal response categories based on frequency of offending for three different kinds of offending (violent offenses, thefts, and selling drugs) as dependent variables. In the current study, offenses are not disaggregated by type because there is no theoretical reason to expect different effects by crime type. Future studies may explore the effect of dropout on different kinds of crime if this line of research appears fruitful.

A key difference between the standard models and random effects models is the data they employ. Although previous studies of dropout and delinquency have used panel data, they have not applied statistical techniques which take advantage of each

wave of panel data. In this study, the first set of models will use measures from four waves of data collection to predict crime in the fifth wave of data collection. This first set of models will extend previous research by separately using frequency and prevalence of offending as dependent variables. This will more precisely identify the effect of dropout. Using prevalence of offending (coded 1 for any offenses and 0 for no offenses) as a dependent variable will identify whether dropout causes onset of delinquency. Using frequency of offending as a dependent variable will allow distinction between onset of delinquency and increased frequency of offending. The random effects model will use all five waves to predict simultaneous effects of dropout on offending.

Concern about identifying selection effects has led many researchers to adopt random or fixed effects models which utilize panel data to control for the effect of persistent individual heterogeneity of unobserved time-varying characteristics. Fixed effects models are distinguished from random effects models by the assumption of random effects models that individual-specific effects are drawn from a defined probability distribution. Fixed effects models, on the other hand, estimate an individual-specific term for each individual (Greene, 2001). The random effects model is used in this study because of its increased efficiency relative to the fixed effects model; rather than estimate individual effects for each individual, one has only to estimate the parameters of the distribution of individual effects. Also, the fixed effects model is not viable when using only five waves of data (Brame et al., 1999).

The most simple version of the random effects model in this study is represented as:

$$y_{it} = \beta_0 + \beta_1 q_i + \delta_1 x_{it} + \delta_2 D_{it} + \tau_i + \varepsilon_{it} \quad (1)$$

Where q_i represents time-invariant individual characteristics, x_{it} represents time-varying individual characteristics, D represents dropout status, and $\tau_i + \varepsilon_{it}$ represents the standard error term decomposed into individual-specific time-stable individual differences and random error which varies over time and individuals (Brame et al., 1999). The time-invariant error term, τ_i , is assumed to follow a normal distribution. The random error term, ε_{it} , is assumed to be uncorrelated with q_i , x_{it} , and τ_i . This last assumption is problematic as it implies that any unobserved variables must be uncorrelated with observed static and time-varying predictors. Therefore, random effects analysis is as vulnerable to omitted variable bias as traditional statistical models. While there is no way to eliminate this bias from the model, it is possible to derive unbiased estimates of the effects of within-individual changes in independent variables using a technique introduced by Bryk and Raudenbush (1992) which separates within-individual changes from between-individual differences. This technique involves three steps: 1) calculate mean level of time-varying independent variable over all waves for each individual:

$$\bar{x}_i = \frac{1}{T} \cdot \sum_{t=1}^T x_{it}$$

2) For each individual, at each wave, calculate independent variable deviation from individual mean level:

$$\Delta x_{it} = x_{it} - \bar{x}_i$$

Finally, 3) introduce these terms into equation (1) as follows:

$$y_{it} = \beta_0 + \beta_1 q_i + \delta_{b1/i} \bar{x}_i + \delta_{w1/i} \Delta x_{it} + \delta_{b2/i} \bar{D}_i + \delta_{w2/i} \Delta D_{it} + \tau_i + \varepsilon_{it} \quad (2)$$

Thus the effect of dropout and other time-varying independent variables is decomposed into between-individual and within-individual effects. This technique removes bias from

the within-individual terms, guaranteeing zero correlation between the within-individual scores and both time-stable and time-varying error terms. The between-individual estimator, is however, vulnerable to omitted variable bias due to correlation with unobserved variables, and any interpretation of the should acknowledge this possible bias (Brame et al., 1999).

The random effects model also allows one to estimate the magnitude of the effect of persistent unobserved heterogeneity (ρ) as follows:

$$\rho = \sigma_T^2 / (\sigma_T^2 + \sigma_E^2) \quad (3)$$

where σ_T^2 represents the variance in the time-stable error term, and σ_E^2 represents the variance of in the time-varying error term. Simply put, ρ is the proportion of the total error variance attributable to unobserved time-stable individual differences.

The main advantage of the random effects model is its capability of controlling for, and estimating the magnitude of the effect of unobserved time-stable individual characteristics. Its two main weaknesses are associated with failure to meet two of its assumptions: no covariance between the error term and time-varying independent variables, and knowledge of initial levels of the dependent variable. While the first assumption is rarely met, it is possible to avoid the negative effects of its violation. The second assumption is only an issue in models which include a lagged dependent variable as an independent predictor. In traditional (not random effects) models, a lagged dependent variable is often included as a proxy for persistent heterogeneity. However, as the decomposed error term of the random effects model accounts for persistent heterogeneity, it is not necessary to include a lagged dependent variable for this purpose.

Data

The data to be analyzed comes from the National Longitudinal Survey of Youth 1997 cohort (NLSY97), which is administered by the Bureau of Labor Statistics. Its primary purpose is to track work experiences over the life-course. Although the focus is work experiences, the topics covered are wide-ranging. The NLSY97 sample is the result of a multistage cluster sample with oversampling of minority youth (Center For Human Resource Research, 2002). Regions of the country were randomly chosen, then areas within regions were randomly chosen, and finally, households were randomly chosen, with oversampling of disadvantaged youth.

Because of oversampling, each participant was assigned a sampling weight which is used in all analyses in order to ensure that inferences to the national population are not biased by the oversampling. In addition, it is necessary to control for clustering in the sample design of the survey. Because all youths of eligible age within the household were interviewed, many siblings were included, and the sample is not truly random. It is possible to control for this design effect using the STATA application, and specifying *household id* as the clustering variable. Design effects were calculated for each wave separately and then averaged across the five waves before adjusting standard errors. Repeated observations on the same subject would be interpreted as clustering, and would inflate the design effects if pooled data were used.

In the first wave, 8984 youths aged 12 to 17 were interviewed. Youths are interviewed every year, with five waves of data released to date. The longitudinal studies of the Bureau of Labor Statistics are known for their low attrition rates. In the fifth wave of the study, 7883 youth (87.7%) were interviewed. Analysis of differences between

those who dropped out of the study by wave five and those who did not revealed several significant differences between the two groups on many of the independent variables measured at wave one. Those who dropped out of the study were more likely to have dropped out of school by wave one, had lower middle school grades, were older, had been sexually active longer, were more likely to have been arrested and had parents with lower educational attainment than those who remained in the study. However, there were no significant differences in frequency or prevalence of offending between the two groups. Because school dropouts are more likely to drop out of the study itself, effects of dropout on delinquency may be more difficult to identify. Also, the effect of attrition is minimized in the random effects models in this paper by including all subjects who missed no more than two waves of data collection (N=8457).

Two separate sampling frames are used in this study. For the traditional analysis of the dropout-delinquency relationship, wave five measures of delinquency are regressed on wave one through four independent variables. Subjects in this sample were interviewed in both waves four and five. This sample consisted of 7548 individuals. Of this sample, 50.4 percent were male, 15.1 percent were black, 12.8 percent were Hispanic, and 72.1 percent were white non-Hispanic. The average age for this sample was 18.5 years at wave four.

For the random effects model, subjects with up to two missing waves (out of five) were included.¹ This sample consisted of 8457 individuals, 51.2 percent of which were male. The average age at wave one was 14.8 years. This sample was 70.3 percent white non-Hispanic, 15.6 percent black, and 12.8 percent Hispanic. Although subjects in this

¹ In addition, random effects analyses were conducted using a balanced panel (N=6932). None of the substantive findings were changed using this sample.

sample were allowed to be missing two waves of data, the average number of waves of valid data for this sample was 4.8. Only 433 of the subjects were missing two waves of data, and 876 of the subjects were missing one wave of data.

Youths are asked about school-status, work-status, delinquent involvement, and host of other topics in each wave. In the early 1990s, the Bureau of Labor Statistics changed from paper and pencil surveying (PAPI) to computer assisted personal interviewing (CAPI) and self-administered questionnaires (SAQ) for sensitive items. This led to a decrease in surveyor-induced measurement error, and a slight increase in response rates to sensitive questions (Zagorsky & Gardecki, 1998). At the same time, there is evidence of under-reporting of illegal activities by minorities in the NLSY97 (Bushway et al., 2000). Subjects are asked about participation in six kinds of offending: intentional destruction of property, theft of items under \$50, theft of items greater than \$50 (including autos), other property crimes, attacking someone with intent to seriously hurt them, and selling illegal drugs. For each positive response, youths are asked for further details, including frequency of offending. For purposes of this study, frequency of offending is simply the summed frequency of offending for the six separate offenses truncated at 50 offenses. Prevalence of offending is coded one if frequency is non-zero, and zero otherwise.

The primary independent variable of interest in this study is dropout. One would expect that one of the simpler tasks in dropout research would be ascertaining the dropout rate. However, this task is more complicated than it appears. Estimates of dropout rates vary considerably depending on the definition of the cohort, individuals' initial status in that cohort, and how dropout status is defined (Rumberger, 1987). The initial cohort to

be considered is a key issue. If, for example, high school freshmen are the initial cohort (a class cohort), then any youth who dropped out before freshman year of high school would not be included in the dropout rate. Age cohorts, which include all people born within a certain time frame, allow for a more accurate dropout rate. The question of initial status in a cohort is only difficult with the class cohort. Determination of dropout status is often a difficult issue as students drift in and out of school. Usually dropout is defined as a residual status (Rumberger, 1987) where those not enrolled in school, and who do not have a high school diploma, are considered dropouts.

Dropout rates derived from the NLSY97 are cohort rates representative of all United States Youths born between January 1st, 1980 and December 31st, 1984 (Center For Human Resource Research, 2002). No question directly pertaining to dropout was asked in the NLSY97. Instead, enrollment status is reported. Respondents who were not enrolled in school and either had no high school diploma or had a GED, were considered dropouts. Dropout literature concerned with labor market outcomes treats GED holders as a special kind of dropout, rather than a kind of graduate (Murnane, 1999; Tyler, Murnane & Willett, 2003) because the educational credentials of a GED are not equivalent to those of a high school diploma (Rumberger, 1987). Just as work outcomes may differ for GED holders, so may involvement in offending. Because of this, GED holders are flagged in all models with a dummy variable. If students were identified as dropouts, questions regarding their school attendance were scanned in order to determine the most recent school the student had attended. The date of interview minus the last date of enrollment in most recent school was taken as the time since dropout variable, coded in years. Time since dropout, disaggregated by type of dropout, is included in the models

for comparison purposes with previous studies. The coefficients for these variables are expected to differ from one another. The coefficients should be interpreted as suggestive rather than conclusive because of limits in the data; over two-thirds of the dropout cases in the five wave sample had less than two years lag and only five percent had more than 4 years lag.

Subjects were asked why they left each school they attended. They were allowed to choose between 25 reasons. However, they were only allowed to choose one reason for leaving school. Responses were used to construct the four categories of reasons for dropout: school, economic, personal and other. School reasons for dropout included leaving because of expulsion, suspension, perceived dangerousness of the school, poor grades, dislike of school, not getting along with other students, friends had dropped out, school had closed, changing to home school, and because student did not have enough credits to graduate. Personal reasons encompassed marriage, pregnancy, child-care responsibilities, moving away, becoming a parent, having a health problem and transportation problems. Economic reasons comprised being offered a job, entering the military, financial difficulties, and home responsibilities. Dropout because of home responsibilities is ambiguous; this could be included in either personal reasons or economic reasons. However, because Jarjoura (1996) interpreted this as an economic reason, it was coded the same way in this study. Finally, several of the responses were not resolvable into any of these categories and were classified “other.” This included those youths who left their most recent school for the stated reason of graduation. Youths in this category may have provided false information, or may have graduated from middle school and not entered high school. The “other” category also includes youths

who dropped out because of drugs or alcohol, incarceration, their response was uncodeable or coded as “other,” or they left their most recent school because of transfer yet no other school is on record. As can be seen in Table 1, dropout for school and other reasons were the most prevalent.

Table 1. Proportion of four types of dropout by wave (N=8457)

Reason	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
personal	.0048	.0146	.0182	.0264	.0289
school	.0169	.0353	.0485	.0648	.0690
economic	.0009	.0055	.0099	.0140	.0151
other	.0013	.0257	.0249	.0321	.0460
total:	.0239	.0811	.1015	.1373	.1590

Using five waves of data with the random effects model allows inclusion of dropouts who eventually return to school. For example of the 868 youths considered dropouts at wave three, 171 (19.7%) were no longer considered dropouts at wave five. Traditional analysis might overlook this kind of dropout, often called a “stopout,” because it only uses dropout status at one time period.

Because males and females differ significantly in reasons for dropout, additional analyses are conducted for both genders. Of the wave five dropouts, 10 percent of the males dropped out for personal reasons whereas 30 percent of the females dropped out for personal reasons. Given that dropout for personal reasons has been found to have little criminogenic effect (Jarjoura, 1993, 1996), one could expect that dropout has little criminogenic effect for females. It is not clear whether dropout for school reasons would have the same consequences for males and females. Analyzing them separately will reveal any differences.

Other demographic factors included in the models are a dummy variable for residence in the South and a dummy variable that indicated whether the mother was 18 years or younger at birth of subject. Both of these variables are included because they predict dropout. The wave five dropout rate for subjects residing in the South is 20 percent whereas for the rest of the country it is 14 percent. Similarly, the dropout rate for youths whose mothers were 18 years of age or younger at their birth is 27 percent whereas for other youth it is 14 percent.

The models included several variables commonly used as a proxy for population heterogeneity in propensity to offend: cumulative prevalence of arrest (coded 1 or 0 at each wave depending on whether youth had ever been arrested), number of years youth has been sexually active, and the cumulative prevalence of suspension from school. It is expected that these variables will strongly predict offending, and will account for a good deal of the persistent heterogeneity in propensity to offend.

Finally, because school-related variables are the best predictor of dropout, several of these were included in the models. Retention is one of the best predictors of dropout (Jimerson et al., 2000), and was coded as a dummy variable indicating if youth had ever been retained. Parental educational attainment was included as highest grade completed by any parent (biological or residential). This was coded from zero to 20 where numbers beyond 12 indicate number of years of college. Previous educational achievement of the youth is indicated by self-reported average grade attained in middle school, coded one for mostly Ds and below, and eight for mostly As. Finally academic tracks and vocational tracks in high school are coded with dummy variables relative to the general track. Mean

levels of the dependent and independent variables (except those already reported) at wave five for various samples are shown in Table 2.

Table 2. Mean levels of dependent and independent variables.

	Total	Males	Females	Dropouts	Non-Dropouts
N	7847	3965	3882	1374	6473
Crime (frequency)	1.93	2.60	1.24	3.78	1.59
Crime (prevalence)	.18	.22	.14	.26	.16
GED	.03	.04	.03	.22	.00
Dropout lag (school)	.17	.21	.13	1.10	.00
Dropout lag (personal)	.07	.04	.10	.43	.00
Dropout lag (economic)	.03	.04	.02	.20	.00
Dropout lag (other)	.06	.07	.04	.35	.00
South	.34	.33	.35	.42	.32
Mother<19 at birth	.13	.13	.13	.21	.11
Years sexually active	2.24	2.39	2.09	3.83	1.94
Ever arrested	.19	.25	.12	.44	.14
Ever suspended	.34	.43	.25	.70	.27
Ever retained	.17	.20	.14	.44	.12
Middle school grade	5.72	5.42	6.04	4.32	5.99
College track	.39	.36	.43	.11	.44
Vocational track	.12	.14	.10	.12	.12
Highest grade – parent	13.7	13.7	13.7	12.2	14.0

Clearly, dropouts differ from non-dropouts on a number of these variables, as do males from females. It is expected, therefore, that a good portion of the differences between dropouts and non-dropouts will be accounted for by the model. However, a number of important measures are missing from the analyses conducted in this study. The most important of these is socioeconomic status and intelligence. Variables representing both of these constructs are available in the NLSY97, but each entail sample attrition of up to 30 percent. In addition, the intelligence score has severe differential attrition by race. The omission of these variables would introduce omitted variable bias to all models in this study. However, the coefficients for within-individual differences in

time-varying characteristics in the random effects models will not be biased by these omitted variables.

The standard models are anticipated to confirm previous research indicating that dropout for school reasons increases delinquent behavior whereas dropout for other reasons has mixed effects. It is possible, however, that the random effects model will reveal this relationship to be spurious—caused by persistent unobserved differences between individuals.

CHAPTER III. RESULTS

Standard Models

The results reported in Table 3 generally confirm past research. Dropout for school reasons has a positive effect on offending while dropout for personal or other reasons appears to have no effect on offending. Dropping out for economic reasons has a strong negative impact on offending. This effect is maintained within male, female, young and old samples. However, dropout for school reasons has a significant effect only for males. Jarjoura (1996) found that dropping out for economic reasons predicted less thefts among poverty status youths, but no previous study has found a general crime inhibiting effect of dropout for economic reasons.

As expected, disaggregating time since dropout by type of dropout yields estimates which differ significantly from one another. Time since dropout for school reasons has a significant negative coefficient while time since dropout for economic reasons has a significant positive coefficient—both of these indicate decay of the main effect of dropout over time. Interestingly, in all but one of twenty cases in Table 3, the sign of the coefficient for time since dropout is opposite that of dropout itself. This suggests that whatever the effect of dropout on offending—whether crime inhibiting or enhancing—it decays over time. It is not possible to extend inferences past about three years' time since dropout because very little of the data falls outside this range.

While the main effect of dropout on offending may decay over time, this does not imply that dropping out of school has no net effect on offending. This study does not examine indirect effects of dropping out on offending, which may be substantial. For

example, dropping out may have a detrimental effect on work and family outcomes, which may increase the probability of offending.

Table 3. Estimates from OLS models of frequency of offending

Variable	All	Male	Female	Young (<18 at wave 4)	Old (≥18 at wave 4)
Dropout – personal years since dropout	2.03 (1.42)	.92 (.36)	2.45 (1.41)	2.52 (.83)	1.99 (1.30)
Dropout – school years since dropout	-.60 (-1.16)	.67 (.58)	-1.05(-1.82)	-2.20(-1.27)	-.56(-1.14)
Dropout – economic years since dropout	2.29 (2.04)	2.81 (1.86)	1.45 (.88)	3.14 (1.24)	1.33 (1.13)
Dropout – other years since dropout	-.75 (-1.94)	-.87(-1.57)	-.53 (-.98)	-1.07 (-.49)	-.45(-1.20)
GED	-3.13 (-6.53)	-3.81(-5.78)	-1.95(-3.48)	-3.86(-3.40)	-3.06(-4.65)
No school status	.63 (2.38)	.81 (2.42)	.22 (.59)	1.81 (1.53)	.58 (.58)
Male	.94 (.91)	.00 (.00)	1.92 (1.23)	-1.86(-1.26)	1.26 (1.02)
Age (wave 4)	-.27 (-.38)	.08 (.08)	-.57 (-.57)	3.19 (1.19)	-.51 (-.68)
Age squared	.65 (.56)	.33 (.20)	1.06 (.62)	2.08 (.42)	.70 (.59)
Black	.31 (.14)	-2.47(-3.50)	3.25 (.78)	-2.65(-4.15)	2.41 (.67)
Hispanic	.76 (4.02)			.63 (1.97)	.86 (3.87)
Other	-2.68 (-1.34)	-1.60 (-.47)	-3.69(-1.83)	-21.3 (-1.05)	1.00 (.19)
South	.06 (1.10)	.03 (.30)	.09 (1.64)	.60 (1.00)	-.04 (-.27)
Mom<19 at birth	-.58 (-2.26)	-.59(-1.31)	-.57(-2.32)	-1.49(-3.61)	-.02 (-.04)
Years sexually active	.36 (1.27)	.77 (1.68)	-.05 (-.15)	.27 (.56)	.44 (1.26)
Ever arrested	.84 (.68)	.99 (.64)	1.03 (.52)	2.93 (1.18)	-.76 (-.84)
Ever suspended	-.33 (-1.67)	-.46(-1.38)	-.21 (-.95)	-.13 (-.39)	-.47(-1.98)
Ever retained	-.28 (1.02)	-.64(-1.48)	.10 (.32)	-.33 (-.68)	-.19 (-.59)
Middle school grade	.20 (4.04)	.19 (2.61)	.21 (3.56)	.40 (3.24)	.15 (2.72)
Missing m.s. grade	2.14 (2.14)	2.74 (5.12)	1.10 (2.23)	1.99 (2.80)	2.22 (4.99)
College track	1.22 (4.32)	1.52 (3.74)	.87 (2.39)	2.18 (4.46)	.57 (1.64)
Vocational track	-.32 (-1.03)	-.26 (-.53)	-.42(-1.21)	-1.00(-1.85)	-.03 (-.07)
Missing track	-.09 (-1.21)	-.11 (-.99)	-.08 (-.74)	.01 (.11)	-.16(-1.71)
Highest grade parent	1.08 (.93)	.02 (.02)	2.33 (1.14)	1.42 (.76)	1.08 (.76)
Miss high grd parent	-.25 (-1.28)	-.18 (-.57)	-.36(-1.65)	-.03 (-.10)	-.40(-1.76)
constant	-.01 (-.04)	-.12 (-.28)	.13 (.38)	.08 (.14)	-.06 (-.18)
N	-.80 (-.95)	-1.56(-1.19)	-.23 (-.21)	-1.83(-1.26)	-.02 (-.02)
R-squared	.14 (4.17)	.20 (3.48)	.09 (2.41)	.11 (1.88)	.16 (4.07)
	.02 (.03)	.27 (.32)	-.37 (-.95)	-.84(-1.13)	.59 (.89)
	28.27 (1.53)	19.07 (.60)	37.56 (2.00)	188.0 (1.09)	-6.72 (-.13)
	7536	3795	3741	3084	4452
	.045	.051	.046	.059	.053

* Numbers in parentheses are T-values.

Only five of the many control variables are significant in the full sample. Males commit more offenses. The coefficient for years sexually active is positive and significant. However, its magnitude is quite small, predicting only one more offense for five additional years of sexual activity. Not surprisingly, having been arrested or

suspended from school predicts more offending. The one surprising significant result is that of parental educational attainment. The coefficient for highest grade completed by parent is positive, indicating that children of parents with more education are more delinquent. Although race is controlled for, this could be a byproduct of known under-reporting of offenses by minorities in the NLSY97 (Bushway et al., 2000).

The most notable finding from the full sample model is that dropping out of school has a significant effect on offending, but the direction of this effect depends on the reasons for dropout. Dropping out for school reasons is associated with increased offending while dropping out for economic reasons is associated with the opposite effect. It is also important to note that only 4.5% of the variance in offending is explained by this model. Because of this, there is a credible threat of omitted variable bias. However, the low explained variance could also be due to the construction of the dependent variable. Number of offenses were censored at 50 so that individuals with more than 50 offenses are coded as having 50. It is not likely that the model can explain variation in offending between individuals with, for example, 10 offenses as opposed to 40. In order to assess the impact of this kind of unexplained variance, one could evaluate the same models with the dependent variable censored at different values.

Bifurcating the sample by gender reveals several interesting results. The significant effect of dropping out for school reasons appears to be driven by males, as this kind of dropout has no effect on offending for females. Dropping out for economic reasons has a negative impact on offending for both genders, although it is much stronger for males than females. Also, this effect does not decay for females. In general, the estimates for females have a smaller magnitude than those for males, probably reflecting

the lower level of offending for females as compared to males. However, the only significant difference between the dropout estimates for males and females is that of dropout for economic reasons ($t=2.15$).²

The sample was also bifurcated by age, dividing the sample at age 18. This was done because dropout status may have different significance for those of school age than those whose peers are out of school. As noted earlier, the magnitudes of the coefficients for dropout were smaller for the older sample, indicating decreasing significance of dropout status as one ages. However, there were no significant differences in the dropout estimates for older and younger youths. The only significant dropout event for either sample was for economic reasons. For both groups, this kind of dropout predicted less offending. Among the control variables, there were only two significant differences. The impact of being Black was significantly negative in the young sample, but not in the older sample ($t=2.27$). Also, school suspension had a greater effect in the young sample than in the old sample ($t=2.68$).

These results add to the previous literature on the dropout-delinquency relationship in several ways. First, they reveal a strong crime inhibiting effect of dropout for economic reasons. Second, they confirm the criminogenic effect of dropout for school reasons, and reveal that this effect is largely driven by males. Finally, they show that time since dropout ought to be disaggregated by reason for dropout because different estimates are drawn for different kinds of dropout.

² Following Paternoster et al. (1998), the formula used to compare regression coefficients on independent

samples was:
$$Z = \frac{b_1 - b_2}{\sqrt{SE_1^2 + SE_2^2}}$$

These models can be modified by using prevalence of offending as the dependent variable, requiring logit models. These models will reveal if dropping out actually leads to engagement in offending, or if it simply causes those already involved in offending to increase their involvement. If the latter is true, we would expect the coefficients for dropping out to be insignificant in the logit model (but significant in the OLS model). If the former is true, however, the coefficients for dropout will be significant in both models.

There are several differences between the logit and OLS models of offending. While, dropout for school reasons is no longer significant, dropout for personal reasons is. This implies that dropping out for school reasons causes those already involved in crime to become more involved (increased number of offenses), but it doesn't cause engagement in crime in general. Furthermore, the OLS estimate for dropout for school reasons is attenuated to the extent that it reflects the non-significant effect of dropout for those starting with zero offenses. On the other hand, it appears that dropping out for personal reasons, although it does not increase the number of offenses, increases the probability of engaging in crime. These effects are less simple to explain. It is possible that dropout for personal reasons is not a homogenous category of dropout; there may be different types of dropout for personal reasons. Alternately, there may be opposite forces at work. Dropout for personal reasons may increase the probability of offending for those not yet engaged in crime, but may decrease frequency of offending for those previously engaged in crime. Dropout for economic reasons decreases the probability of involvement in offending, just as it decreases the frequency of offending.

The estimates for time since dropout reflect the same pattern as they did in the OLS models. That is, they have the opposite sign as that of the main effect of dropout, indicating that the effect of dropout decays over time.

Dividing the sample by gender reveals no significant differences in the dropout variables, and only two significant differences among the control variables: Hispanic ($t=1.91$) and other ($t=2.18$). Therefore, it appears that there are no differences in gender in the impact of dropout on engagement in crime.

Table 4. Estimates from logit models of prevalence of offending

Variable	All	Male	Female	Young (<18 at wave 4)	Old (≥ 18 at wave 4)
Dropout – personal years since dropout	.73 (2.35)	.48 (.98)	.70 (1.72)	.60 (1.18)	.90 (2.22)
Dropout – school years since dropout	-.34 (-2.17)	-.16 (-.68)	-.46 (-2.06)	-.50 (-1.06)	-.40 (-2.12)
Dropout – economic years since dropout	.21 (.96)	.28 (1.01)	.04 (.09)	.73 (1.80)	.11 (.34)
Dropout – other years since dropout	-.03 (-.35)	.02 (.15)	-.07 (-.44)	-.91 (-1.77)	.03 (.30)
GED	-1.03 (-2.13)	-.68 (-1.54)	-2.82 (-1.80)	-.77 (-.85)	-1.00 (-1.77)
No school status	.45 (1.77)	.34 (1.67)	1.07 (1.97)	-.48 (-.43)	.45 (1.60)
Male	.31 (1.40)	.51 (1.78)	-.03 (-.08)	.08 (.18)	.34 (1.22)
Age (wave 4)	-.11 (-.77)	-.02 (-.14)	-.33 (-1.11)	.05 (.12)	-.12 (-.78)
Age squared	.12 (.51)	-.14 (-.46)	.47 (1.22)	.11 (.17)	.09 (.34)
Black	.44 (.93)	.34 (.51)	.56 (.85)	-.67 (-.65)	1.01 (1.77)
Hispanic	.37 (4.97)			.40 (3.68)	.34 (3.31)
Other	.05 (.08)	.24 (.27)	.08 (.07)	-4.14 (.71)	2.65 (1.04)
South	-.01 (-.44)	-.01 (-.55)	-.01 (-.33)	-.13 (-.74)	-.07 (-1.14)
Mom<19 at birth	-.11 (-1.17)	.02 (.13)	-.26 (-1.65)	-.31 (-2.10)	.04 (.33)
Yrs sexually active	.07 (.77)	.23 (1.90)	-.15 (-.95)	-.09 (-.65)	.20 (1.64)
Ever arrested	.19 (.51)	.82 (1.84)	-.69 (-1.30)	.60 (1.40)	-.20 (-.36)
Ever suspended	-.16 (-2.07)	-.23 (-2.36)	-.08 (-.64)	-.19 (-1.66)	-.14 (-1.36)
Ever retained	-.04 (-.30)	-.09 (-.65)	.04 (.22)	.06 (.29)	-.08 (-.60)
Middle school grade	.08 (5.14)	.05 (2.60)	.15 (5.09)	.12 (4.12)	.06 (3.32)
Missing m.s. grade	.63 (7.34)	.70 (6.68)	.53 (3.37)	.52 (3.81)	.70 (6.36)
College track	.62 (7.33)	.63 (5.93)	.66 (4.80)	.62 (4.94)	.64 (5.56)
Vocational track	-.15 (-1.59)	-.07 (-.62)	-.28 (-1.66)	-.21 (-1.43)	-.14 (-1.13)
Missing track	-.04 (-1.83)	-.02 (-.82)	-.07 (-1.72)	-.06 (-1.84)	-.03 (-.85)
Highest grade parent	.40 (1.44)	.19 (.52)	.68 (1.66)	.20 (.48)	.58 (1.48)
Miss high grd parent	.04 (.48)	.10 (1.03)	-.07 (-.48)	.15 (1.28)	-.05 (-.48)
constant	.18 (1.81)	.22 (1.76)	.15 (.81)	.09 (.53)	.26 (1.94)
N	-.16 (-.57)	-.35 (-.92)	.11 (.28)	.31 (.71)	-.36 (-.95)
	.06 (4.18)	.07 (3.97)	.04 (1.79)	.04 (2.09)	.07 (3.92)
	-.07 (-.38)	.01 (.05)	-.27 (.28)	-.08 (-.28)	-.11 (-.40)
	-1.04 (-.17)	-2.62 (-.32)	-.66 (-.07)	-35.4 (-.71)	-26.7 (-1.09)
	7548	3803	3745	3088	4460

There was only one difference in dropout estimates between the young and old samples. The effect of time since dropout for school reasons was negative and significant for the young sample, but not for the old sample ($t=1.79$). There were also significant differences for Blacks ($t=1.87$) and for years sexually active ($t=1.75$). The previous difference has already been observed in the OLS models. The latter was not observed in the OLS models, but is not surprising. Sexual activity decreases in significance as it becomes normative.

The second set of models have revealed that while dropping out for school reasons leads to greater frequency of offenses, it does not lead to greater engagement in offending. On the other hand, dropping out for personal reasons does not lead to greater frequency of offenses but does lead to greater engagement in offending. These results can be reconciled by considering initial state of offending. The results for the logit models may be driven by those previously unengaged in crime, while the results for the OLS models may be driven by those previously engaged in crime. Thus, dropout may have different effects based on previous involvement in offending.

Random Effects Models

All of the models to this point, and all previous research on the dropout-delinquency relationship, are subject to omitted variable bias. Thus, the selection effect explanation has not been ruled out. It is possible that important variables, representing persistent differences between individuals, were omitted from this model. These variables may influence both dropping out of school and offending. Therefore, if they were included in the model, the relationship between dropout and offending would be

revealed as less important, possibly spurious. There are no additional variables from the NLSY97 survey to add to this model without introducing unacceptable sample attrition, but it is possible to account for persistent individual differences using the random effects model with panel data. Random effects models are applied to the first five waves of the NLSY97, with the results reported in Tables 5 and 6.

Where estimates are divided into “time constant” and “within variation,” the latter is interpreted as the effect of individual change in the variable, free from omitted variable bias, whereas the former reflects persistent differences between individuals subject to omitted variable bias. The random effects model also allows identification of the proportion of the error variance attributable to persistent unobserved heterogeneity. The regression diagnostic “rho” indicates that 24 percent of the total variance in offending is attributable to persistent within-individual differences that are not included in the model.

Generally, the conclusions drawn for the OLS models are confirmed using random effects models. That is, dropping out for school and “other” reasons increases frequency of offending and time since dropout attenuates this criminogenic effect. Within-individual variation in dropout for economic reasons, although it has a negative coefficient, is no longer significant. Notably, the “time constant” estimates for dropout are much larger than the “within variation” estimates. For example, the “time-constant” estimate for dropout for school reasons is 5 times greater than the “within variation” estimate. This shows that the significant results in the standard OLS models were primarily driven by persistent differences between individuals who drop out and those who do not. Even so, dropping out for school and “other” reasons has a criminogenic effect over and above the effect of these persistent differences, as evidenced by the

significant “within variation” estimate. On the other hand, the significant crime inhibiting effect of dropout for economic reasons found in the standard model is driven by significant differences between individuals who drop out for economic reasons and those who do not. The implications of these differing magnitudes are illustrated in Chart 1.

Estimates for the control variables echo those of the standard models, with two exceptions. The estimates for “time constant” and “within variation” effects of years of sexual activity reveal a particular strength of this kind of model. The OLS estimate for years of sexual activity was significant, but of small magnitude (.20). The random effects model disaggregates the effect of years of sexual activity into persistent between-individual differences in years of sexual activity, and within-individual change in years of sexual activity. For those youths who ever engaged in sexual activity before or during the five waves of data collection, the latter simply represents aging. The random effects model shows that youths who engage in sexual activity earlier commit more crime (the time constant estimate) whereas youths who engage in sexual activity commit less crime as they age. Similarly, the estimates for living in the south show that youths who live in the south tend to commit less crime than other youths, but moving to the south (within variation) tends to have a criminogenic effect, alternately, moving out of the South has a crime inhibiting effect.

Two additional variables were added to these models due to the nature of the data. “Exposure” reflects time between interviews. This variable is particularly necessary because the time between waves one and two averaged around 18 months whereas

subsequent waves were collected at one year intervals. The “wave” variable simply reflects the wave during which the data was collected.

Table 5. Estimates from random effects OLS models of frequency of offending

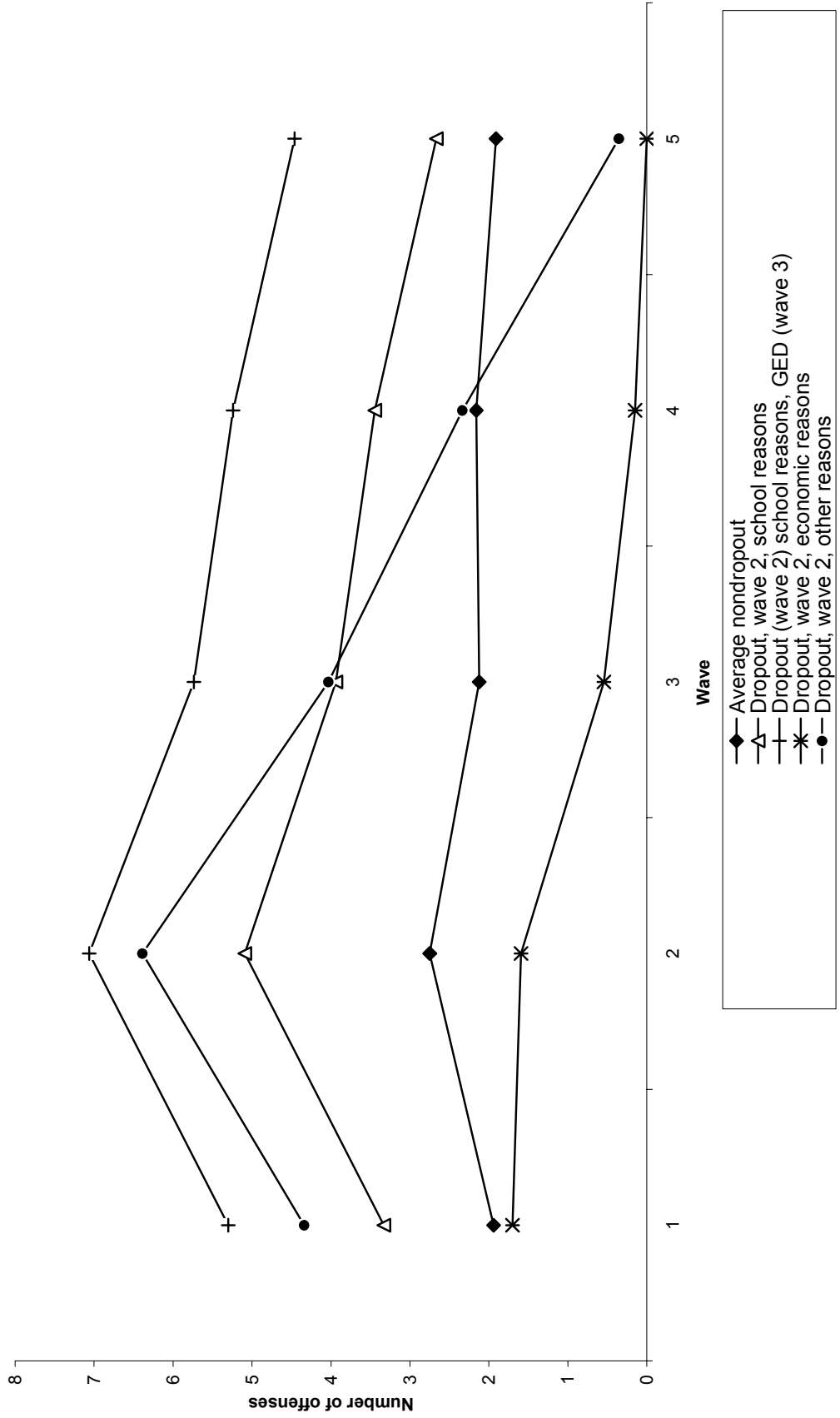
	All		Males		Females	
	Time Constant	Within Variation	Time Constant	Within Variation	Time Constant	Within Variation
Dropout – personal years since dropout	1.81 (1.25)	.55 (.91)	1.45 (.54)	2.13 (1.93)	2.16 (1.60)	-.19 (-.34)
Dropout – school years since dropout	-1.29 (-2.03)	-.26 (-.92)	-.20 (-.16)	-1.17 (-2.03)	-1.48 (-2.42)	-.09 (-.33)
Dropout – economic years since dropout	4.37 (5.33)	.88 (2.23)	4.95 (3.96)	1.29 (2.25)	3.40 (3.47)	.03 (.05)
Dropout – other years since dropout	-1.65 (-5.08)	-.51 (-3.34)	-1.80 (-3.50)	-.43 (-1.85)	-1.47 (-3.82)	-.50 (-2.56)
Missing school status	-2.97 (-1.67)	-1.00 (-1.26)	-4.30 (-1.88)	-.85 (-.78)	-.06 (-.02)	-1.08 (-.95)
Male	.75 (0.90)	-.41 (-1.06)	1.01 (.92)	-.61 (-1.09)	-.02 (-.02)	-.03 (-.05)
Age (wave 4)	1.80 (2.06)	1.16 (2.83)	1.58 (1.13)	1.62 (2.61)	2.22 (2.32)	.49 (1.02)
Age squared	-.10 (-.18)	-1.72 (-5.92)	.05 (.07)	-2.04 (-4.69)	-.59 (-.91)	-1.06 (-3.04)
Black	-1.02 (-1.28)		-1.21 (-.89)		-.91 (-1.18)	
Hispanic	.58 (4.59)					
Other	1.09 (3.02)		1.62 (2.77)		.53 (1.29)	
South	-.04 (-4.00)		-.06 (-3.42)		-.02 (-2.07)	
Mom<19 at birth	-1.28 (-7.41)	.85 (2.21)	-1.63 (-5.77)	.85 (1.34)	-.99 (-4.96)	.83 (1.96)
Years sexually active	-.37 (-2.05)		-.33 (-1.15)		-.44 (-2.25)	
Ever arrested	-.18 (-.34)		-.49 (-.55)		.38 (.63)	
Ever suspended	-.49 (-3.53)		-.67 (-3.01)		-.27 (-1.75)	
Ever retained	.12 (.64)		.20 (.68)		-.03 (-.14)	
Middle school grade	.37 (10.4)	-.27 (-4.73)	.40 (7.55)	-.32 (-3.57)	.35 (7.32)	-.22 (-3.27)
Missing m.s. grade	4.28 (20.0)	3.13 (12.7)	4.66 (14.8)	3.19 (9.11)	3.50 (12.7)	3.17 (9.25)
In high school	1.65 (10.1)	1.24 (4.42)	1.77 (7.13)	.95 (2.22)	1.45 (7.42)	1.70 (4.95)
College track	-.53 (-2.77)	-.36 (-.95)	-.58 (-2.01)	-.10 (-.16)	-.50 (-2.19)	-.71 (-1.54)
Vocational track	-.17 (-4.05)		-.18 (-2.66)		-.17 (-3.39)	
Missing track	1.52 (2.78)		1.61 (1.94)		1.25 (1.85)	
GED	-.09 (-.56)		-.30 (-1.17)		.14 (.78)	
Highest grade parent	-.15 (-.78)	-.06 (-.47)	-.19 (-.58)	-.11 (-.50)	-.19 (-.90)	-.02 (-.14)
Miss high grd parent	.11 (.39)	.17 (.89)	-.13 (-.29)	.28 (.97)	.43 (1.21)	.02 (.09)
Exposure	-.08 (-.46)		-.05 (-.17)		-.13 (-.59)	
Wave	3.11 (3.52)	-.17 (-.39)	5.07 (3.70)	-1.31 (-1.89)	-.22 (-.21)	1.58 (2.90)
Constant	.12 (5.16)		.14 (3.66)		.10 (3.97)	
	-.48 (-1.47)		-.74 (-1.40)		-.23 (-.62)	
	1.07 (7.86)		1.15 (5.29)		.97 (6.20)	
	.37 (6.16)		.34 (3.45)		.41 (5.94)	
	-8.65 (-2.72)		-12.5 (-2.47)		-3.91 (-1.08)	
N (person-waves)	39562		20053		19509	
N (individuals)	8457		4319		4138	
Rho	.242		.241		.237	

Dividing the sample by gender revealed several differences. First of all, although dropout for personal reasons has no effect in the total sample, it has a criminogenic effect on males. The estimates for males and females are significantly different ($t=1.87$) as are

the estimates for time since dropout for personal reasons ($t=1.71$) and dropout for school reasons ($t=1.65$). Among the control variables, the estimate for Blacks was significantly different between males and females ($t=1.84$). Also, the estimate for the time-constant portion of “ever arrested” was significantly different ($t=2.77$) as were both time-constant and within variation for the GED dummy variable ($t=3.06$ and 3.28 respectively).

In order to illustrate the effect of dropout, predicted offending levels for various cases are reported in Chart 1. All control variables were set at their means, and only the values of dropout variables were changed to estimate predicted levels of offending. Dropouts for school reasons are predicted to have higher offending rates for all five waves relative to non-dropouts. This reflects the time-invariant coefficient for school dropout. Those who receive a GED after dropout are predicted to have even higher levels of offending than regular dropouts. It is not clear why this would be the case. Dropouts for economic reasons have less offending than other individuals across all five waves. Dropouts for school reasons are expected to report their highest frequency of offending in the wave when they first drop out. On the other hand, dropouts for economic reasons report lower offending in the year of dropout, and continued lower offending thereafter. It must be noted, however, that these predicted levels for economic dropouts are based on non-significant estimates.

Chart 1. Predicted number of offenses based on random effects OLS model



Random effects logit models, reported in Table 6, allow assessment of the effect of omitted variable bias on the standard logit model estimates. First, the rho estimate shows that 37.4% of the variance in prevalence of offending is due to individual heterogeneity. This is higher than the estimate drawn from the random effects OLS models, indicating that more of the variation in prevalence of offending is attributable to persistent unobserved individual differences. Second, the significant criminogenic effect of dropout for personal reasons observed in the standard logit model is due to stable differences between individuals because the within-variation estimate of dropout for personal reasons is not significant with the “time constant” estimate is. The only marginally significant “within variation” dropout effect observed in the full sample is for time since dropout for school reasons. The main “within variation” effects for dropout for school , economic and other reasons are not significant. That within-variation estimate for dropout for school reasons was not significant confirms the finding from the standard models that dropping out for school reasons increases the frequency of offending while not increasing the probability of offending. The “time constant” estimate for dropout for school reasons is significant, indicating that differences in prevalence of offending between dropouts for school reasons and other individuals are due to persistent individual differences rather than dropout itself.

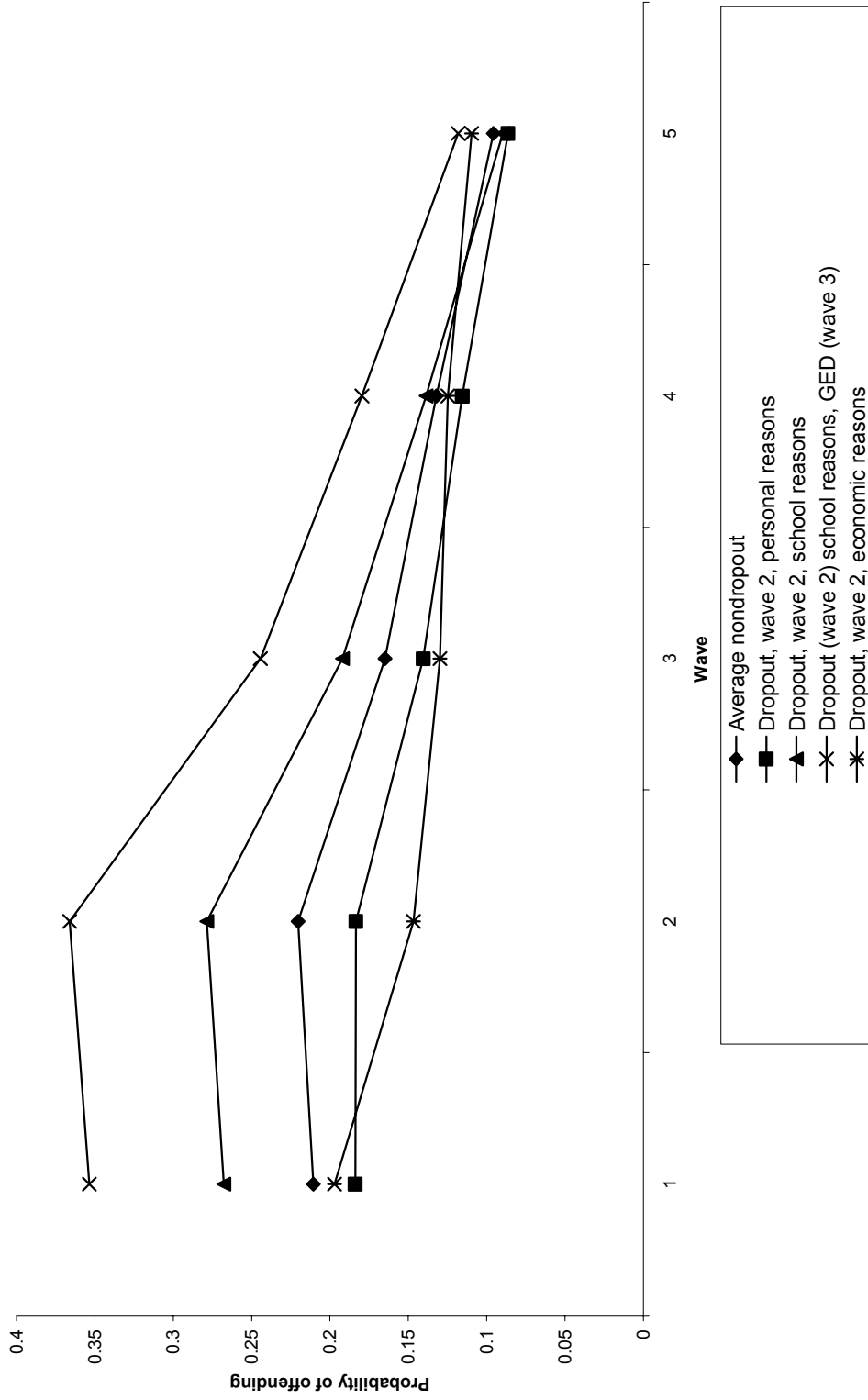
There were no significant differences between males and females on the effects of dropout. However, the difference in estimates for “within variation” in time since dropout for school reasons was significant ($t=2.63$). The estimates for “time constant” variation in years of sexual activity was significantly different for males and females ($t=4.48$). The crime inhibiting effect of higher middle school grades was stronger for

females ($t=2.84$). Finally, switching to vocational track was found to be criminogenic for males but not females ($t=2.03$).

Table 6. Estimates from random effects logit models of prevalence of offending

	All		Males		Females	
	Time Constant	Within Variation	Time Constant	Within Variation	Time Constant	Within Variation
Dropout – personal years since dropout	1.06 (2.00)	-.14 (-.65)	1.12 (1.36)	.03 (.09)	.63 (.90)	-.27 (-.95)
Dropout – school years since dropout	-.88 (-3.24)	.06 (.44)	-.69 (-1.64)	.04 (.17)	-.91 (-2.56)	.04 (.26)
Dropout – economic years since dropout	.79 (2.42)	-.08 (-.55)	.87 (2.15)	-.18 (-.92)	.75 (1.41)	.15 (.57)
Dropout – other years since dropout	-.42 (-3.10)	-.11 (-1.66)	-.38 (-2.21)	.01 (.16)	-.55 (-2.44)	-.37 (-3.05)
Missing school status	-.69 (-.99)	-.50 (-1.59)	-.27 (-.37)	-.63 (-1.82)	-1.15 (-.72)	-.12 (-.22)
Male	.30 (.88)	.23 (1.43)	-.04 (-.09)	.32 (1.70)	.84 (1.09)	.10 (.35)
Age (wave 4)	.28 (.86)	-.03 (-.18)	.55 (1.27)	-.18 (-.94)	.01 (.01)	.28 (1.11)
Age squared	-.21 (-.97)	.02 (.15)	-.24 (-.91)	.13 (.91)	-.21 (-.56)	-.18 (-.93)
Black	-.65 (-1.85)		-.70 (-1.52)		-.62 (-1.18)	
Hispanic	.36 (6.96)					
Other	.78 (4.92)		.76 (3.69)		.84 (3.33)	
South	-.03 (-6.29)		-.03 (-4.63)		-.03 (-4.44)	
Mom<19 at birth	-.47 (-6.85)		-.56 (-6.15)		-.33 (-3.11)	
Years sexually active	-.21 (-2.77)		-.21 (-2.21)		-.18 (-1.52)	
Ever arrested	.01 (.05)		.03 (.08)		-.13 (-.39)	
Ever suspended	-.14 (-2.51)	.24 (1.45)	-.14 (-1.87)	.14 (.63)	-.15 (-1.71)	.43 (1.72)
Ever retained	-.01 (-.14)		.00 (-.02)		-.02 (-.15)	
Middle school grade	.16 (10.7)	-.21 (-8.44)	.12 (6.79)	-.24 (-7.63)	.26 (9.73)	-.16 (-3.83)
Missing m.s. grade	1.48 (18.4)	.67 (7.56)	1.49 (15.3)	.67 (6.30)	1.49 (10.7)	.68 (4.24)
In high school	1.01 (15.8)	.35 (3.35)	.96 (11.9)	.36 (2.72)	1.08 (10.3)	.32 (1.90)
College track	-.20 (-2.69)	-.23 (-1.60)	-.20 (-2.24)	-.06 (-.31)	-.13 (-1.04)	-.50 (-2.14)
Vocational track	-.10 (-5.87)		-.05 (-2.49)		-.15 (-5.59)	
Missing track	.26 (1.23)		.27 (1.03)		.26 (.72)	
GED	-.10 (-1.42)		-.05 (-.59)		-.15 (-1.43)	
Highest grade parent	-.05 (-.65)	.08 (1.43)	-.02 (-.14)	.09 (1.28)	-.06 (-.46)	.05 (.55)
Miss high grd parent	.20 (1.77)	.15 (2.00)	.17 (1.20)	.27 (2.80)	.24 (1.27)	-.05 (-.43)
Exposure	-.13 (-1.77)		-.15 (-1.57)		-.12 (-.98)	
Wave	.58 (1.64)	-.09 (-.52)	.54 (1.24)	-.23 (-1.01)	.57 (.99)	.17 (.57)
Constant	.06 (6.39)		.06 (4.89)		.06 (4.10)	
	-.09 (-.66)		-.09 (-.51)		-.10 (-.45)	
	.29 (5.30)		.28 (3.95)		.31 (3.58)	
	.08 (2.89)		.06 (1.68)		.12 (2.84)	
	-7.92 (-5.81)		-7.70 (-4.36)		-7.86 (-3.66)	
N (person-waves)	39759		20181		19578	
N (individuals)	8476		4330		4146	
rho	.372		.349		.394	

Chart 2. Predicted Probability of offending based on random effects logit model



Predicted probabilities of offending based on the random effects logit model are reported in Chart 2. There is a considerable drop in the predicted probability of offending in the wave of dropout for economic reasons as opposed to stable or increasing probability of offending for all other groups. It must be noted, however, that differences in changes in predicted probabilities between these groups are based on non-significant estimates. However, “time constant” differences, which are expressed over all five waves, are based on significant estimates. Interestingly, after wave 2 the predicted probability of offending steadily drops for all groups. By wave 5, there is very little substantive difference in the predicted probability of offending for wave 2 dropouts as opposed to non-dropouts. This, along with the non-significant estimates for “within variation” suggests that the direct effect of dropout on subsequent offending, if any, is not long-lasting.

CHAPTER IV. DISCUSSION

The results of analysis did not contradict previous research, but specified the relationship between dropout and delinquency more precisely. Because four different statistical models were applied to several distinct samples, a summary of the results are given in Table 7. The standard OLS model, similar to previous research, shows that dropout for school reasons leads to increased frequency of offending relative to non-dropouts. However, this model also revealed that dropout for economic reasons leads to decreased frequency of offending. This is the first study which examines time since dropout for different kinds of dropout. In general, time since dropout has the opposite effect of the main dropout estimate, indicating a decay of the effect of dropout over time. Few gender differences were found for dropout effects. The estimate of dropout for economic reasons was significant for both genders, but significantly stronger for males. There were no significant differences in dropout effects between the older and younger halves of the sample.

Standard logit models reveal the effect of dropout on prevalence of offending. In the logit model, the effect of dropout for school reasons was not significant, while the effect of dropout for personal reasons was. This suggests that—for those without offending histories—dropout for personal reasons has a criminogenic effect; while for those with offending histories, dropout for school reasons has a criminogenic effect. This kind of effect is not predicted by any particular theoretical perspective. However, this is not the first study to reveal a criminogenic effect of dropout for personal reasons.

Table 7. Summary of empirical results

Sample	Model	Type of dropout									
		personal		school		economic		other			
		between effect	within effect	between effect	within effect	between effect	within effect	between effect	within effect		
All	Standard OLS	0	0	++	++	--	0	0	0	0	++
	Random Effects OLS	0	0	++	++	-	0	0	0	0	++
	Standard Logit	++	0	0	0	--	0	0	0	0	0
Males	Random Effects Logit	++	0	++	0	0	0	0	0	0	0
	Standard OLS	0	++	+	++	--	0	0	0	0	++
	Random Effects OLS	0	++	++	++	-	0	0	0	0	0
Females	Standard Logit	0	0	0	0	0	0	0	0	0	0
	Random Effects Logit	0	0	++	0	0	0	0	0	0	0
	Standard OLS	0	0	0	0	--	0	0	0	0	0
Young	Random Effects OLS	0	0	++	0	0	0	0	0	0	0
	Standard Logit	+	0	0	0	-	0	0	0	0	0
	Random Effects Logit	0	0	0	0	0	0	0	0	0	0
Old	Standard OLS	0	0	0	0	--	0	0	0	0	0
	Standard Logit	0	0	0	0	--	0	0	0	0	0
	Standard Logit	++	0	0	0	-	0	0	0	0	0

0 no significant effect, + positive effect $t > 1.64$, ++ positive effect $t > 1.96$, - negative effect $t < -1.64$, -- negative effect $t < -1.96$
 Note: A blank indicates that effect was not estimated.

Jarjoura (1993) found that dropout because of pregnancy or marriage led to increased violent offenses.

Recognizing the vulnerability of standard models to criticisms of spurious results due to selection effects, random effects models were estimated. With one exception, the random effects models confirm the results of the standard models. Dropping out of high school is not a uniformly criminogenic event. Those youths who reported that they dropped out for school or “other” reasons tended to commit a greater number of crimes after dropout. However, those youths who reported having dropped out for personal or economic reasons had no significant change in level of offending after having dropped out. This differs from the standard model in that the crime inhibiting effect of dropout for economic reasons was not evident. The “time constant” coefficient for dropout for economic reasons was large and significant for males, indicating that the significant coefficient in the standard model may have been driven by selection effects, especially among males.

Dropout for school reasons tended to increase the frequency of offending, but not the prevalence of offending. This could be due to different effects of dropout for school reasons conditional on initial involvement in offending. That is, dropout for school reasons is only criminogenic for those individuals who are involved in crime before dropping out. It does not cause individuals to begin offending.

Separating the variation in time-varying variables in the random effects models allowed assessment of the effect of a change in the variable as opposed to differences between individuals. This kind of model makes it possible to assess the individual effect of dropping out for school reasons—called “within variation”—and the stable differences

in offending between those individuals who dropout and those who do not—called “time constant” variation. This analysis revealed that while the “within variation” is significant, it is small in magnitude compared to the “time constant” variation. For example, the random effects OLS model indicates that dropping out for school reasons, on average, increases an individual’s frequency of offending by nearly one offense. On the other hand, the model also shows that an individual who drops out for school reasons in wave 2, and stays dropped out for the next three waves, is expected to commit about 3.5 more offenses³ than a non-dropout *every wave*. The magnitude of the temporary criminogenic effect of dropout pales in comparison to the stable differences in criminal involvement between those individuals who drop out and those who do not.

All significant effects of dropout were accompanied by significant attenuating effects of time since dropout, indicating that the effect of dropout on delinquency decays over time. Significant gender differences were observed in the effect of dropout for personal and school reasons, both of which were criminogenic for males but not females. This study shows that dropout for school or “other” reasons maintains a significant effect on offending independent of persistent unobserved individual heterogeneity. However, it also shows that differences in offending levels between those who drop out for school or “other” reasons and those who do not dropout are largely attributable to stable between-individual differences rather than the act of dropout itself.

The results reported here emphasize the futility of simple theoretical explanations for the dropout-delinquency relationship. Explanations must be contextual, taking into

³ The coefficient for dropout for school reasons (4.37) is multiplied by .8 in this case because the individual is in dropout status for four waves and the values used for “time constant” variation are the average for all five waves. If an individual was a dropout for school reasons for all five waves, one would multiply the estimate by one, whereas if an individual dropped out for school reasons in wave five, the coefficient is multiplied by .2.

account reasons for dropout. In certain contexts, dropout causes more offending, while in other contexts, it has no effect. Youth who drop out because of dislike for school, or other school-related reasons, tend to commit more crime after dropping out. On the other hand, there appears to be no effect of dropping out for personal or economic reasons on offending. The classical strain theory explanation fails to account for these different effects. Strain theory would predict that those who drop out because they dislike school would experience less strain after having dropped out, and would commit less crime after dropout. Control theory would predict that dropout for work or personal reasons would have no effect on offending if the sum of social bonds remained the same. Assuming that the social bonds lost due to dropping out of school is the same for all groups of dropouts, the group that goes on to an occupation, or to start a new family, may establish new social bonds that the other groups whose post-school experiences are unknown do not. Rational choice theory can explain the differences between these groups as well. The group which leaves school in order to work may perceive greater costs of offending (losing a job) than the group which drops out for school reasons. The latter group may perceive very little cost to offending, as their educational and economic prospects may appear very dismal.

While either control theory or rational choice theory may be used to explain the results found in this study, neither perspective presents any advantages over the other for this purpose. Selection effects explain the bulk of the difference between dropouts and non-dropouts in offending. The much smaller temporary criminogenic effect of dropout for school or “other” reasons may be explained by any number of theories, but this explanation is less interesting, and perhaps less important, than explaining the persistent

differences between those youths who drop out and those who do not. Prior research, reviewed in Chapter I, has shown that differences between youths who drop out and those who do not are evident as early as first grade (Ensminger & Slusarick, 1992; Alexander et al., 2001). In addition, several researchers have suggested that dropout is the culmination of a process of disengagement from school, the signs of which are evident quite early in the school career (Stroup & Robins, 1972; Finn, 1989). This research has more clearly identified the independent effect of dropout on delinquency. It calls for further research into the persistent differences between dropouts and non-dropouts by identifying the relative magnitude of stable differences in offending between dropouts and non-dropouts, and temporary changes in offending among dropouts. The temporary changes in offending due to dropout are much smaller than the persistent differences in offending between dropouts and non-dropouts.

One shortcoming of this study is its omission of two key variables known to affect both offending and school outcomes: socioeconomic status, and intelligence.

Unfortunately, the data set did not provide measures of these two constructs without substantial differential attrition. These omissions bias the standard models and the “time constant” estimates in the random effects models. Designers of the NLSY97 survey allowed respondents to state only one reason for leaving school. This forces respondents to choose only one reason for leaving school, when in fact there may have been several reasons for leaving school. The High School & Beyond survey allows respondents to report as many reasons for leaving school as they wish. On average, dropouts who were sophomores in 1980 reported two reasons for dropping out (U.S. Department of Education, 1983). Allowing respondents to report more than one reason for dropout

could allow researchers to conduct more nuanced research into the phenomenon. It is likely, however, that dropouts in the NLSY97 report the most important reason for dropping out, and that differences in reasons reported for dropout are meaningful. In addition, attempting to incorporate multiple reasons into the analysis may result in categories of dropouts with too few numbers to analyze. This study makes the assumption that there is a qualitative difference between individuals who report a school-related reason for dropout as opposed to an economic-related reason for dropout. The analysis provides evidence for this difference in terms of predicted number of offenses. It does not appear, therefore, that much is lost by forcing respondents to report only one reason for dropout, and it is unclear what would be gained by allowing them to report multiple reasons.

Another limitation inherited from the data set is invalidity of offending data with respect to race. That is, there appears to be significant under-reporting of crime by minorities (Bushway et al., 2000). Although several studies have found significantly different educational processes for different races (Voelkl, Welte & Wieczorek, 1999; Lotz & Lee, 1999), this study is not able to address race differences. Also, the coefficients for race are biased by under-reporting of offending by minorities.

While this study was able to assess the affect of dropout in any of the NLSY97's first five waves, it did not distinguish between those individuals who remain dropped out and those who return to school—commonly called “stopouts.” The effect of stopout and dropout are combined in the estimated models, primarily because there was not enough statistical power to estimate the effect of stopout for economic reasons as there were too

few cases. The effect of stopout could be assessed at the expense of differentiation between dropouts by stated reason for dropout.

The random effects models used in this study require the assumption that the time-constant error term, τ_i , is drawn from a normal distribution (Greene, 1999). If this assumption is violated, the estimates may be biased. This assumption of the random effects model can be relaxed using non-parametric statistical modeling. It is possible that such models would yield different results from those reported here.

The greatest strength of this study is that it assesses the alternative explanation of selection effects—that the apparent effects of dropout are simply due to unmeasured pre-existing differences between individuals. The random effects model is able to control for stable pre-existing differences between individuals, allowing one to test the selection effect explanation. In this representative sample of United States 12 to 16-year olds in 1996 it was found that dropout had a significant effect on offending independent time-constant variation, and unobserved heterogeneity. However, the magnitude of “time constant” dropout effects was much greater than “within variation” effects, indicating that the bulk of the difference in offending between offenders and non-offenders is due to stable differences between the two groups rather than dropout itself.

While this study identifies significant dropout effects, it appears that the direct effect of dropout is temporary, dissipating over the course of several years. Life course researchers study “trajectories” which are thought of as paths of development in a particular domain over the life span (Sampson & Laub, 1992). Individuals have distinct work, offending, family, health, and other trajectories. Exogenous events, such as school dropout, are assessed according to the degree to which they divert life course trajectories.

This research has shown that dropout diverts the offending trajectory for at least a few years after the dropout event occurs. Also, those individuals who drop out for school reasons tend to commit more crime across all five waves, reflecting the significant between-individual estimate for school dropout. Dropout for “other” reasons appears to have a shorter criminogenic effect. Inferences about the staying power of dropout effects can only be made to about three years due to limitations of the data. It is quite likely that dropout affects other important life course trajectories which, in turn, affect offending. For example, dropout may have a permanent effect on work trajectories, thus influencing offending trajectories indirectly. This study does not examine the effect of dropout on work outcomes, thus it is not able to assess the indirect effects of dropout on offending trajectories.

This study suggests a number of lines of research for future studies. First, future research should focus on assessing the differences between different kinds of dropouts and non-dropouts. It appears that early identification of potential dropouts may be a fruitful avenue of research which could be used to reduce the detrimental outcomes associated with dropout. This would require a longitudinal data set which collects data much earlier in individuals’ lives than the NLSY97. Second, a theoretical model of dropout should be created which will serve as a framework for future research on the subject. Finn’s (1989) model of disengagement from school seems like a good starting point. Future research on dropout could then directly test and refine theory rather than ignore it, or pit two unsatisfying theories against one another. Third, future research should distinguish between stopouts and dropouts. Many of the “dropouts” identified in this research and past research were really stopouts who later returned to school. It is

likely that the effect of permanent dropout is different from that of temporary dropout. Finally, the effect of dropout on work trajectories, and especially the development of school, offending and work trajectories during the transition to adulthood should be explored. Dropout may have both a direct effect on offending and an indirect effect on offending through its effect on work outcomes. The period of adolescence and the transition to adulthood is a key developmental context within which to study these processes.

APPENDIX

Table 8. Correlation matrix of variables included in models (5 waves pooled, weighted)

Variable Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
(1) Offending frequency	.48																					
(2) Offending prevalence	.02	.00																				
(3) Dropout – personal	.08	.05	-.03																			
(4) Dropout – school	.00	.01	-.01	-.02																		
(5) Dropout – economic	.05	.03	-.02	-.04	-.02																	
(6) Dropout – other	.05	.02	.09	.23	.12	.22																
(7) GED	.10	.12	-.06	.05	.03	.02	.02															
(8) Male	-.01	-.09	.08	.13	.08	.08	.12	.00														
(9) Age	-.02	.00	.03	.00	-.01	.04	.00	-.01	.00													
(10) Black	.00	-.01	.01	.02	.04	.01	-.01	.02	.00	-.16												
(11) Hispanic	.00	.01	-.01	.01	.00	.00	-.01	.00	.00	-.05	-.04											
(12) Other (race/ethnicity)	-.03	-.02	.03	.04	.01	.02	.02	-.02	-.01	.25	-.05	-.01										
(13) South	.02	.02	.06	.04	.01	.03	.02	.00	.02	.13	.03	.01	.06									
(14) Mom<19 at birth	.12	.08	.13	.20	.09	.13	.15	.06	.52	.14	.03	.01	.08	.09								
(15) Years sexually active	.24	.22	.09	.18	.07	.13	.12	.14	.17	.04	.02	.00	.00	.07	.33							
(16) Ever arrested	.18	.22	.09	.19	.06	.12	.10	.19	.10	.21	.05	.01	.05	.11	.32	.33						
(17) Ever suspended	.05	.05	.11	.16	.07	.10	.07	.08	.11	.14	.03	.00	.09	.09	.21	.16	.24					
(18) Ever retained	-.13	-.16	-.09	-.19	-.06	-.11	-.08	-.18	-.01	-.13	-.08	.00	-.03	-.10	-.23	-.23	-.39	-.29				
(19) Middle school grade	-.06	-.06	-.07	-.12	-.04	-.07	-.05	-.06	.15	-.03	-.07	.01	.04	-.06	-.07	-.10	-.16	-.15	.29			
(20) College track	.02	.03	.00	.01	.02	.01	.02	.05	.13	.07	-.02	.00	.03	.03	.12	.04	.08	.06	-.09	.10		
(21) Vocational track	.00	.00	-.08	-.11	-.06	-.07	-.02	.01	.00	-.12	-.27	.02	-.09	-.15	-.14	-.08	-.19	-.16	.27	.19	-.08	
(22) Highest grade parent																						

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