

FACTORS INFLUENCING THE COMPLETION OF THE GED

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CORRECTIONAL SETTING  
A MULTIPLE REGRESSION CORRELATION-PREDICTIVE STUDY

by  
Kimberly Akers  
Liberty University

A Dissertation Presented in Partial Fulfillment  
Of the Requirements for the Degree  
Doctor of Education

Liberty University  
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## ABSTRACT

Kimberly J. Akers. Factors Influencing the Completion of the GED in a Federal Correctional Setting: A Multiple Regression, Correlational-Predictive Study (under the direction of Dr. Holder) School of Education, Liberty University, January 2012.

Correctional education's primary goal is to reduce recidivism and increase employment among ex-offenders. The Bureau of Prison's practical goal in its mandatory GED program is to maximize the number of inmates obtaining the GED in a given time period. The purpose of this research is to model the number of instructional hours an inmate requires to obtain the GED as a regression on socio-demographic and Bureau of Prison policy variables related to inmate conduct in education programs. This quantitative research uses multiple regression to produce and analyze the model. An archival random sample of GED graduates in a large federal correctional complex is selected, the model fit and diagnosed, and a hold-out sample tested for predictive reliability. Any conclusions regarding policy alternatives for the Bureau of Prisons will then be drawn. Such alternatives may lead to improvements in general criminal justice and in correctional education in particular.

Descriptors: GED, good conduct time, instructional hours, GED UNSAT, GED SAT, Federal Correctional Institute, recidivism, custody classification points

## ACKNOWLEDGEMENTS

This dissertation is dedicated to my son Cameron Paul Akers (3-28-83 to 02-14-2012) who I carry in my heart every day and my father Melvin Akers (01-23-1922 to 06-05-2012) who taught me perseverance and humility.

I would like to acknowledge Liberty University for providing the means and opportunity to pursue my educational dreams. The professors and people that I have been blessed to have met while at Liberty University have enriched my life. I am so thankful for all the support I was given while working toward this degree.

I would like to thank Dr. David Holder who has been there for me every step of the way. To Dr. Ellen Black, I will never forget you for being there when one mother needed the compassion of another. My children Jada and Jordan Akers as well as my mother and father Katherine and Melvin Akers for instilling in me the necessary fortitude to go on when I wanted to quit. Thank you WD for your unwavering support during this project, editing this paper and for being an invaluable resource. I would also like to thank my committee members Dr. David Bender and Dr. Anthony Kozis for overseeing this process. Finally I would like to thank Troy Nutall who was there for me during my darkest of days and nights and continues to be my rock.

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## Table of Abbreviations

General Equivalency Diploma-GED  
Federal Bureau of Prisons-BOP  
Good Conduct Time-GCT  
Pre-Release Date-PRD  
Federal Correctional Complex-FCC  
Adult Basic Education-ABE  
Special Learning Needs-SLN  
English as a Second Language-ESL  
Test of Adult Basic Literacy-TABE  
Post-Secondary Correctional Education-PSE  
Vocational Training-VT  
Federal Prison Industries-FPI  
Pre-Sentence Investigation-PSI  
Inmate Skills and Development System-ISDS  
Principle Investigator-PI  
Means Squared Predictor Error-MSPR  
Mean Squared Error-MSE  
Variance Inflation Factor-VIF  
Root Mean Square Error-RMSE

## CHAPTER ONE: INTRODUCTION

### Background

This study determines a multiple regression model for predicting the number of instructional hours an inmate requires to complete a GED given certain socio-economic and correctional policy variables. This chapter is an introduction to the study, formulating purpose, problem statement and research questions and hypotheses. It also identifies the explanatory variables and discusses the significance and limitations of the study.

The goal of correctional education is to aid in the rehabilitation of the offender. In the federal correctional system, the Federal Bureau of Prisons (BOP) requires that “an inmate confined in a federal institution who does not have a verified General Equivalency Diploma (GED) credential or a high school diploma is required to attend an adult literacy program for a minimum of 240 instructional hours or until a GED is achieved, whichever comes first” (Federal Bureau of Prisons [BOP], 2003, p. 1). Upon entry into a federal correctional institution, an inmate’s Unit Team, a group of BOP staff whose role is to guide the inmate through incarceration, or the institution’s Education Department notifies those inmates who are required to enroll in a GED program. Depending upon the availability of class space, the inmate is either placed in a GED class or placed on a waiting list in order to be added to a class when space becomes available. Space may become available for an inmate when a currently enrolled inmate is awarded a GED, transfers to another institution, completes a sentence, or withdraws after completing the mandatory 240 hours.

An inmate within the BOP vests good conduct time (GCT) of 54 days per year of sentence served. Certain disciplinary actions may result in loss of GCT. An inmate who receives disciplinary action for a prohibited act while in the Education Department and enrolled in GED

or who withdraws from the GED program after the mandatory 240 instructional hours may lose up to 12 days per year GCT. Once an inmate is sanctioned for a prohibited act, the inmate is assigned a GED UNSAT, denoting unsatisfactory progress and the loss of GCT. That inmate will have to complete an additional 240 hours of instructional time with no further disciplinary sanctions in order to begin to vest the full GCT. Those students who comply with the policy and rules while in the education program and a GED class are assigned a code of GED SAT, denoting satisfactory progress. The logic behind the requirement for GED classes is stated in BOP policy as, “A high school diploma is the basic academic requirement for most entry level jobs” (BOP, 2003, p. 1). However, there is no specifically stated reason for using loss of GCT to encourage participation in the GED program. Education departments at BOP facilities assume that the assignment of a GED UNSAT code will deter an inmate from committing a prohibited act again or encourage continued enrollment in the GED program. Presumably, greater effort would increase the likelihood of an inmate receiving the GED while incarcerated, other things equal.

Alternatively, loss of GCT for a GED UNSAT progress assignment may lead to greater disruptive behavior affecting the progress and effort of inmate students with a GED SAT progress assignment. Morale of inmate students, inmate tutors, and staff teachers could suffer. The likelihood of obtaining the GED for any inmate student could decrease. Finally, the number of open positions for inmates on the GED waiting list is reduced if an inmate student with little desire to obtain a GED remains in the program merely to maintain the progress assignment of GED SAT and vest all GCT.

**Problem Statement**

This study examines whether current BOP policy is useful in maximizing the number of inmates who obtain the GED while incarcerated by examining what variables explain the number of instructional hours an inmate requires to obtain the GED. Successful completion of the GED program while incarcerated has been linked to reduced recidivism (Aos, Miller, & Drake, 2006; French & Gendreau, 2006; Gaes, 2008; Harlow, Jenkins, & Steurer, 2010; Steurer & Smith, 2006; Wade, 2007) and to higher employment rates and wages (Gaes, 2008; Tyler & Kling, 2007). This study poses the question, “what variables correlate with the number of instructional hours required to obtain the GED while incarcerated?” By identifying such factors, BOP policy alternatives may be considered to place inmates in class according to the length of time required to complete the GED as predicted by the model. As a result, the number of inmates completing the GED in a fixed period of time is maximized, allowing for advanced programming such as vocational trades or post-secondary education, reducing recidivism, and increasing employment. All these factors benefit both the inmate and society economically and socially.

**Purpose Statement**

The purpose of this correlational-predictive study is to identify variables that predict the number of instructional hours that an inmate requires to obtain the GED using regression on a BOP policy variable controlling for inmate socio-demographic variables. By using the resulting model, BOP selection policy alternatives can be considered to maximize the number of inmates obtaining the GED in a given time period; this is especially important given the limited physical and personnel resources and declining fiscal budgets in a criminal justice culture that results in an ever-increasing number of inmates. Assuming that an inmate’s GED SAT or UNSAT progress assignment is a significant factor in the number of hours required to successfully

complete the GED program, possible alternative policies to increase the number of inmates completing the GED include (a) allowing an inmate to withdraw from the GED program after the mandatory 240 hours of instruction without loss of good conduct time; (b) allowing an inmate on the waiting list to enter the GED program based on predicted number of hours to complete the GED rather than the inmate's pre-release date (PRD); (c) allowing an inmate to enter the GED program based on a desire to participate rather than by PRD; and (d) applying positive reinforcement in the form of extra GCT for successfully completing the GED program.

### **Significance of the Study**

An inmate student withdrawing from a GED class after completing the mandatory 240 instructional hours or receiving a disciplinary sanction while enrolled in the GED program receives a progress assignment of GED UNSAT. Under current BOP policy, inmate students who receive a progress assignment of GED UNSAT are denied a portion of their GCT. The goal of the BOP GED program is to ensure that each inmate without a GED or high school diploma obtains a GED prior to release back into society (BOP, 2003). From a practical point of view, the realistic goal is to maximize the number of inmates who obtain a GED prior to release. The current policy of denying GCT to an inmate who withdraws from the GED program is punitive in nature as it effectively extends the length of time the inmate is incarcerated. The loss of GCT is in itself a form of negative reinforcement which caters to the negative experiences that the individual has had with education. This research considers the possibility that current policy hinders the maximization of the number of inmates obtaining the GED prior to release.

The study may provide the first quantitative evidence that the practical goal is not being met; no previous study has been undertaken to make this determination. It is anticipated that this study will show that current policy: (a) increases the number of instructional hours required to

complete GED while incarcerated; (b) increases the waiting list length and time that an inmate must wait to be enrolled in GED; and (c) reduces productivity, measured by number of inmates completing the GED in a given time interval, of inmate tutors, staff teachers, and administrators. One possible alternative is to use positive reinforcement in the form of additional GCT. Such a policy is currently used for successful completion of the Residential Drug Abuse Program (Federal Bureau of Prisons [BOP], 2009).

If this study can offer alternatives to achieving the practical goal of maximizing the number of inmates who obtain the GED prior to release, it will not only make a significant contribution to the literature on correctional education, but also to corrections policy and social welfare.

### **Research Questions**

This study will examine the following research questions:

1. What variables correlate with the number of instructional hours required to complete the GED while incarcerated?
2. Can variables that correlate with the number of instructional hours be used to predict if an inmate will receive a GED SAT or UNSAT progress assignment once enrolled in the GED program?
3. Do any policy alternatives to selection of federal correctional GED students become apparent?

### **Research Hypotheses**

H<sub>01</sub>: The mean number of instructional hours required to complete the GED does not depend upon the inmate's race.

H<sub>02</sub>: The mean number of instructional hours required to complete the GED does not depend upon the inmate's progress assignment.

H<sub>03</sub>: The mean number of instructional hours required to complete the GED does not depend upon the inmate's familial status.

H<sub>04</sub>: The mean number of instructional hours required to complete the GED does not depend upon the inmate's type of crime.

H<sub>05</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's age.

H<sub>06</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's grade level prior to incarceration.

H<sub>07</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's sentence length.

H<sub>08</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's TABE test scores.

### **Identification of Variables**

The primary dependent variable in this study is the number of instructional hours required to complete the GED while incarcerated, denoted by HOURS. An instructional hour accrues to a student when he spends 60 instructional minutes in the GED classroom. BOP records contain this information and are available to all BOP staff in any facility. If an inmate is transferred to a different facility, his records follow him. Transfers occur for medical, security, disciplinary, or family reasons. The latter refers to moving an inmate closer to immediate family to encourage family ties.

The independent variables can be split into exogenous ones for an individual inmate and controllable policy variables determined by the BOP. Specifically, these variables are chosen based on the researcher's experience as a member of the BOP Department of Education.

- **RACE:** A discrete binary random variable that records an inmate's race. The categories used are Caucasian or non-Caucasian. The categories of Caucasian and non-Caucasian are chosen because the BOP records an inmate's race as White, Black, Native American, Asian, or other, and Native American, Asian, and other total less than 9% of the BOP population ([www.bop.gov/news/quick.jsp](http://www.bop.gov/news/quick.jsp)). The accessible population at FCC Butner has an insufficient population of these three races on which to draw a sample. Additionally, the BOP does not record Hispanic as a race; an inmate of Hispanic ethnicity is recorded as one of the five categories of race, particularly White or Black. Therefore, it is not possible to use Hispanic as a category of the variable RACE. While it is certainly true that Hispanic culture has differences with White or Black cultures, most Hispanics within the BOP are not subject to the mandatory GED programming policy as it exempts deportable aliens. (BOP, 2003, p. 8) Therefore, the percentage of Hispanics enrolled in GED classes is very small.

RACE = 1 if an inmate is identified as Caucasian, 0 if not.

- **PROGRESS:** A binary random variable that indicates an inmate student's progress in the GED program.

PROGRESS = 1 if the inmate has a GED UNSAT assignment, 0 if the inmate has a GED SAT assignment.

- **CRIME:** A discrete category random variable that records an inmate's most recent crime classification. The variable CRIME has eight categories, so seven binary random variables are defined:

DRUG = 1 if the crime was a drug offense, 0 if not

WEAP = 1 if the crime was a weapons related offense, 0 if not

IMM = 1 if the crime was an immigration offense, 0 if not.

ROB = 1 if the crime was a robbery, burglary, or similar offense, 0 if not.

FRAUD = 1 if the crime was white collar offense, 0 if not.

VIOL = 1 if the crime was violent, 0 if not.

SEX = 1 if the crime was a sex offense, 0 if not.

An inmate's crime is classified as "other" category in case these seven binary variables have a value of 0; the inmate's crime is classified as a miscellaneous crime category.

- **PARENTS:** A binary random variable indicating whether the inmate was raised in a two-parent household.

PARENTS = 1 if two-parent household, 0 if not.

- **LENGTH:** A continuous random variable recording the number of months an inmate received as a sentence for the most recent offense.
- **READ:** A continuous random variable equal to the inmate's most recent TABE reading score.

- MATH: A continuous random variable equal to the inmate's most recent TABE math score.
- GRADE: A continuous random variable equal to the inmate's self-reported highest completed grade level of education.
- AGE: A continuous random variable equal to the inmate's age in years at most recent incarceration.

### **Assumptions and Limitations**

**Assumptions.** The first assumption is that the accessible population of GED students at FCC Butner, NC is representative of the target population of all GED students in the BOP. The principle investigator's workplace is FCC Butner, so its choice as the accessible population is one of convenience. As FCC Butner is an adult male medical facility, it draws inmates from across the country, so the population is geographically diverse. The BOP does not incarcerate juveniles and only five percent of the population is female. Therefore, FCC Butner can reasonably be considered representative of the target population.

The second assumption is that the effort that an inmate puts forth in the GED classroom is indicative of the value he places on obtaining the GED. Effort is a latent variable that is not directly measured. The variable PROGRESS, which assigns a code of GED SAT or GED UNSAT, is assumed to be a manifest variable for effort as defined by Gall, Gall, and Borg (2007, p. 372) PROGRESS is a policy variable controlled by the BOP and the Education Department, and its significance in the estimated model is important for policy considerations.

The third assumption is that the chosen regression model satisfies the classical regression model assumptions concerning the error term and explanatory variable (Kmenta, 1971, p. 393). In particular, the error term is normally distributed with zero mean vector and a diagonal

variance-covariance matrix of equal variances. Therefore, the error term is homoskedastic and uncorrelated. The assumption of normality about the mean implies that the error term results from “a large number of small causes” (Kmenta, p. 208). The assumption that the errors have the same unknown variance rules out dispersion that changes with the changes in value of the explanatory variables. The lack of auto correlation implies that error terms are not correlated among different students. As to the explanatory variables, it is assumed they are non-stochastic, so either controllable or predictable; therefore this requirement is clearly satisfied in this study. In addition, there is no exact linear relationship between any of the explanatory variables, so there is no multicollinearity. Finally the number of observations exceeds the number of regression coefficients to be estimated so that sufficient degrees of freedom for statistical inference. These requirements will be tested in this study to determine their validity.

**Limitations.** FCC, Butner is a medical complex for male BOP inmates. Therefore, no female inmates will be included in the sample. This opens an obvious area for future research. Inmates move from one facility to another for various reasons, so they may be deleted from the sample. A sufficiently large sample will mitigate this limitation as will historical data points.

The design used will demonstrate association, not causality. If this study suggests policy changes as anticipated, an argument for such changes will require logic as well as quantitative analysis. Thus, this proposal study may lead to future qualitative research such as a case study or grounded theory approach.

Another limitation is that it is not possible to separately code an inmate of Hispanic/Latino ethnicity separately from race as the BOP does not make a distinction as White Hispanic or Black Hispanic. This limitation is significantly mitigated however as deportable aliens are not subject to the same educational requirements previously explained.

**Research Plan**

The research design for this study is a correlational analysis, using multiple regression. This approach allows a dependent variable, in this case the number of instructional hours required to complete the GED, to be explained by independent variables, including those demographic and policy variables to be considered based on the judgment and experience of the researcher. Whether or not this process will have predictive value remains to be determined.

The target population for this study is BOP inmates who do not have a GED or high school diploma. Over half of BOP inmates are members of this targeted population at any point in time. Due to security and procedural hurdles, the accessible population consists of past and present inmates who have been or are students at FCC in Butner, N.C. At any given time, this facility houses approximately 5000 inmates. The waiting list for the GED program at FCC Butner can be as high as 350 inmates and approximately 275 are enrolled at any given time. Since FCC Butner is a medical facility, a number of inmates are exempted from the educational requirements for medical reasons.

The proposed random sampling design is historical sampling of inmates that have participated in the GED program at FCC Butner. Access to computerized records containing values of the variables of interest makes such a sample practical in terms of time and cost.

## **CHAPTER TWO: LITERATURE REVIEW**

The chapter consists of a review of literature related to the constructs comprising the study. The purpose of this section is to review the critical points of current knowledge including important and substantive findings as well as theoretical and methodological contributions to the field. The historical development of the construct will be established, and an overview of the relevant literature will be provided.

### **Conceptual Theoretical Framework**

Correctional education programs are part of the rehabilitative process for incarcerated offenders. Economically, correctional education's purpose is twofold: to improve the human capital entering the labor market from prison and to signal to the employer that the ex-offender will be a worthwhile employee. In his groundbreaking book, Becker (1993) argues that education is an investment in human capital, helping to counteract human capital depreciation much like replacement investment in plant and equipment counteracts physical capital depreciation. Becker was one of the first economists to academically study the economics of crime. Becker (1968) was able to rigorously demonstrate that "the anticipation of conviction and punishment reduces the loss from offences and thus increases social welfare by discouraging some offenders" (p. 204). Correctional education is part of "optimal policies to combat illegal behavior as part of an optimal allocation of resources" (Becker, 1968, p. 209). This is the worldview from which this study is fostered.

The theoretical framework for this study is a force-field analysis as developed by sociologist Kurt Lewin. Lewin's theory places an individual in a "field of forces that are supporting or inhibiting of action along a particular path" (Lewin, 1943). Understanding the forces, determining support for inhibition of a desired goal, identifying which are strongest, and

deciding which are most amendable to manipulation provides an indication of how to help an individual move in a desired direction.

In this study, the desired direction is towards the educational goal of inmates obtaining the General Equivalency Diploma (GED). The forces to be examined include BOP policy of mandatory GED class attendance and the withholding of GCT for unsatisfactory progress. “Through our literacy program, we help inmates develop the skills needed to compete for available jobs and cope with post-release community, family, and other responsibilities. This Literacy Program requires inmates who do not have a GED credential or high school diploma to complete one period (240 instructional hours) of literacy program participation during their confinement” (BOP, 2003, p. 2). The number of instructional hours an inmate requires to obtain the GED is therefore of considerable relevance to current policy. If current practices do not lead to the desired goal, this research may provide guidance to forces that would, and suggest policy alternatives that will lead to the goal of inmates obtaining the GED.

### **Review of the Literature**

Correctional education’s purpose should be no different, and it could be argued, is even more essential, for ex-offenders who have at least one additional negative to contend with by being an ex-offender. Western (2007) contends that obtaining a credential like a GED combats the negative signal that incarceration sends to the labor market. Harer (1995) contends that correctional education can “normalize” an inmate towards pro-social norms that incarceration tends to attack. “Results of this analysis provide substantial evidence that prison education program participation reduces the likelihood of recidivating irrespective of post-release employment. I interpret this result as a support of the normalization hypothesis, which posits that many policies, operations, and programs found in modern prisons reduce prisonization and

nurture pro-social norms supporting rule/law abiding behavior” (Harer, 1995, p. 16). Harer’s conclusion then is that correctional education has more than only economic benefits for the offender and society. It has behavioral benefits also, suggesting that the greater the number of inmates who obtain the GED while incarcerated, the better off society becomes. However the majority of research in correctional education looks at programming that affects post-release outcomes such as recidivism, employment rates, or wage differentials.

Correctional education programs are designed to make the offender’s transition from incarceration back into society more successful. The question is what does “successful” mean to the correctional educator, offender, or society. From the offender’s viewpoint, success includes employment at a living wage. From society’s viewpoint, success means the offender does not recidivate thus reducing the cost of incarceration. If such success is accomplished through the offender’s employment, and resulting contributions to the overall social welfare, then society as well as the offender benefits.

Recidivism is the most frequently used post-release outcome. Meta-analyses by Aos et al. (2006), Chappell (2004), Gaes (2008), and Wilson, Gallagher, and Mackenzie (2000) examine studies which conclude that various types of correctional education programs reduce recidivism to varying degrees. Depending upon the study, recidivism is defined as re-arrest, reconviction, re-incarceration, or parole violation. Employment rate is used as a measure of success in literature reviews by Gerber and Fritsch (1995); Jancic (1998); Taylor (1992); and in the meta-analysis by Wilson et al. (2000).

The studies show that, on average, a greater number of correctional education participants are employed within six months of release than by non-participants. However, averages can be deceiving. As Tyler and Kling (2007) conclude, GED participation improves employment rates

and wages only for non-white inmates and the improvement in wages disappears after three years.

Studies by Batiuk, Lahm, McKeever, Wilcox, and Wilcox (2005); Batiuk, Moke, and Rountree (1997); Burke and Vivian (2001); Clark (1991); Holloway and Moke (1996); Kelso (2000); Knepper (1990); and Stevens and Ward (1997) also demonstrate significantly higher declines in recidivism for post-secondary correctional education when compared to non-post-secondary education participants. On average, the relative reduction in recidivism rates is higher than those reported in studies on vocational training. Batiuk, Lahm, et al. (2005); Callan and Gardner (2007); Davis and Chown (1986); Hull, Forrester, Brown, Jobe, and McCullen (1995); Kelso (2000); Lattimore, Witte, and Baker (1990); Saylor and Gaes (2001); and Schumaker, Anderson, and Anderson (1990) report that vocational training program participation reduces recidivism compared to recidivism of non-participants. Finally, research by Anderson (1995); Batiuk, Lahm, et al. (2005); Holloway and Moke; Ramsey (1988); and Tyler and Kling (2007) demonstrate that GED correctional programs also reduce recidivism compared to correctional education non-participants. The reduction is not as great for vocational training programs. None of these studies exclusively study BOP programs; however Batiuk, Lahm, et al. includes BOP data, combined with state prison data.

An offender who participates in correctional education is both adding to human capital and signaling the labor market of his intent to be a good employee. Education as replacement investment in human capital is based on Becker's seminal work in labor economics. "The origin of this study can be traced to both the finding that a substantial growth in income in the United States remains after the growth in physical capital and labor has been accounted for and to the emphasis of some economists on the importance of education in promoting economic

development” (Becker, 1993, p. 2). Based on this theory of human capital, correctional education programs should aid ex-offenders in facing the labor market upon release. Having a felony, criminal conviction is a serious strike against the ex-offender in gaining employment. Correctional education signals society that the ex-offender has attempted to rehabilitate himself and dependent upon the type of education received, has added to his skill set to varying degrees.

A review of the literature in the context of this theory will provide evidence of how successful correctional education has been in this regard. Assuming that the literature review demonstrates positive outcomes, it lends support to the current study’s purpose of determining characteristics of inmates most likely to be successful in correctional education programs.

**Correctional education programs.** State and federal correctional education departments offer a variety of programs. The specific programs offered differ by state, by facility within a state, and may change over time based on evidence of success or failure and on budgetary changes, especially constraints. According to statistics gathered by Harlow (2003), “About 9 in 10 state prisons, all federal prisons, and almost 9 in 10 private prisons provide educational programs for their inmates” (p. 4).

The Federal Bureau of Prisons (BOP) and most states require inmates without a verifiable high school diploma or General Equivalency Diploma (GED) participate in correctional secondary education classes until the inmate obtains a high school diploma, GED, or completes his or her sentence. In the case of the BOP an inmate must complete 240 instructional hours toward his or her GED and then may choose drop out of the GED program. These mandatory requirements are based on the human capital theory: “A high school diploma is the basic academic requirement for most entry level jobs” (BOP, 2003, p. 1). Unemployment rates for those without a high school diploma historically average over 50% higher than those who

possess one; indeed, unemployment rates vary inversely to education levels. As Harlow (2003) indicates, “Prison educational resources were concentrated on those with the greatest need—those without a high school diploma” (p. 5). Owing in part to mandatory requirements, “Approximately 54% of state inmates who had not completed the 12th grade and 61% with a GED reported that they had participated in educational programs since being admitted to prison. In contrast, about 4 in 10 with a high school diploma or post-secondary courses participated in an educational program” (Harlow, p. 5). These statistics suggest that once an inmate obtains a GED he is more likely than not to take additional correctional education programming. This supports studying factors that correlate with obtaining a GED while incarcerated.

Unfortunately, while the number of inmates participating in correctional education has increased over time, again owing in part to mandatory requirements, the population of inmates has increased faster. Once more as noted by Harlow (2003), “Participation in prison education programs did not expand as rapidly as the population and as a result the percentage of inmates in educational programs fell” (p. 5). Attainment while incarcerated also differs by race suggesting race as a factor correlating with success. As noted in Akers (2010), “The white population is more educated than the black population, which is less educated than other races, whether in prison or not” (p. 15).

The mandatory nature of BOP programs is supported in outcomes in the literature, not just theory. Expectations have been that correctional education would be successful “only if the inmates wanted to participate and enroll voluntarily” (Ryan & McCabe, 1994, p. 459). However, Ryan and McCabe found no significant differences in achievement between voluntary and mandatory correctional education. Furthermore, Ryan and McCabe concluded that “mandatory prison education carries a very important component for contributing to the cost effectiveness of

prison administration... The concept of merely caging offenders must be replaced by the concept of educating offenders” (p. 459-460).

Success in correctional education defined by lower recidivism, higher employment rates, or lower misconducts while incarcerated varies by the type of program according to the literature. The correctional education programs reviewed include adult basic education (ABE), GED, vocational training, post-secondary education, and correctional industry and community employment programs. Most studies examine correctional educational programming in state prisons. Miller and Miller (2010) consider jail programming; this is the only study found for jails, probably because few jails offer educational programming since inmates’ lengths of stay usually terminate in months, if not days.

The evaluation of correctional education programming through a literature review is difficult owed to the poor design of much of the research. The Maryland Scale for Scientific Rigor (Sherman et al., 1977) can be used to rank social science research on a scale from “1” to “5,” with “5” representing the highest level of rigor. Unfortunately, “employing a threshold this high, however, would leave very little research upon which to draw conclusions, and the majority of the research in this field would be disregarded. On the other hand, if the bar of methodological acceptability is set too low, then there can be little confidence in the conclusions drawn based upon this body of research” (Cecil, Drapkin, MacKenzie, & Hickman, 2000, p. 209). Where possible, research with a Maryland Scale Score of “3” or greater is examined to offer some reasonable confidence in the conclusions.

***Adult basic education (ABE).*** Adult Basic Education (ABE) is a program that consists of basic academic and problem-solving skills below what normally is considered the ninth-grade high school level. In correctional education, ABE is for inmates who are unable or have limited

proficiency computing to solve problems, carrying out basic technology tasks, relating effectively with others or have an inability to speak, read or write the English language. In the BOP these ABE classes are referred to as Pre GED, Special Learning Needs (SLN) and English as a Second Language (ESL). These limitations or deficiencies hinder individuals from exercising their rights and responsibilities as community members and citizens, support themselves and their families through gainful employment and in the case of inmates, limits their ability to participate in other correctional education that could assist them in successful re-entry and lower their chances of recidivism. In the BOP the Test of Adult Basic Education (TABE) scores are used to identify inmates who may fall under the ABE umbrella and similar assessment tests are used in state correctional systems.

Cecil et al. (2000) assessed 12 adult basic education studies for impacts on recidivism defined in various ways: “Some common definitions are re-arrest, re-conviction, re-incarceration, violations of community supervision, and self-reported offence” (p. 209). Cecil et al. concluded, “In sum, of the twelve available evaluations, five studies were reasonably well conducted, rated at “level 3” or “level 4” on the Maryland Scale. However, many of these did not use statistical significance tests, and those that did employ statistical tests failed to produce significant findings in favor of program participation” (p. 213). This research found that “adult basic education programs show promise as a means of reducing offender recidivism” (p. 215).

Gaes (2008) conducted a mega-analysis of the literature and found similar results: “If there are limitations to the potential impact of correctional education on reentry success, it may be because other offender needs may have to be addressed such as their drug dependence or lack of work skills” (p. 12). Gaes also noted the problems with methodological rigor in many studies,

“Most of the studies use comparison pools of subjects who are not equivalent to program participants on many dimensions” (p. 10).

In a “level 4” study in 1995, Harer examined ABE programs within the BOP using rigorous multivariate regression techniques to conclude that “...program participation reduces the likelihood of recidivism irrespective of post-release employment” and that...we see that potential dollar savings from prison education programs could be quite large” (p. 16). Harer’s research is often cited in other studies owed to its use of random sampling and its extensive use of independent variables. Both the results and design of Harer will guide the present study.

Another “level 4” study by Steurer and Smith (2006) examines both employment and recidivism outcomes for inmates in Maryland, Minnesota, and Ohio who participated in adult basic education programs. Steurer and Smith also estimate cost and savings to taxpayers of such programs. Steurer and Smith use re-arrest, re-conviction, and re-incarceration as three measures of recidivism and concluded that “all three measures of recidivism showed statistically significant lower rates for participants vs. non-participants” (p. 13), but that “the magnitude of the difference between participants and non-participants varied substantially by state” (p. 14). In addition, “the employment data showed, post-release, the earnings of the correctional education participants were higher than the non-participants” (p. 17). Steurer and Smith’s research supports the present study’s purpose of finding factors that predict GED success before release.

A meta-analysis of the literature by Wilson et al. included six studies of adult basic education. Using an odds ratio to measure recidivism is inconclusive, but that, overall research design methodologies are weak. Inmates who complete ABE programs will move up to GED programs in the BOP and in most state prison systems. If GED programs are shown to reduce

recidivism and increase employment rates, it would logically follow that the additional learning in GED programs over ABE programs is worthwhile.

*General equivalency diploma (GED).* Of all correctional education programs, the GED is the most common, offered in approximately 84% of state prisons and 99% of federal prisons as of 2000 (Harlow, 2003, p. 4). The main reason for the frequency of offerings is the mandatory requirement of participation in the BOP for 240 instructional hours and the states' requirement that inmates attend. The mandatory nature of the GED presupposes that it achieves goals like reduced recidivism and increased employment. A review of the literature supports this assumption overall.

Tyler (2004) examines the impact of the GED on earnings using extensive data from Florida. Tyler concludes that "The central finding of this study is that the earnings of GED candidates who successfully obtained a GED grew faster in the year after the GED attempt than did the earnings of unsuccessful candidates" (p. 595). Unfortunately, while the economic benefit of obtaining a GED is substantial in percentage of earnings, base earnings are low: "Even if the high economic returns estimated in this paper represent the causal impact of the GED, acquisition of this credential can only partially ameliorate the harsh economic realities associated with being a dropout in this country" (p. 596).

Using the same Florida data base, Tyler and Kling (2007) examine employment and wage differences on ex-offenders of the GED credential. The educational attainment differences in race noted by Akers (2010) translate into earnings differences according to Tyler and Kling: "The two most robust findings are the racial/ethnic differences in any returns to a prison GED and the fall off in any GED benefits for non-white offenders after the second year" (p. 27). White offenders saw no earnings benefit from obtaining the GED, but Tyler and Kling also note

that “While we find evidence of a short-term GED impact on earnings for non-white offenders, we also note that participation in prison-based GED programs may generate non-economic benefits that we have not examined” (p. 28); in particular, better behavior while incarcerated is noted. If Harer’s (1995) study’s conclusion applies to the GED, such better behavior while incarcerated could lead to better post-release behavior under Harer’s normalization hypothesis.

Both the Tyler and Kling (2007) studies support the improved earnings picture of GED graduates, even if when the improvements differ by race and decrease over time. Again, predictors of success in obtaining the GED as in the present study would be a useful addition to correctional education literature when a goal of correctional education is to rehabilitate offenders.

In his mega-analysis of the literature, Gaes (2008) examined GED programs from other studies. Gaes found that GED programs reduced recidivism and increased employment (Table 1, p. 19) but notes that “Too many studies in this domain used comparison pools composed of prisoners who had different levels of education, certification, and training” (p. 11). Many studies examined by Gaes would be “level 3” or lower on the Maryland scale. Nevertheless, reductions in recidivism from as low as 18% to as high as 38% suggest these differences are not simply based on methodological deficiencies.

In addition, Gaes (2008) examines those few studies that considered cost-benefits of correctional education programs to taxpayers. The clear result is that savings to taxpayers are substantial: “For GED, the marginal costs were \$962.00 per person and the taxpayer savings were \$5306.00” (p. 6). The evidence suggests that correctional GED programs save taxpayers substantial money, even when a positive economic benefit to the inmate is discounted.

In his qualitative study, Esperian (2010) argues that “statistics support the claim/hypothesis that educating prisoners contributes significantly to reducing recidivism” (p. 323); Esperian goes on to provide supporting examples for this statement. As to cost savings, Esperian notes that “...even small reductions in reoffending can have a significant impact when spread across large numbers of participants” (p. 332). Esperian interviews correctional officials who argue the benefits of correctional education, including cost savings. However, Esperian also points out that “Unfortunately, there is no litmus test to determine which individuals have the potential to change or to recidivate” (p. 331). While this statement is certainly true, inmates who obtain the GED are more likely to have potential to change, thus the present study’s purpose of determining which inmates are most likely to obtain the GED would provide at least a partial “litmus test.”

Wilson et al. (2000) examined eight GED programs using an odds ratio analysis, concluding “All of the evaluations of GED programs observed positive effects...” (p. 14). Unfortunately, Wilson et al. also conclude that “Although the findings across this collection of studies consistently favor the program participants, all of these studies had weak research methodologies...with little or no control or adjustment for selection bias” (p. 14). Again, methodological design appears to be a problem cited by numerous authors.

Aos et al. (2006) conducted a “level 4” study of numerous types of correctional education programs for reductions in recidivism and cost-benefits to taxpayers and crime victims in terms of reduction in future crime. Of the 17 GED programs studied, the reduction in crime averaged 7%; while lower than many studies, Aos et al. discount reported effects based on rigor of the examined study. The reduction in crime benefits victims by \$6325.00 and benefits taxpayers by \$10,669.00 per participant (Exhibit, p. 9). To date, the Aos et al. study is the most complete

study in terms of estimating cost savings. Their approach in estimation is conservative: “We constructed our estimates cautiously to reflect the difficulty that is often encountered when taking programs to a large scale” (p. 16).

The literature is conclusive that GED programs save taxpayers money by reducing recidivism, probably through higher employment and wages. Under this scenario and given the limited number of GED openings in correctional education, the present study’s purpose of determining predictors of inmates who are most likely to obtain the GED will make a significant contribution.

The GED or high school diploma is required for correctional post-secondary education as it is in the private sector. For most vocational training or correctional industry employment, the GED or high school diploma is also necessary. Targeting inmates who will complete the GED in a determinant amount of hours allows for those individuals to take advantage of as much educational programming as possible thus increasing employability upon release.

***Post-secondary correctional education (PSCE).*** In the correctional education setting, PSCE consists of college class work that can lead to a degree and most vocational trades. College classes are either paid for by the inmate, or as with vocational trades, taxpayer dollars. These classes allow an inmate to further develop his or her skills and develop a marketable trade.

A meta-analysis of research by Chapell (2004) from 1990 to 1999 consisting of 15 studies of 7320 offenders represents a “level 4” example and found an average 46% reduction in recidivism, from 41% for those non-participants to 22% of PSCE participants (p. 157). Chapell also conducted meta-analysis on subgroups of the studies, with subset one consisting of six studies where inmates completed PSCE curricula instead of merely participating, subset two consisting of 11 studies in which recidivism was defined as re-incarceration only, subset three

consisting of 10 studies with three-year or less follow up periods, and subset four consisting of three studies using control groups. Chapell notes that the “meta-analysis of post-secondary correctional education and recidivism research conducted between 1990 and 1999 has a correlation of .31 which is statistically significant. There were consistent findings in each of the four subsets, or moderator analyses, and they were also found to be statistically significant (p. 162). Chapell suggests an additional area of research related to the present study that is not noted by any other study reviewed. She states “since each inmate has a different sentence and arrives at a different time, many more logistical factors impact an inmate’s participation than a traditional student” (pp. 165-166).

While Chappell (2004) is referring to PSCE, this point is even more relevant to the GED. Unlike PSCE with a clear start and end date, GED classes in prison are continuous, with a student being enrolled from any point in his sentence until release, some stretching 10 years or more. Inmate GED students also leave the class upon completing his or her sentence, getting the GED, or completing a mandatory number of hours.

Wilson et al. (2000) examine 13 PSCE studies, using odd-ratio of analysis of recidivism; overall the results are significant, but the authors note that “eleven of the 13 studies evaluating the effects of post- secondary education programs demonstrated positive effects, seven of which were statistically significant” (p. 14). Unfortunately, these authors again conclude that “the positive findings across this collection of studies is encouraging, but the generally weak methodology does not allow for the attribution of lower rates of recidivism to the post-secondary programs rather to unique characteristics of inmates who chose to participate in them” (p. 15).

Jansen and Reed (2006) examine three “level 3”, one “level 5”, and one “level 4” studies of PSCE to reach the conclusion that “all of these studies found inmates who participated in post-

secondary education while in prison were substantially less likely to recidivate; therefore we conclude that it is ‘What Works Programming’” (p. 92). These authors do make the point that this is not enough, noting “if policy makers are intent on maximizing the utility resources devoted to correctional programming, we must learn more about how to best match offenders with suitable programs and monitor the implication and outcome of treatment... The next step is to use evaluation research to evolve our knowledge base concerning What Works toward discovering What Works Best” (p. 94-95). By determining those factors that associate with success in a correctional GED program as this study does, the “best” may become evident.

Batiuk, Lahm, et al. study 972 inmates in Ohio who participated in PSCE from 1989 to 1992. This “level 4” study uses covariates to control for factors like race, age, and gender between treatment and control groups; since the design is quasi-experimental, self-selection bias is still an issue, but at least these authors attempt to mitigate it. The study uses a Gompertz hazard model to isolate the recidivism reduction benefits of PSCE compared to other prison based programs like GED. The authors conclude that “participation in post-secondary educational programming reduces the recidivism hazard rate... by some 62 percent in comparison to the non-educational group” (p. 66). Furthermore, using the covariates, the authors examine race and age, finding “the age variable suggests that the hazard rate declines by approximately 21 percent for inmates over the age of 30” and that “non-white inmates have 74 percent higher recidivism hazard rate as compared to white inmates” (p. 67). These findings suggest that older white inmates benefit more from PSCE than younger, non-white inmates. The present study examines these factors for GED programs.

Erisman and Cantado (2005) study PSCE policy across all state programs. While the primary purpose of their study is to advocate for additional funding, it points out benefits to

PSCE that other studies ignore. Erisman and Contardo note, as other studies do, that “post-secondary education, as opposed to other types of prison programming, is particularly effective in reducing recidivism” (p. 9). Overall, Erisman and Contardo find 11% of eligible inmates are enrolled in PSCE, with the BOP, Texas and North Carolina above the average (Table 1, p. 14). Approximately 68% of these inmates are in programs offered through two-year public schools (Figure 8, p. 22) and that 63% of these inmates pay their own expenses (Figure 10, p. 5). In their study, Erisman and Contardo confirm that “the most important benefit of postsecondary correctional education is the prospect of improved chances of employment after release from prison” (p. 8).

While suffering from the same methodological problems of research on other correctional programs, PSCE research indicates a greater reduction in recidivism than any other program. The requirement of a GED or high school diploma makes self-selection bias an important issue, one that the present study addresses.

*Vocational training (VT)*. In correctional education, vocational training refers to coursework and hands-on training in a variety of trades such as carpentry, industrial sewing, automotive repair, culinary arts and the like. Most VT programs, though not all, require an inmate to have a verifiable high school diploma or GED. One motivator to earning a GED is so the inmate may take VT classes hoping to increase the chance of post-release employment. Furthermore, in many parts of the United States, trades jobs are unionized which can lead to higher wages, but also help overcome the stigma of being an ex-offender.

One of a few “level 5” studies in correctional education by Lattimore et al. (1990) examines a vocational rehabilitation program for young property offenders in the North Carolina prison system. Using an experimental study design, Lattimore et al. concludes “specifically, we

found that although the vocational delivery system was not fully implemented, there is only about a one-in-ten chance that the better post-release arrest record of the experimental group is due to chance. There was a 10 percentage point difference in the proportions of the experimental and control groups arrested following release from prison” (p. 22). While the subjects of this study are more narrowly defined than the broader population of the present study, the finding of a statistically significant reduction in re-arrest of program participants in such a rigorously designed study warrants consideration.

Hull, Forrester, Brown, Jobe, and McCullen (2000) examine vocational classes in 36 trade areas offered through the Virginia Department of Corrections. This study found that those inmates who did not enroll in any educational program had a re-incarceration rate of 49.1% as compared to 37.3% for those who enrolled in VT, but did not complete it and 21.3% for those who completed VT (Hull et al., p. 259). While these results are statistically significant, the study design is “level 1” since comparable groups other than treatment are not used.

Bouffard, McKenzie and Hickman (2000) conducted a literature review of 13 vocational training studies, with design scales of “level 5” to “level 2.” Bouffard et al. conclude that “according to the Maryland criteria, we conclude that vocational education programs work” (p. 19). However as these authors point out, while some studies of fairly high scientific rigor have shown positive effects, others of equal rigor have demonstrated no significant impact on recidivism and in some cases the program was associated with increased recidivism” (p. 18). Unfortunately, the authors offer no explanation for these contradictory conclusions.

Jensen and Reed (2006) conducted a literature review of four other reviews and meta-analysis of vocational education for inmates and conclude that “vocational education had

statistically significant effects on reducing recidivism' (p. 89). This study also noted rigor deficiencies using the Maryland scale.

Aos et al. (2006) also examined vocational training programs in prisons. They found an average of 9% reduction in recidivism across the four studies considered. The direct benefit to taxpayers is estimated at \$6806 per inmate participant while the cost is estimated at \$1182 per participant. When reductions in crime are considered, the total net benefit to vocational training is estimated to be \$13,768 per participant, the highest of any adult program (Exhibit 4, p. 9).

Overall, the literature supports vocational training in reducing recidivism. Batiuk, Lahm, et al. (2005); Callan and Gardner (2007); Davis and Chown (1986); Hull et al. (1995); Kelso (2000); Lattimore et al. (1990); Saylor and Gaes (2001); and Schumaker, et al. (1990) report that vocational training program participation reduces recidivism compared to recidivism of non-participants, but many studies are methodologically flawed. The benefits estimated by Aos et al. (2006) may be the most supportive for VT.

***Correctional industry.*** Correctional industry programs include apprenticeship programs, prison industrial work, job assistance, and community employment programs. The BOP's Federal Prison Industries (commonly referred to as FPI or by its trade name UNICOR) program is the largest example of correctional industry. A statute restricts FPI to selling its products to the federal government. Key customers include the Department of Defense, the Department of Homeland Security, the General Services Administration, Federal Bureau of Prisons, Social Security Administration, Department of Justice, United States Postal Service, Department of Transportation, Department of the Treasury, Department of Agriculture, and the Department of Veterans Affairs. UNICOR manufactures, makes and provides furniture, textiles, signs, health technology, food, and business services (Federal Bureau of Prisons, 2012).

Bouffard et al. (2000) examine five studies of such programs. Once again, methodological problems cloud the results: “only one study that was rigorous in many respects found a five percentage point reduction in recidivism...this difference was not significant” (p. 22); only this study was of rigor “level 4.” Of greater concern, the authors note that “many of the specific skills acquired in prison may not be marketable outside this supported work environment. This is a persistent problem for the correctional industry, which often uses outmoded production techniques and equipment” (p. 5).

Wilson et al. (2000) evaluated four correctional work/industry studies of various state and federal programs, using odd-ratio analysis of recidivism. They conclude that “all four of these studies observed lower rates of recidivism in the offenders participating in the work program than the comparison offenders” (p. 15). Citing the same methodological design issues as with the GED studies, Wilson et al. note that “these findings are promising but insufficient to draw any strong conclusions regarding the effects of correctional work programs on future offending rates for prison inmates” (p. 15).

Aos et al. (2006) examined four programs of correctional industry for recidivism and taxpayer savings. They found that a 5.9% average decrease in recidivism with savings to taxpayers of \$4496 and to crime victims of \$5360 per participant in correctional industry. At a cost estimated at \$417, the net benefits are estimated at \$9439 (Exhibit 4, p. 9). While these benefits are less than for those for vocational training, they are still significant and the average cost is lowest of all non-cognitive skills programs.

Correctional industry seems to be worthwhile according to the literature, but with few studies available, and even fewer of scientific rigor, many questions remain. The common

requirement that an inmate have a verifiable GED or high school diploma for correctional industry employment supports the need for the current study.

Of course, not every study found that correctional education programs were successful in all measured outcomes for all groups examined. Some of these studies, like some of those that found significant success, suffer from lack of rigor in controlling for covariates. Other studies, however, were rigorous and found no significant success. Holloway and Moke (1986) found that post-secondary education provided no significant increase in employment over GED graduates and Linden, Perry, Ayers and Parlett (1984) found similar results for recidivism. Ramsey (1988) found no significant reduction in recidivism for GED completers compared to GED participants. Stewart (2005) found that adult basic education provided no significant improvement in employment or recidivism. These studies tended to be the exception rather than the rule.

**Motivation.** Currently, the negative reinforcement of loss of good conduct time (GCT) is used as a punishment for unsatisfactory progress in the BOP GED program and as a "deterrent" to bad behavior or dropping out of the literacy program. Although inmates who successfully complete the GED program are given a minimal monetary reward of \$25.00, inmates who complete the 500-hour residential drug program during their incarceration may be granted up to a one-year reduction in sentence (Federal Bureau of Prisons, 2009). The application of similar sentence reduction for those inmates who successfully complete the GED would help motivate learners with extrinsic motivation: "With extrinsic motivation, learners are motivated to learn to achieve rewards or avoid punitive actions" (Gom, 2009, p. 23). The use of positive reinforcement in this manner may have the consequences of reducing the number of inmate students with a GED UNSAT progress code and increasing the GED pass rate.

- The present research may demonstrate that the number of instructional hours that it takes for an inmate with a GED UNSAT progress code to complete the GED is significantly higher than those with a GED SAT progress code. If such is the case, a policy change that reduces the number of inmates with a GED UNSAT code would then increase the number of inmates receiving the GED during a given period of time. Obviously, most GED UNSAT coded inmates are not intrinsically motivated as defined by Gom (2009): “With intrinsic motivation, learners are motivated to learn because of the personal satisfaction gained from acquiring new knowledge or skills” (p. 23). Based on the experience of the principle investigator, regardless of progress assignment, few inmates are intrinsically motivated to obtain the GED.
- The use of positive reinforcement, rather than avoidance of punishment which is currently the case under the current BOP policy, may have a positive pro-cyclical effect on learning in the correctional environment. Currently, many correctional educators are not engaged in the classroom because of disruptive or unmotivated inmates; these inmates are overwhelmingly coded as GED UNSAT. A reduction in the assignment of GED UNSAT is not only a motivator for inmate students, but for teachers as well. As argued by Komarraju, Karau, and Ramayah (2009), “Engagement was positively related with the perceived use of instructional techniques where avoidance was not significantly related to any” (p. 70).
- Unfortunately, the prison environment more often uses punishment to control non-compliance than positive reinforcement to encourage desired behavior. As Burdon, Pendergast, and DeLore (2011) note, “Correctional systems possess and

promote a fundamentally different philosophy and set of policies regarding management of behavior and tend to enforce compliance with institutional rules and codes of behavioral conduct through the contingent delivery of punishment to individuals who engage in specified behaviors that violate such rules and codes of conduct” (p. 40). In the BOP, some positive reinforcement is used, such as a monetary reward upon successful completion of the GED, or an exemption of pay in which the inmate is granted an increase in hourly wage after completing 480 satisfactory GED hours; however the punitive action taken against those who fail to comply are far more severe than the rewards given. The use of rewards to encourage behavior may lead to better outcomes. At the least, as concluded by Akin-Little, Eckert, Lovette, and Little (2004) in their review of literature, “From this review it is concluded that little detrimental effect is found with the use of external reinforcement” (p. 2). Nauert (2009) is even more encouraging concerning positive reinforcement, stating “The new study found rewards were strongly associated with compliance and cooperation. As such, this approach could help in developing solutions for problems requiring cooperation of large numbers of people to achieve a greater good.” (p. 1).

- If the intended goal of the BOP is to rehabilitate offenders, any policy change that could potentially extrinsically and intrinsically motivate students is worth considering. In particular, “reluctant learners benefit from intrinsic motivation that makes learning relevant to their lives” (Sancore, 2008, p. 40). If the GED is really the minimum necessary skill level to obtain employment and if employment is a necessary condition to reducing recidivism and benefitting

taxpayers, then it follows that BOP policy should offer as much opportunity and incentive to succeed to the maximum number of inmates.

**Barriers to correctional education.** The main barrier to providing correctional education is funding. Governments have to be convinced that funding such education provides a net positive benefit to taxpayers, especially if funding beyond what is required for mandatory GED and ABE programs is to be provided. Aos et al. (2006) estimate benefits to taxpayers for GED and ABE programs. Erisman and Contardo (2005) states that “the states that adequately fund post-secondary programs in their prisons tend to also be the states that recognize the benefits such programs can have in reducing recidivism and saving money for the state’s taxpayers” (p. 32).

Another barrier is the high incidence of poverty in the background of a large majority of GED student-inmates. Studies by Taylor (2005), Weiher and Tedin (2006), Barry (2006), and Koligian (2012) all find that student achievement declines with increased poverty. Koligian finds that “Demographic variables, especially poverty and percent of English learners, were strong predictors of student achievement” (p. 3). It is the opinion of the principle investigator that poverty at home is not only associated with lack of educational achievement prior to as well as during, incarceration, but also with criminal activity that led to incarceration in the first place. Unfortunately, the inmate’s family income is not an available statistic for the principle investigator.

In their qualitative study, Hall and Killacky (2008) suggest that teacher participation in the GED classroom is too often left to inmate tutors and that students “...indicated a desire to have teachers instead of inmate tutors because of the perceived lack of professionalism of inmate tutors and the tutor’s inability to effectively assist the GED students” (p. 316). The solution to

this problem according Hall and Killacky is summarized as “correctional education could benefit by recognizing the need for training for inmate tutors and teachers” (p. 317). By identifying inmates most likely to succeed in the GED, the present study helps address the issue by “making the job easier.”

Erisman and Contardo (2005) identify several other barriers including staff resentment, security issues, overcrowding, organizational issues, and opposition from the public. They suggested solutions can be summarized as “prisoners should be obligated to make some attempt at self-improvement while incarcerated” (p. 44). The use of distance learning can overcome the other issues according to Erisman and Contardo (p. 42). Their suggestion for mandatory self-improvement transfers to mandatory GED programs.

**Literature used to select variables.** While multiple regression methods can determine which variables from a possibly long list should be included in a model and which of the model variables are statistically significant, such methods cannot be used to create the list of variables initially. For this initial step, the researcher must rely on her own experience, in this study the principle investigator’s over 15 years as a BOP correctional educator, and on what was done in prior studies.

In this section, the literature is examined to determine an appropriate initial list of variables to be used to estimate a model. This is done under the practical constraint that a potential variable must be available to the principle investigator through the sources like SENTRY and that are at her disposal.

***Race of inmate (RACE).*** An inmate’s race is a common factor in analyzing both correctional education outcomes and educational outcomes in general. From the broad educational perspective, the minority achievement gap has been observed and studied for

decades. This gap first presents itself in school. As observed by Weiher and Tedin (2006), “minority students do not learn as much as white students at the same point in their educational careers: By the 12-th grade, the average African American and Hispanic student can only do math and read as well as a white eighth grader” (p. 963). The gap in educational achievement persists over an individual’s lifetime in many cases, leading to higher costs for society and lower social welfare. “Those who do not graduate high school are more likely to be in prison, to be unemployed, and to fall below the poverty level” (Orfield, Losen, Wald, & Swanson, 2004, p. 18). This set of negative outcomes leads to a circle of under-achievement. As Taylor (2005) notes, “African American and Latino children are disproportionately affected by poverty” (p. 53). Poverty leads to the achievement gap: “In all academic subjects, children and teenagers from affluent households out-perform low income students” (Taylor, p. 53). The lack of educational achievement leads to prison, unemployment, and poverty as already indicated; thus, a vicious circle is completed.

This circle has led to disproportionate incarceration rate among blacks, which feeds into the circle itself. Garland, Spohn, and Wodahl (2008) conclude that this disproportionate incarceration of blacks, mostly for drug-related crimes, “reinforces longstanding negativity toward the criminal justice system” (p. 12) and “reduces opportunities for upward economic mobility” (p. 13). The presence of racial differences in incarceration is also noted by Rounds-Bryant, Motivans, and Pelisser (2006) who conclude “compared to white participants, African Americans were younger, less educated, less likely to be legally employed prior to incarceration, and were more likely to meet diagnostic criteria for antisocial personality disorder, but less likely to meet criteria for a diagnosis of depression” (p. 11-12).

Unfortunately, expectations and attitudes towards crime and imprisonment differ between races. Walters (2011) reports that “black inmates reported significantly stronger positive outcome expectancies for crime than white inmates... Anticipation of social benefits for crime in the form of love, respect, and security were particularly salient in distinguishing between black and white inmates” (p. 192).

The literature is convincing that racial difference in outcomes and attitudes exist and so race should be considered as a possibly significant factor in this study. The literature’s evidence would suggest that the dependent variable HOURS will be higher for non-Caucasian inmates than for Caucasian inmates.

*Type of crime (CRIME).* The category of crime that an offender has committed is considered in a number of prior studies that examine correctional education program outcomes such as recidivism or employment. Aos, Miller, and Drake (2006) examine recidivism rates by crime category over a 13-year follow-up period after release; this study’s data shows no significant difference in recidivism rates by crime category with the single exception that sex crime offenders are much less likely to recidivate. This outcome contrasts to Batiuk, Lahm, McKeever, Wilcox, and Wilcox (2005) who note that property crimes were the only significantly different category concerning recidivism. Corman and Mocan (2000, 2005) use a 30-year, high frequency time series to examine how policies such as arrests or increased police presence impact criminal incidence rates of various crime categories; their approach finds that “while both economic and deterrence variables are important in explaining the decline in crime, the contribution of deterrence measures is larger than those of economic variables” (2005, p. 235).

In addition to outcomes, other studies examined crime category as a possible factor in explaining behavior while an offender was incarcerated. Lahm (2009) considered crime category

in explaining the number of misconduct incidents of an inmate and found no significant relationship. This result contrasts with Harer's (1995) study that concluded that type of crime was significant in inmate "normalization" towards socially acceptable behavior while incarcerated.

While the literature is not as clear that type of crime is as significant determinant of outcomes such as race, there is sufficient evidence that it may be and is therefore included in this study.

*Age of inmate (AGE).* An offender's age is found to be a significant factor in measuring outcomes like recidivism or employment in Batiuk et al. (2005), Cord (1999), Erisman and Contardo (2005); Greenberg (2007); Heckman and LaFontaine (2006, 2007); Lochner (2004), Sedgely, Scott, Williams, and Derrick (2010); Tyler and Kling (2006); and Zgoba and Jenkins (2008). The studies find that older inmates value correctional education more highly, more easily obtain employment upon release, and have lower rates of recidivism than younger inmates. As noted by Lahm (2009), "specifically, as inmates get older they receive fewer tickets" (p. 47) referring to misconduct incidents. The old adage of "with age comes wisdom" seems to be supported by the literature. For this study, the inclusion of age as an independent variable is justified in the literature findings of both outcomes after incarceration and behavior during incarceration.

*Length of sentence (LENGTH).* Sentence length's significance as a factor in measuring outcomes is inconsistent in the literature. Lahm (2009) finds that sentence length is not a significant factor in misconduct while incarcerated. Witte (1980) and Zgoba, Haugebrook, and Jenkins (2008) likewise find that it is not a significant factor in recidivism. However, Erisman and Contardo (2005) found that correctional post-secondary education programs use sentence

length as one factor in determining whether or not an inmate is allowed to enroll. Lott (1992) found that “Longer prison sentences are consistently related to reduced post-conviction earnings... This reduction could be due to either lost reputation... or because of lost human capital” (p. 597).

In the current economic climate and labor market, the length of time any person has been unemployed is a consideration in hiring that person; such consideration has been frequently noted by the press in the Wall Street Journal, New York Times, and USA Today since 2010. For offenders this problem is even more acute if employers perceive incarceration as a loss in human capital as Becker (1968) or Lott (1992) suggest. Obviously, a longer sentence could be perceived as a longer period of unemployment and loss of human capital by future employers.

Sentence length is therefore included in this study to determine if it is also related to HOURS. In particular, does an inmate with a longer sentence put forth more effort to complete the GED or does that inmate not care given a long time period until release.

***Household status (PARENTS).*** Whether or not an inmate was raised in a two-parent household serves the dual purpose proxy of indicating whether an inmate came from a household that valued education or came from an impoverished household. Harlow (2003) found that prisoners raised in two-parent households were more likely to have some college education than those raised in a single-parent household; it is also noteworthy that there was no significant difference in educational attainment below college level between two-parent or single-parent households (Table 11, p. 8).

Lochner (2004) finds that “as one might expect, young men from an intact family and with more educated mothers are significantly less likely to commit crime” (p. 18). Household status also, unfortunately, reinforces the cycle of crime and poverty. As Erisman and Contardo

(2005) find, “Prior to incarceration, prisoners were, in general, considerably more impoverished than the general population” (p. 2). The correlation between poverty and presence of both parents is also related to race as noted by Rounds-Bryant, Motivans and Pelissier (2006): “compared to white participants [in the TRIAD drug study of inmates], African American participants came from childhood backgrounds characterized by a higher likelihood of having parents who never married, being on welfare, a working mother, and an immediate family member who spent time in jail during a participant’s youth” (p. 9). Thus a parent goes to jail, creating a single parent household in poverty, with a child more likely to commit crime later in life, leading to possibly yet another parent going to jail and the vicious cycle continues. The literature suggests higher education level may at least help to break this circle. If the present research can determine a means of getting the GED to as many inmates as possible, that would be a significant contribution to correctional education policy as well as to the literature.

*Education level (GRADE).* In numerous studies from the literature, the inmate’s education level was associated with a significantly more positive outcome. Higher education levels were associated with lower recidivism rates by Bazos and Hausman (2004); Erisman and Contardo (2005); and Nally (2012). Higher employment levels and wages were associated with higher education levels as concluded by Heckman and La Fontaine (2006, 2007); Lochner (2004); and Sedgley, Scott, Williams, and Derrick (2008). Lahm (2009) found that an inmate’s education level and misconduct while in prison were significantly negatively related.

However, Harer (1995) determined that the inmate’s education level at time of incarceration was a significant factor in pro-social behavior. Batiuk, Lahm, et al. (2005) found that only post-secondary education significantly reduced recidivism; education significantly reduced recidivism; educational level below this was not a significant indicator of recidivism.

For the present study, education level is anticipated to be negatively correlated with the number of hours required to complete the GED.

*TABE test scores (READ, MATH).* The TABE test is designed as an assessment tool for placement into classes both inside and outside of prison. As Batchelder and Koski (2002) indicate, “The test of Adult Basic Education was used as an assessment instrument because it measures a broad range of literacy skills in math, language, and reading” (p. 17). Venezky, Bristow, and Sabotini (1997) found the TABE test to be a reliable placement test for GED or adult basic education classes.

It is this placement purpose for which TABE tests are used by the BOP. Unfortunately, in the principle investigator’s experience as a correctional educator for the BOP, many inmates do not take the TABE test seriously when it is administered because they do not understand or do not care that it is used to place them in an appropriate level GED class. This problematic attitude may compromise the TABE test scores’ reliability in determining the number of hours an inmate requires to complete the GED. Nevertheless, this test is an indicator of which learning objectives a student has mastered and which still need more work prior to placement in the GED classroom other than reported grade level as indicated in the inmate’s records.

### **Summary**

The number of studies that examine educational programming within the BOP is comparatively low compared to the number examining state prison programs. None of these studies exclusively study BOP programs. Batiuk, Lahm, et al. (2005) includes BOP data, combined with state prison data. Since some state educational programs are all voluntary while the BOP’s GED program is mandatory, comparisons must be carefully considered. The literature suggests that correctional education reduces recidivism, increases employment rates

and wages, and saves taxpayer money and studies show that on average, a greater number of correctional education participants are employed within six months of release by non-participants. However, averages can be deceiving. As Tyler and Kling (2007) conclude, GED participation improves employment rates and wages only for non-white inmates and the improvement in wages disappears after three years. Most concerning is that the research suffers from methodological design problems as noted by many of the studies reviewed. Referring to the commonly used quasi-experimental design, Lewis (2006) argues that “this research design is inadequate to offer a true assessment of the impact of correctional education; especially if the outcome variable is recidivism... an argument is made to take a more holistic approach...” (p. 286). Until that time, or until another approach entirely is developed, the quasi-experimental design will continue to be common, but any validity and reliability issues can at least be mitigated with a robust set of covariates and precise measurement and definition of variables.

Of all correctional education programs, the GED serves as a fulcrum between what is required or expected and what is available beyond that. The GED is mandatory for most inmates without a verifiable one or a high school diploma, in part because it is the minimum to find employment upon release. The GED is necessary to move into higher correctional education programs like vocational trades, post-secondary, or to work in correctional industry.

Given the overwhelming need and demand for mandatory GED programs much less higher level programs, there are waiting lists at many prison facilities. The present study’s purpose of identifying which inmates are most likely to succeed in the program will add significantly to the literature and perhaps expedite the GED completion rate.

### **CHAPTER THREE: METHODOLOGY**

Correctional education programs are part of the rehabilitative process for incarcerated offenders. The purpose of this study is to determine those variables that predict an inmate's success in the BOP GED program as measured by the number of hours the inmate requires to complete the GED. Clearly, student effort is one such variable, but it is a latent variable whose value is not directly measured. The binary variable PROGRESS, that measures the inmate's compliance with class attendance policies, is used as a manifest or proxy variable for effort. Other variables measuring an inmate's socio-demographic characteristics are assessed for predictive value of the number of hours the inmate requires to complete the GED while in a correctional setting.

#### **Research Design**

This study employs a correlational-predictive, quantitative design using multiple regression. This design is appropriate because there is no treatment applied to any of the subjects and the study is concerned with an explanation of relationships among variables of interest. In this study, multiple regression is used to describe the relationship between the dependent variable and independent variables and to predict the dependent variable given values of the independent variables for a new subject.

Since multiple regression does not initially select variables to be examined, the principle investigator uses logical reasoning and experience to select potentially relevant variables. "Other considerations include the importance of the variable as a causal agent in the process under analysis; the degree to which the observations on the variable can be obtained accurately or quickly or economically than on competing variables; and the degree to which the variable can be controlled" (Kutner et al., p. 7).

Multiple regression determines association among variables, not causation (unless studying time series which this study does not). “No matter how strong is the statistical relation between X and Y, no cause-and-effect pattern is necessarily implied by the regression model. Regression analysis by itself provides no information about causal pattern and must be supplemented by additional analyses to obtain insights about causal relations” (Kutner et al., pp. 8-9). Once a researcher discovers correlation among variables of interest, it may be possible to apply logical reasoning to infer cause-and-effect. Alternately, an experimental design can be used to argue cause-and-effect. In this study, no treatment is applied to the subjects so an experimental design is not applicable (Creswell, 2009).

### **Research Questions and Hypothesis**

This study will examine the following research questions:

1. What variables correlate with the number of instructional hours required to complete the GED while incarcerated?
2. Can variables that correlate with the number of instructional hours be used to predict if an inmate will receive a GED SAT or UNSAT progress assignment once enrolled in the GED program?

Sample data statistics will be used to determine if inmates with a GED UNSAT assignment have different characteristics from those with a GED SAT assignment as defined by the other explanatory variables. For example, are Caucasian drug offenders more likely to have a GED UNSAT progress assignment than non-Caucasian sex offenders?

3. Do any policy alternatives to selection of federal correctional GED students become apparent?

The regression model may provide a priority ranking of placement in the GED program based on estimated number of hours required to complete the GED rather than current policy placement based on length of remaining sentence (BOP, 2003). Would such a placement system have a disparate racial or age impact?

H<sub>01</sub>: The mean number of instructional hours required to complete the GED does not depend upon the inmate's race.

H<sub>02</sub>: The mean number of instructional hours required to complete the GED does not depend upon the inmate's progress assignment.

H<sub>03</sub>: The mean number of instructional hours required to complete the GED does not depend upon the inmate's familial status.

H<sub>04</sub>: The mean number of instructional hours required to complete the GED does not depend upon the inmate's type of crime.

H<sub>05</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's age.

H<sub>06</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's grade level prior to incarceration.

H<sub>07</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's sentence length.

H<sub>08</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's TABE test scores.

## **Participants**

The target population for this study consists of these BOP inmates subject to the mandatory BOP literacy standard policy (BOP, 2003). As of the end of 2011, this population exceeded 100,000 ([www.bop.gov](http://www.bop.gov)). The accessible population is inmates at the Federal Correctional Complex (FCC) in Butner, N.C. who are required to attend GED class. Security and time restrictions limit the target population to the accessible one.

A random sample of inmates' records is selected from the sampling frame of records in the BOP's secure inmate management database SENTRY, for inmates who completed the GED program from 2008 to 2012 at FCC Butner. Inmates do not personally participate in this study; only their archived SENTRY records are used. A random number generator was used to produce a list of sample observations base on the inmate's registration number. The principle investigator then downloaded required sample variables into an Excel spreadsheet from the SENTRY database. This was accomplished using a password protected computer in a secured, locked office at FCC Butner. Excel sample records are not identifiable by inmate. In order to have test power on the coefficient of determination of 80% and large effect size, a sample of 100 records is used (Cohen, 1988).

## **Setting**

The location of this study is FCC Butner, located in north central North Carolina, approximately one hour northwest of the state capital Raleigh. FCC Butner is an adult male, medical facility within the BOP. FCC Butner consists of five separate institutions denoted by security level. Each of the five institutions offers GED classes.

Since FCC Butner is an adult male complex, the accessible population excludes female inmates and youthful offenders, an obvious limitation to generalizing the results of the study;

however the overall BOP population is all adult and less than 10% female. Since FCC Butner is a medical complex, it draws its population from around the nation and is generally more geographically diverse than other BOP facilities. The geographical diversity of the population provides a broader representation of school districts nationally. Further, inmates in the GED program must either be healthy or have a controlled medical or psychological condition. Inmates with severe medical or psychological impairments may receive a medical exemption from the GED requirement.

### **Instrumentation**

In collecting sample data, three sources of data are used. The Test of Adult Basic Education (TABE) 9 & 10 is a standardized exam, published by CTB McGraw Hill, and designed to test an adult learner's academic knowledge. The skills assessed are reading, math, language, language mechanics, vocabulary, and spelling. The TABE test has been repeatedly determined to be reliable and valid (Impara & Blake, 1998).

All inmates required to attend GED classes within the BOP are required to take the TABE test prior to enrollment so that staff are able to appropriately gauge the inmate's educational level in the respected subject matter.

The second source of data is SENTRY, the BOP-maintained, secure database. The SENTRY database is accessible only to BOP staff with a username and password required to access the system. A staff member can only access SENTRY using a BOP-networked computer housed in a locked office in a locked building. The SENTRY database contains the inmate's sentence length, allowing the independent variable LENGTH to be obtained. SENTRY also contains the inmate's code of GED SAT or GED UNSAT, allowing the binary variable PROGRESS to be recorded. SENTRY includes TABE scores so the variables READ and MATH

are available. AGE and RACE variables as well as the dependent variable HOURS are also obtained from SENTRY.

Data entered into the SENTRY database is checked for accuracy by staff in the Education Department and the inmate's Unit Team frequently and this practice allows for a kind of checks and balance system. The information may be challenged by the inmate if he feels the information is not accurate and any verifiable errors corrected.

The final source of data is the inmate's pre-sentence investigation report (PSI). These reports are shared with staff only in the Inmate Skills and Development System (ISDS) and on one of the BOP computers drives. The PSI contains information necessary to obtain the variables PARENTS and CRIME.

PSI data is objective and the pre-sentence investigating officer attempts to verify and document every one of these variables and all other information included in the PSI prior to producing a draft of the report. Once the draft of the PSI is completed, both prosecution and defense attorneys may object to any portion of it, requesting that changes be made. If either side is still not satisfied, the judge assigned to the case makes a final ruling. While matters related to the case may be open to interpretation, the variables from the PSI used in this study are verified.

### **Procedures**

Once approval was obtained from the Federal Bureau of Prisons IRB and Liberty University IRB, data collection commenced. Based on logic and experience of the PI as a correctional educator for over 15 years, and the information archived within the SENTRY database, the dependent variable HOURS and independent variables GRADE, AGE, RACE, CRIME, PROGRESS, PARENTS, LENGTH, READ, and MATH were selected as the initial variables to be considered in constructing the multiple regression model.

The sampling frame for this study consists of all inmates who successfully completed the GED program at FCC Butner between 2008 and 2012; this sampling frame contains approximately 1100 inmates. These inmates' archival, electronic files located in the SENTRY database are numbered by the inmate's registration number. A random number generator was used to select a sample size of 100 inmates from the sampling frame; the values of the dependent and independent variables for the sample were downloaded into an EXCEL spreadsheet without any inmate identifiers. Inmates were randomly assigned a number from 1 to 100 which eliminated any and all possible identifiers. Since only archival data was used in this study, no permission was required of the inmates and confidentiality is maintained through lack of identifying information.

The sample size of 100 was chosen based on "a general rule of thumb which states that there should be at least 6 to 10 cases for every variable in the pool" (Kutner et al., p. 346). This sample size is also sufficient to identify large effects for the multiple correlation coefficient in a regression model (Cohen, 1998, p. 102). Finally, while the sample in this study consists of archival, electronic records, downloading information from the SENTRY database is time-consuming. Considering the limited amount of time available to access the database on a limited number of computers, the time to download data is a practical constraint on sample size.

### **Data Analysis**

The data analysis for this study is multiple regression analysis since "regression analysis serves three major purposes: (1) description, (2) control, and (3) prediction" (Kutner et al., 2004, p. 8). To answer the research questions posed in this study, variables must be described statistically with covariates to control for socio-demographic characteristics with the purpose of predicting the dependent variable HOURS given the independent variables.

Upon collection of the data in an Excel spreadsheet, the binary independent variables were properly coded to create the sample of observations for the exploratory data analysis of this study. The first formal step of the model building process was to perform a preliminary check on data quality through visual inspection of the sample observations by the PI and another individual unfamiliar with the study. This “extra set of eyes” may spot problems with the data the PI would miss owed to familiarity with the observations. Gross data errors and obvious outliers from typographical mistakes are usually spotted in this data check so that appropriate editing can occur (Kutner et al., p. 346).

The second step is to examine the data for curvilinear effects between an independent and a dependent variable and bilinear interaction between independent variables. Scatterplots and pairwise correlations were used as the primary diagnostic tools. However, “whenever possible, of course, one should also rely on the investigator’s prior knowledge and expertise to suggest appropriate transformations and interactions to investigate” (Kutner et al., p. 346). In this study, there are initially 15 independent variables, including the seven binary variables derived from the category variable CRIME. Of these, five are continuous variables, so five scatterplots are created to consider possible curvilinear effects. The scatterplot can provide an initial guess as to potential transformation to account for the curvilinear effect, if any (Kutner et al., pp. 299-300). Since there are 15 independent variables, there are  ${}_{15}C_2 = 105$  possible interactions. However, the seven binary crime variables are mutually exclusive, so any interaction between them can be deleted, leaving 77 interactions to be considered. The principle investigator’s experience as a correctional educator is used to reduce the number of potential interactions to a manageable size as a regression model with all possible interaction terms would require a prohibitively large sample size.

The third step is to reduce the number of regression models to investigate to 10, or fewer. With only five interaction terms and 15 independent variables, there are still  $2^{20}=1,048,576$  possible models. Once the number of interaction terms has been substantially reduced through the PI's experience and use of pairwise correlations, the Mallow's  $C_p$  criterion is used to select final parsimonious models with small mean squared error and low bias (Miller, 2002).

In the fourth step, once the final model is selected, appropriate hypotheses tests are performed to decide the research hypotheses and to determine significance of the model itself using standard regression procedures (McClave & Benson, 2008, p. 777-781, 788-793). Diagnostics are also used to determine the presence of any outliers and whether the outliers are influential. The externally studentized residual and leverage values are used to determine outliers in the dependent variable HOURS or explanatory variables respectively (Belsley, Kuh, & Welsch, 1980, p. 194-196).

If any outlying cases are identified, the fifth step is conducted to determine if the outlier is influential in that its removal from the sample significantly alters estimates of the regression model parameters. The difference in fitted values and regression coefficients when an outlier is deleted are considered (Belsley, Kuh, & Welsch, 1980, p. 202-208). If the outlier is found to be influential, it is then examined to determine if it was correctly recorded, and if it was, whether remedial measures such as robust regression is required (Rousseeuw & Leroy, 1987).

The fifth step is to determine if the assumptions of multiple regression are satisfied. Variance inflation factors are used to test for multicollinearity; the Brown-Frosythe test is used to test for homoscedasticity (Kutner et al., p.116); and normal probability plots are used to check normality of the error term.

The sixth step is to determine the validity and reliability of the model. A validation sample of 20 cases is used to calculate mean squared over prediction error (MSPR) as a measure of validity. “If MSPR is fairly close to MSE based on the regression fit to the model-building data set, then the MSE for the selected regression model is not seriously biased and gives an appropriate predictive ability of the model” (Kutner et al., p. 371). As stated by Yu (2011), “reliability is a necessary, but not sufficient condition for validity” (p. 1). In this study, reliability is based on using historical, random sampling of archived data involving factual information, not opinion or survey results. The first step in the data analysis procedures is to perform a preliminary check on the data by both the principle investigator and a second researcher.

A visual inspection of the sample data once it was downloaded into an Excel spreadsheet uncovered two types of errors. One case showed the number of hours the inmate required to obtain a GED exceeded sentence length. A check of SENTRY records showed the same error so this case was deleted from the sample. Four other cases showed the variable AGE was less than 10. A check of SENTRY records revealed transcription or subtraction errors which were corrected in the sample. The remaining cases showed no obvious problems.

Since the sampling procedure is random sampling on historical data, reliability in terms of consistency may be expected in a replicated study. The descriptive statistics of the sample show that it is representative of the BOP inmate population. The final model is also globally statistically significant.

Creswell (2009) discusses three types of validity for quantitative research: internal, external, and statistical conclusion validity. Since no inmates are participants in the study, internal validity does not apply to this study. External validity threats “arise when experimenters

draw incorrect inferences from the sample data to other persons, other settings, and past or future situations” (Creswell, p. 162).

Threats to external validity from applying the results of the final model to other persons and settings are minimized by choosing FCC Butner as the setting where the sample data is drawn. While convenient since it is the workplace of the principle investigator, FCC Butner is a BOP medical complex that draws its inmate population from across the country and from all security levels within the BOP. FCC Butner is an adult male, federal facility and an external validity threat could arise if the results were applied to female or youthful offenders. It is conceivable, though unlikely in the PI’s opinion, that the generalization to state, adult male offenders could pose an external validity threat. However, most federal inmates have prior or concurrent state charges, so such a generalization should be valid. The most significant threat to external validity is posed by the reformulated GED that will be used in 2014. The level of knowledge tested on the new GED is higher than on the current one and it is computer-based. Both of these changes, especially the computer-based format, are likely to substantially increase the number of instructional hours required to complete it. If HOURS increase by a constant number for all inmates, the model is easily modified and this external validity threat minimized. Such a statistically simple outcome is unlikely in the PI’s opinion.

Statistical conclusion validity “arises from the data because of inadequate power or the violation of statistical assumptions” (Creswell, 2009, p. 162, 164). The validity of the statistical assumptions for multiple regression has been addressed and the assumptions found to be valid.

## CHAPTER FOUR: FINDINGS

The purpose of this study is to identify those variables that predict the number of instructional hours that an inmate requires to obtain the GED while incarcerated. The resultant model is used to develop policy alternatives to assigning inmates to a GED class based on his pre-release date (PRD) in furtherance of the goal of maximizing the number of inmates completing the GED in a calendar year, or any specified period of time.

The chapter provides the findings of this study in four sections. Section one describes the sample obtained from the setting for the study. Section two discusses the construction of the final model according to the data analysis procedures presented in chapter three. Section three assesses any violations of model assumptions and considers potential outliers. Section four reports specific data concerning validity, performs tests of the research hypotheses and provides answers to the research questions.

### **The Sample**

The accessible population for this study is the inmates at FCC Butner who are required to participate in the GED program under BOP policy 5350.28. A historical random sample of 100 inmates' archived records is selected using a random number generator on the BOP registration numbers in the sampling frame of GED graduates from FCC Butner between 2008 and 2012. No direct participation by inmates is necessary for this study.

Table 1 summarizes measures of central tendency in mean (M) and median (Md), of dispersion in standard deviation (s), of skewness (Sk), and of peakedness or kurtosis (K) for the continuous random variables HOURS, GRADE, AGE, LENGTH, READ, and MATH.

## FACTORS INFLUENCING THE COMPLETION OF THE GED

The binary variable RACE indicates whether or not a sample inmate is Caucasian.

Figure 1 shows the racial composition of the sample compared with those of the BOP population as of September 2012 and the general U.S. population as of the 2010 census. The BOP does not record Hispanic/Latino as a race. A Hispanic inmate is recorded as White, Black or other; in this study therefore, a Hispanic inmate is either Caucasian or non-Caucasian.

A Chi-squared analysis for independence of the inmate's race between the sample and BOP population results in a test statistic of  $X^2 = 0.188$ ; at the 90% confidence level, the rejection region with  $df = 1$  is  $X^2 \geq 2.705$ . Therefore, there is no significant difference in the proportion of each race between the sample and BOP population. White Americans (non-Hispanic/Latino and Hispanic/Latino) are the racial majorities in both the US and BOP populations, with a 72% share of the U.S. population ([www.census.gov](http://www.census.gov)). There is a statistical difference at the 90% level in racial composition between the BOP and the U.S. populations ( $X^2 = 3.73$ ,  $df = 1$ ). The U.S. population is more Caucasian than the BOP population; however the rate of incarceration for non-Caucasians is statistically higher than for Caucasians ([www.bop.gov/news/quick.jsp](http://www.bop.gov/news/quick.jsp)). The racial disparity has been well documented and studied. As noted by Garland, Spohn, and Wodahl (2008), "There is irrefutable evidence that blacks comprise a disproportionate share of the U.S. prison population" (p. 4).

Using a narrow definition of educational attainment as having a high school diploma or GED, data indicate that BOP prisoners are less educated than the U.S. population as a whole. Table 2 provides the percentages of each population without such attainment, broken down by race.

Two comparisons are noteworthy. The percentage of the U.S. population with a GED or high school diploma (70.5%) is about the same as the percentage of BOP population *without* a

high school diploma or GED (71.8%). Additionally, the ratio of BOP Caucasian inmates to Caucasians in the U.S. population without a GED or high school diploma (2.0) is 30% less than the same ratio for non-Caucasian (2.8). So, the BOP population is much less educated than the U.S. population and the non-Caucasian BOP population is even less educated than the Caucasian BOP population. Again this result confirms prior studies (Mauer & King, 2007). The benefits of a correctional GED are thus relatively more important for non-Caucasian inmates who make up a disproportionate share of the BOP population and who are less educated (Tyler, 2004; Tyler & Kling, 2007; Heckman & LaFontaine, 2009).

The variable PARENT indicates whether or not an inmate was raised in a two-parent household. This variable was selected for consideration based on the PI's experience as a correctional educator. Further, data from the Center for Disease Control ([www.cdc.gov](http://www.cdc.gov)) indicates that children from a single-parent household are increasingly likely to be incarcerated, suffer a greater risk of mental or physical health problems, and be less financially successful as the number of adverse childhood events, including incarceration of the parent, increases.

Figure 2 illustrates the percentage of inmates in the sample raised in two-parent households compared to that of the U.S. population. A randomly selected inmate has only a 20% chance of being raised in a two-parent household compared to 66% for a person in the general population and is 3.3 times as likely to have been raised in a two-parent household than a federal inmate. Table 3 breaks down the percentages of those not raised in two-parent households by race for the sample and general U.S. population. In both the sample and U.S. population, Caucasians are only half as likely to have been raised in a household without two parents as non-Caucasians. However, the difference between the sample and U.S. population for either category is not statistically significant at the 90% confidence level ( $X^2 = .01$ ,  $df = 1$ ).

The category variable CRIME indicates the type of crime for which an inmate in the sample was most recently incarcerated; only one category is assigned to each inmate. Table 4 shows the percentage of inmates in the sample broken down by race and type of crime. The percentage of the BOP population by type of crime is also provided.

A majority of inmates in both the sample and BOP population are incarcerated for drug offenses, and the sample of inmates who committed drug offenses is not statistically different than that for the BOP population. A statistically higher percentage of non-Caucasian inmates than Caucasian inmates in the sample are incarcerated for drug crimes at the 90% confidence level ( $X^2 = 2.81$ ,  $df = 1$ ). This result confirms prior studies (Garland, Spohn, & Wodah, 2008).

Finally, the binary variable PROGRESS indicates whether or not the inmate enrolled in a GED class was in compliance with BOP policy. Table 5 shows the sample percentage in compliance (SAT) or not (UNSAT), broken down by race. As Table 5 indicates, only about seven percent of inmates fail to comply with mandatory attendance or have been sanctioned for behavioral problems. Using a Chi-square analysis at a 95% confidence level, the proportion of Caucasian inmates with a GED UNSAT code as a percentage of the Caucasian population (11.1%) is higher than the similar proportion for non-Caucasian inmates (5.1%). As Table 5 indicates, only about seven percent of inmates fail to comply with mandatory attendance or have been sanctioned for behavioral problems. The percentage of Caucasian inmates with a GED UNSAT progress assignment does not differ by race; the Chi-squared test statistics of 1.22 does not fall in the critical region of  $X^2 \geq 2.705$  ( $df = 1$ ).

Overall, the sample is representative of the BOP population and so the random sampling procedure is successful in avoiding bias by having been chosen in one locale. Nevertheless, it is also true that the sample and BOP population are less Caucasian, less educated, and less likely to

have been raised in a two-parent household than the general U.S. population. This study determines if any of these characteristics correlates with number of hours required to complete the GED.

### **The Regression Model**

**Curvilinear and interaction effects.** To consider interaction between dependent variables, a bilinear correlation coefficient is calculated. Using the Pearson t-test (Kutner et al., 2004, p. 84) at 95% confidence level, 19 interaction terms are significant. The most significant interaction occurs between READ and MATH with a correlation coefficient of 71%; this result is not surprising since these TABE test scores are measured contemporaneously and with no change in education level. At this stage in the research, an initial test regression model is estimated with all 15 independent variables and all 19 interaction variables included. The result indicated problematic multicollinearity based on the variance inflation factors (Kutner et al., p. 431). The deletion of MATH eliminated consideration of READ\* MATH and PARENT\*MATH. The bilinear correlation coefficients are shown in Figure 3.

To consider potential curvilinear effects of the continuous independent variables GRADE, AGE, LENGTH, and READ, added-variable, also called partial regression, plots are examined. “Added-predictor variable  $X_K$ , given that the other predictor variables under consideration are already in the model” (Kutner et al., 2004, p. 384). When exponential, quadratic, or cubic functions are estimated for these plots, none are statistically significant. Therefore, no curvilinear effects are included in the model.

**Selection of the final model.** The third step is to substantially reduce the number of regression models to consider to a manageable number. The Mallows’  $C_p$  is “concerned with the total mean squared error of the  $n$  fitted values for each subset regression model” (Kutner et al.,

2004, p. 357). The Mallows  $C_p$  criterion is used to narrow the possible models to eight for consideration. Table 6 indicates the variables included in each possible model. For each model in Table 6, the value of the Mallows'  $C_p$  is approximately equal to the number of independent variables in the model to be examined, and is small compared to the total number of possible variables, 22 in this case; "in using the  $C_p$  criterion, we seek to identify subsets of X variables for which (1) the  $C_p$  value is small and (2) the  $C_p$  value is near p." (Kutner et al., p. 358).

In Table 6, models 2 through 8 are subsets of model 1. Model 1 narrows the CRIME variable to four categories and narrows the interaction variables to six. In particular, the CRIME binary random variables IMM, immigration offense, ROB, robbery, burglary, or similar offense, FRAUD, fraud offense, and VIOLENT, violent offense are included in the OTHER category. While the interaction terms PARENT\*READ and AGE\*GRADE are not included in model 1, the component linear independent variables are. These six variables are excluded as they increase bias as measured by Mallows'  $C_p$  without reducing mean squared error. Models 2 through 8 are estimated as "reduced" models of the "full" model 1; a partial F test is used to determine if the reduced model is significantly different than the full model by comparing coefficients of determination  $R^2$  between them. (Kutner et al., p. 267-268). Model 6 is found to be the best model to use with Mallows'  $C_p$ , the partial F-test, and experience of the principle investigator as a correctional educator. Model 6 includes the interaction variable RACE\*PROGRESS which determines the interaction of the race of the inmates and his progress assignment his progress assignment while enrolled in the GED program. While models 7 and 8 eliminate this interaction term, a partial F-test between model 6 and each of these models indicates the RACE\*PROGRESS term should be retained.

The fourth step analyzes the regression model formed with the variables in Model 6. Table 7 summarizes the regression results of the final model.

The overall significance or global utility of the model is determined by testing the null hypothesis that all coefficients of the independent variables in the final model are simultaneously zero (McClave & Benson, 2008, p. 788-793). This null hypothesis is determined by an F-statistic with  $df_1 = 9$ ,  $df_2 = 89$  degrees of freedom. At 95% confidence, the critical region is  $F \geq 1.981$ . The test statistic of  $F = 6.027$  leads to rejection of the hypothesis that all rejection coefficients are zero; indeed the p-value of this test is  $1.44 \times 10^{-6}$ .

**Outliers and assumptions.** The fifth procedural step is to examine model data for outliers to “determine if the regression model under consideration is heavily influenced by one or a few cases in the data set” (Kutner et al., p. 391). For the dependent variable HOURS, the studentized deleted (or externally studentized) residuals are examined, determined by removing a specific case from the sample and calculating the residuals for that case. Values in excess of 4.0 are significantly different from 0.0 and the corresponding case is an outlier (Kutner et al., p. 396). The largest studentized deleted residual is 2.65 for the sample, so no outlier in HOURS is detected. That is, no observation’s value of HOURS is sufficiently distant from the mean of HOURS to be considered an outlier.

For the independent variables, leverage values are examined, which form the fitted values of HOURS as a linear combination of the actual values (Kutner et al., p. 398). No leverage values exceed 0.32 so no outliers in the independent variables are detected. That is, no observation’s set of values of the independent variables are sufficiently different from the mean of those values to be considered an outlier.

The sixth step in the data analysis is to determine if assumptions of multiple regression are satisfied. The first assumption is that there is no multicollinearity between the independent variables. When multicollinearity is present, “many of the estimated regression coefficients individually may be statistically not significant even though a definite statistical relationship exists between the response variable and the set of predictor variables” (Kutner et al., 2004, p. 283). The variance inflation factor (VIF) measures multicollinearity by regressing one independent variable on the other independent variables, thus one variance inflation is obtained for each independent variable. “A maximum VIF value in excess of 10 is frequently taken as an indication that multicollinarty may be duly influencing the least squares estimates” and “mean VIF value considerably larger than 1 is indicative of serious multicollinearity problems” (Kutner et al., p. 409). For the model in this study, the largest VIF is 2.25 and the mean VIF is 1.6. Therefore, the assumption concerning multicollinearity is satisfied.

The second assumption is that the regression residuals have constant variance, so are homoskedastic. The Brown-Forsythe, or modified Levene test, can be used to determine constancy of variance under robust assumptions about the distribution of the residuals (Kutner et al., p. 116-118). The hypothesis that the error variances are constant is tested using the Brown-Forsythe statistic to yield a p-value of 0.57, so the null hypothesis is not rejected. The assumption of homoskedasticity is valid.

The third assumption of normal distribution with zero mean for the residuals can be tested using a correlation test based on the simple Shapiro-Wilk test (Kutner et al., p. 115-116). The correlation coefficient between the sample errors and their normal probability scores is 0.988, so the residuals are normally distributed at the 5% level of significance.

**Validity and Reliability.** The seventh procedural step is to consider statistical validity results. For this study, the power of the test, the probability of rejecting the hypothesis that the model is significant when true, is determined using the  $f^2$  effect size index specified for multiple regression by Cohen (1988, 1992); for this study, realized effect size is  $f^2 = 0.61$ . The probability of a Type II error is 20% and power of the test is 80%.

To further examine the statistical conclusion validity, a sample of 20 inmates is selected and the number of hours required to complete the GED is predicted using the model in Table 7. Both mean squared prediction error and mean absolute percent prediction error are calculated. As noted by Kunter et al. (2004), “if the mean squared prediction error MSPR is fairly close to MSE based on the regression fit to the model-building set, then the error mean square MSE for the selected regression model is not seriously biased and gives an approximate indication of the predictive ability of the model” (p. 371). For the sample data, the model in Table 7 has MSE of 207,136.3. For the validation sample, the MSPR is 238,347.7. Further, the mean absolute percent prediction error is 31.0%. These values indicate that the model is predictive of HOURS and can be reasonably used by correctional educators.

### **Research Hypotheses**

By examining the p-value for the individual variables in Table 7, the research hypotheses can be rejected or not. At the 5% level of significance the variables GRADE, RACE, DRUG, SEX, PROGRESS, and the interaction terms PROGRESS\*RACE and AGE\*LENGTH are significant. While the variables AGE and LENGTH themselves are not significant, the interaction term is so that “these terms should be kept in the model regardless of the magnitude of their associated p-values” (McClave et al., 2006, p. 808).

For an individual regression coefficient, a d-family effect size can be calculated using a modification of the non-centrality measure described by Kutner et al. (2004, p. 50-51). The effect size is calculated as the product of the noncentrality measure and the root mean squared error, where the null hypothesis that the partial regression is zero is compared to the realized partial regression coefficient. As another measure of effect, the percent change in HOURS for a single unit change in the explanatory variable is compared to the mean of HOURS of 380 hours from Table 1 with no explanatory variables.

These results determine the outcomes of the research hypotheses as follows:

- $H_{01}$ : The mean number of instructional hours required to complete the GED does not depend upon the inmate's race.

At the 5% level of significance, this hypothesis is rejected since the p-value of the variables RACE is 2.6%. RACE also predicts HOURS through interaction with PROGRESS. On average, a non-Caucasian inmate takes 252 hours longer to complete the GED than a Caucasian inmate, all other variables the same. The effect sizes are 0.046 and 5.4%.

- $H_{02}$ : The mean number of instructional hours required to complete the GED does not depend upon the inmate's progress assignment.

At the 5% level of significance, this hypothesis is rejected since the p-value of the variable PROGRESS is 0.7%. However, PROGRESS also predicts HOURS through interaction with RACE. On average, a non-Caucasian inmate with an UNSAT progress assignment takes 656 hours longer to complete the GED than an inmate with a SAT progress assignment, all other variables the same. However, a Caucasian inmate with an UNSAT progress only requires 172 hours more than a Caucasian with a SAT progress assignment. The effect sizes are 1.44 and 172.7%.

- $H_{03}$ : The mean number of instructional hours required to complete the GED does not depend upon the inmate's familial status.

At the 5% level of significance, this hypothesis is not rejected since the p-value of the variables PARENT is 10.2%. This variable only appeared in Model 1 under the Mallows'  $C_p$  criterion and was not included in the final model.

- $H_{04}$ : The mean number of instructional hours required to complete the GED does not depend upon the inmate's type of crime.

At the 5% level of significance this hypothesis is rejected for the categories DRUG and SEX since their p-values are 3.4% and 4.8%, respectively. An inmate with a drug crime takes 128 hours longer to complete the GED than an inmate without a drug crime, all variables the same. An inmate with a sex crime takes 547 hours less than an inmate without a sex crime, all other variables equal. For DRUG, the effect sizes are 0.281 and 33.7% for SEX, the effect sizes are 1.201 and 143.9%.

- $H_{05}$ : The mean number of instructional hours required to complete the GED does not correlate with the inmate's age.

At the 5% level of significance, this hypothesis is not rejected since the p-value of the variable AGE is 49.9%, the highest p-value of any variable in the final model. However, the interaction of AGE and LENGTH is significant. A one-year older inmate at time of incarceration takes 6.8 hours longer to complete the GED on average, all other variables the same. The effect sizes are 0.015 and 1.8%.

- $H_{06}$ : The mean number of instructional hours required to complete the GED does not correlate with the inmate's grade level prior to incarceration.

At the 5% level of significance, this hypothesis is rejected since the p-value of the variable GRADE is 4.3%. A one grade level increase in education reduces the number of hours to complete the GED by 21 hours. The effect sizes are 0.046 and 5.4%.

- H<sub>07</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's sentence length.

At the 5% level of significance, this hypothesis is not rejected since the p-value of the variable length is 15.9%. However, the interaction of AGE and LENGTH is significant. A one-month increase in sentence length implies a decrease in the number of hours to complete the GED of 2.8 hours. The effect sizes are 0.006 or 0.7%.

- H<sub>08</sub>: The mean number of instructional hours required to complete the GED does not correlate with the inmate's TABE test scores.

At the 5% level of significance, this hypothesis is not rejected since the p-value for READ is 42.0%.

The outcomes of the hypotheses overall produce a statistically significant model allowing prediction of the dependent variable HOURS as a function of the explanatory variables GRADE, RACE, DRUG, SEX, PROGRESS, and AGE, LENGTH and the interaction of RACE with PROGRESS and AGE with LENGTH.

The significance of RACE in educational outcomes is common in correctional education literature. Black inmates on average are less well-educated than white inmates (Bryant, Motivans, & Pelisser, 2006; Johnson, 2006; Weiher & Tedin, 2006). So the outcome that a non-Caucasian inmate would require on average of 252 hours longer than a Caucasian inmate to complete the GED other variables equal concurs with the existing literature. Further, in its interaction with PROGRESS, the effect is even greater with a non-Caucasian inmate with an

Unsatisfactory progress assignment requiring 656 hours longer to complete the GED while a Caucasian inmate with similar progress assignment requires 172 additional hours. In the PI's experience, this outcome is expected. Any inmate with an unsatisfactory progress assignment, regardless of race, has demonstrated either behavior misconduct while in education or has dropped out of the GED program demonstrating a lack of initiative. In either situation, requiring additional time to complete the GED is expected.

The lack of significance of PARENTS is not surprising to the PI. While research has shown clearly over a period of time that parental involvement especially in an intact household has numerous benefits (Hara & Burke, 1998; Lochner, 2004; Erisman & Contardo, 205; Phillipson, 210), these benefits accrue prior to incarceration. As Harlow (2003) noted, there is no difference in educational attainment in inmates from two-parent over single parent households below a college level. Since inmates in this study have no college study, or high school degree, this study's outcome regarding household status concurs with the literature. Essentially, once the adult inmate without a high school diploma enters the GED program, familial status has no impact.

Significance of DRUG and SEX criminal offenses are also expected. In the PI's experience, offenders with a drug crime, most of who were also drug users; do not value education as highly as other types of offenders. Drug offenders believe that selling drugs is more lucrative economically than other careers available to a GED holder, and unfortunately, on a purely financial level, they are probably correct. Drug offenders who were heavy drug users may also suffer from the ill effects of that usage. Therefore, drug offenders are less likely to put forth effort, more likely to have an unsatisfactory progress assignment owed to behavioral problems, and will have more difficulty learning even with effort.

On the other hand, sex offenders are more educated than other types of offenders. As noted by Johnson (2006), only 23% of sex offenders lacked a high school diploma or GED, compared to 48% of BOP inmates overall (p. 2). The number of sex offenders in the GED program is therefore very small at 1.1%, calculated as 23% of the 48% of the BOP population that are sex offenders. In the PI's experience, these sex offenders are intelligent and exhibit a "deadly charm," characteristics that help them commit their crime in the first place.

An inmate's age at time of incarceration interacts with the inmate's sentence length; although significant, the effect sizes are small. An older inmate requires slightly more hours to complete the GED than a younger inmate. The older inmate would have been exposed to education longer ago which offsets the likelihood that older inmates value education more highly (Zgoba & Jenkins, 2008). The outcome that inmates with more education prior to incarceration as measured by GRADE take less time to complete the GED is logical and concurs with the literature that more highly educated students more quickly absorb additional information.

Finally, the lack of significance of the TABE reading score was unexpected based on its reliability as a GED placement test in the literature (Venezky, Bristow & Sabotini, 1997). In the PI's experience, the probable reasons behind this outcome are that staff neglect to explain to the TABE test taker its use as a GED placement tool by the BOP and the test taker simply doesn't care about educational programming, but is still mandated to take the test and be placed in a GED class. In either case, lack of effort confounds the TABE test's utility.

### **Research Questions**

- Research Question 1: What variables correlate with the number of instructional hours required to complete the GED while incarcerated?

Since the model is statistically significant overall, the variables GRADE, AGE, RACE,

DRUG, SEX, PROGRESS, and the interaction terms PROGRESS\*RACE and AGE\*LENGTH correlate with hours.

- Research Question 2: Can variables that correlate with the number of instructional hours be used to predict if an inmate will receive a GED SAT or UNSAT progress assignment once enrolled in the GED program?

The answer to this question, the joint probabilities of RACE and CRIME for the subsample of inmates with a GED UNSAT assignment are used as provided in Table 8. The answer to the second research question is clear from Table 8: a Caucasian inmate with a drug crime is four times as likely to receive an unsatisfactory progress assignment as any other group based on race or type of crime. It should be noted that no inmates with a sex crime received an unsatisfactory progress assignment.

- Research Question 3: Do any policy alternatives to selection of federal correctional GED students become apparent?

Analysis of the model's coefficients' impact on HOURS provides the necessary insight for the policy. For convenience in interpretation, for the continuous random variables GRADE, AGE, and LENGTH in the final model, an elasticity coefficient is calculated based on a 10% change in the variable for mean values for all other variables of GRADE = 9.2 years, AGE = 34.3 years, and LENGTH = 133.9 months based on Table 1. This is another measure of effect size. Table 9 shows the elasticities calculated as the ratio of the percent change in HOURS divided by a 1% change in the corresponding explanatory variable.

AGE is the only elastic variable. An increase in an inmate's age by 10% decreases the number of instructional hours to complete the GED by 17.1%. Younger inmates require less time to complete the GED, other variables the same. This result is intuitive in that younger inmates

have more recently attended school. A 10% increase in grade level reduces the hours required to complete the GED by 4.8%. Again, the result is intuitive in that better educated students obtain the GED quicker, all other variables equal. However, of the three continuous variables, AGE has the most impact on HOURS.

Again for convenience, the discrete random variables RACE, PROGRESS, and CRIME (consisting of the binary random variables DRUG, SEX, and OTHER) are analyzed using the mean values of GRADE = 9.2 years, AGE = 34.3 years, and LENGTH = 133.9 months. The result is a reduced regression model given in Table 10.

As noted using the individual variable hypothesis tests, all coefficients in Table 10 are significant. The model in Table 10 is equivalent to a three-factorial ANCOVA model with 12 combinations (Kmenta, 1986, p. 465-473). Table 11 shows the 12 levels for the variable HOURS by PROGRESS, RACE, and CRIME. The first part of Table 11 is for inmates with a GED UNSAT assignment (PROGRESS = 1). Any change in AGE above (below) the mean value increases (decreases) all values in Table 11 by a constant amount; any change in LENGTH above (below) the mean value decreases (increases) all values in Table 11 by a constant amount.

In Table 11, the first value in parentheses is the percent increase in HOURS from CRIME categories of OTHER to DRUG for given RACE and PROGRESS. For example, a Caucasian inmate with a satisfactory progress assignment is predicted to require 156 hours to complete the GED with other than a drug or sex crime, but 284 hours with a drug crime; 284 hours is 82% more than 156 hours. The second value in parentheses is the percent increase in HOURS from Caucasian to non-Caucasian for given CRIME and PROGRESS. For example, a Caucasian with a satisfactory progress assignment and drug crime is expected to require 284 hours to complete the GED while a non-Caucasian requires 535 hours, an increase of 88%. The third value in

parentheses is the percent increase in HOURS from a GED SAT progress assignment to a GED UNSAT for given RACE and CRIME. For example, a Caucasian inmate with a drug crime is predicted to require 284 to complete the GED with a satisfactory progress assignment, but 456 hours with an unsatisfactory assignment, an increase of 71%.

Two points must be noted about sex offenders, who compose less than 5% of the BOP population ([www.bop.gov/quickfacts](http://www.bop.gov/quickfacts)). First, for a non-Caucasian sex offender with an unsatisfactory progress assignment, the model predicts the number of hours to complete the GED at 517. However, no such inmates were contained in the sample, so such an estimate is outside the range of independent variables, meaning that the model should not be used (Kutner et al., 2004). Second, for all other sex offenders' categories, the predicted HOURS is negative. Practically, this implies these inmates can complete the GED with no instruction, but only by taking the exam.

**Policy alternatives.** The findings of the model suggest two alternatives to current policy that places students into the GED program based on earliest projected release date (BOP, 2003). For sex offenders, the model indicates immediate administration of the GED exam because no instructional hours are predicted to be necessary for such a student to pass the exam. While the percentage of sex offenders is less than 5%, such a policy change would immediately open some classroom seats to inmates requiring instruction and increase the number of GED graduates and reduce the waiting list.

Second, at FCC Butner each institution has a literacy coordinator at each institution in its Education Department that is responsible for placing inmates into the GED program. For each inmate who is required to enter the GED program, the literacy coordinator would determine the predicted number of hours using the model to complete the GED. These estimates would be used

to prioritize placement in the GED program, with inmates with lower estimates receiving higher priority with the practical constraint that if the predicted number of hours is greater than the inmate's remaining sentence, he would be ranked in the lowest priority. Such a priority ranking would be a major change from placement based pre-release date (PRD) (BOP, 2003). The model's priority ranking is objective, based solely on predicted instructional hours required to complete the GED. However as Tables 8 and 11 indicate, the impact, though not intent, of such a ranking would be younger inmates receive priority over older ones, non-drug offenders receive priority over drug offenders of either racial category, and Caucasians receive priority over non-Caucasians.

## CHAPTER FIVE: SUMMARY AND CONCLUSIONS

This chapter is organized into three sections. Section one summarizes the results of the model and offers the principle investigator's interpretation of them in light of the study's purpose. Section two discusses the limitations of the study and offers opportunities for future research. Section three concludes the study by discussing its significance to correctional education.

### Summary

The purpose of this study is to identify variables that predict the number of instructional hours that an inmate requires to obtain the GED while incarcerated. A predictive multiple regression model, shown in Table 12, is shown to reliably predict this number of hours based on the BOP progress assignment, inmates sentence length and type of crime, controlling for the inmates education level and age at time of most recent incarceration and race.

While the ideal goal for correctional education is that all inmates complete the GED while incarcerated since recidivism and unemployment rates for ex-offenders decline, the practical goal is to maximize the numbers who complete the GED in a calendar year. Physical space, staffing and budgetary constraints limit the number of inmates who are enrolled in the GED program at any time in most institutions.

**Research question one.** The first research question "what variables correlate to complete the GED while incarcerated" is answered by the variables in Table 12. The result that hours decline as educational level of the inmate rises is intuitive, as is the result that hours rises with the inmate's age. More educated inmates have been exposed to more subject matter that is tested on the GED. Younger inmates have been more recently exposed to the material tested than older inmates.

The result that inmates who commit drug crimes require more hours to complete the GED is also not surprising. These offenders generally drop out of school earlier and spend less time on school work for the alternative of earning income by selling drugs. Less knowledge is retained if the drug seller is also a drug user (Johnson, 2003). Sex offenders require zero estimated hours to complete the GED. A surprising result is that an increased sentence length reduces the estimated number of hours. While the effect is small, a 10% increase in sentence length reduces hours by less than 3%, the direction is unexpected. One possible explanation in the PI's experience is that inmates with a longer sentence may simply want to "get the GED over with" to free up time for other programs, educational, vocational, or recreational.

The result that Caucasians require fewer hours to complete the GED than non-Caucasians is problematic, but not surprising. Earlier studies by Heckman and LaFontaine (2009) find racial bias in GED returns. Finally, BOP progress assignment of GED SAT or GED UNSAT is found to be a useful manifest variable for effort, which is the latent variable the progress code is meant to reflect. As indicated in Table 11, the progress assignment of GED UNSAT increases predicted hours to complete the GED by 71% to 110% for Caucasian, depending on crime category.

**Research question two.** The second research question "can variables that correlate with the number of instructional hours be used to predict if an inmate will receive a GED SAT or UNSAT progresses assignment once enrolled in the GED program" is answered with the finding that Caucasian drug offenders are four times as likely to receive a GED UNSAT assignment than non-Caucasian, non-drug offenders. Caucasian drug offenders comprise 17% of the sample, which is representative of the BOP population. This study suggests that this sub-population of inmates are likely to be most problematic in the classroom. The study shows only about 7% of inmates are assigned a GED UNSAT, but given a BOP population of about 220,000 inmates

roughly 800 Caucasian, drug offenders can be expected to receive a GED UNSAT assignment, which increases hours to complete the GED by an estimated 172 hours. Policies that discourage behavior leading to a GED UNSAT are thus worthwhile, potentially saving a total of 137,600 instructional hours in the classroom.

**Research question three.** The third research question “Do any policy alternatives to selection of federal correctional GED student become apparent” is answered in the affirmative by analysis of model implications of Table 11. First, sex offenders should be tested for the GED with no required classroom instruction. This is true of sex offenders regardless of race. Since the predicted number of hours that a sex offender of any race requires to obtain the GED is zero, placing these inmates directly in for testing for the Pre GED in order to qualify for the official GED would add more space in the classroom for other students. Additionally, assuming the model’s predictions are accurate, sex offenders will quickly obtain the GED, thereby increasing the number of graduates per year in furtherance of the goal of maximizing the number of GED graduates.

Second, current BOP policy places students into the GED program based on length of remaining sentence, with the lowest remaining sentence being highest priority (BOP, 2003) The logic behind this policy is to offer an inmate with a shorter remaining sentence the opportunity to obtain the GED before release. As discussed in the Literature Review, a GED reduces the probability of recidivism and increases the probability of employment for an ex-offender. The model in this study suggests a fundamentally different policy, one in which placement priority in the GED classroom is based on predicted number of hours required to complete the GED, with the lowest predicted hours receiving highest priority. Such a ranking would maximize the number of students predicted to obtain the GED in any year.

This policy shift could conceivably displace an inmate with a shorter remaining sentence in favor of one with fewer estimated hours for GED completion, but with a much longer sentence. This outcome denies an opportunity to the former inmate to obtain a GED before release. A hybrid policy of placing students in GED class based on length of remaining sentence provided his estimated hours to complete the GED are less than his remaining sentence by a sufficient margin of error could be used. Such a policy, while sub-optimal in maximizing number of students who obtain the GED in a given year, has the advantage of offering an inmate the opportunity to obtain a GED if he has a sufficiently high chance of success.

The model in this study indicates that young Caucasian inmates without a drug offense will receive priority placement when estimated hours to complete the GED determines priority placement. The model is objective in that it is statistically based; however, the outcomes discriminate by race and age.

A result that educational outcomes differ by race may be controversial, but is no less real. Walters (2011) suggests that black-white differences in attitudes towards crime and outcome expectancies from crime would at least partly explain the racial difference in attitudes towards crime and outcome expectancies from crime would at least partly explain the racial difference in hours required to complete the GED. As Walters concludes, "Black inmates reported significantly stronger positive outcome expectancies for crime than white inmates... Anticipation of social benefits for crime in the form of love, respect, and security were particularly salient in distinguishing between black and white inmates" (p. 192). In the principle investigator's experience as a correctional educator, young black inmates in particular view prison time almost as a "badge of honor." Until this cultural difference changes, the difference in HOURS by RACE

is unlikely to narrow. A positive outcome of additional good conduct time for completing the GED may be one way to start the change in expectations.

Third, predicted hours can be used as a motivational tool by the correctional educator when sentence length is longer than predicted hours. The educator can show the inmate the estimated hours and let him know the estimated time it will take him to complete the GED. This allows the inmate to set personal goals. If the sentence is substantially shorter, the inmate should not be placed in the GED program since he would be unlikely to obtain the GED and displace another inmate, but rather given the opportunity to Pre-GED test and ultimately GED test or streamlined into a vocational trades program. By providing research results demonstrating reduced recidivism, reduced unemployment rates and higher wages for those with a GED, the inmate as a student may be motivated to put forth effort, which would reduce the chances of a GED UNSAT progress assignment that may result in punitive action, such as the loss of GCT and additional custody classification points. By calculating estimated hours to complete the GED for an inmate with a GED UNSAT assignment and comparing it to the reduced hours with a GED SAT assignment, the educator can encourage the inmate to try harder.

In the principle investigator's experience, students with a GED UNSAT code did not want to participate in the GED program, leading to misconduct in the classroom and resulting in an unsatisfactory progress assignment. By estimating HOURS with each progress assignment, the educator can at the very least inform the inmate of the potential payoff of increased effort in getting him out of a situation he does not want to be in. Restoration of good conduct time and benefits of a GED after release are additional pluses.

Fourth, loss of good conduct time is a policy that punishes the inmate who receives an unsatisfactory progress assignment or drops out of the GED program. This policy interferes with

the goal of maximizing the number of inmates who obtain the GED while incarcerated because inmates with an unsatisfactory progress assignment remain in class a greater number of hours, or merely attend the GED program to avoid loss of good conduct time thus taking a seat from another inmate who would like to attend. It is worth reiterating that a GED UNSAT assignment reflects lack of effort, dropping out of the GED program, or disciplinary infractions while enrolled in GED and in the Education Department. In the PI's experience, inmates with a GED UNSAT or those who remain enrolled in the GED program merely to avoid losing good conduct time disrupt the work of other inmates in the classroom, essentially reducing the amount of instructional time in a two-hour class. In other words, it may take three hours of clock time to equate to two hours instructional time. This "clock time effect" of the GED UNSAT student reduces the number of inmates who complete the GED in a year. Therefore, a policy alternative that avoids lack of effort leading to misconduct or forced attendance is worthwhile.

One alternative is to simply expel the GED UNSAT inmates from the GED program. These inmates actions indicate that they are not serious or do not intend to complete the GED. By attaching loss of good conduct time to attendance, inmates remain in the GED program simply to avoid punitive action and take up limited space. A second alternative with better outcome is a policy encouraging effort through positive reinforcement. As the model in Table 12 indicates, a GED SAT progress assignment with effort maximizes the number of inmates completing the GED in a calendar year. Policies that reward an inmate who maintains a GED SAT progress assignment not only benefits the inmate, but helps achieve the BOP educational goal. While rewards like cash or commissary credit are possible, these cost money, an issue in constrained budgets. A reward of extra good conduct time would not have a cost to the BOP and would encourage effort on the part of the inmates.

### **Limitations and Future Research**

This study's design and choice of setting minimizes threats to validity. There are some limitations that remain. First, the model and results should not be generalized to female or youthful offenders as neither category is included in the sample. Future research that includes women could be done using this study's model as a starting point. It may be that the addition of a binary gender variable would suffice to expand the model to incarcerated females. As for youthful offenders, the model from this study can be directly applied to male youth through the variable AGE. However, any age below 18 years is outside of the independent variable's range so caution in such extrapolations is necessary. Further, in the principle investigator's experience, independent variables different than those in this study's model may be needed. The variables PARENT may be significant for youthful offenders and the educational level of the offender's parent may also be important. A future study on youthful offenders is warranted.

Second, this study may not predict HOURS for the 2014 GED reliably with the model in Table 12. Since the new GED is computer based, an additional independent variable measuring computer literacy may be necessary to improve reliability and validity. The higher level of knowledge tested on the 2014 GED should simply increase the size of the intercept, which would reduce the number of inmates who complete the GED within a year. Further research in a few years using a sample from the 2014 GED will be required.

Third, while the study does find that race is a statistically significant predictor of the number of hours required to complete the GED, it does not provide any socioeconomic explanation behind this result. Statistically, race is a manifest variable for those underlying latent variables that affect the number of hours required to complete the GED.

The achievement gap between Caucasians and non-Caucasians in education has been observed in test scores, course grades, and educational aspirations (Kao & Thompson, 2003). The reasons behind these observed gaps include ethnic group differences, parental practices, and schooling opportunities (Kao & Thompson; Hirschman & Lee, 2005). The achievement gap affects unemployment rates, earnings, and economic success among races (Goldsmith, 2009). While numerous studies have considered solutions to the achievement gap in earnings, all of them suggest higher educational levels are necessary (Sum et al., 2007).

The latent variables such as parenting practices, grades, and family income are not available to the principle investigator. However, the observed correlations between race and educational level and whether or not an inmate was raised in a two parent household that are discussed in this research demonstrate at least some of the racial achievement gap socioeconomic relationships.

A distinction between Hispanic/Latino origin from White and Black race categories is also not available in BOP records. As previously stated, an inmate of Hispanic ethnicity is recorded as Black or White only. This limitation is mitigated by the fact that few Hispanic inmates are mandated to take GED programming.

Finally, if any or all of the policy alternatives proposed in this study are implemented, future research that determines if HOURS is reduced would be necessary to test the benefit of the new policies, that is, to confirm the predictions of the model.

### **Significance of the Study**

This study contributes to both the correctional education literature and to the practice of correctional education. More broadly, it offers policy alternatives for the BOP that can help achieve educational goals, benefitting the inmate and society.

As the review of the literature indicates, numerous studies have examined the positive effects on recidivism, unemployment, and wages of the outcome of obtaining a GED. This study adds to the literature by providing a model to determine how quickly an inmate is expected to obtain the GED. By providing a method of ranking inmates by how quickly they are expected to obtain the GED, correctional education is made more efficient in practice by increasing the number of GED graduates per year. This outcome reduces the cost per inmate per year of the GED.

The results of this study must be considered from the perspective of correctional education. Unlike education for the general population of adults, the correctional GED program is mandated by law for most offenders who are not GED holders or high school graduates. This portion of the BOP population must attend GED classes for at least 240 instructional hours. If an inmate refuses to attend for the mandated time period, he is penalized by receiving an incident report, receiving a GED UNSAT progress assignment and can be placed in special housing (SHU), essentially locked in a cell 23 hours per day. Even after the completion of the mandatory 240 hours an inmate who chooses to drop the GED program will receive a progress assignment of GED UNSAT and lose up to 12 days GCT. Essentially, the correctional education system treats adult men who misbehave or refuse to participate in the same way the general education system treats misbehaving or non-participating children, except the punishment is more severe and counseling is rarer.

While the public education system does not have the option of using a ranking model to select students who attend school, private charter, and magnet schools do use various selection procedures, all of which by definition discriminate based on variables such as academic achievement, economic status, zip code, gender, race, or religion. Selection procedures are used

to determine those students who are most likely to succeed given the school's specific mission. This study proposes a similar perspective for BOP GED programming by establishing a ranking model to select those students most likely to succeed the quickest given the BOP education department's mission of maximizing the number of inmates who receive the GED while incarcerated,

This ranking model uses some of the same variables as those in private, charter, or magnet schools like academic achievement (GRADE) and age (AGE) and the crime category of DRUG or SEX relates to socioeconomic status. While the private educational system may use race for affirmative action, the ranking in this study does place younger, non-Caucasian drug offenders with little education at the very bottom. While objective, this obviously racially biased result cannot be overlooked. One possible compromise. Is to develop a selection procedure that interviews the individual inmate with these characteristics to determine the effort he is likely to put forth.

Per capita and total costs of incarceration continue to rise and the BOP is 38% overcrowded (James, 2013). These increases are simply unsustainable to reduce the issues including those suggested in this study (James, 2013).

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APPENDIXES

APPENDIX A

*Table 1*

*Descriptive Statistics of Continuous Variables*

Table 1

*Descriptive Statistics of Continuous Variables (N=99)*

Variables	M	Mdn	SD	Sk <sup>a</sup>	K <sup>b</sup>
HOURS	380.06	204.00	424.43	1.6	1.90
GRADE	9.20	10.00	2.15	-2.71	8.48
AGE	34.30	34.00	11.91	-0.11	2.50
LENGTH	133.93	120.00	79.56	0.79	0.54
READ	8.33	8.80	3.29	-0.79	0.46
MATH	7.45	7.60	3.71	-0.81	0.54

Notes: Sk<sup>a</sup> = coefficient of skewness. K<sup>b</sup> = coefficient of kurtosis.

APPENDIX B

*Table 2*

*Percentage of BOP and US Population Without a  
High School Diploma or GED as of 2010*

Table 2

*Percentage of BOP and US Population Without a High School Diploma or GED as of 2010*

Race	US Population	BOP Population
Caucasian	13.95%	27.80%
Non-Caucasian	<u>15.60%</u>	<u>44.00%</u>
TOTAL	29.50%	71.80%

Source: [www.census.gov](http://www.census.gov); [www.bop.gov](http://www.bop.gov)

APPENDIX C

*Table 3*

*Percentage of Children Not Raised in Two-Parent  
Households by Race as of 2010*

Table 3

*Percentage of Children Not Raised in Two-Parent Households by Race as of 2010*

Race	Sample	US Population
Caucasian	25.5%	24.0%
Non-Caucasian	55.3%	54.0%

Source: [www.census.gov](http://www.census.gov)

APPENDIX D

*Table 4*

*Percentage of Inmates Whose Most Recent Offense is Given Criminal Category*

Table 4

*Percentage of Inmates Whose Most Recent Offense is Given Criminal Category*

Sample	Type of Crime							
	Drug <sup>a</sup>	Weap <sup>b</sup>	Rob <sup>c</sup>	IMM <sup>d</sup>	Fraud <sup>e</sup>	Viol <sup>f</sup>	Sex <sup>g</sup>	Other <sup>h</sup>
Caucasian	17.1%	3.8%	3.2%	2.1%	3.2%	2.1%	3.8%	2.1%
Non-Caucasian	<u>38.1%</u>	<u>13.3%</u>	<u>2.1%</u>	<u>2.1%</u>	<u>0.0%</u>	<u>3.2%</u>	<u>0.0%</u>	<u>3.8%</u>
TOTAL	55.2%	17.1%	5.3%	4.2%	3.2%	5.3%	3.8%	5.9%
BOP	50.6%	15.2%	4.1%	12.0%	5.2%	2.7%	4.8%	5.4%

*Notes:* <sup>a</sup>DRUG = drug-related offense. <sup>b</sup>WEAP = weapons violation. <sup>c</sup>ROB = robbery, burglary, or theft offense. <sup>d</sup>IMM = immigration offense. <sup>e</sup>FRAUD = fraud, blackmail, or extortion offense. <sup>f</sup>VIOL = violent crime such as murder or rape. <sup>g</sup>SEX = sexual offense. <sup>h</sup>OTHER = any other kind of offense.

APPENDIX E

*Table 5*

*Percentage of Sample Inmates with GED SAT or GED UNSAT Progress Assignment*

Table 5

*Percentage of Sample Inmates with GED SAT or GED UNSAT Progress Assignment*

Race	Progress Assignment	
	<i>GED SAT</i>	<i>GED UNSAT</i>
Caucasian	33.7%	4.2%
Non-Caucasian	<u>58.9%</u>	<u>3.2%</u>
TOTAL	92.6%	7.4%

APPENDIX F

*Table 6*

*Possible Model Choices for Mallows's  $C_p$  Criterion*

Table 6

*Possible Model Choices for Mallow's  $C_p$  Criterion*

Variable	Model Number							
	1	2	3	4	5	6	7	8
PARENTS	*							
AGE	*	*	*	*	*	*	*	*
GRADE	*	*	*	*	*	*	*	
READ	*	*	*	*				
LENGTH	*	*	*	*	*	*	*	*
DRUG	*	*	*	*	*	*	*	*
WEAP	*	*	*					
SEX	*	*	*	*	*	*	*	*
PROGRESS	*	*	*	*	*	*	*	*
RACE	*	*	*	*	*	*	*	*
PROGRESS*GRADE	*	*	*					
PROGRESS*AGE	*	*						
PROGRESS*RACE	*	*	*	*	*	*		
LENGTH*AGE	*	*	*	*	*	*	*	*
GRADE*RACE	*	*						
GRADE*LENGTH	*							

*Note:* \*indicates the corresponding variables included in the model.

APPENDIX G

*Table 7*

*Summary of Regression Analysis for Variables Predicting  
Instructional Hours Required to Complete GED*

Table 7

*Summary of Regression Analysis for Variables Predicting Instructional Hours  
Required to Complete GED*

Variable	$\beta$ Coefficient	SE $\beta$	p-Value
CONSTANT	288.53	313.42	0.359
GRADE	-20.86*	10.17	0.043
AGE	6.68	9.85	0.499
RACE	-251.84*	111.30	0.026
DRUG	127.93*	59.50	0.034
SEX	-546.78*	273.05	0.048
LENGTH	-2.86	2.01	0.159
PROGRESS	656.13**	236.92	0.006
PROGRESS*RACE	-484.95*	242.47	0.048
AGE*LENGTH	0.10*	0.05	0.046

*Notes.* Adjusted  $R^2 = 0.3159$  ( $p < .001$ ),  $df = 98$ . \* $p < .05$ , \*\* $p < .01$

APPENDIX H

*Table 8*

*Joint Probabilities of RACE and CRIME Given GED UNSAT Progress Assignment*

Table 8

*Joint Probabilities of RACE and CRIME Given GED UNSAT Progress Assignment*

---

RACE	CRIME Category	
	DRUG	OTHER
Caucasian	57.1%	14.3%
Non-Caucasian	14.3%	14.3%

APPENDIX I

*Table 9*

*Elasticity of HOURS for Explanatory Variable*

Table 9

Elasticity of HOURS for Explanatory Variable

---

<u>Variable</u>	<u>Elasticity</u>
GRADE	-0.48
AGE	1.71
LENGTH	-0.19

---

*Notes.* A 1% change in indicated variable leads to a percent change in HOURS equal to the given elasticity

---

APPENDIX J

*Table 10*

*Reduced Regression Model for Binary Explanatory Variables Predicting  
Instructions Hours Required to Complete the GED with Continuous  
Explanatory Variables at Values\**

Table 10

*Reduced Regression Model for Binary Explanatory Variables Predicting Instructions Hours Required to Complete the GED with Continuous Explanatory Variables at Values\**

Variable	$\beta$ Coefficient
<i>INTERCEPT</i>	407.49
DRUG	127.93
SEX	-546.78
RACE	-251.84
PROGRESS	656.13
PROGRESS*RACE	-484.95

*Notes.* \*Mean values are GRADE = 9.2 years. AGE = 34.3 years, and LENGTH = 133.9 months.

APPENDIX K

*Table 11*

*Effect Sizes for Estimated HOURS by RACE, CRIME, and PROGRESS  
for Mean Values of GRADE, AGE, and LENGTH*

Table 11

*Effect Sizes for Estimated HOURS by RACE, CRIME, and PROGRESS  
for Mean Values of GRADE, AGE, and LENGTH*

PROGRESS = 0 (GED SAT)			
RACE	CRIME CATEGORY		
	DRUG	SEX	OTHER
Caucasian	284 (82, -, -)	0	156
Non-Caucasian	535 (31, 88, -)	0	407
PROGRESS = 0 (GED SAT)			
RACE	CRIME CATEGORY		
	DRUG	SEX	OTHER
Caucasian	455 (39, -, 71)	0	327 (-, -, 110)
Non-Caucasian	1192 (12, 162, 123)	517	1064 (-, 225, 161)

*Notes:* First value in parentheses is percent increase in HOURS from OTHER crime category to DRUG crime category for given PROGRESS and RACE. Second value in parentheses is percent increase in HOURS from Caucasian to Non-Caucasian for given PROGRESS and CRIME. Third value in parentheses is percent change in HOURS from GED SAT to GED UNSAT for given RACE and CRIME.

APPENDIX L

*Table 12*

*Final Regression Model*

Table 12

*Final Regression Model*

Variable	$\beta$ Coefficient
CONSTANT	288.53
GRADE	-20.86
AGE	6.68
RACE	-251.84
DRUG	127.93
SEX	-546.78
LENGTH	-2.86
PROGRESS	656.13
PROGRESS*RACE	-484.95
AGE*LENGTH	0.10

APPENDIX M

*Figure 1*

*Racial Composition by Percent*

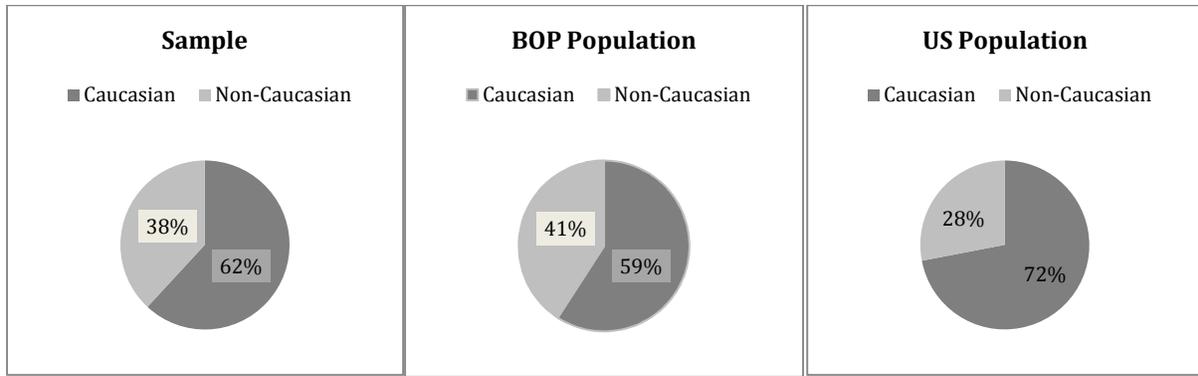


Figure 1. Racial composition by percent. Source: [www.bop.gov](http://www.bop.gov); [www.census.gov](http://www.census.gov)

APPENDIX N

*Figure 2*

*Percentage Raised in Two-Parent Households*

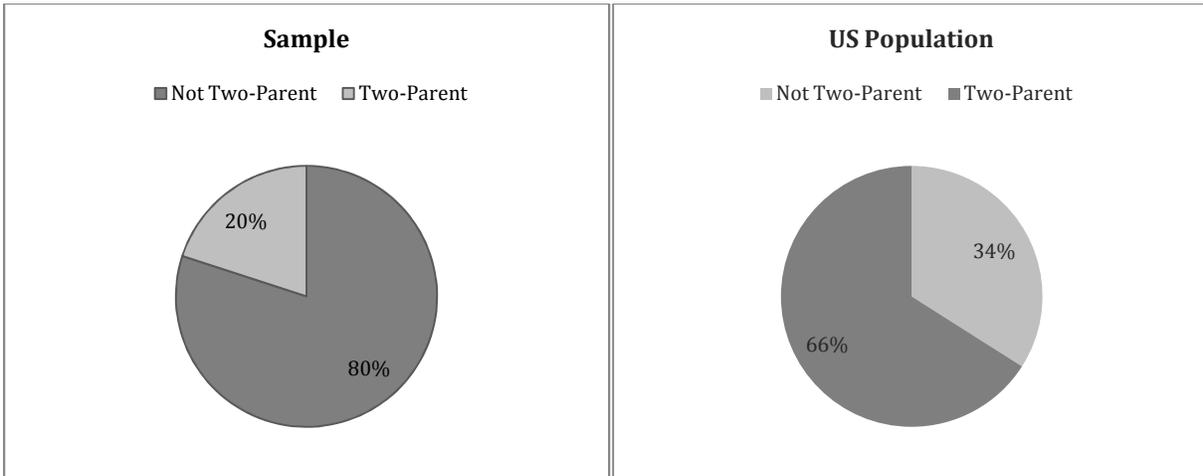


Figure 2. Percentage raised in two-parent households.

Source: [www.census.gov](http://www.census.gov)

APPENDIX O

*Figure 3*

*Bilinear Correlation Coefficients*



## Independent Variable

	GRADE	AGE	RACE	DRUG	WEAP	SEX	PARENTS	LENGTH	PROGRESS	READ
GRADE	1.000									
AGE	.1016	1.000								
RACE	1.1707*	.2922*	1.000							
DRUG	-.0960	-.1456	-.2024*	1.000						
WEAP	.0837	-.2384*	-.1090	nm	1.000					
SEX	.1627	.4929*	.2712*	nm	nm	1.000				
PARENTS	.0612	.1473	.2879*	-.1992*	-.0388	.2972*	1.000			
LENGTH	.0386	.3012*	-.1845*	.2841*	-.2936	.0234	-.1674	1.000		
PROGRESS	.1854*	-.2129*	.2630	-.1680	-.1319	-.0570	-.0208	.1859*	1.000	
READ	-.0107	.0549	.2012*	-.1261	.1065	-.0142	.2374*	.0138	.0302	1.000

Figure 3. Bilinear correlation coefficients between independent variables.

Note. \* $p < .05$ .