

The Effect of Foster Care Experience and Characteristics on Academic Achievement

Alexandra Calix

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Approved by

Charles L. Usher, PhD

Shenyang Guo, PhD

Dean F. Duncan, PhD

Dennis Orthner, PhD

Karolyn Tyson, PhD

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Abstract

Alexandra Calix: The Effect of Foster Care Experience and Characteristics on Educational Outcomes

(Under the direction of Charles L. Usher, PhD)

This study examined the effect of foster care experience and characteristics on educational outcomes. The typical strategy in examining the effect foster care has on educational outcomes is to compare the educational achievement of youth with foster care experience to that of their peers or to national norms. This strategy fails to take selection bias into account and thus findings based on this research can be misleading. Many studies also fail to provide information regarding how the experience of foster care may have contributed to low educational achievement.

The study presented here used educational and child welfare data to assess the effect foster care has on educational outcomes. Four test-year cohorts of youth in North Carolina who took the Algebra I End of Course test in 1999-2002 were used in this study. The use of this data made it possible to apply propensity score matching techniques to systematically construct comparison groups of youth without foster care experience that account for selection bias. Once differences in achievement between foster care youth and non-foster care youth were examined, characteristics of the foster care experience that may contribute to low educational outcomes were assessed.

Findings from this study suggest that youth with foster care experience score lower on the test and are less likely to pass than youth without foster care experience. This study also suggests that characteristics and variations based on the foster care experience such as race, reason for placement, age at entry, length of time in foster care, and number of foster care placement settings, are related to low educational achievement.

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Chapter I:

Introduction and Significance of Research

Literature on the foster care population illustrates several areas in which this population is disadvantaged and in need of intervention. One of these areas is education. Foster care youth often struggle to succeed in school, and an unusually large percentage will experience school failure (Altshuler, 1997). Youth at risk of failing school or dropping out also have a high risk for drug abuse, delinquency, and violence, as well as later unemployment and reliance on public assistance (Dyfroos, 1990; Hawkins, Catalano, & Miller, 1992). A substantial proportion of foster care youth experience negative outcomes after transitioning out of the system, including poor mental health, substance abuse, serious physical and sexual victimization (Cook, 1994), incarceration (Jonson-Reid & Barth, 2000), hospitalization, homelessness, abduction, and unemployment (Courtney & Barth, 1996).

The most promising mechanism to mitigate the negative outcomes of foster care youth is likely to be a good education (Casey Family Programs, 2003). Research shows that education is key to successful youth development and adult self-sufficiency (Casey Family Programs, 2003; Redd, Brooks, & McGarvery, 2002). A study by Westat Inc. (1991) found that foster care youth who completed high school were more likely to secure stable employment and have a higher level of self-sufficiency after discharge than those who had not completed high school.

Unfortunately, foster care youth in general are not faring well educationally. A number of studies provide evidence that foster care youth are an educationally vulnerable population. The Chapin Hall study on foster care youth attending Chicago public schools found that youth in care lagged at least half a school year behind demographically similar non-foster care students in the same schools (Smithgall, Gladden, Howard, George, & Courtney, 2004). Close to 50% of third- to eighth-graders in foster care scored in the bottom quartile on the reading section of the Iowa Tests of Basic Skills (Smithgall et al., 2004). The study also found that 15-year-olds in foster care were only about half as likely as other students to have graduated five years later; instead, many dropped out (55%) or were incarcerated (10%) (Smithgall et al., 2004).

The Midway Study (2005), a three-state study of foster care youth who had just completed 10th or 11th grade, found that, on average, these youth read at a seventh-grade level. Students in the study were more likely to receive failing grades and less likely to receive A's than their peers; in fact, fewer than one in five received an A in English, math, history, or science (Courtney, Terao, & Boost, 2004). These students were at a higher risk of being retained, more than twice as likely to be suspended, and almost four times as likely to be expelled than their peers (Courtney, Terao, et al., 2004). The study also found that more than one-third of foster care youth had not received a high school diploma or a GED by age 19, compared to less than 10% of non- foster care peers in a comparable national sample (Courtney, Terao et al., 2004).

A 2001 analysis of educational attainment of youth in Washington State public schools found that foster care youth scored 16 to 20 percentage points lower than non-foster care youth in standardized tests in third, sixth, and ninth grades (Burley & Halpern, 2001).

Findings also revealed that only 59% of youth in care who started 11th grade went on to complete 12th grade (Burley & Halpern, 2001). In contrast, the national high school completion rate for all students is 70% (Swanson, 2006).

Overall, youth in foster care exhibit poorer educational outcomes than the general student population, even when controlled for demographics and income (Burley & Halpern, 2001; Courtney, Terao, et al., 2004; Dubowitz & Sawyer, 1994; Dubowitz, Zuravin, Starr, Feigelman, & Harrington, 1993; Evans, 2001; Smithgall et al., 2004).

This issue is of timely importance in light of recent attention from policy makers and child welfare advocates on outcomes of youth in care. For example, the federal Child and Family Service Review (CFSR) is a results-based system of federal oversight of state child welfare systems. The CFSR holds states accountable for achieving seven outcomes related to child safety, permanency, and well-being (which include education). According to the CFSR, states must provide appropriate services to meet the educational needs of youth in foster care, and financial penalties are incurred by states that fail to make progress on educational and other outcomes (DHHS, 2007). States that do not provide such services and supports for youth in foster care face a high risk of losing funding. According to a report of the National Conference of State Legislatures, only 11 states have “substantially achieved” these education-related outcomes (Christian, 2003). The CFSR and other policy initiatives such as the Adoption and Safe Families Act suggest that increasing attention is being placed on the educational outcomes of youth in care in the present and future. Therefore, research into educational outcomes of youth in foster care is of significant importance. Research that informs the development of interventions, practice, and policy is important in planning for

this vulnerable population (Stone, 2007) and for preventing negative outcomes for these youth once they transition out of the foster care system.

Approaches to Examining Educational Outcomes of Youth with Foster Care Experience

Although several studies elucidate the educational struggle of youth in foster care, most have methodological limitations. Many studies fail to use representative samples of sufficient size for multivariate analysis. Also, few researchers have attempted to systematically construct meaningful comparison groups based on whether youth do or do not have foster care experience. For the most part, the typical strategy is to compare the educational achievement of youth with foster care experience to that of their peers or to national norms (Benedict, Zuravin, & Stallings, 1996; Courtney, Piliavin, Grogan-Taylor, & Nesmith, 2001; Fansel, Finch, & Gurdy, 1990; Mc Millen & Tucker, 1999). These types of studies fail to take confounding factors and selection bias into account, and as a result, their findings can be misleading. Some studies are also limited in that they are unable to account for age of entry into or length of time in foster care (e.g., Blome, 1997; Buehler, 2000; Korthenkamp & Ehlre, 2001) and do not provide specific information regarding how the experience of foster care may have contributed to low educational achievement (Stone, 2007).

Adoption and Foster Care Analysis and Reporting System (AFCARS) point-in-time data are often used by researchers to gather information on youth in the foster care system and their experiences during care. However, this data set is limited in that it fails to distinguish among several very distinct subsets of youth in care, among them: (1) children who come into the foster care system before puberty and stay in the system throughout adolescence and then emancipate, (2) children who come into the system before puberty and

leave the system prior to emancipation (3) those who enter care as adolescents and continue in the system throughout adolescence and then emancipate and (4) those who enter the system as adolescents and leave prior to emancipation.

AFCARS and other point-in-time data collection systems fail to account for these different patterns of participation in foster care. Therefore, results of studies which rely exclusively on point-in-time data should be interpreted with caution. Without data that identifies patterns of participation in foster care, it is extremely difficult to link foster care experience to developmental stages, and therefore, to assess accurately the impact of foster care on outcomes for young adults.

Goals of Research

Taking into consideration the current state of knowledge in this area, the purpose of this dissertation is to fill in some of the existing gaps in the research. In doing so, the goal of this study is to inform practice, research, and policy to prevent negative educational outcomes for foster care youth. This dissertation will try to accomplish this by: (1) truly assessing the differences in educational achievement of youth with and without foster care experience by attempting to control for confounding factors and selection bias in creating a comparison group, and (2) assessing the effect placement characteristics have on educational outcomes for youth with foster care experience based on their patterns of participation in foster care. This is achieved by linking three data sets: (1) End-of-Course (EOC) Algebra I test data of four test-year cohorts (1999-2002) from North Carolina Education Research Data Center, (2) the North Carolina Child Welfare Experiences data set created and maintained at the Jordan Institute for Families of the University of North Carolina, and (3) the Work First data created and maintained at the Jordan Institute for Families. By linking these data sets, it

is possible to construct refined comparison groups using propensity score matching, and thus, attempt to control for confounding factors and selection bias.

The data used in this dissertation are unique in that several variables (e.g., length of time in care, age at entry) are available to determine variations and patterns in the foster care experience. Therefore the linkage of these data makes it possible to explore the educational performance (measured by Algebra I test scores) of foster care youth based on the volume of their foster care experience. By creating subsets of foster care youth based on their patterns of participation in care, this dissertation examines the effect placement characteristics have on educational outcomes.

In examining the educational achievement of youth in foster care, it is important to lay the groundwork for such a study by determining whether the same set of educational dynamics holds true—that is, are predictive of educational achievement in the manner that the literature states they are—for youth with foster care experience (foster care youth) and those without foster care experience (non-foster care youth)¹. This is achieved by examining, in both populations, variables known in the literature to be predictors of educational achievement (e.g., race, gender, parent educational level as proxy for SES, participation in after-school activities, etc.).

Once this groundwork is completed, modeling is conducted to determine whether differences in educational achievement exist between groups of foster care and non-foster care youth matched on variables available in the data that can predict placement in foster care. Once these differences are identified, further modeling determines whether these differences in achievement are due to the foster care experience.

¹ Youth with foster care experience will also be identified as foster care youth; youth without foster care experience will also be identified as non-foster care youth throughout this document.

Research Questions and Hypotheses

This dissertation aims to answer the following research questions:

1. Do the same set of educational dynamics hold true—that is, are they predictive of educational achievement in the manner that the literature states they are—for youth with foster care experience and youth without foster care experience?
2. Do test scores and the effect of youth characteristics on test scores differ between full test-year cohorts ² (unmatched) and matched test-year cohorts once selection bias is controlled?
3. Are differences in test scores among foster care youth due to overall patterns of the foster care experience?
4. Are differences in test scores among foster youth associated with variation in their foster care experience?

This study used four hypotheses that addressed the research questions:

1. Predictors of educational achievement hold true for both the foster care and non-foster care populations.
2. Test scores and the effect of youth characteristics on test scores will differ between non-foster care youth and foster care youth in both full-test and matched cohorts. Non-foster care youth will score higher than foster care youth on the test. However, once selection bias is accounted for via matching, the gap in scores between non-foster care and foster care youth will be smaller.
3. Differences in the test scores of foster care youth are due to overall patterns and characteristics of the foster care experience.

² Full test-year cohorts include all non-foster care youth and foster care youth who took the test that year. These cohorts are not matched.

4. Differences in test scores among subsets of foster care youth (i.e., (a) youth who took the test before placement in foster care or (b) youth who took test in their first and only spell of foster care or (c) youth with multiple placement experiences who took the test in their first, second or later spell in foster care or (d) youth who took the test between spells or (e) youth who took the test after having completed their final or only spell in foster care) are associated with variations in their experience in foster care.

Chapter II:

Risk Factors and Predictors of Educational Achievement

Factors Contributing to the Low Educational Achievement of Youth

Risk factors

A growing body of research has elucidated many factors that contribute to the low educational achievement of youth. These factors often coexist, and the presence of one can exacerbate another (i.e., poverty). This type of research often times utilize theories including ecological, developmental, attachment, and social support to help conceptualize and explain phenomena related to educational achievement of at youth- as was also done in this dissertation.

Poverty. Youth from economically disadvantaged families exhibit lower levels of cognitive functioning and academic achievement, along with lower levels of physical and social development, than do other youth from more advantaged families (Duncan, Brooks-Gunn & Klebanov, 1994; Elder, Nguyen & Caspi, 1985; McLoyd, 1990). The unstable and impoverished conditions that contribute to difficulty in parenting and learning may also determine maltreatment and learning problems for youth (Beckwith, Howard, Espinosa & Tyler, 1999; Crozier & Barth, 2005). Youth who spend more time in poverty receive fewer years of schooling, are less likely to graduate from high school and attend college, and have lower earnings (Duncan & Brooks-Gunn, 1997). Research also shows that achievement test scores and grades are highly correlated with parental SES (Kao & Thompson, 2003).

Parental welfare. The research is mixed regarding the effect of parental welfare receipt on the educational achievement of youth. Studies have found that parental welfare receipt has adverse effects on the completion of high school (Haveman, Wolfe & Spaulding, 1991) and negative effects on youth educational achievement and earnings (Duncan & Yeung, 1994). Similarly, another study found that youth living in families that received welfare had worse academic outcomes and less labor market experience, even when controlling for income level (Peters & Mullis, 1997). In contrast, other research indicates a positive link between parental welfare receipt and youth academic achievement. Duncan and Brooks-Gunn (1997) found that black adolescents living in families receiving welfare had higher achievement test scores and more years of completed education than similar black adolescents living in families that did not receive welfare. Other researchers (Chase-Lansdale et al., 2003) found that youth in families that recently went off welfare lagged behind over time in the development of their reading comprehension skills compared to youth from families continuing to receive welfare (Chase-Lansdale et al., 2003).

Family structure. Growing up in a one-parent home is associated with lower educational achievement and more behavioral and psychological problems (Duncan & Brooks-Gunn, 1997). Youth raised in single-parent families, especially those in mother-only families, have high rates of poverty, further contributing to their low educational achievement (Duncan & Brooks-Gunn, 1997). Youth in single-parent homes may also be disadvantaged in that they receive less parental supervision and monitoring of school work, and have less social capital (Zill, 1996). Biblazar and Raferty (1999) suggest that the limited economic and social resources of many single parents are the primary cause of the lower

educational achievement of youth from single-parent families compared to those from two-parent families.

Parent level of education. Research has shown that better-educated mothers are more likely to spend more time supervising their children (Zuravin, 1988) and that better-educated parents are more likely to advocate for their child's placement in honors courses, manage more actively their child's academic achievement, and be more informed about school issues than less-educated parents (Baker & Stevenson, 1986; Yonzewa, 2000). The educational attainment of female children has also been shown to be enhanced by having a more educated mother (Mensch & Kendal, 1988). Having parents who did not graduate high school is also positively associated with children's likelihood of dropping out of high school (Teachman, Paasch, Day & Carver, 1997).

Parental involvement. Lack of parental involvement can also contribute to the low educational achievement of youth (Maccoby & Martin, 1983). Research shows that youth benefit from warm, responsive, and highly involved parents (Loeber & Stouthamer-Loeber, 1986). Parental involvement— whether helping youth with homework, attending school events, or parent-teacher collaboration, has been linked to indicators of educational achievement (i.e., higher achievement test scores and better grades) (Deslandes, Royer, Potvin & Leclerc, 1999; Epstein & Van Voorhis, 2001). Parental involvement has also been associated with lower rates of grade retention and drop-out, higher rates of on-time high school graduation, and higher rates of participation in Advanced Placement courses (Barnard, 2004; Ma, 1999; Marcon, 1999; Miedel & Reynolds, 1999).

Neighborhood characteristics. Negative neighborhood characteristics (e.g., low socioeconomic status and social disorganization) can affect the educational achievement of

youth. Studies show that the academic performance of youth from disadvantaged neighborhoods is consistently below that of their peers from other higher-SES communities (Brooks-Gunn, Duncan & Aber, 1997; Hetherington, Camara & Featherman, 1983; Heynes, 1985; Jencks & Mayer, 1990; Leventhal & Brooks-Gunn, 2000; Ramey & Campbell, 1991). Low-SES neighborhoods often lack high-quality educational and social resources for youth (Furstenberg, 1993). Studies comparing the school environments in low-SES neighborhoods to those in higher-SES neighborhoods reported differences in classroom instruction (i.e., subject matter, instructional arrangements, materials, and teacher behavior) that contributed differentially to youth intelligence, achievement, and school success (Greenwood, 1991; Reynolds, 1991). Youth attending low-SES schools experience higher drop-out rates than those in higher-SES schools (Mayer, 1991). In terms of social disorganization, research suggests that living in a high-crime neighborhood is associated with poor academic and behavioral outcomes (Bowen & Bowen, 1999). High levels of neighborhood crime may also undermine a youth's child's sense of school coherence, negatively affecting his or her education (Nash, 2002).

Ethnicity. Race is another important factor to take into account, if for no other reason than its consistent correlation with poverty. Higher percentages of minority populations (24.9% of African Americans and 21.89% of Hispanics) live in poverty than do Whites (8.7%) (U.S. Census, 2007). Thus, minorities are disproportionately at higher risk of experiencing many of the poverty-related factors that can contribute to the low educational achievement of youth. Some African American children who live in improvised environments fail to draw the correlation between succeeding academically and future career success (Cokley, 2003). Children from minority groups are significantly more likely than

others to drop out of school (Kao & Thompson, 2003; Warren, 1996; White & Kaufman, 1997).

Factors Contributing to the Low Educational Achievement of Youth due to Placement in Foster Care

Risk Factors

Exposure to the aforementioned risk factors- being an ethnic minority, poverty, parental welfare receipt, low parent education level, lack of parental school involvement, growing up in a single-parent home, and negative neighborhood characteristics, among others, may put children at risk for poor educational outcomes even before they enter foster care (Duncan, Brooks-Gunn & Klebanov, 1994; Haveman, Wolfe & Spaulding, 1991; Kao & Thompson, 2003; Miedel & Reynolds, 1999; Zuravin, 1988). Circumstances after entry may put them at even further risk. In addition, other factors uniquely associated with placement in care can contribute to their low educational achievement.

Maltreatment. Maltreated children are more likely than their peers to exhibit aggression, poor peer relations, and emotion dysregulation (Dodge, Pettit & Bates, 1994; Wolfe, 1999). These types of behavior problems result in the likelihood of maltreated children to receive school disciplinary referrals and suspensions (Eckenrode, Laird & Doris, 1993) and may also lead these children to experience grade retention, placement below age-appropriate grade levels, and placement in special education (Zetlin, Weinberg & Kimm, 2004).

Disruptions in placement and School Mobility. Unstable living conditions and disruptions in placements undermine children's social, emotional, and physical development, perpetuating poor outcomes (Robertson, 2005). Lack of placement stability commonly results in foster care youth having several school placements; in fact, fully half of foster care

youth change schools at least four times (Emerson & Lovitt, 2003). According to some experts, children may require four to six months to recover academically from the disruption of changing schools (Emerson & Lovitt, 2003), resulting in a tendency to fall increasingly further behind in academics and experience more learning difficulties (Blome, 1997). Further exacerbating the problem, children who experience frequent school placements often miss large portions of the school year, lose academic credits due to mid-semester moves, and have incomplete educational records due to missing transcripts and assessments (Eckenrode, Laird, & Brathwaite, 1995), which can result in being forced to repeat a grade or not receiving services identified in their Individualized Education Plan (IEP) (Altshuler, 1997).

Length of stay in care. Youth average about 28.6 months in foster care (median: 15.5 months) (GAO, 2008). Of the 287,000 children leaving care in fiscal year 2005, fifty percent of these children had been in care for 11 months or less, while 17% had been in care for 3 years or more (DHHS, 2006). Youth with longer lengths of stay may experience higher rates of school transfers which may negatively effect their educational achievement. However, research as shown that youth with shorter stays in foster care (90 days or less) are twice as likely to re-enter than those who stay longer their first time in care, thus negatively affecting them educationally (Conger & Rebeck, 2001).

In studying the effect placement in foster care has on educational outcomes it is important to consider the variables mentioned above to adequately examine the patterns of the foster care experience and its relation to educational risks. This dissertation looks at some of these variables for that purpose.

Predictors of Educational Achievement

In examining educational outcomes it is important to have an understanding of variables that are said to be predictive of educational achievement. This study used what the literature posits as predictors of educational achievement to examine educational outcomes and to see if these predictors hold true (i.e., are predictive of educational achievement in the manner that the literature states they are) in the data.

Race. Ethnic minority children and adolescents from low SES backgrounds are at an increased risk for low test scores and academic performance, completing fewer years of schooling and are disproportionately placed in low-ability groups early in their educational careers and in non-college bound groupings in middle and high school (Joseph, 1998; Kao & Thompson, 2003; Oaks, 1985; Slavin & Braddock, 1993). Minority children living in improvised environments may be aware of the stereotypes associated with their race- which can have an effect on their self-concept and thus negatively affect their school performance (Cokley, 2003).

Gender. Research indicates that gender differences exist in academic achievement (i.e., test scores) (Chambers & Schreiber, 2004; Hyde, Fennema, & Lamon, 1990; Warrington & Younger, 2000). Although the gender gap has been narrowing, (Bae, Choy, Geddes, Sable, Snyder, 2000) girls continue to lag behind boys in high school math and science test scores (Chambers & Schreiber, 2004). Mathematics is a subject that is perceived to be stereotypically masculine by many and thus differential socialization exists (Eccles, 1994). Differential socialization by parents, peers, and schools contribute to gender differences in achievement (Eccles, 1994). Differential socialization sends different messages to girls and boys regarding their efficacy at different tasks (Arbona, 2000).

Socio-economic Status (SES). Research shows that achievement test scores and grades are highly correlated with parental SES (Kao & Thompson, 2003). Youth from economically disadvantaged families exhibit lower levels of cognitive functioning and academic achievement, along with lower levels of physical and social development, than do other youth from more advantaged families (Duncan, Brooks-Gunn & Klebanov, 1994; Elder, Nguyen & Caspi, 1985; McLoyd, 1990).

Parents' level of education. Parental education background is significantly related to student achievement outcomes (House, 1999). A mother's education level has been found to be a predictor of first-grade student achievement test scores (Luster & McAdoo, 1996). Parental education may also directly contribute to mathematics achievement, via the parents' ability to aid the student with their math homework (Cooper, Lindsey, Nye, & Greathouse, 1998).

Participation in extra-curricular activities. Numerous studies have found a positive association between extracurricular participation and positive academic outcomes such as school engagement, test scores, and educational aspiration (Cooper, Valentine, Nye, & Lindsay, 1999; Eccles & Barber, 1999; Marsh, 1992; Marsh & Kleitman, 2002). Not only can participation in extracurricular activities predict academic achievement, it can also predict psychological competencies including higher self-esteem, and lower depression (Barber, Eccles, & Stone, 2001). Students that participate in extracurricular activities are more likely to bond or attach to their schools, these types of attachments increase the likelihood for positive educational outcomes (Randolph, Rose, Fraser, & Orthner, 2004).

Number of hours watching television (TV). Evidence suggests that quantity, quality, and consistency of TV watching are negatively associated with scholastic achievement.

Achievement declines as the amount of TV viewing increases (Comstock, 1991a; Comstock, Chaffee, Katzman, McCombs, & Roberts, 1978, pp. 146-147; Neuman, 1988, Sharif & Sargent, 2006). This inverse association increases as family SES rises. In some studies, children and adolescents who watch TV three or more hours a day had greater declines in achievement. The inverse association is more pronounced in higher grades (high school), especially when educational demands are greater (Hedley, Antonacci, & Rabinowitz, 1995). The American Academy of Pediatrics recommends that older children watch quality programming no more than 2 hours daily (American Academy of Pediatrics, 2009).

Exceptionalities. Students with exceptionalities such as learning disorders, physical, emotional, and behavioral disorders have lower achievement levels than that of students without these types of exceptionalities (Geary, Hoard, Byrd-Craven, Nugent, & Numtee, 2007; Schiff, Bauminger, & Toledo, 2009). Students with learning disabilities on average demonstrate inefficient information processing skills. This may be the underlying cause of their cognitive-academic and social emotional difficulties (Schiff, Bauminger, & Toledo, 2009). Due to these types of exceptionalities, students have a difficult time achieving academically and thus interventions are set in place to help them succeed.

Academic self-perception/expectancies. Students who expect success in their academic abilities tend to perform well in different learning situations (Zimmerman, 2000). For example, students who anticipate an A or B on a test may do better than students who anticipate a D or F. Students with low ability beliefs, task difficulty beliefs, and expectations of failure, are associated with negative academic outcomes (Dweck, & Legget, 1988; Murphy & Alexander, 2000; Zimmerman, 2000).

Chapter III

Theory and Educational Outcomes of Youth with Foster Care Experience

The study of educational outcomes of youth with foster care experience has been influenced by many theories including Ecological, Developmental, and Attachment theories. These theories allow for the conceptualization and understanding of factors uniquely associated with placement of youth in foster care that can contribute to their low educational achievement. The discussion that follows includes a brief description of each theory and how they apply to the study of educational outcomes of foster care youth.

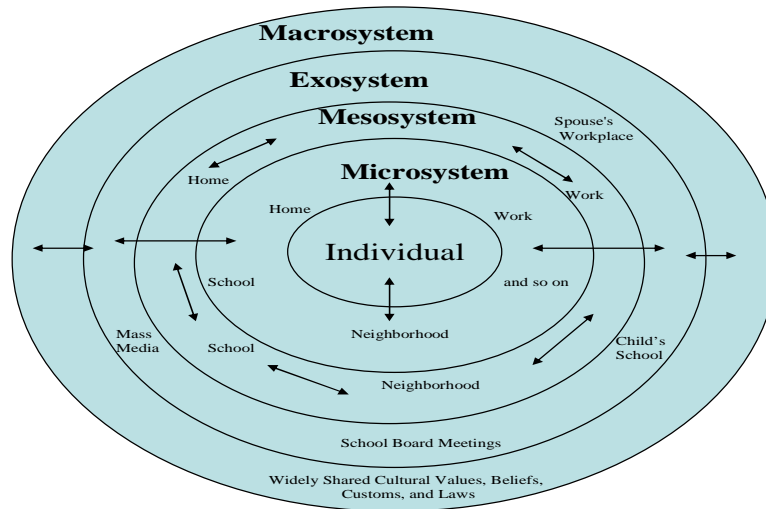
Ecological Theory and the Education of Youth in Foster Care

Ecological theory can be useful in conceptualizing the educational achievement problems often experienced by youth in foster care. Ecological theory captures the process of mutual adaptation and continuous transaction between individuals and their environment (Richman & Bowen, 1997). The person and the environment continuously change and accommodate for one another. According to Bronfenbrenner (1979), “The ecology of human development involves the scientific study of progressive, mutual accommodation between an active, growing human being and the changing properties of the immediate settings in which the developing person lives, as this process is embedded” (p. 21). Bronfenbrenner conceptualizes the environment as a set of four embedded regions: the microsystem, mesosystem, exosystem, and macrosystem.

Each region is defined by its proximity to the individual (Bronfenbrenner, 1979) (see Figure 1). It is important to take into account how different microsystems affect the educational achievement of youth because they spend a significant amount of time in a variety of systems, including their family, homes, schools, peer groups, and neighborhoods (Nash, 2002).

The *microsystem* is the individual's immediate environment in which s/he directly participates and interacts with family, friends, neighborhood, and school. The *mesosystem* "comprises the interrelation among two or more settings in which the developing person actively participates" (Bronfenbrenner, 1979, p. 25). An example of an interaction in the mesosystem environment is the relationship between an adolescent's school and church. The *exosystem* is "one or more settings that do not involve the developing person as an active participant, but in which events occur that affect, or are affected by, what happens in the setting containing the developing person" (Bronfenbrenner, 1979, p. 25). For example, an adolescent may be affected by certain situations at the parent's workplace or policies determined by the school system. Finally, the *macrosystem* reflects the larger cultural institutions (i.e., economic, social, political, educational, and legal systems) and the pattern of these institutions in society (Clancy, 1995).

Figure 1. Topological Model of the Environment: A Schematic Diagram of the Levels of the Environment in Bronfenbrenner's (1979) Ecological Theory



Note: Arrows across rings indicate reciprocal interactions at all levels

Academic problems rarely occur in isolation; instead they usually cause or are exacerbated by problems or issues in other systems (i.e., microsystems, etc.). A variety of factors in a youth's microsystem can affect their educational achievement, including family structure (e.g., living in a single-parent family), low parental involvement, neighborhood social disorganization, and low family SES (Deslandes et al., 1999; Duncan et al., 1994; Furstenberg, 1993).

Child maltreatment, which can lead to foster care placement, may result from negative characteristics of a child's microsystem such as parental use of harsh discipline (Moffit & Caspi, 2001), parental stress (Stern, Smith & Jang, 1999), or parental substance abuse (Magura & Laudet, 1996). Being removed from the home and placed in foster care introduces new factors into the child's microsystem that can negatively affect their educational achievement. The removal process itself, which involves separation from family

of origin, friends, and schools, can cause problems, as can subsequent events, such as multiple placement settings and school transfers, and the degree of attachment youth have with their foster parents, social workers, and teachers can also effect their educational achievement (Emerson & Lovitt, 2003; Harker et al., 2003; Robertson, 2005).

Within the foster care youth's mesosystem, the lack of collaboration within agencies (i.e., school system, child welfare system) and people in daily contact with foster care youth (i.e., teachers, foster parents, and social workers) can have a negative effect on the youth's education (Altshuler, 1997; Stone et al., 2007). Factors within the exosystems of youth in care that can affect their educational achievement are structural inequality and racially biased decision-making that may contribute to the disproportionately high placement rate of minority youth in the foster care system – which in turn can lead to lowered educational achievement (Chipunga & Bent-Goodley, 2004). Factors within the macrosystem of a child in care can positively affect his/her educational achievement by increasing public attention placed on their educational outcomes. The Adoption and Safe Families Act [P.L. 105-89], which includes the educational progress of youth in care as an outcome to evaluate state performance, is one such example of how the macrosystem can affect a child's well-being (Stone, 2007).

Although Ecological theory is useful in examining the person in their environment it is limited in that it does not consider time dimension. There is also little attention placed on the influence the individual has on the environment. This theory also considers concepts without context. For example, in examining academic achievement, individually distinguishing factors like race, gender, and class are oftentimes not accounted for, resulting in misinterpretation.

Developmental Theory and the Education of Youth in Foster Care

Developmental theorists commonly describe development in terms of periods related to an individual's age (Erickson, 1959; Levinson, 1986; Piaget, 1983). The most widely utilized classification of these developmental periods begins with the prenatal period and goes on to infancy, early childhood, middle and late childhood, adolescence and adulthood. The *prenatal period* generally includes the time of conception to birth, roughly a nine-month period. During this time there is tremendous growth involving the formation of a single cell to an organism with a brain and behavioral abilities (Erickson, 1959; Santrock, 2001).

The *infancy period* extends from birth to 18-24 months. During this time, infants are extremely dependent on adults. Activities of this period include the formation of language, symbolic thought, sensorimotor coordination, and social learning. The *early childhood period* extends from the end of infancy to age 5 or 6. This period may also be referred to as the *preschool years*, which end at the start of first grade. In this period, children learn to become self-sufficient and to care for themselves, develop school readiness skills (i.e., following directions), and spend many hours playing with peers.

Middle and late childhood extends from approximately 6 to 11 years of age (Erickson, 1959; Piaget, 1983; Santrock, 2001). This period corresponds to the elementary school years. During this period children master fundamental skills such as reading, writing and mathematics, and also become exposed to society and culture. Achievement is a major theme during this period. *Adolescence* is the developmental period in which a transition from childhood to early adulthood occurs. This period begins at 10 to 12 years of age and ends at 18 to 22 years of age. Youth during this period experience rapid physical changes (i.e., large increases in height and weight, and the development of secondary sexual characteristics,

racial identities). They begin to think logically, abstract, and idealistic. Adolescents also spend more time outside the family (Erickson, 1959; Piaget, 1983; Santrock, 2001).

Developmental theory can be used to examine the needs and the impact foster care has on children and youth at different developmental periods (Dozier, Albus, Fisher & Sepulveda, 2002). Many children in foster care experience disruptions in placements and relationships, have temporary caregivers, and may have a history of inadequate care or maltreatment. Struggles caused by these experiences may differ according to the developmental period in which they occur. The experience of maltreatment, for example, is of significant risk for a child at any point in their developmental stage. Maltreatment during infancy increases the risk of disorganized attachments to caregivers (Carlson, Cicchetti, Barnett & Braunwald, 1989). For preschoolers, the experience of maltreatment may result in unrealistic conceptions of self and negative conceptions of caregivers. The experience of maltreatment for during the school-age years children may cause children to have negative attributional biases and inadequate inhibitory control, which may lead to aggression (Rogosch, Cicchetti & Aber, 1995) and subsequent. Inadequate inhibitory control may lead to labeling of the child by teachers and peers as aggressive, which in turn may negatively affect their education (Dodge et al., 1994). The experience of maltreatment for adolescents during adolescence can disrupt their identity formation and the transition to a period of greater autonomy (Dozier et al., 2002).

Academic achievement is one way to measure positive developmental adjustment (Hines, Merdinger & Wyatt, 2005). Focusing on adolescents, school life is especially important during the adolescent period. Adolescents spend a significant amount of time in school than anywhere else, and teachers are likely to be the primary non-familial adults in

many adolescents' lives (Eccles & Harold, 1993). As such, teachers are positioned to have a major positive impact on adolescents and also play a protective role in their lives (Eccles & Harold, 1993). Schools can also play a critical role in keeping adolescents on a healthy, non-risky, developmental trajectory (Eccles & Harold, 1993). Unfortunately, adolescents in foster care, many of whom are shuffled from school to school, may be unable to experience this positive impact of schools and teachers due to lack of placement stability.

Parents play a critical role in their adolescents' academic achievement and their socio-emotional development (Eccles & Harold, 1993). Parent, community, and school collaboration during the adolescent period are important for promoting healthy living and academic achievement (Eccles & Harold, 1993). Youth in foster care may not have parents or foster parents who can play a role in their academic achievement and in fact frequently go without the educational services they need to learn because they lack educational advocates (i.e., parents, foster parents, case workers, teachers) (Zetlin Weinburg, & Kimm, 2004).

Children and youth in foster care travel a challenging path and encounter many obstacles to their optimal development along the way. The impact of experiences endemic to children in foster care (i.e., maltreatment, disruptions in relationships with family, multiple placement moves) can be devastating to their development, both short- and long-term. Nonetheless, foster care and the histories of youth prior to placement may have a differential impact on the developmental issues that are salient for youth at the time (Dozier et al., 2002). Thus, developmental theory can be useful in examining the impact of placement in foster care on educational and other outcomes at differing developmental periods.

Although, developmental theory can be helpful in identifying the needs of children and youth in care at different developmental periods, a criticism of this theory is that is too

broad. It also defines a sequence in which individuals follow and does not allow for variability. Some individuals experience developmental events at different stages from others.

Attachment Theory and the Education of Youth in Foster Care

Attachment theory is concerned with behaviors beyond gaining proximity to and maintaining contact with an attachment figure. Attachment theory considers exploration of the environment as well as managing and coping with fear/wariness and threat (Bowlby, 1973) and provides a set of ideas for making sense of feelings and behaviors in times of need in the context of close relationships (Howe, Brandon, Hinings & Schofield, 1999). Attachment theory posits that negative experiences (e.g., abuse) from early relationships are carried forward to other settings and other relationships. This carrying forward may include a child or youth's cognitive models concerning the self and others formed through their history of interactions (Bretherton & Mulholland, 1999).

Attachment theory helps explain the need for children to have contact with their caregivers (Bowlby, 1973). Attachment quality is important because it is reflective of the quality of an infant's relationship to the caregiver, and also because attachment is associated with the child's late interpersonal functioning (Dozier et al., 2002). Children who are securely attached with their caregivers display more competent problem solving skills as toddlers (Matas, Arend & Sroufe, 1978). Securely attached preschoolers show more independent and confident behaviors with teachers (Sroufe, 1983). Securely attached school age children show more competent interactive behaviors with peers at school than do children without a secure attachment (Sroufe, 1983). Children who have disorganized attachments are at high risk for a host of problem behaviors including aggressive behaviors with peers (Elicker, Englund & Sroufe, 1992). A lack of attachment to parents and hostile

relationships with parents has been shown to predict depressive symptoms in adolescents (Ge, Best, Conger & Simons, 1996).

Healthy attachment brings love, security, and joy; unhealthy attachment brings anxiety, grief, and depression. All humans form attachments to their primary caregivers in order to survive (Bowlby, 1973). Secure attachments provide children and youth with a reliable base that encourages the safe exploration of the wider society (Bowlby, 1988). The sense of a secure base for an adolescent is cultivated by a sense of belonging in supportive social networks, by attachment to both reliable and responsive people, as well as, by a routine and structured life (Bowlby, 1988). Most adolescents can expect to have a secure base with one or both of their parents, siblings, and extended family members (Byng Hall, 1995). While adolescents may spend much of their time away from their secure base, they know they can return to it whenever they need to, right into middle adulthood (Byng-Hall, 1995).

Attachment theory can contribute to the understanding of the effects of foster care placement on the quality of relationships, well-being, and educational experience of youth in care. Attachment theory can also guide interventions that build healthy relationships with foster parents, teachers, and other adult figures in the lives of youth in care. These attachments can be used to promote the education of youth in care as well as provide them with a nurturing and supportive environment.

Maltreatment prevents or damages the formation and security of children's attachments with their caregivers (Emery, 1989), and subsequent removal from the home and placement with strangers may further exacerbate attachment difficulties. Long-term, the effect of insecure attachments for youth placed in foster care may lead to interpersonal

difficulties, disturbances of self, impaired affect regulation, and internalizing and externalizing behaviors (Alexander, 1992; Greenberg, Speltz & DeKlyen, 1993).

The sense of a secure base for youth enhances their feelings of belonging in supportive social networks and attachment to people they deem reliable and supportive (Bowlby, 1988). Most adolescents can expect to have a secure base with one or both of their parents, siblings, and extended family members (Byng -Hall, 1995), but this may not be the case for youth in foster care who are separated from their parents, siblings, and their extended family. Youth in care may not have a secure base with their foster family, nor may they be able to return to the secure base of their family or community of origin. On the other hand, the right placement (i.e., one with a caring and supportive foster family) may actually increase a youth's sense of attachment and security.

The level of adolescents' attachment to parental figures is relevant in regard to their academic achievement and motivation. Parental attachment provides an adolescent with a secure emotional foundation on which they can build a sense of academic competence and a school achievement (Eccles & Midgley, 1990). In a 1997 study by Jacobsen and Hoffman, adolescents with secure parental attachment demonstrated greater attention-span, decreased insecurity about themselves, and higher grade point averages. Similarly, Learner and Kruger (1997) found that parental attachment was positively related to youths' motivation to succeed academically. One can posit, then, that the converse is true – that children and youth placed in foster care due to parental abuse and/or neglect may lack a secure parental attachment and may be less motivated to succeed academically than their counterparts as are other children and youth with secure parental attachment.

A sense of attachment and belonging to school can promote academic performance, provide motivation, and enhance a youth's emotional well-being. Academic success can assist a youth's recovery from adverse events (Romans, 1995). Particularly to youth in foster care and attachment, there is evidence about the protective value of a positive educational experience (Jackson & Martin, 1998). Thus, it is important for professionals (i.e., social workers and teachers) and caregivers (i.e., biological parents, foster parents and kin) working with youth in need – including children in foster care – to consider the academic, social, and developmental importance of a positive school experience (Gilligan, 2000).

Just as youth form secure attachments to parents and family members, so do they form attachments with their teachers and their schools. Frequent changes in placement settings and schools, however, may inhibit the formation of school attachment and a sense of belonging to their school for children in foster care, thus eliminating these children's access to the positive and protective factors that school attachment provides.

Similarly, children who experience frequent changes in placement are less able to form attachment to their teachers. Ideally, teachers play an important role in the lives of children and youth, as they can be confidants, mentors, and guarantors of their welfare (Gilligan, 1998), but children in foster care may not enjoy such rich and beneficial student-teacher relationships. This stunting of relationship may be due to the brevity of a child's stay in a given school or could be caused or exacerbated by teachers who lack awareness and sensitivity to foster children in their classrooms (Powers & Stotland, 2002).

Although attachment theory can contribute to the understanding of the effects of foster care placement on the quality of relationships, well-being, and educational experience

of youth in care, the list of attachment behaviors is limited to those that occur with the primary attachment figure- usually the mother.

Chapter IV:

Methodology

Study Design and Conceptual Model

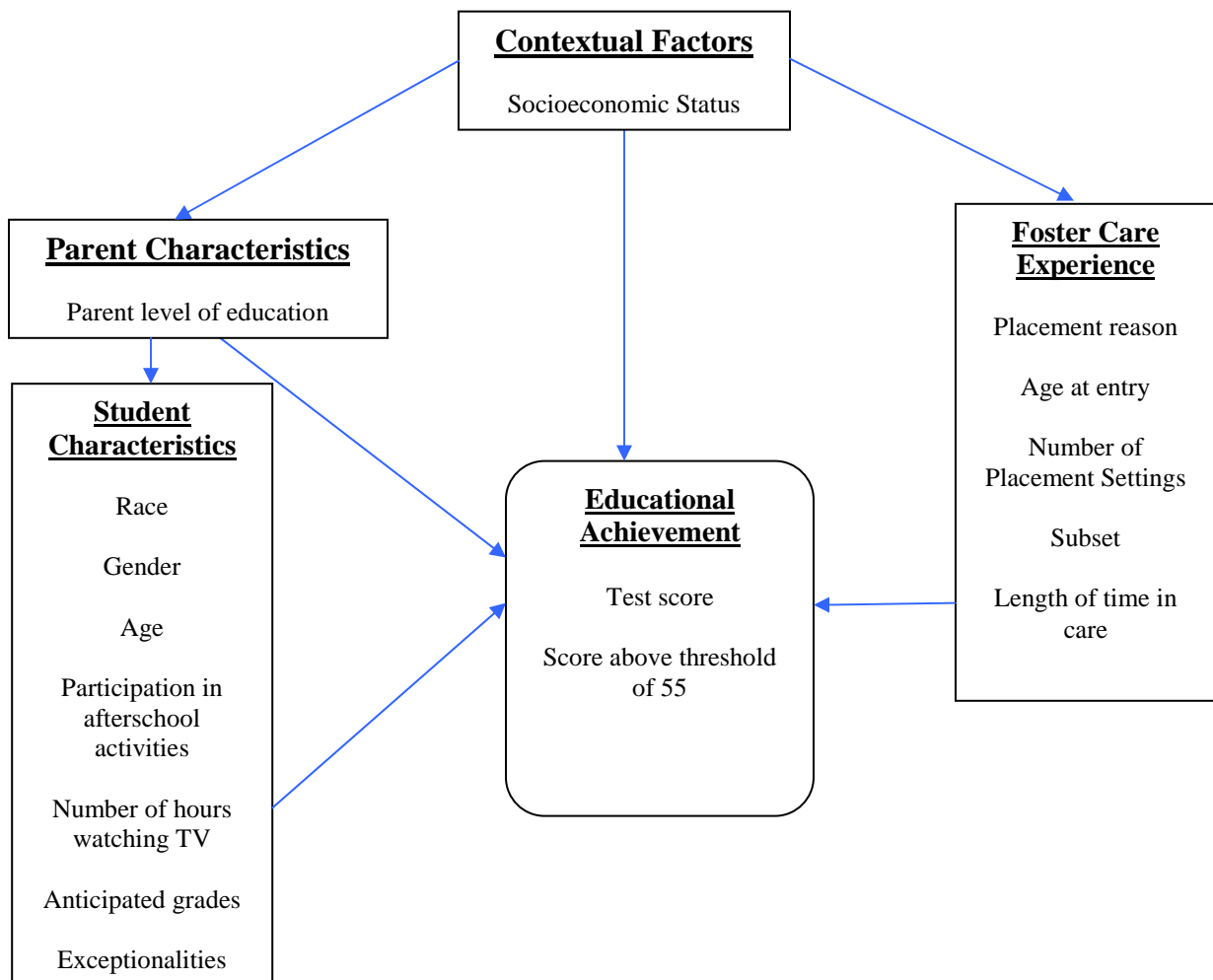
The design of this study was grounded in the literature regarding educational predictors, student and family characteristics, contextual factors, and foster care characteristics as previously discussed in Chapters 2 and 3. In addition, the study design was guided by the interrelationships of all of these variables with educational achievement (see Figure 2).

This study used cross-sectional data. Four test-year cohorts of youth in North Carolina were used in this study. These test-year cohorts include all youth in North Carolina who took the End of Course (EOC) Algebra I test in 1999, 2000, 2001, and 2002. These cohorts included both youth with and without foster care experience. The first set of analyses laid the groundwork for the remaining analyses that examined the differences in achievement between youth with and without foster care experience and the effect foster care characteristics have on achievement. This was achieved by examining the educational dynamics of foster care and non-foster care populations per test-year cohort and determining whether the same set of educational dynamics held true (i.e., are predictive of educational achievement in the manner that the literature states they are) for both populations. This set of analyses used descriptive statistics (i.e., cross tabulations) and multi-level modeling.

The second set of analyses examined the differences in educational performance of youth with and without foster care experience. Because of the nature of the data, propensity score matching was used to create comparison groups of non-foster care youth that accounted for selection bias. To provide support and help validate the need to use propensity score matching in this study, the second set of analyses were also evaluated using the full test-year cohort data that was not matched.

Finally, the last set of analyses helped determine whether the differences seen in educational achievement between matched foster care and non-foster care youth were due to the foster care experience.

Figure 2. Factors Contributing to Educational Achievement



Study Population

The study population, as is illustrated in table 1, consisted of four test-year cohorts of youth in North Carolina who took the Algebra I end of course test between 1999 and 2002. The population size over all four years ranged between 88,589 in 1999 to 100,457 in 2002. There were higher percentages of Whites (62-66%) in each test-year cohort. Blacks comprised 28-29% of the population each year, while students of other racial identities made up a similar proportion. Over all test years, males and females were for the most part equally represented. On average, youth took the test at the age of 15 (Table 1).

Table 1. Total Population Demographics by Test-year Cohort

Characteristics	1999	2000	2001	2002
Total	88,589	91,253	94,308	100,457
Race				
White	58,189 66%	60,110 66%	60,534 64%	63,053 62%
Black	25,038 28%	25,158 28%	26,841 28%	29,218 29%
Other	5,338 6%	5,981 6%	6,926 7%	8,185 8%
Gender				
Female	43,836 49%	45,719 50%	47,382 50%	50,995 51%
Male	44,734 51%	45,533 50%	46,925 50%	49,461 49%
Age				
Mean	15	15	15	15
SD	1.30	1.29	1.27	1.26

Note: Age is the youth's age at time of test

Each test-year cohort includes two subpopulations of non-foster care youth and foster care youth as is illustrated in Table 2. Of course, over all test-year cohorts, the vast preponderance of students did not have experience in foster care. Males and Females were for the most part equally represented in the non-foster care subpopulation. In contrast, well over half of the of the foster care subpopulation over all test years were female. Across all test-year cohorts, non-foster care youth consisted of higher percentages of Whites (between 63% and 66%) than Blacks (between 27% and 28%); whereas youth in foster care consisted of a higher percentage of Blacks (between 48% and 50%) than Whites (between 44% and 45%). On average, youth took the test at age 15 years (Table 2).

Table 2. Non-foster Care and Foster Care Youth Demographics by Test-Year Cohort

Characteristics	Non-Foster Care Youth				Foster Care Youth			
	1999	2000	2001	2002	1999	2000	2001	2002
Total	87,623	90,119	93,008	98,824	966	1,134	1,300	1,633
Race								
White	57,764 (66%)	59,591 (65%)	59,948 (65%)	62,336 (63%)	425 (44%)	519 (46%)	587 (45%)	717 (44%)
Black	24,554 (28%)	24,613 (28%)	26,214 (28%)	28,417 (29%)	484 (50%)	545 (48%)	627 (48%)	801 (49%)
Other	5,281 (6%)	5,911 (7%)	6,840 (7%)	8,070 (8%)	57 (6%)	70 (6%)	86 (7%)	115 (7%)
Gender								
Male	43,480 (50%)	45,086 (50%)	46,411 (50%)	48,807 (49%)	356 (37%)	447 (39%)	514 (40%)	654 (40%)
Female	44,125 (50%)	45,032 (50%)	46,596 (50%)	50,016 (51%)	609 (63%)	687 (61%)	786 (60%)	979 (60%)
Age								
Mean	15	15	15	15	16	15	15	15
SD	1.30	1.29	1.27	1.26	1.23	1.23	1.23	1.20

Note: Age is the youth's age at time of test

As illustrated in Table 3, a similar pattern in foster care characteristics exists across the test-year cohorts; specifically, foster care youth in test-year cohort 1999 and 2000 were an average of 10 years old when they were placed in foster care in the placement prior to taking the test. In contrast, test-year cohorts 2001 and 2002 youth were placed at an average of 9 years old. Across all test-year cohorts between 63% and 67% of youth were primarily placed in foster care due to neglect, followed by physical or sexual abuse between 14-18%. Across all test-year cohorts the highest percentage (41% to 45%) of youth had spent one year or less in foster care prior to having taken the test. Only 18% to 20% of youth had spent one to two years in foster care prior to taking the test. The highest percentage (32% to 35%) of youth in foster care across all test-year cohorts had been in five or more foster care placement settings prior to taking the test. The second highest percentage (21%) of youth across all test-year cohorts had two placement settings prior to taking the test. Across all test-year cohorts, the highest percentage of foster care youth took the test after having completed their final spell in foster care (53% to 66%)³. This was followed by youth across all test-year cohorts who took the test before placement in foster care.

³ This large difference may be due to students in the later cohorts having less follow-up time and therefore, the 66% figure may be an underestimate.

Table 3. Foster Care Characteristics by Test-Year Cohort

Characteristics	Test-Year Cohorts			
	1999 <i>N= 966</i>	2000 <i>N= 1,134</i>	2001 <i>N=1,300</i>	2002 <i>N=1,633</i>
Age Placed	10 (Mean) 5 (SD)	10 (Mean) 5 (SD)	9 (Mean) 5 (SD)	9 (Mean) 5(SD)
Reason for placement				
Neglect	607 (63%)	732 (65%)	832 (64%)	1094 (67%)
Physical or sexual abuse	171 (18%)	187 (16%)	200 (15%)	231 (14%)
Child behavior	85 (9%)	91 (8%)	114 (9%)	138 (8%)
Other	103 (10%)	124 (11%)	154 (12%)	170 (10%)
Length of time in care at test time	1.42 (Mean) 1.49 (SD)	1.43 (Mean) 1.50 (SD)	1.26 (Mean) 1.41 (SD)	1.27 (Mean) 1.44 (SD)
1 year or less	398 (41%)	468 (41%)	580 (45%)	732 (45%)
1-2 years	183 (19%)	208 (18%)	256 (20%)	311 (19%)
2 -3 years	104 (11%)	132 (12%)	168 (12%)	197 (12%)
3-5 years	137 (14%)	150 (13%)	138 (11%)	187 (11%)
5 yrs or above	144 (15%)	176 (16%)	155 (12%)	206 (13%)
Number of placements				
1	205 (21%)	234 (21%)	274 (21%)	348 (21%)
2	232 (24%)	235 (21%)	288 (22%)	366 (23%)
3	106 (11%)	164 (14%)	189 (15%)	234 (14%)
4	94 (10%)	109 (9%)	125 (10%)	156 (10%)
5 and above	329 (34%)	392 (35%)	424 (32%)	529 (32%)
Subsets				
First and only spell	120 (13%)	122 (11%)	151 (12%)	178 (11%)
Before placement	252 (26%)	253 (22%)	222 (17%)	250 (15%)
Multiple spells	68 (7%)	89 (8%)	78 (6%)	94 (6%)
Between spells	13 (1%)	16 (1%)	26 (2%)	34 (2%)
After final spell	513 (53%)	654 (58%)	820 (63%)	1077 (66%)

Note: Characteristics are based on where the child was at test time

Note: Age is based on the age of entry into the latest placement at test time

Note: Child behavior includes alcoholism and drug abuse

Data Sources and Variables

Three secondary data sets were used in this study: (a) End-of-course (EOC) Algebra I test data obtained from North Carolina Education Research Data Center; (b) the North Carolina Child Welfare Experiences data set obtained from the Jordan Institute for Families; and (c) the North Carolina Work First data set, which was also obtained from the Jordan Institute for Families.

EOC testing is mandatory for all North Carolina youth in public schools. Student EOC scores are used in the computation of school growth and performance composites mandated by the state's ABC's Education Accountability Program as well as used for determining the student yearly progress (North Carolina Research Data Center, 2007). EOC student data for those who took the Algebra I test between 1999 and 2002 were used in this study. These four test-year cohort data sets provided student-level variables including demographic and educational variables (i.e., test scores, achievement level; North Carolina Research Data Center, 2007). Some students may have taken the test more than once, although in different years. Repeated testing may be the case if a student took the test as an eighth grader but did not meet the competency standard and the high school then recommended that the student take the test again (NCPublicschool.org, 2008). To account for multiple records per student across cohorts, all analyses were conducted based on the individual test cohorts; that is, a 1999 test cohort, a 2000 test cohort, a 2001 test cohort, and a 2002 test cohort. To assess each student's test experience prior to a given test year, students who took the test during the two previous year were identified. For example, the 1999 test cohort was assessed by reviewing the 1998 and 1997 test cohorts; the 2000 cohort was assessed by reviewing the 1998 and 1999 cohort. The cohort reviews identified students who may have repeated the test via the same identification number. A variable in each cohort-year data identified those students in the analysis. All of the measures are related to the test year cohort.

The Child Welfare Experiences data set provides longitudinal data on all children entering the foster care system for the first time. These data reflect selected child welfare indicators: (a) initial placements, (b) length of time in custody, (c) experiences of children

placed in nonfamily settings, (d) placement stability, and (e) re-entry into care (Duncan, Kum, Flair, Stewart, Weigensberg, 2007). The Work First data provides longitudinal data on the experiences of the Work First families and recipients while they are participating in the program and after they leave the program. Work First is North Carolina's Temporary Assistance for Needy Families (TANF) program. Through Work First, parents can get short-term training and other services to help them become employed and self-sufficient. These data are available at the county- and state-level and for key demographic characteristics including age, race, and family size (Duncan et al., 2007).

The four EOC test year cohort data sets were linked to the Child Welfare data and Work First data via common identification numbers. These identification numbers were internally created by the child welfare system. The resulting four test-year cohort data sets contained the educational data of all youth (i.e., both foster care and non-foster care youth); child welfare data for youth with foster care experience; and Work First data indicating whether any youth participated in the program.

Dependent Variables

Two dependent variables were used in this study. Both dependent variables measure achievement on the Algebra I test. These variables came from the EOC Algebra I data sets.

One of the dependent variables was a continuous variable measuring the Algebra I score. The test scores are scaled scores with a range of 23 to 88 and 23 to 96.⁴ The other dependent variable is a dichotomous variable measuring whether the test score is above the

⁴ Scaling in 1999 and 2000 was 23-88, scaling in 2001 and 2002 was 23-96. The same mathematics standard course of study and criteria was applied to each test in each year. When a new form of the test is added, the form is equated using Item Response Theory (IRT). It can happen that the maximum raw score on one form will translate to a different scale score than from a different form. A statistical procedure is used to link test scores across years so that longitudinal comparisons can be made. Because of the different scaling, a stratified approach was used for the analyses in this study.

threshold of 55 for consistent performance (1=yes, 0=no). If the threshold is below 55 the student has inconsistent or insufficient mastery on the test.

Independent Variables

Gender, ethnicity, age, number of hours watching TV, exceptionalities, participation in after-school activities, anticipated grades, parent level of education as a proxy for SES, Work first participation, and the amount of times the test was taken are some of the covariates in this analysis. These variables were chosen based on the literature that posits these variables to be predictors of educational achievement (see details in the literature review). These variables came from the EOC data set, with the exception of Work First which came from the Work First data set.

Gender is a dichotomous variable coded as 1=female and 0=male. *Ethnicity* included two dummy variables White and Others, Black was used as the reference group. *Age* is a continuous variable that signifies the age in which the child took the test. A dummy variable signifying two age categories was constructed to signify whether the child was young (ages 11-16) when they took the test, otherwise (17- above). *Number of hours watching TV* was recoded into three dummy variables TV watching zero to 1 hour or less each school day as the reference group; 2 hours; 3 hours; and 4 hours or more. *Exceptionality* was recoded into two dummy variables with no exceptionality as the reference group; other exceptionality; and gifted. Other exceptionalities include behaviorally-emotionally handicapped, hearing impaired, educable mentally handicapped, specific learning disabled, speech-language impaired, visually impaired, other health impaired, orthopedically impaired, traumatic brain injured, Other exceptional classifications. *Assistance on test* (i.e., youth received extra time on test) was a dummy variable coded as 1=yes, 0=no. *Participation in After-school Activities*

is a dichotomous variable, coded as student participates in any after school activities 1=yes, 0=no. *Anticipated grade* was recoded into four dummy variables with anticipated grade of F as the reference group; anticipated grade of D; anticipated grade of C; anticipated grade of B; and anticipated grade of A. *Parent level of education* was recoded into four dummy variables, with parent did not finish high school as the reference group; high school graduate; enrolled in a business or trade school; trade school/business school/community/tech or junior school graduate; and four year graduate or graduate school degree. *Work First* signifies participation in the Work First program coded as 1=yes, 0=no. *Amount of times* a test was taken was based on the test cohort year and looking back 2 years prior; this variable was coded into two dummy variables, with test taken 1 time as the reference group, test taken 2 times, and test taken 3 times. Another educational variable used is *single* signifying whether the test was taken a single time, 1=yes, 0=no.

Other covariates used in this analysis are child welfare variables which came from the child welfare data set. These variables capture characteristics of placement in foster care. Prior research indicates that age at entry, reason for placement, and length of time in care, have an effect on educational outcomes (Duncan, Brooks-Gunn & Klebanov, 1994; Haveman, Wolfe & Spaulding, 1991; Kao & Thompson, 2003; Miedel & Reynolds, 1999; Zuravin, 1988).

Age at entry is a continuous variable. Length of time in care was recoded into four dummy variables with less than or equal to 1 year as the reference group; greater than 1 year less than or equal to two years, greater than 2 years less than or equal to 3 years, greater than 3 years less than or equal to 5 years, and greater than 5 years and above. *Reason for placement* was recoded into three dummy variables with Neglect as the reference group;

Physical Abuse or Sexual Abuse; Child behavior/child alcohol/child drug abuse; and Other. *Subset* signifies the subsets of foster care youth based on the volume of their foster care experience relative to when the test was taken. *Subset* was recoded into three dummy variables with youth who took test in his/her first and only spell of foster care as the reference group; took the test before placement into foster care, took test in the first, second or later spell in a multi-spell experience; took test in-between spells; and took the test after their last spell. *Number of placements* is the number of placements a youth had relative to when the test was taken. This variable was recoded into four dummy variables with 1 placement as the reference group, 2, 3, 4, and 5 and more placements. *Foster experience* is a dichotomous variable signifying whether the child was in foster care 1=yes, 0=no.

Analytic Procedures

In testing the hypotheses, several analytic methods were used, including multiple linear regression with ordinary least-squares estimator (OLS), weighted least-squares estimator (WLS) to correct for heteroscedasticity, binary logistic regression, and propensity score matching. *SAS version 9.1* and *Stata SE version 10* were used to run the analyses. *Stata/PSMATCH2* was used to conduct the propensity score analyses. All models described below were applied to each individual test-year cohort; therefore, each model was run four times using the four different test cohort years. This study used an alpha level of .05 for all statistical tests.

OLS regression modeling provides information on how much variance in the dependent variable is explained by the independent variables at a significant level (through a significance test of R^2). A critical assumption of OLS regression is homoscedasticity- the variance of residual error is constant for all values of the independent variables. If the

independent variables have different error variance at different ranges of their values, then the estimates of the regression coefficients have biased standard errors for some ranges of the dependent variable and too small for other ranges. These results in the reduction of power in significance tests and the regression estimates are inefficient (Kuthner, Nachtsheim, & Neter, 2004). In this study, results from OLS modeling were reported using the unstandardized regression coefficients.

WLS regression models were used to correct for heterocedacity in this study. WLS regression modeling corrects for violation of the homoscedasticity assumption by weighting cases differentially. That is, cases whose value on the dependent variable corresponds to large variances on the independent variables count less and those with small variances count more in estimating the regression coefficients. Cases with greater weights contribute more to the fit of the regression model. The result is that the estimated coefficients are usually very close to what they would be in OLS regression, but under WLS regression their standard errors are smaller (Kuthner, Nachtsheim, & Neter, 2004). In this study the user-developed program `wls0` in *Stata* was used for conducting the WLS modeling. Results from WLS modeling were reported using the unstandardized regression coefficients.

Logistic regression is used when the dependent variable is dichotomous. Logistic regression is also used for prediction of the probability of occurrence of an event by fitting data to a logistic curve. Odds ratio and relative risk is usually used to explain the impact of predictor variables (Peng, Lee, & Ingersoll, 2002).

To test hypothesis one: Predictors of educational achievement for both populations hold true (are predictive of educational achievement in the manner that the literature states they are); Model 1 used OLS modeling for each individual test cohort. Multiple-linear

regression was used to predict the variance in an interval dependent variable based on linear combinations of interval, dichotomous, or dummy independent variables.

In Model 1, the Algebra I score was used as the outcome variable (continuous variable). The independent variables used are: race, gender, age when test was taken, parent educational level, participation in after-school activities, Work First experience, whether student took test at a young age, youth exceptionality status, child assistance on test, anticipated grade and, number of times the student took the test.

Observational data as is used in this study lacks random assignment. Drawing causal inferences using observational studies without randomization is challenging because of threats to internal validity. Threats to internal validity are factors other than intervention or the focal stimuli that affect outcomes. One of these threats is selection bias which can take the form of: self-selection into different groups, bureaucratic selection, geographic selection, attrition selection, instrumental selection, or measurement selection (Guo & Fraser, 2009). Studies using observational data fail to consider the counterfactual framework which emphasizes that individuals selected into either treatment or nontreatment groups have potential outcomes in both states (Guo & Fraser, 2009).

Observational (nonrandomized) data violate the ignorable treatment assignment assumption which assumes that conditional on observed covariates, study participants' receipt of treatment is independent of potential outcomes. In cases where the ignorable treatment assignment assumption is violated, remedial action is warranted. Statistical controls with OLS regression is oftentimes used to remedy this violation. The use of OLS regression models using dichotomous indicators of treatment is however not appropriate. In these models the error term is correlated with the explanatory variable resulting in inconsistent and

biased estimation of treatment effects (Guo & Fraser, 2009). The use of OLS regression and simple covariance control is no longer the method of choice among statisticians and econometrics when treatment assignment is nonignorable (Guo & Fraser, 2009).

Propensity score matching (PSM) is a better approach to estimate causal effects from observational data (Guo, Barth, & Gibbons, 2005; Guo & Fraser, 2009). The PSM method this study employed was developed by Rosenbaum and Rubin (1983), commonly known as greedy matching, or nearest-neighbor matching within caliper. PSM aims to re-balance assigned conditions to be more akin to data generated via randomization, and estimate counterfactuals that represent different treatment effects of interest via selected statistics (Guo & Fraser, 2009).

In PSM, the propensity score is the conditional probability of assignment to a particular treatment given a vector of observed covariates (Rosenbaum & Rubin, 1983). For example, the propensity score for participant i ($i = 1, \dots, N$) is the conditional probability of assignment to a particular treatment ($W_i = 1$) versus nontreatment ($W_i = 0$) given a vector of observed covariates x_i : $e(x_i) = pr(W_i = 1 \mid X_i = x_i)$. In this study, a “treatment” condition is receiving foster care service, and a “nontreatment” condition is not receiving such service. An advantage of PSM is the reduction in dimensionality of vector X that may include many covariates. An exact matching on such a high-dimension vector makes many treated participants fail to find matches. PSM reduces such a high-dimension vector to a one-dimensional score and eases the burden of exact matching (Guo & Fraser, 2009).

Propensity scores balance observed differences between treated and control participants in the sample. After PSM, treatment assignment and observed covariates are conditionally independent, that is, $x_i \perp w_i \mid e(x_i)$, where x_i is the observed covariate

vector, w_i is the treatment assignment, and $e(x_i)$ is the estimated propensity score, all for participant i . The expected difference in observed response between treatment and nontreatment conditions at $e(x_i)$ is equal to the average treatment effect at $e(x_i)$. This property links the propensity score model to the counterfactual framework. The mean difference of the outcome variable between the treated and control participants with the same propensity score value is an unbiased estimate of the average treatment effect at the propensity score: $E[E(Y_1, | e(x_i), W_i=1) - E(Y_0, | e(x_i), W_i=0)] = E[Y_1 - Y_0 | e(x_i)]$ (Guo & Fraser, 2009).

Pair matching is one approach to using propensity scores. In pair matching the expected difference in responses of both treatment and control units in a matched pair with the same propensity score equals the average treatment effect at the propensity score. The mean of matched pair differences is unbiased for the average treatment effect $\tau = E(Y_1 | W=1) - E(Y_0 | W=0) = E[Y_1 - Y_0 | e(x)]$. Other approaches to using propensity scores include subclassification of propensity scores, and covariance adjustment (Guo & Fraser, 2009). This study focuses more so on using propensity scores in pair matching.

This study used propensity score matching in an attempt to control for selection bias in creating a comparison group and to provide valid estimates of average treatment effects. To accomplish this, a three-step analytic procedure was followed to construct the comparison group. The first step was to select conditioning variables or covariates that may be causing the imbalance between the treated and control groups and to estimate propensity scores using a logistic probit model, $\log[(1-p)/p]$. The logistic probit model was used because the distribution of the propensity score approximates to normal.

Model 2 was used to estimate the propensity scores. The dependent variable used in the logistic regression was a binary variable indicating whether the youth had foster care experience (1= yes, 0= no). The conditioning variables, which are variables that are predictive of placement into foster care that were available in the data, included race, age when test was taken, gender, parent level of education (proxy for SES), Work First experience, and whether the youth took the test a single time. The conditioning variables were selected by using substantive information from prior studies about possible predictors of placement in foster care, and the availability of data to this study.

Bivariate chi-square tests were conducted to determine whether variables were statistically significant ($p < 0.05$) before matching. This was done to test whether the treated and control groups differ on covariates included in the logistic regression. If so, this indicates that the covariate distributions do not overlap sufficiently between foster care youth (treatment group) and nonfoster care youth (control group) in the original sample (Guo & Fraser, 2009). Chi-square tests were also conducted after matching to make sure differences between groups did not remain.

After obtaining the propensity scores, the second step was the matching or resampling of cases that share similar likelihoods of being assigned to the treatment condition. The key at this point was to check whether PSM corrected the imbalances on observed covariates between groups as it aimed to, and to see whether the two groups of participants were as much alike as possible after matching. The nearest neighbor within caliper matching algorithm was used in this study to identify a one-to-one match. Nearest neighbor matching within a caliper is a form of greedy matching. It entails the random ordering of treated and nontreated participants; then the first treated participant and nontreated participant with the

closest propensity score within a predetermined common-support (caliper) is selected. Both of these participants are then removed from the pool for matching and the next treated participant is released (Guo & Fraser, 2009).

A limitation of using greedy matching is the incomplete matching and inaccurate matching problem. For example, while trying to maximize exact matches, cases may be excluded due to incomplete matching; or while trying to maximize cases, more inexact matching is typically the result (Parsons, 2001). Because of this, running different caliper sizes is recommended. Rosenbaum and Rubin (1985) suggest using a caliper size of a quarter of a standard deviation of the sample estimated propensity score. The caliper sizes used in this study were set to 0.05 (a narrowest caliper) and a quarter of a standard deviation of the estimated propensity score. Because of the consistency of the new matched samples and subsequent results after testing these two calipers, only the results for the models using the narrowest caliper of 0.05 are reported.

To address some of the limitations found in greedy matching (e.g., incomplete matching and inaccurate matching dilemma; the need for a sizeable common-support region) optimal matching was developed. Some of the limitations found in greedy matching might render some to use optimal matching. Greedy matching was chosen in this study because of its unique advantage that allows for subsequent multivariate analysis of almost any kind specifically when using nearest neighbor matching within caliper. This method allows researchers to evaluate causal effects as would be achieved with randomized experiments. Greedy matching is popular because it was the earliest method developed to analyze observational data.

The third and final step in constructing a comparison group using propensity score matching is to perform multivariate analysis with the new sample derived from matching. This study evaluated Model 3 using the matched test-year cohorts and the full test-year cohorts (unmatched) to evaluate an OLS regression model that tests the study's second hypothesis: Test scores and the effect of youth characteristics on test scores will differ between non-foster care youth and foster care youth in both full test-year and matched groups. Non-foster care youth will score higher than foster care youth on the test. However, once selection bias is accounted for via matching, the gap in scores between non-foster care and foster care youth will be smaller.

The outcome variable used in model 3 was the Algebra I test score (continuous variable). The independent variables used were: race, gender, age when test was taken, foster care experience, Work First experience, parent educational level, and amount of times the student took the test.

Model 4 was also used to test the second hypothesis by evaluating a logistic regression model. The outcome variable used in this model indicated whether the youth scored above the threshold of 55 points for consistent performance on the test. The independent variables used in model 3 were also used in model 4.

Model 5 used OLS modeling to test the study's third and fourth hypotheses: Differences in the test scores of foster care youth are due to overall patterns and characteristics of the foster care experience; and differences in test scores between subsets of foster care youth [i.e., (a) youth who took the test before placement in foster care or (b) youth who took test in his/her first and only spell of foster care or (c) in the first, second or later

spell in a multi-spell experience or (d) in between spells or (e) taking the test after having completed their last spell in foster care].

Model 5 used the Algebra I test score (continuous variable) as the outcome variable. The independent variables used were: race, gender, age at entry into care, reason for placement, length of time in care, number of placements, and subsets (signifies the subsets of foster care youth based on the volume of their foster care experience). All of these variables are relative to when the student took the test.

Model 6 was also used to test the study's third and fourth hypotheses by evaluating a logistic regression. The outcome variable used in this model indicated whether the youth scored above the threshold of 55 points for consistent performance on the test. The independent variables used in model 5 were also used in this model.

Missing Data

Listwise deletion was used in this study to handle missing data. Listwise deletion omits cases that do not have data on all variables in the variables list of the current analysis. This method is a better approach than traditional mean-substitution. Mean substitution has the potential for creating selection bias. Multiple imputation was not selected because the effects of using this approach on PSM are unknown (Allison, 2001). However, multiple imputation is increasingly becoming the method used by social science researchers to handle missing data especially when using propensity score matching (Guo & Fraser, 2009).

Diagnostics

OLS assumes normal distribution of the dependent variable and the residuals. Normality was checked using a histogram of the dependent variable (Algebra I scores) on the residuals. To identify outlying observations leverage values were used. To identify influential

data Cook's Distance was used. Cases with Cook's distance exceeding a critical F value were considered influential observations. The Breusch-Pagan/Cook-Weisberg and the Goldfeld-Quandt tests were used to test for heteroscedasticity. According to the Breusch-Pagan/Cook-Weisberg test, heteroscedasticity exists if the probability is less .05. According to the Goldfeld-Quandt, if a Lambda value based on observed data is greater than a critical F value, heteroscedasticity may exist (Gujarati, 1995). The Goldfeld-Quandt test was also used in this study after conducting WLS regressions to check whether heteroscedasticity remained. To test for multicollinearity, the Variance inflation factor (VIF) was checked. Harmful multicollinearity exists if any VIF is greater than 10 (Kuthner, Nachtsheim, & Neter, 2004).

Chapter V:

Results

Population Description

As is illustrated in Table 4, findings for individual test cohorts follow a similar pattern. For each cohort 6-7% of parents did not graduate from high school. Overall in 1999, the highest percentage (47%) of parents graduated from either a trade school, business school, community college, technical college, or junior college. This is unlike the distribution for the other cohorts, where the highest percentage of parents graduated from a four-year college (36-37%). This suggests that parents of youth in test-year cohort 1999 are characteristically different in education levels than the other cohorts.

Over all test year cohorts, there were more non-foster care youth (98-99%) than foster care youth (1-2%). The majority of youth in each test year did not have Work First experience (90-92%). Ninety percent of youth in each test year took the Algebra I test only one time. Over all, youth in each test year watched TV between zero to one hour or less (28%-29%) or for two hours daily (27-28%). The majority of youth in each test year did not receive any type of assistance on the test (94-97%). High percentages (77-78%) of youth participated in after-school activities in each test-year. In each test year, higher percentages (26-27%) of youth anticipated receiving a B on the test, while lower percentages (12-14%) of youth anticipated an F. Most youth took the test between the ages of 11-16 (87-89%).

Higher percentages of youth (78-80%) in each test year did not have exceptionalities. Between 14-15% of youth in each test year was classified as gifted (Table, 4).

Table 4. Total Population Descriptives by Test-year Cohort

<i>Characteristics</i>	1999 N=88,589	2000 N=91,253	2001 N=94,308	2002 N=100,457
Parent Education				
Non-HS graduate	7%	6%	6%	7%
HS graduate	31%	26%	25%	25%
Enrolled in Bus/trade	4%	9%	11%	12%
Graduate Bus/trade	47%	22%	21%	20%
Graduate of 4-year college/ graduate school	11%	37%	37%	36%
Foster Care Experience				
Yes	99%	99%	99%	98%
No	1%	1%	1%	2%
Work First Experience				
Yes	8%	8%	9%	10%
No	92%	92%	91%	90%
Number of times test taken				
1	90%	90%	90%	90%
2	9%	9%	9%	9%
3	1%	1%	1%	1%
Daily TV watching				
none to 1 hour or less	28%	29%	29%	29%
2 hours	28%	28%	27%	28%
3 hours	23%	23%	22%	22%
4 or more hours	21%	21%	22%	21%
Assistance on test				
Yes	3%	4%	5%	6%
No	97%	96%	95%	94%
AF participation				
Yes	77%	78%	78%	77%
No	23%	22%	22%	23%
Anticipated grade				
A	16%	16%	16%	16%
B	26%	26%	27%	27%
C	26%	25%	26%	27%
D	19%	19%	18%	18%
F	13%	14%	13%	12%
Age category				
11-16	87%	88%	88%	89%
17-above	13%	12%	12%	11%
Exceptionality Status				
None	80%	79%	78%	78%
Gifted	14%	15%	15%	15%
Other	5%	6%	7%	7%

Note: HS in parent education level stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: AF school participation stands for After School participation

Note: Age at time of test

Subpopulation Description

As illustrated in table 5, findings over all test years follow the same pattern. Higher percentages (16-18%) of parents with foster care youth do not graduate high school as compared to parents of non-foster care youth (6-7%). Overall educational levels, higher percentages of parents with foster care youth receive high school degrees (30-38%), while higher percentages of parents with non-foster care youth receive advanced degrees. In 1999, 47% of parents with non-foster care youth received either a trade school, business school community college, technical college, or junior college degree. This is different from parents of non-foster care youth in test years 2000-2002 where the highest percentage (37%) received a four year college degree. This suggests that parents of non-foster care youth in test-year cohort 1999 are characteristically different in education levels than the other non-foster care cohorts.

Over each test year, higher percentages (23-30%) of foster care youth had Work First experience relative to non-foster care youth (8-10%). The majority of non-foster care (90%) and foster care youth (88-92%) over all test years took the test one time. In 1999, 9% of non-foster care youth took the test 2 times relative to 7% of foster care youth. In 2001, 11% of foster care youth took the test two times relative to 9% of non-foster care youth. In each test year higher percentages of both non-foster care and foster care youth watched TV between zero to one hour or less (28-30%). More foster care youth (25-28%) watched TV for four or more hours daily compared to non-foster care youth (21-22%).

In each test year, the majority of non-foster care (94-97%) and foster care youth (91-93%) did not need any type of assistance on the test. Of youth that did receive assistance, foster care youth (6-9%) comprised a larger percentage compared to non-foster care youth

(3-6%). Over all test years, both groups had high levels of after-school participation. Lower percentages (66-70%) of foster care youth participated in after-school activities compared to non-foster care youth (77%-78%). Out of all possible grades, higher percentages (27-30%) of foster care youth in each test year anticipated a C on the test, whereas, non-foster care youth (26-27%) anticipated a B. In each test-year, 21-23% of foster care youth anticipated a failing grade (F) compared to 12-14% of non-foster care youth. In each test year, both groups took the test between the ages of 11-16. The majority of youth in both groups do not have an exceptionality. More foster care youth (12-13%) have an exceptionality compared to non-foster care youth (6-7%). While more non-foster care youth (14-15%) are considered gifted compared to foster care youth (3-4%) in each test year (Table 5).

Table 5. Non-foster Care and Foster Care Youth Descriptives by Test-year Cohort

	1999		2000		2001		2002	
<i>Characteristics</i>	NF N=87,623	FC N=966	NF N=90,119	FC N=1,134	NF N=93,008	FC N=1,300	NF N=98,824	FC N=1,633
Parent Education								
Non-HS graduate	6%	18%	6%	15%	6%	17%	7%	18%
HS graduate	31%	38%	26%	34%	25%	30%	25%	32%
Enrolled in Bus/trade	4%	5%	9%	8%	11%	11%	11%	12%
Graduate Bus/trade	47%	35%	22%	21%	21%	18%	20%	16%
Graduate of 4-year college/grad school	12%	4%	37%	22%	37%	24%	37%	22%
Work Experience								
Yes	8%	23%	8%	27%	9%	28%	10%	30%
No	92%	77%	92%	73%	91%	72%	90%	70%
Number of times test taken								
1	90%	92%	90%	89%	90%	88%	90%	89%
2	9%	7%	9%	9%	9%	11%	9%	9%
3	1%	1%	1%	2%	1%	1%	1%	2%
Daily TV watching								
none to 1 hour or less	28%	31%	28%	30%	29%	28%	29%	29%
2 hours	28%	25%	28%	25%	27%	23%	28%	22%
3 hours	23%	19%	23%	22%	22%	21%	22%	22%
4 or more hours	21%	25%	21%	23%	22%	28%	21%	27%
Assistance on test								
Yes	3%	6%	4%	8%	5%	8%	6%	9%
No	97%	93%	96%	92%	95%	92%	94%	91%
AFschool participation								
Yes	77%	66%	78%	70%	78%	68%	77%	70%
No	23%	34%	22%	29%	22%	32%	23%	30%
Anticipated grade								
A	16%	7%	16%	6%	16%	8%	17%	7%
B	26%	21%	26%	19%	27%	20%	27%	20%
C	26%	28%	25%	28%	26%	30%	26%	27%
D	19%	23%	19%	24%	18%	22%	18%	23%
F	13%	21%	14%	23%	13%	20%	12%	21%
Age category								
11-16	87%	80%	88%	79%	88%	82%	89%	83%
17-above	13%	20%	12%	21%	12%	18%	11%	17%
Exceptionality Status								
None	80%	84%	79%	85%	78%	85%	78%	83%
Gifted	14%	4%	15%	3%	15%	3%	15%	4%
Other	6%	12%	6%	12%	7%	12%	7%	13%

Note: HS in parent education level stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: AF school participation stands for After School participation

Note: Age at time of test

Test Scores

As illustrated in Table 6, test scores increased for the entire population and both subgroups from 1999 to 2002. In each year, non-foster care youth score five points higher than foster care youth. Average test scores for foster care youth range from 53-57 while on average non-foster care youth score between 58 and 62 points. The increase in test scores above the threshold of 55 for both groups is also consistent over test-years. Between 65-78% of non-foster care youth score above the threshold of 55 in contrast to 43-60% of foster care youth.

Over all foster care test-year cohorts, average test scores are lower than non-foster care youth average test scores. Because of the differences across cohorts and the different scaling of the test (1999-2000: 23-88, 2001-2002: 23-96) the development of individual models (stratified analysis) for each test-year cohort was needed.

Table 6. Algebra I Test Scores by Test-year Cohorts

	1999	2000	2001	2002
Full Population	<i>N</i> =88,589	<i>N</i> =91,253	<i>N</i> =94,308	<i>N</i> =100,457
	Mean= 58 Median=59	Mean= 60 Median=60	Mean= 61 Median=61	Mean= 63 Median=62
<i>Score Above Threshold</i>	Y (57%) N (32%)	Y (68%) N (32%)	Y (75%) N (25%)	Y (78%) N (22%)
Foster care Youth	<i>N</i> =966	<i>N</i> =1134	<i>N</i> = 1300	<i>N</i> = 1633
	Mean=53 Median=53	Mean=54 Median=54	Mean= 56 Median= 56	Mean= 57 Median=57
<i>Score Above Threshold</i>	Y (43%) N (57%)	Y (48%) N (52%)	Y (55%) N (45%)	Y (60%) N (40%)
Non-Foster care youth	<i>N</i> =87623	<i>N</i> =90119	<i>N</i> = 93008	<i>N</i> = 98824
	Mean=58 Median=59	Mean=59 Median=60	Mean= 61 Median= 61	Mean= 62 Median=63
<i>Score Above Threshold</i>	Y (65%) N (35%)	Y (68%) N (32%)	Y (75%) N (25%)	Y (78%) N (22%)

Note: Score above threshold indicates a score above the threshold of 55 for consistent performance; Y indicates Yes, N indicates No.

Results of Model 1

The first analytic model set the groundwork and built upon the remaining analyses that examined the differences in achievement between youth with and without foster care experience and the effect foster care characteristics have on education outcomes. Model 1 evaluated the educational dynamics of the non-foster care population and the foster care population within each test year. This model provided information on the differences and similarities between the two populations regarding educational predictors. Model 1 tested the first hypothesis that predictors of educational achievement hold true for both the foster care and non-foster care populations. The testing of this hypothesis was completed by examining the effect of variables reported to be predictive of educational achievement (race, gender, age when tested, parent educational level, participation in after-school activities, Work First experience, whether the student took the test at a young age (11-16 versus 17 and above), youth exceptional status, whether the child received assistance on the test, anticipated grade, and number of times the student took the test) on the dependent variable (Algebra I test score).

This analysis used OLS modeling and reported unstandardized regression coefficients. In cases where heteroscedasticity was present in the model, a WLS model was employed and the unstandardized regression coefficients were reported. When interpreting a regression coefficient all other variables were held constant. In total, Model 1 was evaluated eight times: once for non-foster care youth in each of the four test-year cohort populations and once for foster care youth in each of the four test-year cohort populations. Following the results of

Model 1 for both populations in each test year, a summary of results based on patterns seen across test-year cohorts is presented⁵.

Test-Year Cohort 1999

Test-year cohort 1999 included 87,623 non-foster care youth and 966 foster care youth. The non-foster care population was 66% White, 28% Black, and 6% Other, while the foster care population was 44% White, 50% Black, and 6% Other. Males (50%) and females (50%) were equally represented in the non-foster care population, while the foster care population contained a higher percentage of females (63%) than males (37%). On average, the non-foster care population took the test at age 15, while the foster care population took the test at age 16.

An OLS regression was employed to evaluate Model 1a for the non-foster care population. Test scores were regressed on variables reported to be predictive of educational achievement. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 3 in Appendix I). The VFI found no factors greater than 10; thus, harmful multicollinearity did not exist in the model. Based on the Goldfeld-Quandt Test, Model 1a proved to have harmful heteroscedasticity. To correct for heteroscedasticity in the OLS model, a WLS regression model was employed. A post-WLS Goldfeld-Quandt Test proved that there was no heteroscedasticity in the model. The WLS model found predictors to account for 42% ($R^2 = .49$) of the variance in non-foster care youth test scores, $F(23, 85635) = 3434.50, p < .05$. With the exception of the age category variable

⁵ From here on, the findings of Model 1 will be described according to test-year cohort. Therefore, Model 1 will be referred to as Model 1a for test-year cohort 1999, Model 1b for test-year cohort 2000, Model 1c for test-year cohort 2001, and Model 1d for test-year cohort 2002.

(the child's age when tested was coded as a binary variable: ages 11-16 and age 17 or older), all other variables were statistically significant ($p < .05$)⁶ (see Table 7 in Appendix II).

Model 1a was also evaluated for the foster care population using an OLS regression. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 4 Appendix I). The VFI found no factors greater than 10; thus, harmful multicollinearity did not exist in the model. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was not significant for non-constancy of variance. The educational predictor variables in Model 1a explained 36% (adjusted $R^2 = .36$) of the variance in test scores of the foster care population $F(23, 893) = 24.05, p < .05$. As illustrated in Table 7, just over half of the variables in the model were significant ($p < .05$). Insignificant were gender; the educational level of parents being "enrolled in business or trade school"; Work First experience; the number of times the test was taken; watching TV for 2 hours per day; watching TV for 3 hours per day; after-school participation; and age category variable (the child's age when tested was coded as a binary variable: ages 11-16 and age 17 or older).

Results of Model 1a for the non-foster care and foster care populations showed a few similar patterns in the contributing effect of certain characteristics on test scores, all in the expected directions. Both groups showed approximately a 1-point decrease in test scores with every one-year increase in age when tested, controlling for all other factors in the model ($p < .001$). Similar patterns were found in both groups regarding the effect of a youth's expected grade on the actual test score. Youth in both groups who expected to receive an A scored approximately 13 points higher than those who expected to fail (13.7 points for non-

⁶ This study uses four cohorts that constitute the population of students taking the test in that year, as such it is arguable that it is not necessary or appropriate to employ test of significance. However, if the cohorts are taken to represent the "superpopulation" of all students who have taken or will take the test in NC, the tests are appropriate in making estimates to that superpopulation (Meehl, 1997, 404).

foster care youth, 13.5 for foster care youth, $p < .001$). Youth in both groups who were considered gifted scored approximately 3 points higher than those not considered gifted (3.5 points for non-foster care youth, 3.0 for foster care youth, $p < .001$). Whites in both groups scored higher than Blacks on the test, in this case by 3 points for the non-foster care group and by 3.79 points in the foster care group ($p < .001$).

Although there were some similar patterns in the effect of certain characteristics on test scores in both groups, there were many more dissimilar patterns. The following variables were significant predictors of achievement for the non-foster care group but not significant for the foster care group: gender, Work First experience, number of times the test was taken, after-school participation, parent level of education being “parent enrolled in business or trade school,” watching TV for 2 hours daily, and watching TV for 3 hours daily. Another dissimilar pattern seen between groups was that having parents with a high school degree or above (e.g., a two-year or four-year college degree) had a greater effect on scores for the foster care group than for the non-foster care group. For example, in the foster care group, youth with parents who had a high school degree or above scored between 1.6 to 2.9 points higher than those whose parents didn’t finish high school; in non-foster care group, youth with parents who had a high school degree or above scored only 0.4 to 1.8 points higher than those whose parents didn’t finish high school ($p < .001$). Similarly, in the non-foster care group, youth who watched 4 or more hours of TV daily scored 0.14 of a point higher than those who watched 1 hour or less; among foster care youth, those who watched 4 or more hours of TV score 1.70 points higher than those who watched 1 hour or less ($p < .001$).

Results for the non-foster care population suggest that for the most part, predictors of educational achievement do indeed hold true. All but one variable in the model were

significant predictors of achievement (only the age category when tested (i.e., 11-16 or 17-above) was not significant). The literature states that females generally score lower on math tests than males. In the non-foster care population studied here, females scored .76 of a point lower than males ($p < .001$). As expected, non-foster care youth in the study population who had Work First experience scored 0.34 of a point lower than those without Work First experience ($p < .001$). Non-foster care youth who took the test three times within a span of three years scored 1.46 points higher than those in this population who took the test once ($p < .001$). This suggests that the more opportunities youth have to take the test, the better they perform.

A perplexing finding was that non-foster care youth who received assistance on the test scored 1.8 points *lower* than youth in this population who did not receive assistance ($p < .001$); this suggests that such assistance was targeted at youth whose academic performance indicated that they needed it. Also unexpected was a small, but significant difference in the scores (0.1 of a point; $p < .001$) of non-foster care youth who watched 4 or more hours of TV per day compared to youth in this population who watched 1 hour or less. The youth who watched a lot of TV scored *higher* than those who watched less. This finding suggests that TV viewing among this group may be indicative of something different than for the general population. As hypothesized, results based on the non-foster care population suggest that predictors of educational achievement hold true.

In summary, results for the foster care population showed many non-significant predictors in the model. The indicators of gender, Work First experience, and after-school participation did not have a significant effect on test scores. A perplexing finding was that foster care youth who watched TV for 4 or more hours per day had scores about 1.8 points

higher than the scores of youth in this group who watched zero to one hour or less ($p<.001$). Also, foster care youth who received assistance on the test scored 3.25 points *lower* than those in this group who did not receive assistance ($p<.001$). This may suggest that youth receiving assistance had significantly greater need for academic support than others in this group.

In a finding consistent with race and achievement outcomes cited in the literature, scores of foster care youth whose ethnicity was Other did not differ from scores of Black foster care. This is not surprising, given that this category consists of persons in minority groups. Also consistent with the literature, White foster care youth scored higher than Blacks in this group by nearly 4 points ($p<.001$). Foster care youth whose parents were college graduates scored nearly 3 points higher than students in this group whose parents had not finished high school ($p<.001$). As would be expected, foster care youth with exceptionalities scored 3.15 points lower than youth in this group without exceptionalities ($p<.001$).

Test-Year Cohort 2000

Test-year cohort 2000 included 90,119 non-foster care youth and 1,134 foster care youth. The non-foster care population was 65% White, 28% Black, and 7% Other, while the foster care population was 46% White, 48% Black, and 6% Other. Males (50%) and females (50%) were equally represented in the non-foster care population; in contrast, there was a higher percentage of females (61%) than males (39%) in the foster care population. On average, both groups took the test at age 15.

Model 1b was evaluated using the non-foster care population via OLS regression. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 5 Appendix I). Harmful multicollinearity was not found in the model,

as there were no factors greater than 10 based on the VFI. According to the Goldfeld-Quandt Test, this model proved to have harmful heteroscedasticity. To correct for heteroscedasticity, a WLS regression model was employed. The WLS model found predictors in the model to account for 53% ($R^2 = .53$) of the variance in non-foster care youth test scores, $F(23, 87,975) = 4483.35, p < .05$. Only two variables in the model were not significant predictors of test scores (age when tested -either 11-16 or 17 and above, watching TV for 2 hours daily; see Table 7 Appendix II). A post-WLS Goldfeld-Quandt Test proved that there was not a harmful problem with heteroscedasticity. However, the dummy variable for the parent educational variable of having a four-year college degree or graduate degree had a lambda value of 1.06 which was slightly larger than the critical F value of 1.02 indicating that heteroscedasticity may still exist in this dummy variable. Because the lambda value and critical F value were only slightly different, no remedial action was taken.

Model 1b was also evaluated using the foster care population via OLS regression. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 6 Appendix I). The VFI found no factors greater than 10; therefore, harmful multicollinearity did not exist in the model. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity proved there was no heteroscedasticity. The educational predictor variables in Model 1b explained 38% (adjusted $R^2 = .38$) of the variance in test scores of the foster care youth sample $F(23, 1060) = 29.63, p < .05$. Of the 23 predictor variables in the model, 15 were not significant.

Both non-foster care and foster care populations shared similar patterns regarding the effect of certain characteristics on test scores. In both groups, the older a youth was when the test was taken, the lower the score (1.5 points lower for the non-foster care group and 1.9

points lower for the foster care group, $p < .001$). In both groups, Whites scored almost 4 points higher than Blacks ($p < .001$). Youth in both groups who expected to receive an A on the test scored about 16 points higher than youth who expected to receive an F ($p < .001$).

Non-foster care and foster care groups differed regarding the effect of some predictors on test scores. The following variables were not significant for the foster care group but were for the non-foster care group: gender; ethnicity of Other; parent level of education; Work First experience; number of times the test was taken; most of the TV viewing variables (i.e., watching TV 1 hour or less daily, watching for 3 hours, watching for 4 or more hours); receiving assistance on the test; after-school participation; and presence of exceptionality.

Females in the non-foster care population scored lower on the test than males by almost 1 point ($p < .001$). In the non-foster care group, Whites and Others scored higher than Blacks, by 3.6 points and 2.19 points, respectively ($p < .001$). Non-foster care youth whose parents were college graduates scored 1.5 points higher than youth in this group whose parents did not graduate high school ($p < .001$). As predicted in the literature, non-foster care youth with Work First experience scored .27 of a point less than youth in this group without Work First experience ($p < .001$). Non-foster care youth who took the test three times scored 2.2 points higher than youth in this group who took the test once ($p < .001$). As would be expected, non-foster care youth who watched a lot of TV (4 or more hours daily) scored 0.37 of a point below youth in this group who watched no TV to 1 hour or less ($p < .001$).

A surprising finding was that non-foster care youth who received assistance on the test scored 2 points *lower* than non-foster care youth who did not receive assistance ($p < .001$). As would be expected, non-foster care youth who participated in after-school activities

scored 0.34 of a point higher than those in this group who did not participate ($p < .001$). Non-foster care youth with exceptionalities scored lower (2.77 points) on the test than youth in this group without exceptionalities ($p < .001$). Non-foster care youth who were considered gifted scored almost 4 points higher than those in this group who were deemed as such ($p < .001$).

In the foster care youth population, there were several non-significant findings. Unexpectedly, parent level of education had no effect on scores for this group. Also unexpected were that gender, TV viewing, participation in after-school activities, receiving assistance on the test, and Work First experience were not significant predictors of test scores in this group. Foster care youth who expected to receive an A on the test scored 16 points higher than youth in this group who expected an F ($p < .001$). A clear pattern was seen in that the higher a youth expected a test score to be, the higher the actual score. Not surprisingly, foster care youth with exceptionalities scored 5.2 points lower than youth in this group without exceptionalities ($p < .001$).

Test-Year Cohort 2001

Test-year cohort 2001 included 98,824 non-foster care youth and 1,300 foster care youth. The non-foster care group was 65% White, 28% Black, and 7% Other, while the foster care group was 45% White, 48% Black, and 7% Other. While males (50%) and females (50%) were equally represented in the non-foster care group, the foster care group contained a higher percentage of females (60%) than males (40%). On average, both groups took the test at age 15

Model 1c was evaluated for the non-foster care population via OLS regression. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal

distribution (see Figure 7 Appendix II). Harmful multicollinearity was not found in the model based on the VIF. According to the Goldfeld-Quandt Test, this model proved to have harmful heteroscedasticity. To correct for heteroscedasticity, a WLS regression model was employed. The WLS model found predictors in the model to account for 52% ($R^2 = .52$) of the variance in non-foster care youth test scores, $F(23, 90,985) = 4385.11, p < .05$. Only one variable in the model (watching TV for 2 hours daily) was not significant (see Table 7 Appendix II). A post-WLS Goldfeld-Quandt Test revealed no heteroscedasticity in the model.

Model 1c was also evaluated for the foster care group using an OLS regression. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 8 Appendix I). The VIF found no factors greater than 10; thus, harmful multicollinearity did not exist in the model. Based on the Goldfeld-Quandt Test, there was heteroscedasticity in the model. To correct for heteroscedasticity, a WLS regression model was employed. The educational predictor variables in Model 1c explained 34% (adjusted $R^2 = .34$) of the variance in test scores of the foster care youth sample $F(23, 1217) = 33.59, p < .05$. Thirteen of the 23 predictor variables were not significant in this model. A post-WLS Goldfeld-Quandt Test revealed no heteroscedasticity in the model.

The non-foster care and foster care groups showed a few similar patterns in the effect of certain predictors on test scores. In both groups with every one year increase in age when test was taken youth scored 1.6 points lower. In both groups, Whites and Other ethnicities scored higher than Blacks. In the non-foster care group, Whites scored 3.5 points higher than Blacks; in the foster care group, Whites scored 4 points higher ($p < .001$). In both groups, the higher the expected grade, the higher the actual grade received. Non-foster care youth who expected to receive an A on the test scored 13 points higher than youth in this group who

expected an F. Similarly, foster care youth who expected to receive an A scored 12 points higher than youth in this group who expected an F. In both groups, youth considered to be gifted scored approximately 4 points higher than youth who were not deemed gifted ($p<.001$). Youth with exceptionalities in both groups scored approximately 3 points lower than youth without exceptionalities ($p<.001$).

Non-foster care and foster care populations differed regarding the effect of some of the predictors in the model on test scores. Many predictors that were significant in the non-foster care group were not significant in the foster care group, including gender, parent level of education, Work First experience, watching TV for 3 hours daily, watching TV for 4 or more hours daily, receiving assistance on the test, after-school participation, and age when tested (whether test taken at 11-16 years old or 17 and above).

As expected based on the literature, females in the non-foster care group scored 1.32 points lower than males in this group ($p<.001$). Both White and Other non-foster care youth scored higher than Blacks in this group. Whites scored almost 4 points higher, while Others scored 2 points higher ($p<.001$). As would be expected, non-foster care youth whose parents had a four-year college degree scored 1.4 points higher than youth in this group whose parents did not finish high school ($p<.001$). Non-foster care youth with Work First experience scored .43 of a point lower than youth in this group without Work First experience ($p<.001$). In this group, the more times the test was taken, the higher the score. Non-foster care youth who took the test three times scored 1.5 points higher than those in this group who took it once ($p<.001$). As expected, non-foster care youth who watched a lot of TV (4 or more hours daily) scored 0.34 of a point below youth in this group who watched zero to 1 hour or less ($p<.001$).

A surprising finding was that non-foster care youth who received assistance on the test scored 0.55 of a point lower than non-foster care youth who did not receive assistance ($p<.001$). Non-foster care youth who participated in after-school activities scored 0.41 of a point higher than those in this group who did not participate ($p<.001$). Non-foster care youth who took the test at age 17 or above scored 0.57 of a point lower than those in this group who took the test between the ages of 11 and 16 ($p<.001$). As would be expected, non-foster care youth with exceptionalities scored 2.6 points lower than youth in this group without exceptionalities ($p<.001$). Non-foster care youth who were considered gifted scored approximately 4 points higher than those in this group who were not considered gifted ($p<.001$).

There were several unexpected findings of non-significance in the foster care group. Parent level of education had no effect on scores for this group. Other unexpectedly non-significant predictors were gender, number of hours spent watching TV, having taken the test three times, participation in after-school activities, receiving assistance on the test, Work First experience, and age when tested (whether 11-16 or 17 and above). Foster care youth who expected to receive an A on the test scored 12 points higher than youth in this group who expected an F ($p<.001$). A clear pattern was seen in that the higher a youth expected a test score to be, the higher the actual score. Foster care youth considered to be gifted scored 4.3 points higher on the test than youth in this group not considered gifted ($p<.001$). On the other hand, youth in this group with exceptionalities scored 2.73 points lower than foster care youth with no exceptionalities ($p<.001$).

Test-Year Cohort 2002

Test-year cohort 2002 included 98,824 non-foster care youth and 1,633 foster care youth (see Table 2). The non-foster care youth group was 63% White, 29% Black, and 8% Other, while the foster care group was 44% White, 49% Black, and 7% Other. The non-foster care group was 49% male and 51% female; in contrast, the foster care group was 40% male and 60% female. On average, both groups took the test at age 15.

An OLS regression was employed to evaluate Model 1d for the non-foster care group. Algebra I test scores were regressed on variables reported to be predictive of educational achievement. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 9 Appendix I). The VFI found no factors greater than 10; thus, harmful multicollinearity did not exist in the model. Harmful heteroscedasticity was found via the Goldfeld-Quandt Test. To correct for heteroscedasticity in the OLS model, a WLS regression model was employed. A post-WLS Goldfeld-Quandt Test proved that there was no heteroscedasticity in the model. The WLS model found predictors in the model to account for 54% ($R^2 = .54$) of the variance in non-foster care youth test scores, $F(23, 96658) = 5056.43, p < .05$. All predictors in this model were found to be statistically significant (see Table 7 Appendix II).

Model 1d was also evaluated using the foster care population via OLS regression. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 10 Appendix I). The VFI found no factors greater than 10; therefore, harmful multicollinearity did not exist in the model. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity proved there was no heterokedasticity. The educational predictor variables in Model 1d explained 40% (adjusted $R^2 = .40$) of the variance in test scores of the

foster care youth group $F(23, 1538) = 46.56, p < .05$. Of the 23 predictor variables in the model, 9 were not significant.

Similarities existed between the groups in the effect of some predictors on test scores. Youth in both groups experienced a decrease in scores for each one-year increase in age at test time ($p < .001$). Non-foster care youth experienced a 1.68-point decrease compared to other youth in this group, while foster care youth experienced a 1.71-point decrease compared to other youth in this group ($p < .001$). Although the effect of gender was more prominent in the foster care group, the directionality of gender was the same in both groups. Females in the non-foster care group scored 1.32 points lower than males in this group, while females in the foster care group scored nearly 1 point lower than males in this group ($p < .001$). The effect of race on test scores was similar in both groups. Whites in the non-foster care group scored 3.4 points higher than Black youth in this group ($p < .001$). Similarly, Whites in the foster care group scored 4 points higher than Black youth in this group ($p < .001$).

Youth in both groups who took the test twice scored approximately 1 point higher than those who took the test one time ($p < .001$). In both groups, youth considered to be gifted scored close to 5 points higher than those not considered gifted. Also, youth with exceptionalities in both groups scored lower than those without exceptionalities: 2.8 points lower in the non-foster care group and 3.0 points lower in the foster care group ($p < .001$).

Similarly, non-foster care youth who expected to receive an A on the test scored 13.8 points higher than youth in this group who expected an F. While, foster care youth who expect an A scored only 11.4 points higher than foster care youth who expected a failing grade ($p < .001$).

There was some dissimilarity between the groups. While parent level of education, having taken the test 3 times, and participating in after-school activities were significant predictors of achievement in the non-foster care group, they were not in the foster care group. Non-foster care youth who watched TV for 4 or more hours daily scored lower (by 0.39 of a point) than youth in this group who watched zero to one hour or less of TV in this group, while foster care youth scored 1.44 points *higher* than youth in this group who watched zero to one hour or less of TV daily. Although the directionality of the effects of receiving assistance on the test and age when tested (11-16 or 17 –above) were the same in both groups, the magnitude was different. In the non-foster care group, youth who received assistance on the test scored 1.40 points lower than those in that group who did not ($p<.001$), while for youth in the foster care group who needed assistance scored 2.09 points lower than youth in this group who did not need assistance.

Youth in both groups who took the test between the ages of 11 and 16 scored lower than their counterparts who take the test at age 17. The younger members of the non-foster care group scored 0.74 of point lower than those in that group aged 17 and above ($p<.001$); in the foster care group, the younger students scored 1.68 points lower ($p<.001$).

In the non-foster care population, females scored 1.32 points lower than males in this group ($p<.001$). Whites in the non-foster care group scored almost 4 points higher than blacks ($p<.001$). Non-foster care youth whose parents had a college degree scored 1.5 points higher than non-foster care youth whose parents did not finish high school ($p<.001$). Non-foster care youth with Work First experience scored 0.43 of a point below youth in this group without Work First experience ($p<.001$). In the non-foster care group, the more times the test was taken, the higher the score. For example, non-foster care youth who took the test three

times scored 1.5 points higher than youth in this group who took the test once ($p < .001$). Non-foster care youth in this group who expected to receive an A on the test scored almost 14 points higher than youth in this group who expected to fail ($p < .001$).

In the foster care population, it was surprising that parent level of education, Work First experience, and after-school participation were not significant predictors in the model. Even more surprising was that foster care youth who watched TV for 4 or more hours daily scored 1.44 points *higher* than those in this group who watched zero to one hour or less daily ($p < .001$).

Patterns Among Test-Year Cohorts

Among all test-year cohorts of non-foster care and foster care populations, each one-year increase in age decreased test scores by approximately 2 points. Gender was a significant predictor for the non-foster care population in all test years. Females in this group scored approximately 1 point lower than males. Other than in test year 2002, gender was not a significant predictor of test scores for the foster care population. (In 2002, foster care females scored 1 point lower than foster care males.) Among all years and populations, Whites scored 3 to 4 points higher than Blacks. Parent level of education was a significant predictor for the non-foster care populations. Youth in the non-foster care groups whose parents had a four-year college degree scored about 2 points higher than youth in these groups whose parents did not finish high school. Among the foster care populations, parent level of education was, for the most part, not a significant predictor of test scores; the only exception was in test year 1999, when foster care youth with parents who had a college degree scored 3 points higher than youth in this group whose parents did not finish high school ($p < .001$).

Among all test-year cohorts, non-foster care youth with Work First experience scored less than 1 point lower than those in these populations without Work First experience. Work First experience was not a significant predictor of test scores in the foster care populations. In the non-foster care populations, youth who took the test more than one time scored 1 to 2 points higher than those who took the test once. The number of times the test was taken among foster care populations was, for the most part, not a significant predictor of test scores. However, in 2001 and 2002, foster care youth who took the test twice scored 1 to 2 points higher than foster care youth in these test years who took the test once. Non-foster care youth in test year 1999 who watched TV for 4 or more hours daily scored 0.14 of a point higher than youth in this group who watched TV for zero to one hour or less. However, non-foster care youth generally experienced a decrease in scores the more hours they spent watching TV. Number of hours watching TV did not have a significant effect for the most part in the foster care populations for test years 1999-2001.

Over all years, students in the non-foster care groups who received assistance on the test experienced a decrease in scores by 1 to 2 points. Among the foster care groups, assistance on the test was a significant predictor only in test years 1999 and 2002; scores for those receiving assistance decreased by 3 points and 2 points, respectively. Over all years, non-foster care youth who participated in after-school activities scored less than 1 point higher than non-foster care youth who did not participate. After-school participation was not a significant predictor of test scores for any of the foster care groups. Non-foster care youth over all years who expected an A on the test scored 13 to 16 points higher than those in these groups who expected an F. Foster care youth over all years who expected an A scored 11 to 14 points higher than those in their groups who expected an F.

In test years 2000 and 2001, non-foster care youth who took the test between the ages of 11 and 16 scored almost 1 point lower than youth in this group who took it at age of 17 or above. Foster care youth who took the test between ages 11 and 16 scored 3 points lower in 2000 and 2 points lower in 2002 than youth in these groups who took the test at age 17 or above. Over all test years, non-foster care and foster care youth who were considered gifted scored 4 to 5 points higher than non-gifted youth in these groups. Non-foster care youth with exceptionalities scored 2 to 3 points lower than youth without exceptionalities in these groups in all years; among foster care youth, those with exceptionalities scored 3 to 5 points lower than those without exceptionalities in all years.

Results of Model 2

Propensity score matching was used to create comparison groups for each test year cohort. This method was used to correct for selection bias in observational study, and therefore, to increase the study's internal validity that makes a valid causal inference. Because this study uses observational data, which does not allow for random assignment of participants into treatment conditions, direct comparisons of outcomes of foster care and non-foster care youth may be misleading. This lack of random assignment requires that statistical measures be taken to balance the data so as to allow a meaningful assessment of the effect of foster care on education outcomes. In this study, this was accomplished by using propensity score matching to control for selection bias.

Appendix III, contains box plots of preliminary estimated propensity scores of foster care youth and potential controls (non-foster care youth) in each test-year cohort. Per test-year cohort there is substantial difference between foster care youth and non-foster care youth, but there is also a fair amount of overlap in the distributions of foster care youth and

non-foster care youth. This implies that good matches are available per test-year cohort. Below are results based on the three-step procedure completed to create the comparison groups as is described in the design section of this dissertation.

Step One: Bivariate Testing and Estimation of Propensity Scores

To gauge the importance of controlling for covariates and selection bias in studying the educational differences between foster care youth and non-foster care youth, bivariate analyses of case characteristics were conducted. Appendix IV Tables 8-11 illustrate results of the bivariate analyses among the entire study sample in each test-year cohort. Chi-square tests are also reported in the tables comparing foster care and non-foster care youth.

In all of the test-year cohorts, foster care and non-foster care youth were significantly different in almost all characteristics tested. Therefore, the ignorable treatment assignment assumption is violated in this data set. The correlation between treatment assignment and a test covariate indicates that the treatment assignment is not ignorable. Because of this, taking remedial measures to correct this violation is necessary; in this study, the remedial measure was using propensity score matching.

In test-year cohort 1999, foster care youth and non-foster care youth were statistically different in all characteristics tested. The most common age at testing for foster care youth was 15 (32%), while non-foster care youth most commonly took the test at age 14 (33%, $p<.0001$). The foster care group had a higher percentage of Blacks (50% vs. 28%), while the non-foster care group had a higher percentage of Whites (66% vs. 44%, $p<.0001$). There were more females (63%) than males (37%) in the foster care group, while males and females were equally represented in the non-foster care group ($p<.0001$). While 23% of foster care youth had Work First experience, only 8% of non-foster care youth had Work

First experience ($p<.0001$). A higher percentage of foster care youth than non-foster care youth had parents who did not finish high school (18% vs. 6%, $p<.0001$). While 92% of foster care youth took the test one time, 90% of non-foster care youth took the test one time ($p=.0145$).

In test-year cohort 2000, foster care youth and non-foster care youth did not significantly differ in whether they took the test a once or multiple times. However, they differed in the remaining case characteristics. In the foster care group, the most common age at testing was 15 (31%), while the non-foster care youth most commonly took the test at age 14 (34%, $p<.0001$). There was a higher percentage of Blacks (48% vs. 28%) in the foster care group, while the non-foster care group had a higher percentage of Whites (65% vs. 46%, $p<.0001$). The foster care group had more females (61%) than males (39%), while genders were equally represented in the non-foster care group ($p<.0001$). A higher percentage of foster care youth than non-foster care youth had Work First experience (27% vs. 6%, $p<.0001$). A lower percentage of foster care youth had parents with a four-year college or graduate degree than did the non-foster care group (22% vs. 37%, $p<.0001$).

In test year 2001, foster care and non-foster care youth did not significantly differ in whether they took the test once or multiple times. They differed on all other case characteristics, however. In the foster care group, the most common age at testing was 15 (34%), while non-foster care youth most commonly took the test at the age of 14 (33%) ($p<.0001$). The foster care group had a higher percentage of Blacks (48% vs. 28%, $p<.0001$). The foster care group had a higher percentage of females (60%) than males (28%), while genders were equally represented in the non-foster care group ($p<.0001$). A higher percentage of foster care youth than non-foster care youth had Work First experience (28%

vs. 9%, $p < .0001$). A lower percentage of foster care youth had parents with a four-year college or graduate degree compared to non-foster care youth (24% vs. 37%, $p < .0001$).

In test year 2002, foster care and non-foster care youth did not significantly differ in whether they took the test a single time or more than once. They differed in all other characteristics tested. In the foster care group, the most common age at testing was 15 (35%), while the non-foster care youth most commonly took the test at age 14 (34%, $p < .0001$). The foster care group had a higher percentage of Blacks (49% vs. 29%), while the non-foster care group had a higher percentage of Whites (63% vs. 44%) ($p < .0001$). There was a higher percentage of females in the foster care group than in the non-foster care group (60% vs. 51%) ($p < .0001$). While 30% of foster care youth had Work First experience, only 10% of non-foster care youth had Work First experience ($p < .0001$). A lower percentage of foster care youth had parents with four-year college or graduate degrees compared to non-foster care youth (22% vs. 37%) ($p < .0001$).

Significant differences found from the bivariate analyses comparing foster care and non-foster care youth in each test-year cohort helped identify confounding variables that may have contributed to selection bias. Wherein, youth with certain characteristics may have had a greater or lesser likelihood of experiencing foster care. Model 2, a logistic regression model, was used to estimate propensity scores to help account and control for selection bias found in each test-year cohort. The dependent variable used in the logistic regression was a binary variable indicating whether the youth had foster care experience (1=yes, 0=no). The conditioning variables (i.e., the variables that are said to be predictive of placement in foster care based on prior studies) included race, age when tested, gender, parent level of education (which served as a proxy for SES), Work First experience and whether the test was taken a

single time. Appendix V (Tables 12-15) contains the results of the logistic regression models used to predict the propensity scores per test-year cohort. The logistic regression models for each test-year cohort demonstrated good model fit as indicated by the significant likelihood ratio chi-squares for each test-year cohort model.

Step 2: Matching

Matching was conducted by using the propensity scores obtained from the logistic regressions for each test-year cohort. The nearest neighbor within caliper algorithm was used to identify a one-to-one match without replacement. This was performed using two different caliper widths to create the matched samples for each test year. The caliper sizes used to create the newly matched sample for each test-year cohort were 0.05 (narrowest) and a quarter of the standard deviation of the sample estimated propensity score. The quarter of the standard deviation sizes for each test-year cohort were as follows: 1999: 0.183; 2000: 0.165; 2001: 0.160; 2002: 0.167. Because both caliper sizes (.05 and a quarter of the standard deviation) produced identical results, the results using the narrowest caliper (0.05) were presented. This was the case because there were enough matches falling into the caliper for each foster care youth, and as such, the algorithm picked up the same non-foster care youth as a match regardless of how narrow the caliper was.

In this study, propensity score matching controlled for selection bias when creating newly sampled comparison groups (per test-year cohort) of non-foster care youth. As shown in Appendix VI (Tables 16-19) the results of post-matching bivariate testing of case characteristics between the two groups in every test-year cohort are not significant, indicating that propensity score matching has successfully removed all differences in the observed characteristics between foster care (treated) and non-foster care (untreated) youth.

Furthermore, this indicates that comparison (non-foster care) groups for each test-year cohort share the same characteristics as the treated (foster care) groups. Results of analyses using the newly matched samples per test-year cohort are therefore attributed to differences of experiencing foster care and not to observed differences in case characteristics.

Step 3: Multilevel Analysis

Once the matched samples were created using propensity score matching, multivariate analysis was conducted. The multivariate analyses results that follow attribute outcome differences to experiencing foster care and not to observed differences in characteristics.

Results of Model 3

Model 3, an OLS regression model, was used to test the study's second hypothesis: Test scores and the effect of youth characteristics on test scores will differ between non-foster care youth and foster care youth in both full-test and matched cohorts. Non-foster care youth will score higher than foster care youth on the test. However, once selection bias is accounted for via matching, the gap in scores between non-foster care and foster care youth will be smaller. The outcome variable used in Model 3 was the Algebra I test score (continuous variable). The independent variables used were: race, gender, age when tested, foster care experience, Work First experience, parent educational level, and number of times the test was taken.

In testing the second hypothesis it was necessary to not only employ Model 3 with the matched test-year cohort samples but also with the unmatched full test-year cohort samples. The analyses performed on the matched samples assessed the true effect of foster care on test scores by controlling for selection bias when creating a comparison group of youth without

foster care experience. Employing Model 3 using the unmatched full test-year samples demonstrated the differences in results when selection bias is controlled (matched samples) and when selection bias is not controlled (unmatched full test-year cohort data). The differences in results between the matched and unmatched samples provided substantial evidence demonstrating the need to apply statistical methods to control for selection bias when making direct comparisons of outcomes between foster care and non-foster care youth. If selection bias is not controlled (as was the case with the unmatched test-year cohorts), results can be biased and thus misleading. As such, the use of propensity score matching in this study was warranted.

The following are the results of Model 3 using the matched groups and unmatched groups for each test year. This analysis used OLS modeling and reported unstandardized regression coefficients. In cases where heteroscedasticity was present in the model, a WLS model was employed and the unstandardized regression coefficients were reported. When interpreting the effect of an individual predictor variable on test scores, all other variables are controlled. In total, Model 3 was evaluated eight times, four times using the four matched test-year cohorts and four times using the four full test-year cohorts⁷.

Matched and Unmatched Samples for Test-Year Cohort 1999

Model 3a was evaluated using the matched sample of 965 foster care youth and 965 non-foster care youth using an OLS regression model. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 15 Appendix VIII). The VFI found no factors greater than 10; thus, harmful multicollinearity did not exist in the model. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was not

⁷ From here on, the findings of Model 3 will be described according to test-year cohort. Therefore, Model 3 will be referred as Model 3a for test-year cohort 1999, Model 3b for test-year cohort 2000, Model 3c for test-year cohort 2001, and Model 3d for test-year cohort 2002.

significant for non-constancy of variance. The predictor variables in this model explained 23% (adjusted $R^2 = .23$) of the variance in test scores of the matched sample after correcting for the number of predictors in the model $F(12, 1821) = 46.23, p < .0000$.

Model 3a was also evaluated using the unmatched (full test-year cohort) sample of 966 foster care and 87,623 non-foster care youth using an OLS regression model. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 16 Appendix VIII). Based on the VFI, which found no factors greater than 10, harmful multicollinearity did not exist. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was not significant for non-constancy of variance. The predictor variables in this model explained 27% (adjusted $R^2 = .27$) of the variance in test scores of the unmatched sample after correcting for the number of predictors in the model $F(12, 86,576) = 2772.45, p < .0000$.

Matched Sample for Test-Year Cohort 1999

In the 1999 test-year cohort matched sample, for every one-year increase in age at testing, there was a 2.6 decrease in test scores ($p < .001$). Females scored 1.6 points higher than males in this group ($p < .001$). Blacks in this sample scored lower on the test than did Whites and Others. Whites scored 4.4 points higher than Blacks, while Others scored 2 points higher than ($p < .001$). Over all parent level of education categories, test scores rose with level of education. Youth whose parents had a four-year college or graduate degree scored almost 3 points higher on the test than youth whose parents did not finish high school ($p < .001$). For this sample, parental level of education of “enrolled in a business or trade school” was not a significant predictor of achievement. Most importantly for the purposes of this study, youth in the matched sample with foster care experience scored 1.7 points lower

than non-foster care youth ($p<.001$). Youth in the matched sample with Work First experience scored 1.1 points lower than those in the sample without Work First experience ($p<.01$). Also, youth in the matched sample who took the test two times scored almost 2 points higher than youth who took the test only once.

Matched vs. Unmatched Results for Test-Year Cohort 1999

Predictors in the matched model accounted for a smaller percentage (23%) of variance than in the unmatched model (27%). This indicates that the predictors in the model actually account for less of the variability in test scores when selection bias is controlled. In comparing the matched and unmatched results, there are many differences in the effect of predictors in the models on test scores. These differences in effect were found for gender, race, parent level of education, foster care experience, Work First experience, and number of times the test was taken.

While females in the matched sample scored 1.60 points higher than males in that sample, females in the unmatched sample scored only .15 of a point higher than males ($p<.001$)—quite a large difference. Whites in both samples scored about 4 points higher than Blacks; however, Others in the matched sample scored 2 points higher than Blacks, while Others in the unmatched sample scored almost 4 points higher than Blacks ($p<.001$)—again, quite a large difference. The difference between samples is dramatic in regard to parent level of education. Youth in the matched sample whose parents graduated high school scored 1.3 points higher than youth in that sample whose parents didn't graduate; in the unmatched sample, the difference less than a point (.88, $p<.001$).

The low increase in scores in the unmatched sample for youth whose parents graduated high school vs. those whose parents didn't graduate is unexpected. One would

presume that youth with parents who finished high school would score higher than just .88 of a point than those whose parents didn't graduate high school. Another dramatic difference between samples is the finding that youth in the matched sample whose parents had a four-year college degree scored 2.9 points higher than parents in this sample without a high school degree; in contrast, youth in the unmatched sample score almost 4 points higher than youth in this sample with parents without a high school degree ($p < .001$).

More importantly for this study are the differences between the matched and unmatched samples in the effect of foster care experience. In the unmatched sample, foster care youth scored almost 2 points lower than non-foster care youth; in the matched sample, the difference was only 1.7 points ($p < .001$). Hence, the effect of foster care experience on achievement is actually *lower* in the matched group. The effect of Work First experience on test scores also differed in the matched and unmatched samples. In the unmatched sample, youth with Work First experience scored .98 of a point lower than those without Work First experience; in the matched sample, the difference was 1.14 points. For the matched sample, taking the test three times was not a significant predictor of achievement; however, this predictor was significant for the unmatched sample. Youth in the unmatched sample who took the test three times scored 2.6 points higher than youth in this sample who only took the test once ($p < .001$). It is important to note that the large size of the unmatched sample may contribute to the high significance of predictor variables in that model.

Matched and Unmatched Samples for Test-Year Cohort 2000

Model 3b was evaluated using the matched sample of 1,134 foster care youth and 1,134 non-foster care youth using an OLS regression model. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 17

Appendix VIII).The VFI found no factors greater than 10; thus, harmful multicollinearity did not exist in the model. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was not significant for non-constancy of variance. The predictor variables in this model explained 20% (adjusted $R^2 = .20$) of the variance in test scores of the matched sample after correcting for the number of predictors in the model $F(12, 2154) = 45.17, p<.0000$.

Model 3b was also evaluated using the unmatched (full test-year cohort) sample of 1,134 foster care youth and 90,119 non-foster care youth using an OLS regression model. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 18 Appendix VIII).Based on the VFI which found no factors greater than 10, harmful multicollinearity did not exist. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was not significant for non-constancy of variance. The predictor variables in this model explained 30% (adjusted $R^2 = .30$) of the variance in test scores of the unmatched sample after correcting for the number of predictors in the model $F(12, 89070) = 3195.77, p<.0000$.

Matched Sample for Test-Year Cohort 2000

In the 2000 test-year cohort matched sample, for every one-year increase in age when tested, there was a 2.8-point decrease in test scores ($p<.001$). Gender was not a significant predictor of test scores in the matched sample. Also not significant in the matched sample was parent level of education. Whites in the matched sample scored 4.6 points higher than Blacks ($p<.001$), while youth of Other ethnicities scored higher than Blacks by 2.2 points ($p<.05$). Foster care youth in this sample scored 1.6 points lower on the test than non-foster care youth ($p<.001$). Youth with Work First experience also scored lower on the test than youth in this sample without Work First experience, by 1 point ($p<.05$). Finally, youth in the

matched sample who took the test twice scored 2.3 points higher than those who took it once ($p<.001$); those who took the test three times scored 5 points higher than those who took it once ($p<.05$).

Matched vs. Unmatched Results for Test-Year Cohort 2000

Predictors in the matched model accounted for a smaller percentage (20%) of variance than in the unmatched model (30%). In comparing the matched and unmatched results, there were many differences in the effect predictors in the model had on test scores. In the unmatched sample, for every one-year increase in age when tested, scores decreased by 3.3 points ($p<.001$); in the matched sample, the decrease was only 2.8 points. Gender was a significant predictor in the unmatched sample but not in the matched sample. Whites in the unmatched sample scored 5 points higher than Blacks ($p<.001$); in the matched sample, the difference was 4.6 points. The degree of difference between the matched and unmatched samples was larger when comparing test scores of Blacks and those in the Other ethnicity group. In the unmatched sample, Others scored almost 4 points higher than Blacks ($p<.001$), while in the matched sample, Others scored only 2.2 points higher. Youth in the unmatched sample whose parent level of education was “enrolled in business or trade school” scored 1.8 points higher than those in this sample whose parents didn’t graduate high school ($p<.001$); in the matched sample, this predictor was not significant. Similarly, youth in the unmatched model whose parents had a four-year college or a graduate degree who scored 3.3 points higher than youth in this sample whose parents didn’t graduate high school ($p<.001$); this predictor was not significant in the matched model.

There were differences between the matched and unmatched samples in the effect of foster care experience. In the unmatched sample, foster care youth scored 2 points lower than

non-foster care youth ($p < .001$); in the matched sample, foster care youth scored only 1.6 points lower than non-foster care youth. The difference in the effect of Work First experience on youth in the matched and unmatched samples was slight. In the unmatched sample, youth with Work First experience scored 1.09 points lower than those without Work First experience ($p < .001$) compared to a 1.02-point decrease in scores in the matched sample. In both the matched and unmatched samples, youth who took the test more than once scored higher than those who took it once. In the unmatched sample, youth who took the test twice scored 2.4 points higher than those who took it once ($p < .001$); in the matched sample, the difference was 2.3 points ($p < .001$).

Matched and Unmatched Samples for Test-Year Cohort 2001

Model 3c was evaluated using the matched sample of 1,298 foster care youth and 1,298 non-foster care youth using an OLS regression model. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 19 Appendix VIII). The VFI found no factors greater than 10; thus, harmful multicollinearity did not exist in the model. Harmful heteroscedasticity was found via the Goldfeld-Quandt Test. To correct for heteroscedasticity in the OLS model, a WLS regression model was employed. A post-WLS Goldfeld-Quandt Test proved that there was no heteroscedasticity. The predictor variables in this model explained 23% (adjusted $R^2 = .23$) of the variance in test scores of the matched sample after correcting for the number of predictors in the model $F(12, 2465) = 60.52, p < .0000$.

Model 3c was also evaluated using the unmatched (full test year cohort) sample of 1,300 foster care youth and 93,008 non-foster care youth using an OLS regression model. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal

distribution (see Figure 20 Appendix VIII). Based on the VFI, harmful multicollinearity did not exist as there were no factors greater than 10 in the model. Harmful heteroscedasticity was found via the Goldfeld-Quandt Test. To correct for heteroscedasticity in the OLS model, a WLS regression model was employed. A post-WLS Goldfeld-Quandt Test proved that there was no heteroscedasticity. The predictor variables in this model explained 33% (adjusted $R^2 = .33$) of the variance in test scores of the unmatched sample after correcting for the number of predictors in the model $F(12, 92237) = 3716.34, p < .0000$.

Matched Sample for Test-Year Cohort 2001

In the test-year cohort 2001 matched sample, gender, parent level of education of “high school graduate,” Work First experience, and having taken the test three times were not significant predictors of test scores. In this sample, for every one-year increase in age when tested, there was a 2.2-point decrease in test scores ($p < .001$). Whites and Others scored higher on the test than did Blacks. Whites in this sample scored 4.6 points higher than Blacks ($p < .001$), while Others scored 3.2 points higher than Blacks ($p < .001$). Youth whose parents had pursued education after high school scored higher than youth whose parents who did not finish high school. Youth whose parents had a four-year college or graduate degree scored 1.20 points higher than youth whose parents didn’t finish high school ($p < .001$). Foster care youth scored 1.3 points lower on the test than non-foster care youth ($p < .001$). Youth who took the test twice scored 1.6 points higher than those who took the test once ($p < .001$).

Matched vs. Unmatched Results for Test-Year Cohort 2001

Predictors in the matched model accounted for a smaller percentage (23%) of variance than in the unmatched model (33%). In comparing the matched and unmatched results, there were many differences on the effect predictors in the model have on test scores.

Gender was significant in the unmatched sample, but not in the matched sample. Similarly, the effect of having parents with a high school degree, having Work First experience, and having taken the test three times were significant in the unmatched model but not in the matched model.

In the unmatched sample, for each one-year increase in age when tested, scores decreased by almost 3 points ($p < .001$); in contrast, the difference in the matched sample was 2.2 points. ($p < .001$). The difference between the matched and unmatched samples in the effects of race and test scores was small. In the unmatched sample, Whites scored 5 points higher than Blacks ($p < .001$), while Whites in the matched sample scored 4.6 points higher than Blacks ($p < .001$). The effect of foster care experience on test scores differed between the matched and unmatched samples. In the unmatched sample, foster care youth scored 1.6 points lower than non-foster care youth ($p < .001$), while the difference in the matched sample was only 1.2 points ($p < .001$). The difference between the unmatched and matched samples in the effect of taking the test twice was only slight. In the unmatched sample, youth who took the test twice scored 1.7 points higher than those who took the test once ($p < .001$), compared to a difference of 1.6 points in the matched sample ($p < .001$).

Matched and Unmatched Samples for Test-Year Cohort 2002

Model 3d was evaluated using the matched sample of 1,631 foster care youth and 1631 non-foster care youth using an OLS regression model. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 21 Appendix VIII). The VFI found no factors greater than 10; thus, harmful multicollinearity did not exist in the model. Harmful heteroscedasticity was found via the Goldfeld-Quandt Test. To correct for heteroscedasticity in the OLS model, a WLS regression model was

employed. A post-WLS Goldfeld-Quandt Test proved that there was no heteroscedasticity in the model. The predictor variables in this model explained 25% (adjusted $R^2 = .25$) of the variance in test scores of the matched sample after correcting for the number of predictors in the model $F(12, 3089) = 85.31, p < .0000$.

Model 3c was also evaluated using the unmatched (full test-year cohort) sample of 1,633 foster care youth and 98,824 non-foster care youth using an OLS regression model. A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 22 Appendix VIII). The VFI found no factors above 10; therefore, harmful multicollinearity did not exist in the model. Harmful heteroscedasticity was found via the Goldfeld-Quandt Test. To correct for heteroscedasticity in the OLS model, a WLS regression model was employed. A post-WLS Goldfeld-Quandt Test proved that there was no heteroscedasticity in the model. The predictor variables in this model explained 33% (adjusted $R^2 = .33$) of the variance in test scores of the unmatched sample after correcting for the number of predictors in the model $F(12, 98231) = 3965.85, p < .0000$.

Matched Sample for Test-Year Cohort 2002

In the test-year cohort 2002 matched sample, gender, parent level of education of “high school graduate,” and having taken the test three times were not significant predictors of test scores. In this sample, for every one-year increase in age when tested, there was a 2.5-point decrease in test scores ($p < .001$). Whites and Others scored higher on the test than did Blacks. Whites in this sample scored 5 points higher than Blacks ($p < .001$), while Others scored 3.6 points higher than Blacks ($p < .001$). Youth of parents with four-year college or graduate degrees scored 1.7 points higher than youth whose parents didn’t finish high school ($p < .001$). Youth of parents enrolled in a business or trade school scored almost one point

higher on the test than that of youth whose parents did not finish high school ($p < .05$). Having foster care experience lowered the scores for youth in this sample, as did having Work First experience. Foster care youth scored 1.6 points lower than non-foster care youth ($p < .05$), while youth with Work First experience scored .86 of a point lower than youth without Work First experience ($p < .05$). Youth who took the test twice scored 1.27 points higher on the test than those who took the test once ($p < .05$).

Matched vs. Unmatched Results for Test-Year Cohort 2002

Predictors in the matched model accounted for a smaller percentage (25%) of variance than in the unmatched model (33%). In comparing the matched and unmatched results, there were many differences in the effect of predictors in the model on test scores. For example, gender was significant in the unmatched sample but not in the matched sample. The effect having taken the test three times was not significant for either sample.

Both samples experienced a decrease in scores for each one-year increase in age when tested. However, the difference in the unmatched sample was 3.22 points ($p < .001$), while for the matched sample the difference was 2.5 points ($p < .001$). The differences in the effect of race on test scores were similar for the matched and unmatched samples. In the unmatched sample, Whites scored 5.1 points higher than Blacks ($p < .001$); Whites in the matched sample scored 5.0 points higher ($p < .001$). In the unmatched sample, Others scored 3.8 points higher than Blacks ($p < .001$); in the matched sample, Others scored 3.6 points higher than Blacks ($p < .001$). A big difference was found between groups regarding the effect of parent level of education on test scores. In the unmatched sample, youth whose parents graduated from a business or trade school or junior or community college scored 2.4 points higher than youth whose parents didn't finish high school ($p < .001$); in the matched sample,

the difference was only 1.2 points ($p<.001$). Similarly, youth in the unmatched sample whose parents had a four-year college or graduate degree scored 3.8 points higher than youth in this group with parents lacking a high school degree ($p<.001$); for the matched sample, the difference was only 1.7 points ($p<.001$).

Having foster care experience resulted in a decrease in scores for both sample groups, as did having Work First experience. However, the amount of decrease differed between sample groups. In the unmatched sample, foster care youth scored 1.7 points lower than non-foster care youth ($p<.001$), while in the matched sample, foster care youth scored 1.6 points lower ($p<.001$). The effect of Work First was larger in the unmatched sample than in the matched sample. While having Work First experience reduced test scores by 1.1 points in the unmatched sample ($p<.001$), it reduced scores by only .86 of a point for the matched sample ($p<.001$). The effect of taking the test twice also differed between the matched and unmatched samples. In the unmatched sample, youth who took the test twice scored 2 points higher than those who took the test once ($p<.001$); in the matched sample, the difference was only 1.2 points ($p<.05$).

Patterns Among Matched Test-Year Cohorts

An examination of the matched cohorts from all four test years revealed a number of inconsistencies across years. The effect of age on test scores was similar across all years in that for each one-year increase in age when tested, scores decreased by 2.26 points to 2.8 points. The effect of gender, however, differed across years. Gender was not a significant predictor for test-year cohorts 2000-2002, but in test year 1999, females scored 1.6 points higher than males ($p<.001$). Also inconsistent across years was the effect of parent level of education on test scores. Youth in test year 1999 whose parents were high school graduates

scored 1.3 points higher than youth whose parents didn't finish high school ($p < .001$). In contrast, the effect of having parents who graduated high school was not significant in all other years. Youth in test year 2001 whose parent level of education was "enrolled in business or trade school" scored 1.8 points higher than youth whose parents didn't finish high school ($p < .001$). However, the effect of parent level of education being "enrolled in business or trade school" was not a significant predictor in other test years.

A similar trend was found across years regarding youth with parents who graduated from a business or trade school or junior or community college. These youth scored 1 to 2 points higher than those in their cohort whose parents didn't finish high school ($p < .001$). Youth whose parents had a four-year college or graduate degree scored 1 to 3 points higher than youth whose parents didn't finish high school ($p < .05$); this predictor was significant in all years except test year 2000. Most important to this study, across all years, foster care youth scored lower than non-foster care youth, with differences ranging from 1.2 to 1.7 points ($p < .05$). Because propensity score matching was used to obtain the matched comparison groups, the measured impact of foster care experience on test scores is purer as selection bias is controlled. Having Work First experience decreased scores by approximately 1 point in all test-year cohorts. Work First experience was not a significant predictor in test year 2001. Over all years, youth who took the test twice scored up to 2 points higher than youth who took it once ($p < .05$). Having taken the test three times was not a significant predictor except in test year 2000, when those who took the test three times scored 5 points higher than those who took the test once.

Overview of Differences Between Matched and Unmatched Samples Across Test-Year Cohorts

In each of the four test-year cohorts, the results for matched and unmatched samples consistently differed. The effect of a predictor may have been significant in one sample and not in the other; the effect of a predictor on test scores may not have been as dramatic in one sample as in the other. These results indicate that when selection bias is controlled, findings are different than when selection bias is not taken into account. Thus, modeling that controls for selection bias may produce more accurate results. These findings also strongly support the need to control for selection bias when creating comparison groups by using analytic techniques such as propensity score matching.

Over all test-year cohorts, the effect of age when tested was greater in the unmatched samples than in the matched samples. For example, in unmatched test-year cohort 2002, for every one-year increase in age when tested, there was a 3.2-point decrease in test scores, while the decrease was only 2.5 points in the matched cohort for that year. Similarly, while gender was a significant predictor of test scores in the unmatched samples in most years, it was a significant predictor in only one matched sample. The effect of race on test scores was generally greater for the unmatched samples than the matched samples. While Whites and Others scored higher than Blacks in all samples across all years, the difference was generally greater in the unmatched samples than in the matched samples. For example, Whites scored 5.1 points higher than Blacks in unmatched test-year cohort 2000, while in that year's matched cohort Whites scored only 4.6 points higher than Blacks. Similarly, Others in unmatched test-year cohort 2000 scored 3.8 points higher than Blacks, while Others in that year's matched cohort scored only 2.2 points higher than Blacks.

The effect of parent education level on test scores differed across both samples and across years. In some cases, parent level of education was a significant predictor in the unmatched samples but not in the matched samples, and vice versa. However, in cases where parent level of education was a significant predictor in both samples, the effect was higher in the unmatched samples than in the matched samples. For example, in unmatched test-year cohort 1999, youth whose parents had a four-year college or graduate degree scored 3.7 points higher than those whose parents did not finish high school; in the matched cohort from that year, the difference was only 2.9 points. Over all matched and unmatched test-year cohorts, having foster care experience decreased scores. However, the decrease was more profound in the unmatched samples. For example, in unmatched test-year cohort 2000, foster care youth scored 2.1 points lower than non-foster care youth, while in that year's matched cohort, foster care youth scored 1.6 points lower than non-foster care youth.

Having Work First experience also decreased scores in all test-year cohorts, both unmatched and matched, although the decrease was not always more profound in the unmatched samples. In nearly all test-year cohorts and samples, youth who took the test twice scored higher than youth who took the test once, generally by 1 to 2 points. However, the increase in scores was greater in the unmatched cohorts than in the matched cohorts.

Test Scores of Foster Care and Non-Foster Care Youth

The differences between results when using the matched vs. the unmatched samples were evident not only in the effect of case characteristics on test scores as was previously discussed; these differences were also evident when comparing the average test scores between the matched and unmatched cohorts of foster care and non-foster care youth. As is illustrated in Table 21 Appendix IX, test scores among foster care and non-foster care youth

in unmatched and matched cohort groups increased across test years. In each of the unmatched cohorts, test scores of foster care youth and non-foster care youth differed by about 5 points. However, when selection bias was controlled by creating matched cohorts, the gap in scores between these groups decreased to 1-2 points. For example, in the matched cohort for test year 1999, foster care youth scored an average of 53 on the test while non-foster care youth scored an average of 55.

These findings support the second hypothesis, namely that youth without foster care experience will score higher than youth with foster care experience on the test. However, once selection bias is accounted for via matching, the gap in scores between foster care and non-foster care youth will be smaller than when full (i.e., unmatched) cohorts are compared. These findings indicate that although foster care experience may have a negative effect on test scores, the effect is not as pronounced when using comparison groups where selection bias is controlled rather than using unmatched comparison groups based on the general population.

Results of Model 4

Model 4, a logistic regression model, was also used to test the second hypothesis. The outcome variable used in this model indicated whether the youth scored above the threshold of 55 points for consistent performance on the test. The independent variables used in model 3 were also used in model 4 which included: race, gender, age when test was taken, foster care experience, Work First experience, parent educational level, and amount of times the student took the test. When interpreting the effect of an individual predictor variable on test scores, all other variables are controlled.

Similar to the analysis carried out in model 3, it was necessary to not only employ model 4 with the matched test-year cohort samples, but also the unmatched full test-year cohort samples. By employing model 4 using the matched samples the effect of foster care on test scores may be truly assessed by controlling for selection bias when creating a comparison group of youth without foster care experience. Employing model 4 using the unmatched full test-year samples demonstrates the differences in results when selection bias is controlled (matched samples) and when selection bias is not controlled (unmatched full test-year cohort data). The differences in results between both samples provide substantial evidence demonstrating the need to apply statistical methods to control for selection bias when making direct comparisons of outcomes between foster care and non-foster care youth. If selection bias is not controlled as was the case with the unmatched test-year cohorts, results can be biased and thus misleading. As such, the use of propensity score matching in this study was warranted.

Following are the results of Model 4 using the matched groups per test year and the results using the unmatched groups per test year. In total, Model 4 was evaluated eight times, four times using the four matched test-year cohorts and four times using the full test-year cohorts.⁸ The findings will be reported based on the relative risk of youth scoring above the threshold of 55. When interpreting the effect an individual predictor variable has on test scores, all other variables are controlled. Table 22 in Appendix X displays the results of Model 4. Results will be reported based on relative risks of scoring above the threshold of 55.

⁸ From here on, the findings of Model 4 will be described according to test-year cohort. Therefore, Model 4 will be referred as Model 4a for test-year cohort 1999, Model 4b for test-year cohort 2000, Model 4c for test-year cohort 2001, and Model 4d for test-year cohort 2002.

Logistic models: Matched and Unmatched Test-year Cohort 1999

Model 4a was evaluated using the matched sample of 1,930 foster care (N=965) and non-foster care youth (N= 965) using a logistic regression model. The model has a decent fit to data with a likelihood ratio chi-square of 376.59 (df=12, $p<.000$). The model pseudo R^2 was 0.14.

Model 4a was also evaluated using the unmatched sample of 88,589 non-foster care (N=87,623) and foster care youth (N=966) using a logistic regression model. The model has a decent fit to data with a likelihood ratio chi-square of 1863.91 (df=12, $p<.000$). The pseudo R^2 was 0.16.

Matched Model Test-year Cohort 1999

Having taken the test three times and having parents enrolled in business or trade school were not significant predictors. The likelihood of youth scoring above the threshold of 55 the older they are in age when taking the test is 44% less than those who took the test at younger ages ($p<.001$). The likelihood of females scoring above the threshold of 55 is 51% higher than males. Both Whites (1.57%) and Others (66%) have a greater likelihood of scoring above the threshold of 55 compared to Blacks ($p<.05$). Youth whose parents have a high school degree have a 57% likelihood of scoring above the threshold of 55 than youth whose parents do not have a high school degree ($p<.001$). Similarly, youth whose parents have a business or trade school degree are 1.20% more likely to score above the threshold of 55 compared to youth whose parents lack a high school degree ($p<.001$). Youth in this sample whose parents earned a four year college or graduate degree also have a higher likelihood (1.01%) to score above the threshold of 55 than do youth with parents without a high school degree ($p<.001$).

Most importantly in this study the finding that foster care youth are 23% less likely to score above the threshold of 55 than non-foster care youth ($p<.01$). Likewise, youth with Work First experience were also 23% less likely to score above the threshold of 55 ($p<.05$). Youth who took the test two times were more likely (48%) to score above the threshold than those who took the test one time ($p<.05$).

Test-year Cohort 1999 Matched vs. Unmatched Results

The matched and unmatched results differ slightly in some ways and substantially in others. The older a youth was when the test was taken the less likely they were to score above the threshold of 55 in both sample groups. In the unmatched sample, youth were 46% less likely to score above the threshold compared to 44% in the matched sample ($p<.001$). Youth in the unmatched sample with Work First experience were 19% less likely ($p<.05$) to score above the threshold while in the matched sample they were 23% less likely ($p<.001$). Another slight difference between the two samples was the effect of gender. In the unmatched sample, females were 50% more likely to score above the threshold than males, while in the matched sample females were 51% more likely ($p<.001$).

While all of the levels of parent education and whether or not youth took the test three times were significant in the unmatched sample, they were not in the matched sample. Foster care youth in the unmatched sample were 30% less likely to score above the threshold than non-foster care youth ($p<.001$). In the matched sample, foster care experience had a lesser effect where foster care youth were only 23% less likely to score above the threshold than non-foster care youth ($p<.01$). In regards to race, both Whites and Others had a greater likelihood to score above the threshold than that of Black youth. While in the unmatched sample Whites were 1.43% more likely to score above the threshold than Blacks, Whites in

the matched sample were 1.57% more likely ($p<.001$). The percent likelihood of Others scoring above the threshold than Black youth was strikingly higher in the unmatched sample (1.24%) ($p<.001$) compared to the percent likelihood in the matched sample (66%) ($p<.01$).

In both sample groups, youth whose parents obtained a high school degree or an advanced degree (i.e., four year college degree) had a higher percent likelihood of scoring above the threshold. However, there were large differences on the effect of the parent education levels between both sample groups. For example, in the unmatched sample, youth whose parents had a four year college degree or graduate degree were 1.87% ($p<.001$) more likely to score above the threshold than youth whose parents lacked a high school degree; while in the matched sample the percent likelihood was 1.01%.

Test-year Cohort 2000 Matched and Unmatched

Model 4b was evaluated using the matched sample of 2,268 foster care ($N=1,134$) and non-foster care youth ($N= 1,134$) using a logistic regression model. The model has a decent fit to data with a likelihood ratio chi-square of 393.20 ($df=12$, $p<.000$). The model pseudo R^2 was 0.12.

Model 4b was also evaluated using the unmatched sample of 91,253 non-foster care ($N=90,119$) and foster care youth ($N=1,134$) using a logistic regression model. The model has a decent fit to data with a likelihood ratio chi-square of 20701.42 ($df=12$, $p<.000$). The pseudo R^2 was 0.18.

Test-year Cohort 2000 Matched

Gender was the only predictor in this test-year cohort that was not significant. The likelihood of youth scoring above the threshold of 55 the older they are in age when taking the test is 42% less than those who took the test at younger ages ($p<.001$). Whites (1.59%)

and Others (1.03%) have a greater likelihood of scoring above the threshold of 55 compared to Blacks ($p<.001$). Youth whose parents have a high school degree have a 61% likelihood of scoring above the threshold of 55 than youth whose parents do not have a high school degree ($p<.001$). Youth whose parents are enrolled in a business or trade school are 70% more likely to score above the threshold of 55 compared to youth whose parents lack a high school degree ($p<.001$). Similarly, youth whose parents obtained a business, trade school, community, or junior college have a 1.04% greater likelihood of scoring above the threshold ($p<.001$). Youth in this sample whose parents earned a four year college or graduate degree also have a higher likelihood (98%) to score above the threshold of 55 than do youth with parents without a high school degree ($p<.001$).

Foster care youth in this sample are 24% less likely to score above the threshold of 55 than non-foster care youth ($p<.01$). Likewise, youth with Work First experience were also 24% less likely to score above the threshold of 55 ($p<.05$). The more times youth in this sample took the test, the better they achieved on the test. For example, youth who took the test two times were 51% more likely to score above the threshold ($p<.01$), as well as youth who took the test three times were more likely by 2.1% ($p<.05$).

Test-year Cohort 2000 Matched vs. Unmatched Results

While all predictors were significant in the unmatched model, gender was the only non-significant predictor in the matched model. In the unmatched model the likelihood of youth scoring above the threshold of 55 the older they are in age when taking the test is 48% less than those who took the test at younger ages ($p<.001$), compared to 42% in the matched sample ($p<.001$). Whites and Others in both sample groups were more likely than Blacks to score above the threshold. However, in the unmatched sample, Whites had a greater

likelihood (1.73%) of scoring above the threshold than Whites in the matched sample (1.59%) ($p<.001$). Other races in both sample groups were 1.02% (unmatched) to 1.03% (matched) more likely to score above the threshold than Blacks ($p<.001$). The effect of parent level of education on the likelihood of youth scoring above the threshold was higher in the unmatched sample than in the matched sample over all levels of education. For example, youth in the unmatched sample whose parents received a high school degree were 86% more likely to score above the threshold than youth whose parents lacked a high school degree ($p<.001$); compared to 61% in the matched sample ($p<.001$). Similarly, youth in the unmatched sample whose parents received a four year college degree or graduate degree were 1.84% more likely to score above the threshold of 55 ($p<.001$) than youth whose parents did not receive a high school degree; compared to 98% in the matched model ($p<.001$). In both sample groups youth who took the test more than one time had a greater likelihood of scoring above the threshold than youth who took it one time. However, the percent likelihood of scoring above the threshold was lower in the unmatched sample. While youth in the unmatched sample were 1.05% more likely to score above the threshold than youth in this sample who took the test one time ($p<.001$); youth in the matched sample were 2.1% more likely than youth who took the test one time ($p<.05$).

Test-year Cohort 2001 Matched and Unmatched

Model 4c was evaluated using the matched sample of 2,596 foster care (N=1,298) and non-foster care youth (N= 1,298) using a logistic regression model. The model has a decent fit to data with a likelihood ratio chi-square of 399.79 (df=12, $p<.000$). The model pseudo R^2 was 0.11.

Model 4c was also evaluated using the unmatched sample of 94,306 non-foster care (N=93,008) and foster care youth (N=1,300) using a logistic regression model. The model has a decent fit to data with a likelihood ratio chi-square of 19937.54 (df=12, $p<.000$). The pseudo R^2 was 0.18.

Test-year Cohort 2001 Matched

In this test-year cohort, gender, having Work First experience, and having taken the test three times not significant predictors. The likelihood of youth scoring above the threshold of 55 the older they are in age when taking the test is 38% less than those who took the test at younger ages ($p<.001$). Both Whites (1.84%) and Others (96%) have a greater likelihood of scoring above the threshold of 55 compared to Blacks ($p<.001$). Youth whose parents have a high school degree and beyond (i.e. 4 year college degree) are between 77% to 1.33% more likely to score above the threshold of 55 than youth whose parents do not have a high school degree ($p<.001$). Similarly, youth whose parents have a business or trade school degree are 1.20% more likely to score above the threshold of 55 compared to youth whose parents lack a high school degree ($p<.001$). Youth in this sample whose parents earned a four year college or graduate degree also have a higher likelihood (1.01%) to score above the threshold of 55 than do youth with parents without a high school degree ($p<.001$). Foster care youth in this sample are 26% less likely than non-foster care youth to score above the threshold of 55 ($p<.001$). Youth who took the test two times were 33% more likely to score above the threshold than were youth who took the test one time ($p<.05$).

Test-year Cohort 2001 Matched vs. Unmatched Results

All predictors used in the unmatched model were significant. In contrast gender, Other ethnicities, and whether youth took the test three times were not significant predictors

in the matched model. In the unmatched sample, the likelihood of youth scoring above the threshold of 55 the older they are in age at test time is 47% less than those who took the test at younger ages ($p<.001$); while in the matched sample the likelihood was 38% ($p<.001$). The effect of parent education level on the likelihood of scoring above the threshold was higher in the unmatched sample. For example, youth in the unmatched model whose parents received a high school degree had a 91% greater likelihood of scoring above the threshold than youth whose parents lack a high school degree ($p<.001$). In contrast, youth in the matched model whose parents received a high school degree were 81% more likely to score above the threshold ($p<.001$).

A striking difference between the sample groups is the effect of having a parent with a four year college or graduate degree. In the unmatched sample, youth whose parents have a four year college or graduate degree have 1.89% greater likelihood of scoring above the threshold than youth in the sample whose parents lack a high school degree ($p<.001$). In contrast, youth in the matched sample whose parents have a college or graduate degree are 77% more likely to score above the threshold than that of youth in this sample whose parents do not have a high school degree ($p<.001$). While youth in the unmatched sample who took the test two times are more 36% more likely to score above the threshold than youth in this sample who took the test one time ($p<.001$), youth in the matched sample are only 33% more likely to score above the threshold ($p<.05$).

Test-year Cohort 2002 Matched and Unmatched

Model 4d was evaluated using the matched sample of 3,262 foster care (N=1,631) and non-foster care youth (N= 1,631) using a logistic regression model. The model has a decent

fit to data with a likelihood ratio chi-square of 530.98 (df=12, $p<.000$). The model pseudo R^2 was 0.12.

Model 4d was also evaluated using the unmatched sample of 100,457 non-foster care (N=98,824) and foster care youth (N=1,633) using a logistic regression model. The model has a decent fit to data with a likelihood ratio chi-square of 18963.53 (df=12, $p<.000$). The pseudo R^2 was 0.17.

Test-year Cohort 2002 Matched

Having Work First experience, and having taken the tests two to three times were not significant predictors. The likelihood of youth scoring above the threshold of 55 the older they are in age when taking the test is 41% less than those who took the test at younger ages ($p<.001$). Both Whites (1.74%) and Others (1.02%) have a greater likelihood of scoring above the threshold of 55 compared to Blacks ($p<.001$). Youth whose parents have a high school degree and beyond (i.e. 4 year college degree) are between 81% to 1.04% more likely to score above the threshold of 55 than youth whose parents do not have a high school degree ($p<.001$). For example, youth whose parents have a high school degree are 81% more likely to score above the threshold of 55 than are youth whose parents do not have a high school degree. Youth in this sample whose parents earned a four year college or graduate degree also have a higher likelihood (1.04%) to score above the threshold of 55 than do youth with parents without a high school degree ($p<.001$). Foster care youth in this sample are 26% less likely than non-foster care youth to score above the threshold of 55 ($p<.001$).

Test-year Cohort 2002 Matched vs. Unmatched Results

All predictors in the unmatched model were significant, in contrast, having Work First experience, and having taken the test more than one time were not significant predictors

in the matched model. Results from both sample groups differed across all predictors. Age at test time and having foster care experience lessened the likelihood of scoring above the threshold for both sample groups. However, the effect of these two predictors was greater in the unmatched sample. In the unmatched sample the likelihood of youth scoring above the threshold of 55 the older they are in age when taking the test is 46% less than those who took the test at younger ages ($p<.001$). In contrast, the likelihood in the matched sample is 41% ($p<.001$). While, foster care youth in the unmatched sample were 30% less likely to score above the threshold than that of non-foster care youth ($p<.001$), foster care youth in the matched sample were only 26% less likely to score above the threshold ($p<.001$). Females in the unmatched sample were 16% more likely to score above the threshold than males ($p<.001$), while in the matched model, females were even more likely than males (20%) to score above the threshold ($p<.05$).

Whites in both samples had similar likelihoods of scoring above Blacks. Whites in the unmatched sample had a 1.75% likelihood while Whites in the matched sample had a 1.74% likelihood of scoring above the threshold of 55 than Black youth ($p<.001$). The effect of parent level of education on the likelihood of scoring above the threshold for the unmatched sample was greater. In the unmatched sample, youth whose parents obtained a high school degree were 98% more likely to score above the threshold of 55 than were youth whose parents did not have a high school degree ($p<.001$); while in the matched sample the likelihood was only 81% ($p<.001$). Likewise, youth in the unmatched sample whose parents had a four year college or graduate degree were 2.18% more likely to score above youth whose parents did not have a high school degree ($p<.001$); the likelihood was 1.04% in the matched sample ($p<.001$).

Patterns across Matched Test-year Cohorts

Similar patterns were found across all matched test-year cohorts. For example, age when test was taken (whether younger ages or older ages), having foster care experience, and having Work First experience decreased the likelihood of youth scoring above the threshold of 55. The remaining predictors in the model increased the likelihood of youth scoring above the threshold across test-year cohorts. Race was a significant predictor across all test years. Whites and Others were more likely to score above the threshold across all test years than were Blacks. Across all test-year cohorts the more education parents of youth had, the higher the percent likelihood of them scoring above the threshold over youth whose parents did not have a high school degree. Youth whose parents had a four year college or graduate degree were between 77% and 1.04% more likely to score above the threshold than that of youth whose parents did not have a high school degree.

Foster care youth in this sample were between 23% and 25% less likely to score above the threshold of 55 than non-foster care youth. Similarly, youth with Work First experience were between 13% and 24% less likely to score above the threshold than youth without Work First experience. Across all test years youth who took the test two times were between 21% and 51% more likely to score above the threshold than youth who took the test one time. However, with the exception of test-year cohort 2000, having taken the test three times had no significant effect on the likelihood of scoring above the threshold.

Overview of Findings Among Matched and Unmatched Samples

Across all test-year cohorts the results of the unmatched and matched samples consistently differ. This supports the notion that taking selection bias into account when creating comparison groups may provide more accurate results. Results based on unmatched

samples may be misleading as those samples do not control for selection bias. The differences in findings between the unmatched and matched samples strongly support the need to control for selection bias when creating comparison groups by using analytic technique like propensity score matching.

Differences in the effect of age at test time had a greater effect on the likelihood of youth scoring above the threshold in the unmatched samples while the effect was lesser in the matched samples across all years. Across all test-year cohorts, gender varied between samples. For example, in test-year cohort 1999 females in the unmatched sample were only 4% likely than males to score above the threshold while in the matched sample females were 50% more likely. In contrast, females in the unmatched sample in test-year 2001 were 8% more likely to score above the threshold of males, while that same year females in the matched sample were only 6% more likely.

Over all test-year cohorts in the unmatched samples, the effect of being White on the likelihood of scoring above the threshold was larger than that of the matched samples. The effect of parents having a high school degree and advanced degrees compared to parents without high school degrees had a greater effect on the likelihood of scoring above the threshold than for the matched samples. Having foster care experience lessened the likelihood of scoring above the threshold to a greater degree in the unmatched samples compared to the matched samples across all test-years. While in all test-year cohorts unmatched and matched the effect of Work First experience lessened the likelihood of scoring above the threshold, this effect was greater in the matched samples in test-year cohort 1999 and 2000. In contrast, the effect was greater in the unmatched sample in cohort 2001. Youth across all test-year cohorts unmatched and matched samples who took the test two

times were likely to score above the threshold than youth who took the test a single time. However, this effect was for the most part higher in the matched samples. For the most part, the effect of having taken the test three times was not significant in the matched samples while it was significant across all unmatched test-year cohorts.

Threshold Above 55 Results for Matched and Unmatched Samples across Test-years

Differences between results using the matched and unmatched samples per test-year cohort were captured in the effect of case characteristics on the likelihood of scoring above the threshold of 55 as presented in previous sections. It is important to note that these differences are the consequence of controlling for selection bias in the matched samples. By controlling for selection bias via propensity score matching the results were more accurate. The differences between both sets of results using the matched and unmatched samples support the need to use propensity score matching in this study.

Differences in results between matched and unmatched foster care and non-foster care youth samples per test-year cohort provide further support that controlling for selection bias is important when making comparisons between these youth. As is illustrated in Table 23 Appendix XI, the difference in the percentage of foster care youth scoring above the threshold of 55 compared to the percentage of non-foster care youth is large in the unmatched samples. For example, in test-year cohort 1999, only 43% of foster care youth were likely to score above the threshold compared to 65% of non-foster care youth in the unmatched sample. Similarly, in unmatched test-year cohort 2000, 48% of foster care youth were likely to score above the threshold compared to 68% of non-foster care youth that same year. This trend continues in the unmatched foster care and non-foster care 2001 and 2002 test-year cohorts.

While there are large differences in the percentage of youth scoring above the threshold of 55 between unmatched foster care and non-foster care samples per test-year cohort, the differences between these groups are less in the matched samples. For example, in matched test-year cohort 1999, 43% of foster care youth were likely to score above the threshold while 48% of non-foster care youth were likely to score above the threshold. Likewise, in matched test-year cohort 2000, while 48% of foster care youth are likely to score above the threshold of 55, 53% of non-foster care youth are also likely to score above the threshold. This pattern continues in the remaining matched test years. Another pattern found is that there is an increase in the percentage of matched and unmatched foster care and non-foster care youth who are likely to score above the threshold across test years.

These findings indicate that although foster care experience may lower the likelihood of foster care youth scoring above the threshold of 55, the effect is not as pronounced when using comparison groups where selection bias is controlled rather than using comparison groups based on the general population whose characteristics are not like those of foster care youth.

Results of Model 5

Model 5 used an OLS regression model and a WLS regression model in cases where heteroscedasticity existed to test the study's third and fourth hypotheses: Differences in the test scores of foster care youth are due to overall patterns and characteristics of the foster care experience; and differences in test scores between subsets of foster care youth (i.e., (a) youth who took the test before placement in foster care or (b) youth who took test in his/her first and only spell of foster care or (c) in the first, second or later spell in a multi-spell experience

or (d) in between spells or (e) taking the test after having completed their last spell in foster care.

Model 5 used the Algebra I test score (continuous variable) as the outcome variable. The independent variables used were: race, gender, age of entry into the placement prior to test, reason for placement, length of time in care, number of placements, and subsets (signifies the subsets of foster care youth based on the volume of their foster care experience). All of these variables were measured at the time when the student took the test.

Following are the results of Model 5 using foster care youth data for each test year. Model 5 was evaluated four times, one time for each test-year cohort.⁹ When interpreting the effect an individual predictor variable has on test scores, all other variables are controlled. Results from Model 5 are presented in Table 24 Appendix XII.

Foster Care Test-year Cohort 1999

Model 5a, an OLS regression model, was evaluated using the foster care sample (N=966). A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 23 Appendix XII). The VFI found no factors greater than 10 and thus harmful multicollinearity did not exist in the model. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was not significant for non-constancy of variance. The predictor variables in this model explained 14% (adjusted $R^2 = .14$) of the variance in test scores of the foster care sample after correcting for the number of predictors in the model $F(19, 896) = 8.53, p < .0000$.

Foster care youth in this sample scored .001 of a point less the older they were in foster care when they took the test ($p < .001$). In this sample foster care females are likely to

⁹ From here on, the findings of Model 5 will be described according to test-year cohort. Therefore, Model 5 will be referred as Model 5a for test-year cohort 1999, Model 5b for test-year cohort 2000, Model 5c for test-year 2001, and Model 5d for test-year cohort 2002.

score 1.6 points higher than males in foster care ($p < .001$). White foster care youth scored 4.4 points higher on the test than Black foster care youth ($p < .001$), being of Other ethnicities was not a significant predictor of achievement. Surprisingly, reason for placement had no significant effect on achievement. Being in foster care between one and two years had no effect on test scores. Youth in foster care for three to five years scored 2.5 points lower than youth in care for one year or less ($p < .001$). Youth in care for a total of five years and more score 3.4 points lower on the test than youth in care for one year or less ($p < .001$).

Youth who had five or more placement settings in foster care scored 1.7 points lower on the test than youth who only had one placement setting in care ($p < .05$). Youth who took the test before placement in foster care scored 4 points lower on the test than youth who took the test in their first and only spell in foster care ($p < .05$). In contrast, youth who took the test between spells in foster care score 7.3 points higher than youth who took the test during their first and only spell in care ($p < .001$).

Foster Care Test-year Cohort 2000

Model 5b, and OLS regression model was evaluated using the foster care sample ($N = 1134$). A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 24 Appendix XII). The VFI found no factors greater than 10 and thus harmful multicollinearity did not exist in the model. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was not significant for non-constancy of variance. The predictor variables in this model explained 8% (adjusted $R^2 = .08$) of the variance in test scores of the foster care sample after correcting for the number of predictors in the model $F(19, 1064) = 6.30, p < .0000$.

Foster care youth in this sample scored .0008 of a point less the older they were in foster care when they took the test ($p<.001$). In this sample the gender of foster care youth in this sample was not a significant predictor. White foster care youth scored almost 5 points higher on the test than Black foster care youth ($p<.001$). Being of Other ethnicities was not a significant predictor in this sample. The reason for placement in foster care had no significant effect on achievement. Being in foster care for one to two years had no effect on test scores. Youth in care for one to two years were likely to score 1.9 points lower than youth who spent one year or less in foster care ($p<.05$). Youth in foster care for over three years but less than or equal to five years scored 2.7 points lower than youth in care for less than or equal to one year ($p<.001$). Youth in care for a total of five or more years scored almost 3 points lower on the test than youth in care for less than or equal to one year ($p<.001$).

Surprisingly, the number of placement settings a youth had prior to test time was not a significant predictor of test scores. Youth in foster care who took the test before their first placement scored 4 points lower on the test than youth who took the test during their first and only spell ($p<.05$).

Foster Care Youth Test-year Cohort 2001

An OLS regression was employed to evaluate model 5c for the foster care youth sample (N=1300). A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 25 Appendix XII). The VFI found no factors greater than 10 as such harmful multicollinearity did not exist in the model. Harmful heteroscedasticity was found via the Goldfeld-Quandt Test. To correct for heteroscedasticity, a WLS regression model was employed. A post-WLS Goldfeld-Quandt Test proved that

there was not a harmful problem with heteroscedasticity. However, the dummy variable of having four placement settings had a lambda value of 1.17 which was slightly larger than the critical F value of 1.16 indicating that heteroscedasticity may still exist in this dummy variable. Because the lambda value and critical F value were only slightly different, no remedial action was taken. The WLS model found predictors in the model to account for 17% ($R^2 = .17$) of the variance in foster care youth test scores, $F(19, 1218) = 13.06, p < .05$.

Foster care youth in this sample scored .001 of a point less the older they were in foster care when they took the test ($p < .001$). Gender was not a significant predictor of achievement in this sample. White foster care youth and youth of Other ethnicities scored higher on the test than blacks. Whites in foster care scored 5 points higher on the test than Black foster care youth ($p < .05$), while Others scored 2.7 points higher ($p < .001$). Surprisingly, reason for placement had no significant effect on achievement. Being in foster care for two to three years had no effect on test scores. Youth in foster care for two to three years were likely to score 2 points lower than youth who took the test while in care for one year or less ($p < .05$). Youth in foster care for three to five years scored 2.6 points lower than youth in care for one year or less ($p < .001$). Youth in care for a total of five years and more score 3 points lower on the test than youth in care for one year or less ($p < .001$).

Surprisingly, the number of placement settings youth had did not have a significant effect on test scores. Youth who took the test before placement in foster care scored 3.8 points lower on the test than youth who took the test in their first and only spell in foster care ($p < .01$). Youth who took the test during a multispell experience scored 2 points lower on the test than youth who took the test during their first and only spell in care ($p < .05$).

Foster Care Youth Test-year Cohort 2002

An OLS regression was employed to evaluate model 5d for the foster care youth sample (1633). A histogram of the dependent variable (Algebra I scores) on the residuals assumed a normal distribution (see Figure 26 Appendix XII). The VFI found no factors greater than 10 as such harmful multicollinearity did not exist in the model. Based on the Goldfeld-Quandt Test there was heteroscedasticity in the model. To correct for heteroscedasticity, a WLS regression model was employed. A post-WLS Goldfeld-Quandt Test proved that there was no heteroscedasticity in the model. The WLS model found predictors in the model to account for 12% ($R^2 = .12$) of the variance in foster care youth test scores, $F(19, 1540) = 12.44, p < .05$.

Foster care youth in this sample scored .0007 of a point less the older they were in foster care when they took the test ($p < .001$). Gender was not a significant predictor of achievement in this sample. White foster care youth and youth of Other ethnicities scored higher on the test than blacks. Whites in foster care scored 5 points higher on the test than Black foster care youth ($p < .05$), while Others scored 3 points higher ($p < .001$). Surprisingly, reason for placement had no significant effect on achievement. Being in foster care for one to two years had no effect on test scores. Youth in foster care for two to three years were likely to score 1.3 points lower than youth who took the test while in care for one year or less ($p < .05$).

Youth who experienced two placement settings in foster care prior to taking test scored 1.3 points less than youth who had only one placement setting ($p < .05$). Youth who took the test after experiencing five or more placement settings in foster care scored 1.6 points lower than youth who had only one placement setting in foster care ($p < .05$). Youth

who took the test before placement in foster care scored 3 points lower on the test than youth who took the test during their first and only spell in care ($p < .01$).

Pattern across Foster care Test-year Cohorts

Across all test-year cohorts, test scores decreased slightly for every one year increase in age. With the exception of test-year cohort 1999, gender was not a significant predictor of test scores. In test-year cohort 1999, females scored 1.5 points higher than males. Across all test-year cohorts, White foster care youth scored almost 5 points above Black foster care youth. Being of Other ethnicities was a significant predictor in test-year cohorts 2001 and 2002 only. Others in both test-year cohort 2001 and 2002 scored between 2.7 to 3 points higher than Black foster care youth.

A surprising finding across test-year cohorts was that reason for placement in foster care did not have a significant effect on test scores; however, the length of time a youth was in foster care prior to the test for the most part had a significant effect on test scores. With the exception of test-year cohorts 1999, 2001, and 2002, having spent one to two years in care decreased the score by almost 2 points in compared to youth who spent one year or less in foster care prior to the test. With the exception of test-year cohorts 1999 and 2000, youth who spent two to three years in care scored 2 points lower on the test in 2001 and 1.3 points lower in 2002 than that of youth who spent one year or less in foster care. With the exception of test-year cohort 2001, youth who had a length of stay in care for three to five years scored almost 3 points less than youth who spent one year or less in foster care before taking the test. With the exception of test-year cohort 2002, youth who had a length of stay in care of three to five years scored almost 3 points less than youth who spent up to a year in foster care before taking the test. Foster care youth in test-year cohorts 1999 to 2001 that spent five or

more years in care prior to taking the test, scored 3 to 3.4 points lower than youth who spent one year or less in foster care. Over all, the longer youth were in foster care prior to the test the more likely they were to score less than youth who only spent up to a year in foster care.

Across all test-year cohorts, the number of placement settings a youth had in foster care for the most part did not have a significant effect on test scores. However, in test-year cohort 2002 youth who had two foster care placement settings scored 1.3 points lower than youth with one placement setting in foster care. In both test year 1999 and test year 2002, youth with five or more placement settings scored almost two points less than youth with only one placement setting prior to taking the test. Across all test-year cohorts, youth who took the test before placement in foster care scored 3 to 4 points lower on the test than youth who took it during their first and only spell in foster care. A surprising finding was that foster care youth in test-year cohort 1999 who took the test between spells scored 7 points higher on the test than that of youth who took the test during their first and only spell in foster care. Across all test-year cohorts, having taken the test after the final spell in foster care had no significant effect on test scores.

Results of Model 6

By evaluating a logistic regression model, Model 6 was also used to test the study's third and fourth hypotheses: Differences in the test scores of foster care youth are due to overall patterns and characteristics of the foster care experience; and differences in test scores between subsets of foster care youth (i.e., (a) youth who took the test before placement in foster care or (b) youth who took test in his/her first and only spell of foster care or (c) in the first, second or later spell in a multi-spell experience or (d) in between spells or (e) taking the test after having completed their last spell in foster care.

The outcome variable used in this model indicated whether the youth scored above the threshold of 55 points for consistent performance on the test. Scoring above the threshold indicates youth passed the test, scoring below indicates youth failed the test. The independent variables used in model 5 were also used in this model. Following are the results using samples of foster care test-year cohort data. Model 6 was evaluated one time per test-year cohort for a total of four times.¹⁰ The findings will be reported based on the relative risk of youth scoring above the threshold of 55. When interpreting the effect an individual predictor variable has on test scores, all other variables are controlled. Table 25 in Appendix XIV displays the results from Model six.

Foster care Test-year cohort 1999

Model 6a was evaluated using a foster care sample of N= 964. The model has a decent fit to data with a likelihood ratio chi-square of 96.41 (df=19, $p<.000$). The model pseudo R^2 is 0.07. In regards to age at entry relative to placement prior to testing, with every one year increase in age there was a lesser the likelihood of youth scoring above the threshold by 1% ($p<.001$). Females in foster care were 51% more likely to score above the threshold of 55 than males ($p<.01$). White foster care youth were 1.36% more likely to score above the threshold than that of Black youth in foster care ($p<.001$). Being of Other ethnicities had no significant effect on the likelihood of scoring above the threshold when compared to Black youth. Two striking findings were that reason for placement and the length of time youth spent in foster care prior to taking the test did not have a significant effect on the likelihood of scoring above the threshold. In this foster care population, youth who had five or more placement settings in foster care were 34% less likely to score above

¹⁰ From here on, findings of Model 6 will be described according to test-year cohort. Therefore, Model 6 will be referred as Model 6a for test-year cohort 1999, Model 6b for test-year cohort 2000, Model 6c for test-year cohort 2001, and Model 6d for test-year cohort 2002.

the threshold than that of youth you had one placement setting ($p<.01$). Having had less than five placement settings did not have a significant effect on the likelihood of scoring above the threshold. This suggests that the greater the number of placement settings youth had the less likely they were to score above the threshold. Youth who took the test after their final spell in foster care were 12% more likely to score above the threshold of 55 than youth who took the test while in their first and only spell ($p<.05$).

Foster care Test-year Cohort 2000

Model 6b was evaluated using a foster care sample of $N= 1134$. The model has a decent fit to data with a likelihood ratio chi-square of 99.48 ($df=19, p<.000$). The model pseudo R^2 was 0.06. In regards to age at entry relative to placement prior to testing, with every one year increase in age there was a lesser the likelihood of youth scoring above the threshold by 1% ($p<.001$). Gender was not a significant predictor of the likelihood of scoring above the threshold in this test-year cohort. White foster care youth were 1.29% more likely to score above the threshold than that of Black youth in foster care ($p<.001$). Being of Other ethnicities had no significant effect on the likelihood of scoring above the threshold when compared to Black youth. Youth placed into foster care due to physical or sexual abuse were 58% more likely than to score above the threshold than that of youth placed in foster care due to neglect ($p<.001$). Compared to youth who spent one year or less in foster care prior to taking the test, youth who spent one to two years were 35% less likely to score above the threshold of 55 ($p<.01$). Similarly, youth who spent three to five years were 39% less likely to score above the threshold of 55 ($p<.05$). Youth who took the test before placement in foster were 10% less likely to score above the threshold of 55 ($p<.01$).

Foster Care Test-year Cohort 2001

Model 6c was evaluated using a foster care sample of $N= 1295$. The model has a decent fit to data with a likelihood ratio chi-square of 133.08 ($df=19$, $p<.000$). The model pseudo R^2 was 0.07. In regards to age at entry relative to placement prior to testing, with every one year increase in age there was a lesser the likelihood of youth scoring above the threshold by 1% ($p<.001$). Gender did not have a significant effect on the likelihood of scoring above the threshold of 55. In contrast, being White and of Other ethnicities compared to Blacks did have a significant effect. White youth in foster care were 1.79% more likely to score above the threshold than that of Black youth ($p<.001$). Similarly, youth of Other ethnicities were 80% more likely to score above the threshold of 55 compared to Black youth ($p<.05$). In this test-year cohort reason for placement was not a significant predictor of the likelihood of scoring above the threshold.

Compared to youth who spent one year or less in foster care prior to taking the test, youth who spent two to three years were 37% more likely to score above the threshold of 55 ($p<.05$). Likewise, foster care youth who spent three to five years were 37% less likely to score above the threshold than that of youth who spent one year or less in foster care ($p<.05$). Youth who had five or more foster care placement settings were 35% less likely to score above the threshold than that of youth who only had one placement setting ($p<.05$). Youth who took the test after their final spell in foster care were 3% more likely to score above the threshold of 55 than that of youth who took the test during their first and only spell in foster care ($p<.05$).

Foster Care Test-year Cohort 2002

Model 6d was evaluated using a foster care sample of N= 1,629. The model has a decent fit to data with a likelihood ratio chi-square of 154.78 (df=19, $p<.000$). The model pseudo R^2 was 0.07. In regards to age at entry relative to placement prior to testing, with every one year increase in age there was a lesser the likelihood of youth scoring above the threshold by 1% ($p<.001$). Females in foster care were 31% more likely to score above the threshold of 55 than males ($p<.01$). White youth in foster care were 1.93% more likely to score above the threshold than that of Black youth ($p<.001$). Similarly, youth of Other ethnicities were 96% more likely to score above the threshold of 55 compared to Black youth ($p<.01$). Youth placed for behavior related issues such as behavior problems, alcoholism, or drug abuse were 37% less likely to score above the threshold than that of youth placed in foster care for neglect ($p<.05$). Youth who spent 5 or more years in foster were 35% less likely to score above the threshold than that of youth who spent one year or less in care ($p<.05$). The number of foster placement settings a youth had did not have a significant effect on the likelihood of scoring above the threshold of 55. Compared to youth who took the test during their first and only spell youth who took the test before placement into foster care were 71% less likely to score above the threshold of 55 ($p<.001$).

Foster Care Test-year Cohort Patterns

Across all years, with every one year increase in age at entry in placement prior to testing there was a lesser likelihood of youth scoring above the threshold by 1% ($p<.001$). With the exception of test-year cohort 2000 and 2001, females in foster care were 51% (1999) and 30% (2002) more likely to score above the threshold of 55 than males. Across all test-year cohorts, White foster care youth were between 1.29% and 1.93% more likely to

score above the threshold than that of Black youth in foster care. With the exception of test-year cohorts 1999 and 2000, youth of Other ethnicities were between 80% (2001) and 96% more likely to score above the threshold of 55 than that of Black youth in care. Although reason for placement was not a significant predictor in test-year cohort 1999 and 2001, it was in test-year cohort 2000 and 2002.

Youth placed in care for physical or sexual abuse were 58% more likely to score above the threshold in test-year cohort 2000 than youth placed in care for neglect. This indicates that in this cohort youth who are neglected are more likely to fail than youth physically or sexually abused youth. In contrast, youth placed due to behavior issues (behavior problems, alcoholism, drug abuse) were 37% less likely to score above the threshold than youth placed in care for neglect in test-year cohort 2002. This indicates that youth placed because of behavior problems are more likely to fail than youth placed for neglect.

In test-year cohorts 1999, 2001, and 2002, having spent one to two years in foster care compared to spending one year or less did not have a significant effect on scoring above the threshold. However, in test-year cohort 2000 youth who spent one to two years were 35% less likely to score above the threshold of 55. In test-year cohorts 1999, 2000, and 2002, having spent one to two years in foster care compared to having spent one year or less in foster care did not have a significant effect on scoring above the threshold. In contrast, in test-year cohort 2001, youth who spent one to two years in foster care were 37% less likely to score above the threshold than that of youth who spent one year or less in foster care prior to the test. Across test-years cohorts 2000 (39% less) and 2001 (37% less), youth who spent three to five years in foster care were less likely to score above the threshold than that of

youth who spent one year or less in foster care. Youth who spent five or more years in foster care prior to the test were 54% in test-year cohort 2000 and 35% in test-year cohort 2002 less likely to score above the threshold compared to youth who took the test after spending one year or less in care.

Across test year cohorts, having been in five or more placement settings compared to only one placement setting was a significant predictor of scoring above the threshold in test-year cohorts 1999 (34% less likely) and 2001 (35% less likely). Youth who took the test before placement into foster care in test-year cohort 2000 and 2002 were less likely to score above the threshold than that of youth who took the test during their first and only spell. In test-year 2000 they were 10% less likely while in test-year cohort 2002 they were 71% less likely. Having taken the test after experiencing multiple spells, or taking it between spells compared to after first and only spell was not significant across all test-year cohorts. Youth who took the test after the final spell in foster care in test-year cohort 1999 and 2001 were more likely to score above the threshold than that of youth who took the test during their first and only spell in those cohorts. In test year 1999 they were 12% more likely while in test-year cohort 2001 they were 3% more likely.

Chapter VI:

Discussion

To help answer the research questions posed in this study, three sets of analyses were undertaken. The goal with the first set of analyses was to determine whether the same set of educational dynamics held true, that is are predictive of educational achievement on the Algebra I test in the manner that the literature states they are for both foster care and non-foster care populations.

By using propensity score matching techniques, the second set of analyses examined the differences in educational performance of matched youth with and without foster care experience. The second set of analyses was also evaluated using the full test-year data that was not matched to lend support for the use of propensity score matching in this study.

In conclusion, the last set of analyses helped determine whether the differences seen in educational achievement between matched foster care and non-foster care youth were due to the foster care experience.

The Educational Dynamics of Foster Care and Non-foster Populations

Prior studies have reported certain contextual factors, individual student characteristics, and family characteristics that may predict achievement. Model 1 included some of these types of contextual factors and characteristics.

The results from model one sought to examine the research question, “Do the same set of educational dynamics hold true (i.e., are predictive of educational achievement in the

manner that the literature states they are) for youth with foster care experience, youth without foster care experience?

In both foster care and non-foster care populations across all test-year cohorts the older a youth was when the test was taken the better they performed. This pattern may be related to the maturity level of the older student, cognitive development and having taken more classes compared to younger students that may lead to a better understanding of mathematic concepts. Studies suggest that there are positive effects of age at test, implying that being one year older when taking a test increases the score on the test (Black, Devereux, & Salvanes, 2008; Elder & Lubotsky, 2008).

Across test-year cohorts in the non-foster care population females scored approximately one point less than males. This finding is supported by previous research that indicates that although the gender gap has been narrowing, (Bae, Choy, Geddes, Sable, Snyder, 2000) females continue to lag behind males in math and science test scores (Chambers & Schreiber, 2004). Surprisingly, with the exception of test-year cohort 2002 where females scored one point less than males, gender was not significantly related to test scores in the foster care population. Ethnic minority children and adolescents from low SES backgrounds are at an increased risk for low test scores and academic performance (Joseph, 1998; Kao & Thompson, 2003; Oaks, 1985; Slavin & Braddock, 1993). This was the case across all test-year cohorts and both foster care and non-foster care populations, White youth scored 3 to 4 points above Black youth.

Parental education background is significantly related to student achievement outcomes (House, 1999). Over all test-year cohorts, parent level of education was significantly related to test scores in non-foster care populations. The more education a

parent had the higher the score was for non-foster care youth compared to non-foster care youth whose parents lacked a high school degree. Unexpectedly, with the exception of test-year cohort 1999 in which foster care youth with parents who received college degrees scored 3 points above youth in this group whose parents did not finish high school, parent level of education was not significantly related to test scores in the foster care population. This suggests that there may be other characteristics related to foster care youth that may have a more significant effect on test scores- perhaps characteristics of the foster care experience.

Research is mixed regarding the effect of parental welfare receipt on the educational achievement of youth. Studies have found that parental welfare receipt has negative effects on youth educational achievement (Duncan & Yeung, 1994). In contrast, other research indicates a positive link between parental welfare receipt and youth academic achievement. In this study non-foster care youth across all test-year cohorts with Work First experience scored under one point below other non-foster care youth without Work First experience. Surprisingly, Work First experience was not significantly related to test scores in the foster care population across all test-year cohorts. This finding suggests that other characteristics related to this population more significantly affects test scores.

The amount of times the test was taken had a greater effect on test scores across all non-foster care test-year cohorts than that of foster care test-year cohorts. In the non-foster care populations across test-year cohorts, youth who took the test two to three times scored 1 to 2 points above those who took the test one time. Similarly, but only in test-year cohorts 2001 and 2002, foster care youth who took the test two times scored 1 to 2 points higher than

foster care youth in these test years who took the test one time. This suggests that the more times a student takes the test the better they perform on the test.

Previous research suggests that quantity, quality, and consistency of TV watching are negatively associated with scholastic achievement. Achievement declines as the amount of TV viewing increases (Comstock, 1991a; Comstock, Chaffee, Katzman, McCombs, & Roberts, 1978, pp. 146-147; Neuman, 1988, Sharif & Sargent, 2006). In this study the effect of watching TV on test scores differed across test-year cohorts and populations. In some cases watching more TV compared to watching no TV was associated with increased scores, in other cases watching TV compared to watching no TV was associated with decreased scores. Across all test-year cohorts non-foster care youth generally experienced a decrease in scores the more hours they spent watching TV. In contrast, in foster care test-year cohorts the number of hours watching TV was significantly related to test scores, the more hours foster care youth watched TV the better they performed on the test. This suggests that watching TV among foster care populations may be indicative of something different than in the general population.

Unexpectedly, across non-foster population test-year cohorts, youth who received assistance on the test experienced a decrease in scores by 1 to 2 points compared to those who did not receive assistance. This decrease was also found in foster care test-year cohorts 1999 where the score decreased by 3 points and in 2002 where the score decreased by 2 points. This finding may suggest that youth receiving assistance may have significantly greater academic needs than expected.

A number of studies have found a positive association between extracurricular participation and positive academic outcomes such as school engagement, test scores, and

educational aspiration (Cooper, Valentine, Nye, & Lindsay, 1999; Eccles & Barber, 1999; Marsh, 1992; Marsh & Kleitman, 2002). Students that participate in extracurricular activities are more likely to bond or attach to their schools, these types of attachments increase the likelihood for positive educational outcomes (Randolph, Rose, Fraser, & Orthner, 2004). As is found in the literature, among all test-year cohorts, non-foster care youth who participated in after-school activities score almost a point higher than other non-foster care youth who did not participate. Unexpectedly, across all foster care test-year cohorts, participation in after-school activities was not significantly related to test scores. This finding suggests that after-school participation in these foster care populations may be indicative of something different than in the general population.

Prior research posits that students who expect success in their academic abilities tend to perform well in different learning situations (Zimmerman, 2000). Students with low ability beliefs, task difficulty beliefs, and expectations of failure, are associated with negative academic outcomes (Dweck, & Legget, 1988; Murphy & Alexander, 2000; Zimmerman, 2000). In line with this research, across all test-year cohorts and populations, youth with better expectations of test performance performed better on the test than youth who expected failure. Non-foster care youth over all years who expected an “A” on the test scored 13 to 16 points above those in these groups who expected an “F.” Similarly, foster care youth over all years who expected an “A” on the test scored 11 to 14 points above foster care youth in these groups who expected an “F.”

Students with exceptionalities such as learning disorders, physical, emotional, and behavioral disorders have lower achievement levels than that of students without these types of exceptionalities (Geary, Hoard, Byrd-Craven, Nugent, & Numtee, 2007; Schiff,

Bauminger, & Toledo, 2009). As is found in the literature, in this study over all test-year cohorts and populations, youth with exceptionalities scored below youth without exceptionalities.

As is evident from results of model one, the educational dynamics of the non-foster care population across all test-year cohorts were for the most part in line with the literature. In contrast, the educational dynamics of the foster care population across all test-year cohorts were for the most part not in line with what the literature posits. Consequently, this suggests that in the foster care population certain contextual factors and characteristics that are reported to be predictive of achievement may be indicative of something different than in the general population.

Matching

Many studies demonstrate the academic vulnerability of youth in foster care. According to these studies, youth in foster care exhibit poorer educational outcomes compared to the general student population; score below non-foster care youth on standardized tests; on average read at a seventh grade level; and are likely to receive failing grades, among other negative outcomes (Burley & Halpern, 2001; Dubowitz & Sawyer, 1994; Eckenrode, Laird, & John, 1993; Evans, 2001; Smithgall, Gladden, Howard, George, & Courtney, 2004).

The typical strategy in prior research examining education outcomes of youth with foster care experience is to compare the educational achievement to that of their peers or to national norms (Benedict, Zuravin, & Stallings, 1996; Courtney, Piliavin, Grogan-Taylor, & Nesmith, 2001; Fansel, Finch, & Gurdy, 1990; Mc Millen & Tucker, 1999). Because these studies lack random assignment, there is a possibility for selection bias resulting in

misleading findings. Consequently, new approaches are necessary to examine the relationship between the foster care experience and education outcomes. An ideal approach for examining the differences in achievement between foster care youth versus non-foster care youth is the use of propensity score matching. In this study, propensity score matching was used to create a comparison group which took selection bias into account.

For model 2, a logistic regression model was used to estimate propensity scores for matching. The matching allowed for the comparison of foster care youth with other youth who had a high statistical probability of being in foster care although they had no experience in the foster care system. As reported in the results section, bivariate testing post-matching indicated that case characteristics between foster care and non-foster care youth per test-year cohort were not significant. Hence, the propensity score matching was successful in removing all differences on the observed characteristics of foster care and non-foster care youth. The use of propensity score matching led to multivariate analysis using matched groups in Models 3 and 4.

Education Outcomes of Foster care and Non-foster Care Youth

The results from models 3 and 4 sought to examine the research question, “Do test scores and the effect of youth characteristics on test scores differ between full test-year cohorts (unmatched) and matched test-year cohorts of youth with and without foster care experience once selection bias is controlled”?

As was outlined in the results section of models 3 and 4, to answer this question it was necessary to employ these models with the matched test-year cohort data and also the unmatched full test-year cohort data. Not only did employing models 3 and 4 in this manner provide an answer to this question but it also supported the use of propensity score matching

in this study. In doing so, this analysis helped examine whether similar conclusions could be made based on who foster care youth were compared to- the peers in the general population or matched peers.

In this study, average test scores between foster care youth and non-foster care youth in the general population (unmatched full test-year cohort data) and matched non-foster care youth differed. Foster care youth scored less on the test compared to both unmatched and matched non-foster care youth, however, these findings differed based on the comparison group used to examine foster care youth test scores.

Similar to studies comparing foster care youth to their peers in the general population, foster care youth in this study performed worse on the test. Foster care youth in each test-year cohort scored 5 points less than that of non-foster care youth. However, when compared to matched non-foster care youth wherein selection bias was accounted for, foster care youth in each test-year cohort scored between 1 to 2 points less on the test. As a result, the gap in scores between matched foster care youth and non-foster care youth across test-year cohorts decreased once selection bias was accounted for via matching.

As evidenced in the results of model 3, having foster care experience contributed to between a 1.28 and 1.78 decrease in scores across test-year cohorts compared to matched non-foster care youth, holding all other variables in the model constant. The effect of having foster care experience also contributed to a decrease in scores when comparing foster care youth to unmatched non-foster care youth. In this case, foster care youth scored almost 2 points less on the test than non-foster care youth. Again, the effect of foster care on test scores differs based on the comparison group used. Regardless of the comparison group used, foster care youth across test-year cohorts scored less on the test. This may suggest that

certain factors related to the foster care experience may contribute to the lower performance on the test.

Similar to the overall results of model 3, the results of model 4 suggested that foster care youth fare worse educationally than both matched and unmatched non-foster care youth. Higher percentages of foster care youth were less likely to score above the threshold of 55 compared to both matched and unmatched non-foster care youth. However, the percentage of foster care youth less likely to pass compared to non-foster care youth differed based on whether the non-foster care group was matched or unmatched. Findings between foster care youth and unmatched non-foster care youth across test-year cohorts suggested that between 18% and 22% of non-foster care youth were more likely to score above the threshold than that of the percentage of foster care youth. In contrast using the matched samples of non-foster care youth as comparison groups, between 5% and 6% of non-foster care youth were more likely to score above the threshold than that of the percentage of foster care. Furthermore, model 4 indicated that across all test-year cohorts foster care youth were between 23% and 27% less likely to score above the threshold compared to matched non-foster care youth and between 28% and 35% less likely compared to unmatched non-foster care youth.

Among other case characteristics (predictors) tested in models 3 and 4, the effect of these characteristics on test scores consistently differed based on whether the matched or unmatched data was used in the analysis. This again provides evidence that results based on data that take selection bias into account differs from results based on data that do not take selection bias into account. Regardless of the comparison group used, foster care youth scored less on the test and were less likely to pass the test than matched or unmatched non-

foster care youth. This may suggest that foster care experience may be contributing to the lower performance of these youth on the test.

The Effect of Foster Care Experience on Achievement

The results of models 3 and 4 where there were differences in test scores between foster care youth and non-foster care youth regardless of comparison group led to the analyses of Models 5 and 6 which sought to examine research questions “Are differences in foster care youth test scores due to overall patterns of the foster care experience? Are differences in test scores among foster youth associated with variation in their foster care experience prior to the test?”

Surprisingly in this study, reason for placement did not have as much predictive power as found in other studies where reason for placement is related to lower levels of educational achievement (test scores) (Eckenrode, Laird, & Doris, 1993; Kendall-Tackett & Eckenrode, 1996; Perez & Widon, 1994). Across test-year cohorts, reason for placement was not significantly related to actual test scores, however it was related to the likelihood of scoring above the threshold of 55 in test-year cohorts 2000 and 2002. In test-year cohort 2000 youth placed in foster care for physical or sexual abuse were more likely to score above the threshold of 55 compared to youth who were placed for neglect. Youth in test-year cohort 2002 who were placed in foster care due to child behavior issues such as alcoholism and drug abuse were less likely to score above the threshold than that of youth who entered for neglect. Similar to this study, research has found that youth who experience neglect are especially at risk for general academic skills deficits, while children who experienced physical abuse seem especially at-risk for school-related behavioral difficulties (Stone, 2007).

Across all test-year cohorts, the older youth were at entry into the placement prior to the test the less they scored on the test and the less likely they were to pass the test. This suggests that youth entering into care at older ages do worse than youth who enter care at younger ages prior to the test. Younger youth may not have been exposed to neglectful or abusive environments as long as older youth. Older youth and younger youth in these cohorts may have had different experiences prior to placement and during placement in foster care.

Research examining gender and achievement has found that there is a gender gap in that females tend to lag behind males in math and science (Arbona, 2000; Chambers & Schreiber, 2004; Eccles, 1994). In contrast to previous studies, gender was for the most part not significantly related to test scores across the foster care test-year cohorts. Unlike prior research where males perform better on math tests than that of females, females in foster care test-year cohort 1999 were likely to score almost 2 points higher than males and were more likely to score above the threshold of 5. In foster care test-year cohort 2002 females were more likely to pass the test than males. This finding may be indicative of the differences between youth in the general student population and youth with foster care experience in the cohorts used in this study. In the foster care population in this study, males may be worse off academically than females and have different experiences prior to placement and during placement in foster care.

In this study, race across all test-year cohorts was significantly related to test scores. In the foster care population, Black youth are disproportionately over-represented (Chand, 2000; Chipungu & Bent-Goodley, 2004). Black youth constitute 15% of the U.S. population but account for 41% of the children in foster care (Government Accountability Office [GAO], 2007). Minority youth in the foster care system have different experiences through the

system. Not only are minority children disproportionately represented, they are also treated differently by the system. Once in care, African American children and youth have longer lengths of stay – an average of nine months longer than white children (GAO, 2007). African American children and other minorities also receive fewer contacts with caseworkers, fewer written case plans, and fewer developmental or psychological assessments (Chipungu & Bent-Goodley, 2004). Based on the treatment and experiences of minority groups in foster care, it is not surprising that race had an effect on test scores in this study. White foster care youth in each cohort scored approximately 5 points higher on the test and were more likely to pass than Black foster care youth. Other minority groups in this study in test-year cohorts 2000 and 2002 scored approximately 3 points higher and were also more likely to score above the threshold than that of Black youth. This suggests that Black youth in these cohorts were much more disadvantaged than other minority groups in these two cohorts.

In this study, length of time in care was significantly related to test scores across all test-year cohorts. Youth in care for one to two years, as well as youth in care for greater than three years scored lower on the test and were less likely to pass than that of youth in care for one year or less in test-year cohort 2000. Similarly youth in cohorts 2001 and 2002 in care for two to three years scored less on the test and were less likely to pass than that of youth in care up to a year. The biggest decrease in scores was seen among youth with length of stays of three years or greater. Youth in test-year cohorts 1999 and 2001 with length of stays of three years or greater scored approximately 3 points lower on the test than that of youth in those cohorts who were in care for one year or less. Similarly, youth in test year 2002 with a length of stay greater than five years were less likely to pass the test than youth in care for one year or less. This suggests that youth in these cohorts who stay in foster care for a year or

greater may experience challenges along their tenure in foster care that may effect their educational achievement. Research has shown that youth with longer lengths of stay may experience higher rates of school transfers which may negatively affect their educational achievement and remain less likely to achieve reunification (Conger & Rebeck, 2001).

Unlike test-year cohort 2000, the number of placements settings a youth had was significantly related to test scores. In test-year cohort 1999 and 2001, youth who had five or more placement settings had lower test scores and were less likely to pass the test than that of youth who had one placement setting. In test-year cohort 2002, having had two placement settings or five or more placement settings compared to one was significantly related to lower test scores. Over these test-year cohorts, the greater number of placement settings youth had the greater the negative effect was on their test scores. It is not surprising that youth who have several placement settings have academic difficulties. Unstable living conditions and disruptions in placements undermine children's social, emotional, and physical development, perpetuating poor outcomes (Robertson, 2005). A lack of placement stability can result in youth having several school placements.

The variation/pattern of the foster care experience on test scores was significantly related to test scores across all foster care youth test-year cohorts. Across all test-year cohorts, youth who took the test prior to entering foster care score between 3 and 4 points below youth who took the test during their first and only spell. Furthermore, in test-year cohort 2000 youth who took the test before placement were less likely to score above the threshold compared to youth who took it during their first and only spell. This finding suggests that youth who enter foster care may already be academically vulnerable. Evidence suggests that youth tend to be overage for their grade and perform poorly on standardized tests prior to

formal placement (Smithgall, Gladden, Howard, George, & Courtney, 2004). This finding may also suggest that compared to youth who took the test prior to entering care, youth who took the test in their first and only spell may have been provided with services that helped them perform better once in the foster care system.

Youth who had multi-spell experience in foster care compared to youth with only one spell in foster care was not significantly related to test scores in test-year cohorts 1999, 2000, and 2002. However, in test-year cohort 2001, youth with a multi-spell experience scored 2 points higher than foster care youth in that cohort who were in care for only one spell, controlling for all other variables. Having taken the test between spells compared to youth who took the test in their first and only spell was not significantly related to test scores in test-year cohort 2000 through 2002. However, youth in test-year cohort 1999 who took the test between spells scored 7 points higher than youth who took the test in their first and only spell, controlling for other variables. Over all test-year cohorts, having taken the test after the last spell compared to those who took the test in their first and only spell was only significantly related to lower test scores in test-year cohorts 1999 and 2001. In test-year cohort 1999 and 2001, youth who took the test after leaving foster care scored 1 point higher on the test than that of youth who took it in their first and only spell. This suggests that youth in these two cohorts benefited educationally from leaving the foster care system. Overall, these findings suggest that foster care youth in this study have similar and some dissimilar patterns of participation in foster care. Some of the factors related to foster care experience decreased test scores while others improved test scores.

Findings in this study that were non-significant, but were significant in previous studies may be indicative of changes in the characteristics of the current population of

children and families served by the child welfare system. Compared to foster care cohorts used in previous studies, the cohorts in this study may be different and may have different experiences in the foster care system. As a result, educational achievement of cohorts used in this study may be affected by different factors compared to previous foster care cohorts and vice versa. Therefore, these results may not be generalizable to other cohorts in foster care.

Chapter VII:

Limitations and Implications of Findings

Study Limitations

Certain limitations to this study should be considered in assessing the findings reported here. First, this study relies on cross-sectional data and thus cannot examine educational history and family history of youth prior to entrance into foster care. There are not many variables in the dataset to use as predictors of educational achievement. A compensating strength of the design is that the use of multiple cohorts captured changes among foster youth and in test performance across time. As a result, this enhances the generalizability of findings to a broader segment of youth with foster care experience. Another compensating strength is that the use of the child welfare administrative data lends a longitudinal perspective where the sequence of the intervention (foster care) is known at the point in time when the test was taken. This provides a better sense of when the test occurred in the context of the foster care experience. This study explored the effects of foster care characteristics on educational achievement. This study would have greatly benefited by exploring placement types (i.e., group home, kinship care, etc.) and their effect on educational outcomes.

In this study there was a small percentage of (approximately 9% of between 88,589 and 100,457) cases per test year cohort that had multiple records across cohorts.

To account for this, the analyses were conducted based on the individual test cohorts; that is, a 1999 test cohort, a 2000 test cohort, a 2001 test cohort, and a 2002 test cohort. To assess each student's test experience prior to a given test year, students who took the test during the two previous years were identified. For example, the 1999 test cohort was assessed by reviewing the 1998 and 1997 test cohorts; the 2000 cohort was assessed by reviewing the 1998 and 1999 cohort. All of the measures are related to the test year cohort.

The usefulness of propensity score matching in this study is limited. This is because of the relatively small number of variables used as conditional variables in the matching process. Propensity score matching cannot adjust for unobserved covariates and its success hinges on having covariates that are related to treatment assignment, but not to the outcome (Rubin & Thomas, 1996). Generally, the procedure is more successful when data are available for a larger number of covariates.

There are also limitations to using administrative data because of inaccurate or missing data due to problems with data entry. A stronger approach would be to combine administrative data with survey data from students and parents which would afford richer insights into their backgrounds and lives.

Implications for Social Work Practice

Meeting the educational needs of youth in foster care should be a top priority for the child welfare system. This study showed that youth who entered care at older ages tended to do worse on the test. Child welfare workers may want to increase the educational services provided to older youth entering care to help them perform better in school. Race in this study was highly related to poor performance on the test by Blacks and Other minorities in foster care. Black and other minority youth consistently performed lower on the test and were

more likely to fail than White youth. Child welfare workers should focus more attention to the educational needs of minority groups in foster care.

In focusing on the educational needs of minority groups in foster care, it is important for child welfare workers to be culturally sensitive when working with these groups. Child welfare workers need to be especially culturally sensitive when making placement decisions and decisions concerning education. Child welfare workers can benefit from cultural sensitivity training to help them understand the cultural values and perceptions of their clients. Cultural sensitivity training can empower the worker to consider issues related to diversity, cross-cultural communication, and the influence of culture on the family, among others- all of which will help the worker make better decisions. Cultural sensitivity training can also benefit teachers. This type of training may enable teachers to be aware of any implicit or explicit bias in themselves, for example, lower achievement expectations from minority foster care youth.

Child welfare workers can also promote the educational achievement of youth in care by becoming educational advocates for these youth. They can ensure that the rights of youth in foster care are met (i.e., right to an IEP, right to special education services). Child welfare workers should aim to build good working relationships with parents, foster parents or other caretakers, teachers and school administrators, and the Court and School systems. Collaboration and communication between these individuals and systems in contact with youth in foster care can result in the joint provision of services that address the educational needs of youth in foster care.

This study found the largest percentages of youth across all test-year cohorts were placed in foster care due to neglect. Although in this study, reason for placement did not have

as much of an effect on educational performance across all test-year cohorts as found in other studies, youth in two cohorts in this study who were placed in foster care for physical or sexual abuse were more likely to pass the test than that of youth placed for neglect. Because youth who experience neglect are especially at risk for general academic skills deficits (Stone, 2007), child welfare workers should increase the educational services and resources of youth placed in care for neglect as well as other child related issues.

In this study, foster care youth who stay in care for longer periods and have multiple placement settings tended to perform lower on the test and were less likely to pass the test than youth who spent one year or less in foster care and had only one placement setting. Because youth with several placement settings may also have to change schools, child welfare workers can promote the educational achievement of youth in care by keeping them within their same schools. If a placement outside of their school district is the only option, transportation to the youth's original school should be made available. The disruption of school changes and mid-semester moves can have a negative effect on the educational achievement of youth in foster care. School changes can result in loss of records, loss of credits, and grade retention. Keeping youth placed in foster care within their own schools can promote a sense of attachment and belonging to their school which can promote academic performance, motivation, and enhance their emotional well-being (Romans, 1995).

As found in this study, youth with longer lengths of stays in foster care performed worse on the test. Child welfare workers should make it a priority to provide plenty of resources and services to the families of youth in foster care so that youth can be reunified with their families. If reunification with their families is not possible, child welfare workers should explore other suitable placements for youth outside of the foster care system that may

provide a safe, loving, and stable environment for these youth such as adoption. Length of time youth spend in foster care is generally used as a key measure in evaluating foster care programs. Although ensuring that youth do not stay in foster care for long periods of time, caution should be taken when deciding to reunify youth with their families. Pressure to reduce the length of time youth stay in foster care may result in harmful discharge plans. Youth may be prematurely reunified with their families only to be neglect or abused again and thus be placed back in the system.

In this study, variations in patterns of participation and subgroups of youth in foster care led to different educational outcomes. Hence, child welfare workers should figure out a set of intervention points based on patterns of participation and subgroups of youth who have relatively different or similar patterns of experience and educational needs.

Youth in this study who took the test prior to entering foster care did worse on the test than that of youth who took the test during their first and only spell in foster care. This suggests that these youth were already at-risk educationally prior to placement. Other studies have also found evidence suggesting that youth are academically vulnerable (overage for grade and perform poorly on standardized tests) before formal placement in foster care (Smithgall, Gladden, Howard, George, & Courtney, 2004). Regardless of substantiation of maltreatment reports, child welfare workers should refer families to educational programs that can help meet some of the educational needs of youth that came in contact with the child welfare system.

Implications for Social Work Research

Social work research needs to account for and distinguish between the different subsets of youth in foster care and their developmental stage. Current research examines

youth in the foster care population as a whole as if there were no differences in the foster care experience of youth. As was done in this study, to accurately examine youth in foster care and the impact foster care has on their educational achievement it is vital to account for the subsets of youth in foster care. As was the case in this study, the foster care experience of youth is different depending on their inclusion in a particular subset and thus there will also be differences in their educational outcomes. Research needs to consider that there are variations in patterns of participation and subgroups of youth in foster care that lead to different outcomes.

Methodological limitations plague many studies examining educational outcomes of youth in foster care. Some studies do not control for academic performance prior to entry into foster care or their maltreatment histories. Some studies also confound the effects of maltreatment and placement in foster care, lack precision in measuring placement change, lack comparison groups, and often times do not account for age of entry or length of stay. Simultaneously controlling for variables related to socio-demographics, maltreatment and placement type, and school factors can improve the methodology of some of these studies. This study demonstrates the usefulness of administrative data in that it allows one to control for some of the aforementioned variables as well as use statistical and procedural controls to mitigate other limitations found in current studies.

Propensity score matching as used in this study controlled for selection bias and tested more rigorously the effects of certain variables in the absence of matching. A limitation found in several research studies examining the effects of foster care placement on educational outcomes is that they fail to control for selection bias and compare foster care youth with their peers or national norms (Benedict, Zuravin, & Stallings, 1996; Courtney,

Piliavin, Grogan-Taylor & Nesmith, 2001; Fansel, Finch, & Gurdy, 1990; Mc Millen & Tucker, 1999). As was done in this study, the use of datasets linking educational data and child welfare data (i.e., case records) can help researchers create more sophisticated comparison groups by using statistical methods like propensity score matching.

Studies suggest several sources of heterogeneity in youth involved with the child welfare system such as maltreatment type, placement type, and the nature of achievement problems (e.g. Stone, 2007). Regardless of this heterogeneity there are lack of studies exploring potential moderating and mediating influences on educational achievement of foster care youth (Stone, 2007). Research studies should explore potential moderating effects that can help identify protective and promotive factors that can benefit youth educationally. Analysis of mediating factors can also help decompose complex effects of foster care placement.

Studies examining the education of youth in foster care often focus on low achievers and how factors related to their placement in foster care contribute to their low educational achievement. More studies are needed that examine youth in foster care who are high achievers, who graduate from high school and continue into post-secondary education. These types of studies will shed light to the differences between the trajectories of those in foster care who are high achievers and those that are not. These types of studies can highlight the factors related to the foster care experience and the services that were provided to these youth that promoted their educational achievement.

Implications for Policy

As found in this study, youth with foster care experience are not faring well educationally. The creation of policies addressing the educational needs of youth in foster

care is way to promote the educational achievement of this population. Flexible funding polices can enable child welfare workers to provide services and resources such as tutoring, extra-curricular activities, and the purchasing of educational materials, among others. The funding of scholarships to colleges, universities, and vocational training can help youth in foster care become self-sufficient once out of the system.

Initiatives that focus on improving coordination and cooperation between child welfare agencies and schools, among other agencies and systems can produce positive outcomes for youth in foster care. This study found youth with longer lengths of stay perform worse on the test- the creation of a shared database can keep track of youth in foster care and enable them to receive the services they need. Shared databases automate and standardize both child welfare records and educational records, among other type of records (i.e., juvenile records, medical records) (Conger & Finkelstein, 2003). A shared database between a school system and a child welfare agency allows these parties to closely monitor the school attendance, academic progress, and disciplinary records of youth in foster care (Zetlin, Weinberg, & Kimm, 2004).

Policies passed in some states that promote the educational needs of youth in foster care should be considered for passage by other states. For example, some of the provisions in Senate Bill 6709 (SB 6709) enacted by the Washington legislature (2003) aimed to facilitate collaboration between systems and individuals in contact with youth in care. SB 6709 requires that child welfare agencies develop protocols with school districts and courts for the purpose of collaboration, information sharing, and to ensure educational stability. The formation of an interagency oversight committee is also required for the development of strategies to recruit foster parents in school districts with high rates of foster youth

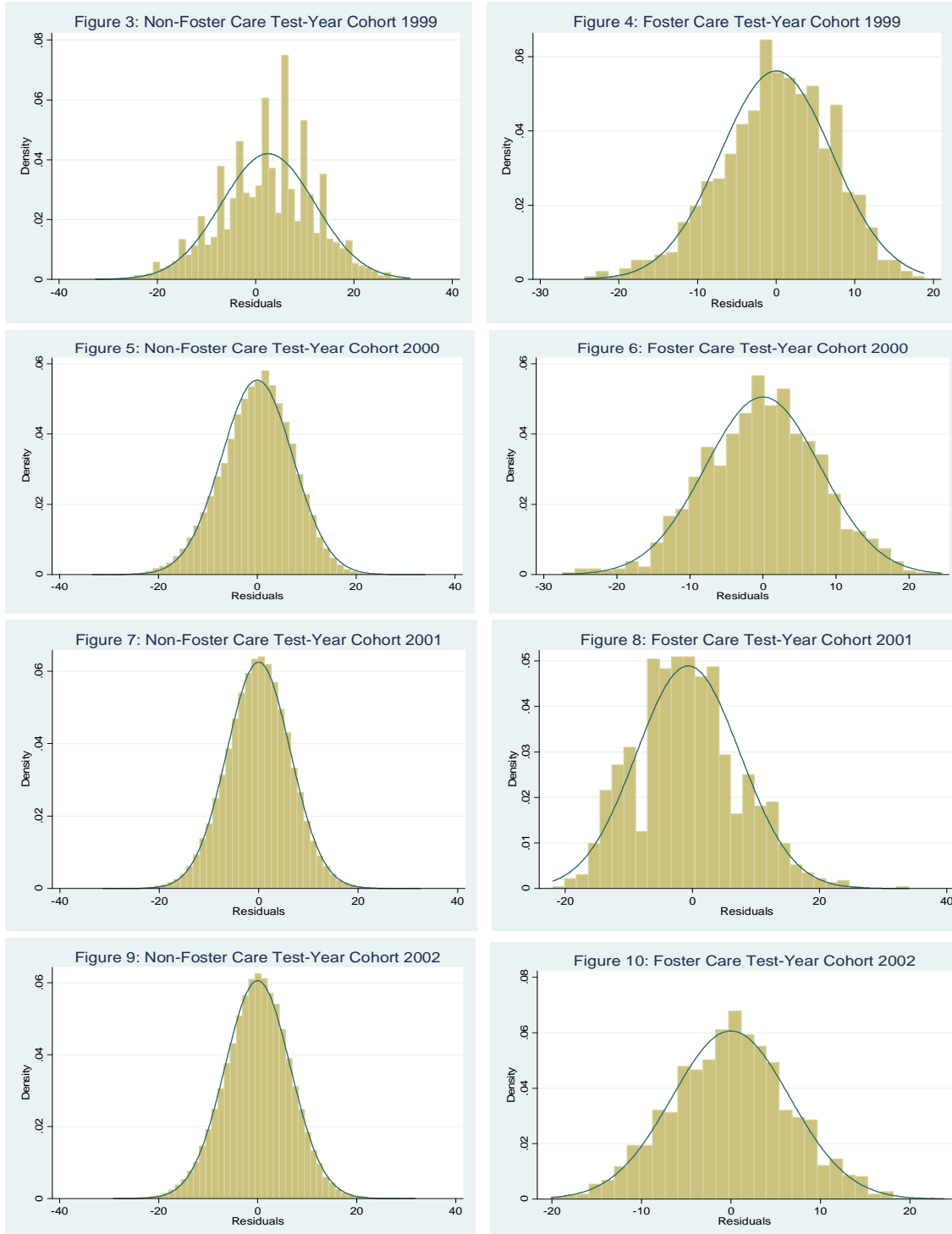
placements and to promote best practices for educational continuity. The bill provides a declaration of state policy that youth in care, when practical should remain in their own schools (S. Res. 6709, 2002).

Another policy, the California Assembly Bill 490 (AB 490) passed in 2003 ensures the proper educational placement, enrollment, and transfer of youth in care. The bill requires each local educational agency to assign a staff member as an educational liaison for youth in foster care. As stated in the bill's legislative intent, foster youth are also ensured the same educational opportunities and are to be held to the same standards as are other children. The bill provides that youth in care be placed in the least restrictive environment and that educational placements should be made in the best interest of the youth. Furthermore, the bill requires that youth in care to continue attending their school of origin for the duration of the school year (AB 490, 2003).

Appendix I

Figure 3

Histograms of dependent variable (Algebra I scores) on residuals for Non-foster Care and Foster Care test-year cohorts Model 1



Appendix II

Table 7

Regression Coefficients for Non-foster Care and Foster Care Youth, Predictors of Educational Achievement (dependent variable Algebra I Test Score)

Characteristics	1999		2000		2001		2002	
	NF N=85659	FC N=917	NF N=87999	FC N=1084	NF N=91009	FC N=1241	NF N=96682	FC N=1562
Age when test taken	-1.50**	-1.60**	-1.55**	-1.92**	-1.56**	-1.56**	-1.68**	-1.71**
Gender								
(Male)								
Female	-0.76**	0.14	-0.97**	-.91	-1.32**	-0.33	-1.32**	-0.93**
Race								
(Black)								
White	3.00**	3.79**	3.61**	3.98**	3.54**	4.16**	3.42**	4.04**
Other	1.84**	0.44	2.19**	0.62	1.94**	1.78*	2.04**	2.37**
Parent Education								
(Non-HS graduate)								
HS graduate	0.43**	1.64**	0.34**	-0.20	0.48**	0.47	0.69**	0.16
Enroll in Bus/trade	0.60**	1.78	1.04**	0.74	1.41**	0.80	1.54**	0.43
Graduate Business/trade	0.99**	1.84**	1.08**	1.13	1.27**	0.75	1.63**	0.97
Graduate of 4-year college/graduate school	1.80**	2.97**	1.45**	0.84	1.49**	-0.17	2.00**	0.97
Work First Experience	-0.34**	-0.85	-0.27**	-.50	-.43**	-0.60	-0.37**	0.32
# of times test taken								
(1)								
2	1.32**	1.73	1.63**	0.94	1.21**	1.85**	1.21**	1.16*
3	1.46**	-3.23	2.29**	1.94	1.51**	2.31	1.45**	2.06
Daily hours watching TV								
(none to 1 hour or less)								
2 hours	0.35**	0.56	-0.06	0.01	0.09	0.90	0.11*	1.38**
3 hours	0.37**	1.26	-0.16**	0.74	-0.26**	0.67	-0.13*	1.41**
4 or more hours	0.14*	1.79**	-0.37**	0.76	-0.34**	0.94	-0.39**	1.44**
Assistance on test	-1.81**	-3.25**	-2.05**	-1.39	-0.55**	-.75	-1.40**	-2.09*
AF School participation	0.19**	0.11	0.34**	.12	0.41**	0.48	0.30**	0.35
Anticipated grade								
(F)								
D	3.23**	3.83**	4.23**	4.45**	3.04**	3.47**	3.29**	3.06**
C	6.02**	5.01**	7.31**	7.00**	5.43**	4.41**	5.80**	5.26**
B	9.58**	8.61**	11.34**	11.29**	8.58**	6.72**	9.29**	8.21**
A	13.74**	13.47**	16.00**	16.07**	12.97**	11.56**	13.88**	11.43**
Test taken age 11-16	-0.10	-1.23	-0.04	-2.73**	-0.57**	-0.44	-0.74**	-1.68*
(17-above)								
Exceptionalities								
(None)								
Gifted	3.54**	3.06**	3.91**	2.08	4.20**	4.30**	4.72**	5.04**
Other	-2.56**	-3.15**	-2.77**	-5.29**	-2.66**	-2.73**	-2.28**	-3.04**

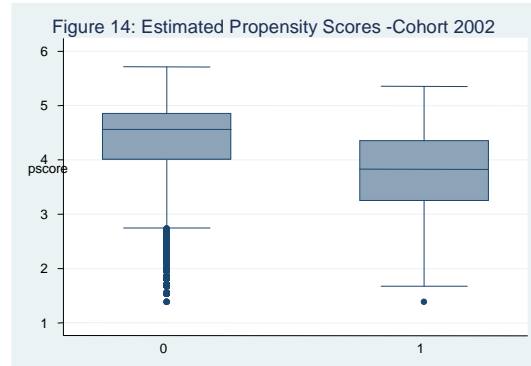
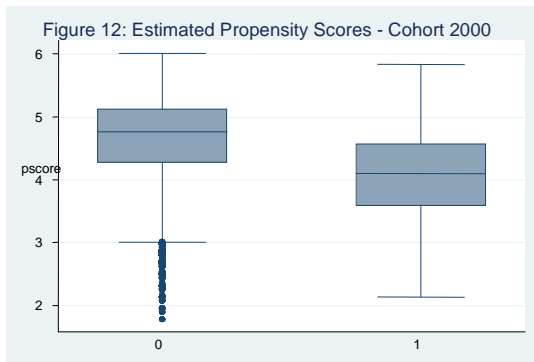
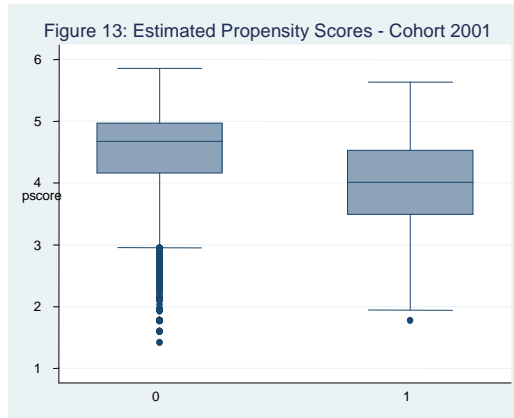
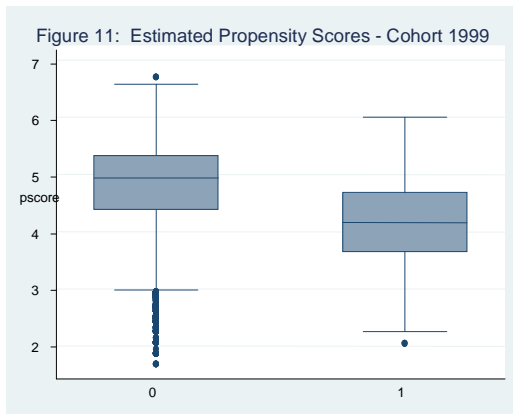
Note: NF stands for Non-foster care youth, FC stands for Foster care youth, Reference group in parenthesis
 Note: HS stands for High school; AF School participation stands for After School participation; the 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college

Note: Reference group for Work First experience, Assistance on test, After school participation are youth who did not participate nor receive those services

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

Appendix III

Box Plots of Preliminary Estimated Propensity Scores per Test-year Cohort



Note: 0= non-foster care (untreated); 1= Foster Care (treated)

Appendix IV

Table 8

Sample Characteristics by Foster Care Participation Test-year Cohort 1999

Characteristics	Total Sample N=88,589	FC N=966	NF N=87,623	p-value
Foster care Exp				
Yes	1%	100%	0	
No	99%	0%	100%	
Age				.0001***
11	.01%		.01%	
12	.51%		.51%	
13	8.29%	1.97%	8.36%	
14	32.88%	18.96%	33.03%	
15	28.62%	31.81%	28.58%	
16	16.87%	26.84%	16.76%	
17	8.29%	14.09%	8.22%	
18	3.41%	4.66%	3.39%	
19	.98%	1.55%	.97%	
20	.14%	.10%	.15%	
21				
22				.0001***
Race				
White	66%	44%	66%	
Black	28%	50%	28%	
Other	6%	6%	6%	
Gender				.0001***
Male	51%	37%	50%	
Female	49%	63%	50%	
Work First Exp				.0001***
Yes	8%	23%	8%	
No	92%	77%	92%	
Parent education				.0001***
Non-HS	7%	18%	6%	
HS-Graduate	31%	38%	31%	
Enrolled in Bus/Trade	4%	5%	4%	
Graduate Bus/Trade	47%	35%	47%	
Graduate 4-yr college/ Graduate school	11%	4%	12%	
Test taken single time				.0145*
Yes	90%	92%	90%	
No	10%	8%	10%	

Note: p-value is for difference between non-foster care and foster care youth

Note: NF stands for Non-foster care youth, FC stands for Foster care youth

Note: HS stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: exp stands for experience

* $p < .05$, ** $p < .01$, *** $p < .0001$

Appendix IV cont.

Table 9

Sample Characteristics by Foster care Participation Test-year Cohort 2000

Characteristics	Total Sample N=91,253	FC N= 1,134	NF N=90,119	p-value
Foster care Exp				
Yes	1%	100%	0	
No	99%	0%	100%	
Age				.0001***
11	.02		.02	
12	.62	.18%	.62	
13	8.30	2.12%	8.38	
14	33.86	21.69%	34.01	
15	29.69	30.78%	29.67	
16	15.12	24.07%	15.01	
17	8.12	15.61%	8.03	
18	3.28	4.67%	3.26	
19	.84	.88%	.84	
20	.15		.15	
21	.01		.01	
Race				.0001***
White	66%	46%	65%	
Black	38%	48%	28%	
Other	6%	6%	7%	
Gender				.0001***
Male	50%	39%	50%	
Female	50%	61%	50%	
Work First Exp				.0001***
Yes	8%	27%	8%	
No	92%	73%	92%	
Parent education				.0001***
Non-HS	6%	15%	6%	
HS-Graduate	26%	34%	26%	
Enrolled in Bus/Trade	9%	8%	9%	
Graduate Bus/Trade	22%	21%	22%	
Graduate 4-yr college/ Graduate school	37%	22%	37%	
Test taken single time				0.1297
Yes	90%	89%	90%	
No	10%	11%	10%	

Note: p-value is for difference between non-foster care and foster care youth

Note: NF stands for Non-foster care youth, FC stands for Foster care youth

Note: HS stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: AF School participation stands for After School participation

Note: exp stands for experience

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

Appendix IV cont.

Table 10

Sample Characteristics by Foster Care Participation Test-year Cohort 2001

Characteristics	Total Sample N=94,308	FC N= 1,300	NF N=93,008	p-value
Foster care Exp				
Yes	1%	100%	0	
No	99%	0%	100%	
Age				.0001***
11	.01%		.01%	
12	.64%		.64%	
13	7.87%	2.85%	7.94%	
14	33.15%	19.80%	33.34%	
15	30.56%	34.28%	30.51%	
16	15.74%	24.73%	15.61%	
17	7.78%	12.25%	7.72%	
18	3.31%	4.78%	3.30%	
19	.80%	1.31%	.79%	
20	.13%		.13%	
21	.01%		.01%	
Race				.0001***
White	64%	45%	65%	
Black	28%	48%	28%	
Other	7%	7%	7%	
Gender				.0001***
Male	50%	40%	50%	
Female	50%	60%	50%	
Work First Exp				.0001***
Yes	9%	28%	9%	
No	91%	72%	91%	
Parent education				.0001***
Non-HS	6%	17%	6%	
HS-Graduate	25%	30%	25%	
Enrolled in Bus/Trade	11%	11%	11%	
Graduate Bus/Trade	21%	18%	21%	
Graduate 4-yr college/ Graduate school	37%	24%	37%	
Test taken single time				0.1159
Yes	90%	88%	90%	
No	10%	12%	10%	

Note: p-value is for difference between non-foster care and foster care youth

Note: NF stands for Non-foster care youth, FC stands for Foster care youth

Note: HS stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: exp stands for experience

* $p < .05$, ** $p < .01$, *** $p < .0001$

Appendix IV cont.

Table 11

Sample Characteristics by Foster Care Participation Test-year Cohort 2002

Characteristics	Total Sample N=100,457	FC N= 1,633	NF N=98,824	p-value
Foster care Exp				
Yes	2%	100%	0	
No	98%	0%	100%	
Age				.0001***
11	.01%		.01	
12	.71%	.43%	.71	
13	7.74%	3.19%	7.81	
14	34.15%	20.54%	34.38	
15	30.91%	35.32%	30.83	
16	15.18%	23.67%	15.04	
17	7.41%	12.75%	7.32	
18	2.93%	3.37%	2.92	
19	.82%	.67%	.82	
20	.13%	.06%	.13	
21	.02%		.02	
Race				.0001***
White	62%	44%	63%	
Black	29%	49%	29%	
Other	8%	7%	8%	
Gender				.0001***
Male	51%	40%	49%	
Female	49%	60%	51%	
Work First Exp				
Yes	10%	30%	10%	
No	90%	70%	90%	
Parent education				
Non-HS	7%	18%	7%	.0001***
HS-Graduate	25%	32%	25%	
Enrolled in Bus/Trade	12%	12%	12%	
Graduate Bus/Trade	20%	16%	20%	
Graduate 4-yr college/ Graduate school	21%	22%	37%	
Test taken single time				
Yes	90%	89%	90%	.2232
No	10%	11%	10%	

Note: p-value is for difference between non-foster care and foster care youth

Note: NF stands for Non-foster care youth, FC stands for Foster care youth

Note: HS stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: exp stands for experience

p<.05*, *p*<.01**, *p*<.0001***

Appendix V

Table 12

Logistic Regression Predicting Propensity Scores Test-year Cohort 1999

Characteristics	β	Odds Ratio	95% CI
Total subjects	88,360		
Likelihood ratio chi-square (<i>p</i> -value)	656.14***		
Logistic intercept	-7.2***		
Age when test taken	0.19***	1.21	(.44,.59)
Gender			
Male	(reference)		
Female	0.46***	1.58	(1.3,1.8)
Race			
Black	(reference)		
White	-0.66***	0.51	(.44,.59)
Other	-0.62***	0.53	(.40,.70)
Parent Education			
Non-HS graduate	(reference)		
HS graduate	-0.67***	0.51	(.43,.60)
Enroll in Business/trade school	-0.68***	0.50	(.36,.70)
Graduate Bus/trade school	-1.00***	0.36	(.30,.43)
Graduate 4-year college/graduate school	-1.39***	0.24	(.17,.34)
Work First Experience	0.82***	2.27	(1.9,2.6)
Test taken single time	0.59***	1.82	(1.4,2.3)

Note: Reference groups for Work First experience and Test taken a single time is No.

p<.05*, *p*<.001**, *p*<.0001***

Appendix V cont.

Table 13

Logistic regression Predicting Propensity Scores Test-year Cohort 2000

Total subjects	91158		
Likelihood ratio chi-square (p-value)	680.4***		
Characteristics	β	Odds Ratio	95% CI
Logistic intercept	-6.69		
Age when test taken	0.17	1.19	(1.1,1.3)
Gender			
Male	(reference)		
Female	0.35	1.42	(1.2,1.6)
Race			
Black	(reference)		
White	-0.56	0.57	(.50,.65)
Other	-0.55	0.57	(.44,.74)
Parent Education			
Non-HS graduate		(reference)	
HS graduate	-0.35	0.69	(.58,.82)
Enroll in Business/trade school	-0.67	0.51	(.39,.65)
Graduate Bus/trade school	-0.57	0.56	(.46,.68)
Graduate 4-year college/graduate school	-0.84	0.42	(.35,.52)
Work First Experience	1.05	2.86	(2.4, 3.2)
Test taken single time	0.12	0.56	(.24,1.3)

Note: Reference groups for Work First experience and Test taken a single time is No.

p<.05, p<.001**, p<.0001****

Appendix V cont.

Table 14

Logistic Regression Predicting Propensity Scores Test-year Cohort 2001

Total subjects	94205		
Likelihood ratio chi-square (p-value)	753.8***		
Characteristics	β	Odds Ratio	95% CI
Logistic intercept	-6.52***		
Age when test taken	0.17***	1.19	(1.1,1.2)
Gender			
Male	(reference)		
Female	0.36***	1.44	(1.2,1.6)
Race			
Black	(reference)		
White	-0.55***	0.57	(.50,.64)
Other	-0.60***	0.54	(.43,.68)
Parent Education			
Non-HS graduate		(reference)	
HS graduate	-0.50***	0.60	(.51,.70)
Enroll in Business/trade school	-0.62***	0.53	(.43,.66)
Graduate Bus/trade school	-0.76***	0.46	(.38,.55)
Graduate 4-year college/graduate school	-0.82***	0.44	(.36,.52)
Work First Experience	1.06***	2.90	(2.5,3.2)
Test taken single time	0.17*	1.18	(1.0,1.4)

*Note: Reference groups for Work First experience and Test taken a single time is No.
 p<.05*, p<.001**, p<.0001****

Appendix V cont.

Table 15

Logistic Regression Predicting Propensity Scores Test-Year Cohort 2002

Total subjects		100323		
Likelihood ratio chi-square (p-value)		1035.9***		
Characteristics	β	Odds Ratio	95% CI	
Logistic intercept	-5.7***			
Age when test taken	0.14***	1.15	(1.1,1.2)	
Gender				
Male	(reference)			
Female	0.31***	1.37	(1.2,1.5)	
Race				
Black	(reference)			
White	-0.57***	0.56	(0.5,0.6)	
Other	-0.70***	0.49	(0.4,0.6)	
Parent Education				
Non-HS graduate	(reference)			
HS graduate	-0.60***	0.54	(0.4,0.6)	
Enroll in Business/trade school	-0.78***	0.45	(0.3,0.5)	
Graduate Bus/trade school	-0.95***	0.38	(0.3,0.4)	
Graduate 4-year college/graduate school	-1.04***	0.35	(0.3,0.4)	
Work First Experience	1.11***	3.05	(2.7,3.4)	
Test taken single time	0.18*	1.19	(1.0,1.4)	

Note: Reference groups for Work First experience and Test taken a single time is No.

p<.05, p<.001**, p<.0001****

Appendix VI

Table 16

Test-year Cohort 1999 by Foster Care Status

Characteristics	Total Sample N= 1,930	FC N= 965	NF N=965	p-value
Age				1.0000
13	1.92%	1.97%	1.87%	
14	19.02%	18.96%	19.07%	
15	31.81%	31.81%	31.81%	
16	26.84%	26.84%	26.84%	
17	14.09%	14.09%	14.09%	
18	4.61%	4.66%	4.56%	
19	1.61%	1.55%	1.66%	
20	.10%	.10%	.10%	
Race				.9800
White	44%	44%	44%	
Black	50%	50%	50%	
Other	6%	6%	6%	
Gender				.9762
Male	37%	37%	37%	
Female	63%	63%	63%	
Work First Exp				.9143
Yes	23%	23%	23%	
No	77%	77%	77%	
Parent education				1.0000
Non-HS	18%	18%	18%	
HS-Graduate	38%	38%	38%	
Enrolled in Bus/Trade	5%	5%	5%	
Graduate Bus/Trade	34%	34%	34%	
Graduate 4-yr college/ Graduate school	5%	5%	5%	
Test taken single time				1.0000
Yes	92%	92%	92%	
No	8%	8%	8%	

Note: p-value is for difference between non-foster care and foster care youth

Note: NF stands for Non-foster care youth, FC stands for Foster care youth

Note: HS stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: AF School participation stands for After School participation

Note: exp stands for experience

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

Appendix VI cont.

Table 17

Test-year Cohort 2000 by Foster Care Status

Characteristics	Total Sample N= 2, 268	FC N= 1,134	NF N=1,134	p-value
Age				.9807
12	.18%	.18%	.18%	
13	2.12%	2.12%	2.12%	
14	21.69%	21.69%	21.69%	
15	30.78%	30.78%	30.78%	
16	24.03%	24.07%	23.99%	
17	15.61%	15.61%	15.61%	
18	4.63%	4.67%	4.59%	
19	.88%	.88%	.88%	
20	.09%		.18%	
Race				.9007
White	46%	46%	46%	
Black	48%	48%	48%	
Other	6%	6%	6%	
Gender				.8300
Male	40%	40%	40%	
Female	60%	60%	60%	
Work First Exp				.9623
Yes	27%	27%	27%	
No	73%	73%	73%	
Parent education				.9996
Non-HS	15%	15%	14%	
HS-Graduate	34%	34%	35%	
Enrolled in Bus/Trade	8%	8%	8%	
Graduate Bus/Trade	21%	21%	21%	
Graduate 4-yr college/ Graduate school	22%	22%	22%	
Test taken single time				.9496
Yes	89%	89%	89%	
No	11%	11%	11%	

Note: p-value is for difference between non-foster care and foster care youth

Note: NF stands for Non-foster care youth, FC stands for Foster care youth

Note: HS stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: AF School participation stands for After School participation

Note: exp stands for experience

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

Appendix VI cont.

Table 18

Test-year Cohort 2001 by Foster Care Status

Characteristics	Total Sample N= 2,596	FC N= 1,298	NF N=1,298	p-value
Age				1.0000
13	2.81%	2.85%	2.77%	
14	19.80%	19.80%	19.80%	
15	34.28%	34.28%	34.28%	
16	24.77%	24.73%	24.81%	
17	12.33%	12.25%	12.40%	
18	4.74%	4.78%	4.70%	
19	1.27%	1.31%	1.23%	
Race				.9967
White	45%	45%	45%	
Black	48%	48%	48%	
Other	7%	7%	7%	
Gender				1.0000
Male	40%	40%	40%	
Female	60%	60%	60%	
Work First Exp				1.0000
Yes	28%	28%	28%	
No	72%	72%	72%	
Parent education				.5573
Non-HS	16%	17%	14%	
HS-Graduate	31%	30%	31%	
Enrolled in Bus/Trade	11%	11%	12%	
Graduate Bus/Trade	18%	18%	18%	
Graduate 4-yr college/ Graduate school	24%	24%	25%	
Test taken single time				.9017
Yes	89%	89%	89%	
No	11%	11%	11%	

Note: p-value is for difference between non-foster care and foster care youth

Note: NF stands for Non-foster care youth, FC stands for Foster care youth

Note: HS stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: AF School participation stands for After School participation

Note: exp stands for experience

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

Appendix VI cont.

Table 19

Test-year Cohort 2002 by Foster Care Status

Characteristics	Total Sample N= 3,262	FC N= 1,631	NF N=1,631	p-value
Age				.9973
12	.40%	.43%	.37%	
13	3.19%	3.19%	3.19%	
14	20.54%	20.54%	20.54%	
15	35.29%	35.32%	35.25%	
16	23.73%	23.67%	23.79%	
17	12.75%	12.75%	12.75%	
18	3.37%	3.37%	3.37%	
19	.71%	.67%	.74%	
20	.03%	.06%		
Race				.9906
White	44%	44%	44%	
Black	49%	49%	49%	
Other	7%	7%	7%	
Gender				.9430
Male	40%	40%	40%	
Female	60%	60%	60%	
Work First Exp				.9303
Yes	30%	30%	30%	
No	70%	70%	70%	
Parent education				.6740
Non-HS	17%	18%	16%	
HS-Graduate	32%	32%	33%	
Enrolled in Bus/Trade	12%	12%	12%	
Graduate Bus/Trade	17%	16%	17%	
Graduate 4-yr college/ Graduate school	22%	22%	22%	
Test taken single time				.9558
Yes	89%	89%	89%	
No	11%	11%	11%	

Note: Chi-square tests of significance were used to obtain p-values for difference between non-foster care and foster care groups

Note: p-value is for difference between non-foster care and foster care youth

Note: NF stands for Non-foster care youth, FC stands for Foster care youth

Note: HS stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: AF School participation stands for After School participation

Note: exp stands for experience

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

Appendix VII

Table 20

Regression Coefficients for Matched and Unmatched Foster Care and Non-Foster Care Test-year Cohort Groups (dependent variable Algebra I Test Score)

Characteristics	1999		2000		2001		2002	
	Matched N=1,821	Unmatched N=87,623	Matched N=2,154	Unmatched N=89,070	Matched N=2,465	Unmatched N=92,237	Matched N=3,089	Unmatched N=98,231
Age	-2.62***	-2.98***	-2.83***	-3.39***	-2.26***	-2.99***	-2.59***	-3.22***
Gender								
(Male)								
Female	1.60***	.15***	.20	.16***	.01	-.37***	0.004	-0.23***
Race								
(Black)								
White	4.41***	4.34***	4.61***	5.16***	4.68***	5.05***	5.00***	5.12***
Other	2.17***	3.74***	2.29**	3.88***	3.21***	3.56***	3.61***	3.78***
Parent Education								
(Non-HS graduate)								
HS graduate	1.38**	.88***	.21	.68	.58	.829***	0.39	1.03***
Enroll in Bus/trade	1.12	1.01***	.57	1.81***	1.80***	2.07***	0.95*	2.27***
Grad Bus/trade	1.96***	1.98***	1.57**	1.83***	1.15**	2.08	1.23**	2.48***
Grad of 4-year college/graduate school	2.94**	3.75***	.91	3.30***	1.20**	3.20	1.73***	3.83***
Foster Care exp	-1.78***	-1.92***	-1.67***	-2.10***	-1.28***	-1.61***	-1.62**	-1.73***
Work First exp	-1.14**	-.98***	-1.02*	-1.09***	-.37	-1.16***	-0.86**	-1.13***
# of times test taken								
(1)								
2	1.95**	2.04***	2.35***	2.42***	1.67***	1.73***	1.27**	2.00***
3	4.85	2.66***	5.24**	4.20***	1.75	2.81***	0.66	3.02

Note: Age is at time of test

Note: Reference group in parenthesis

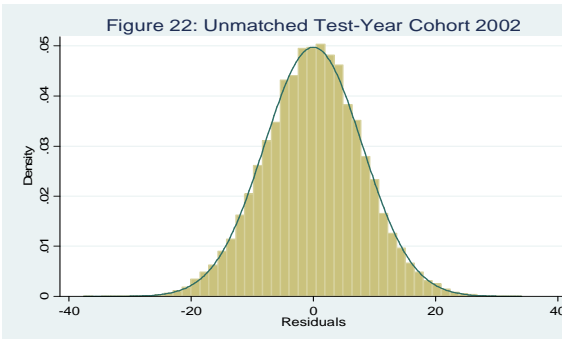
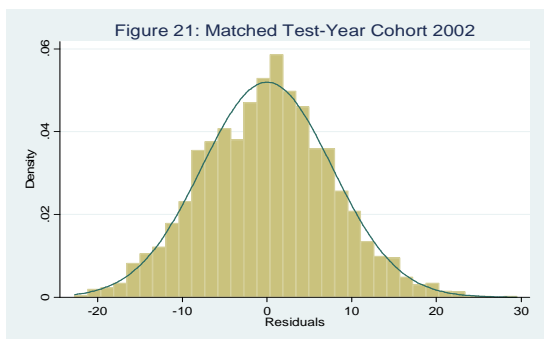
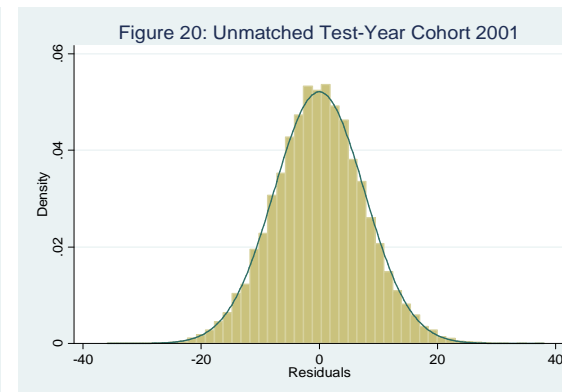
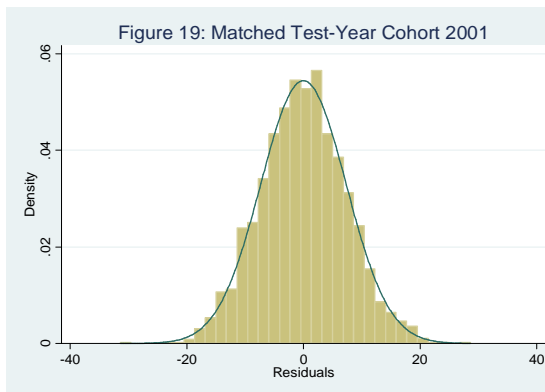
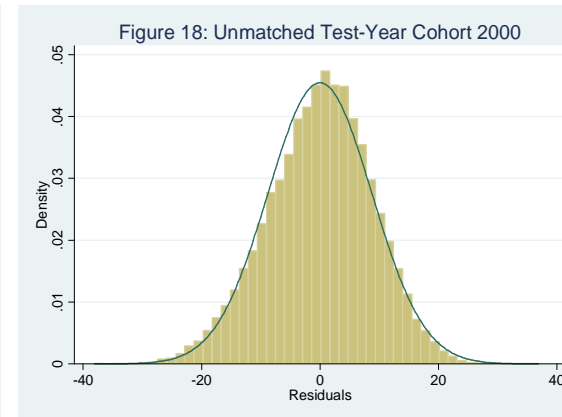
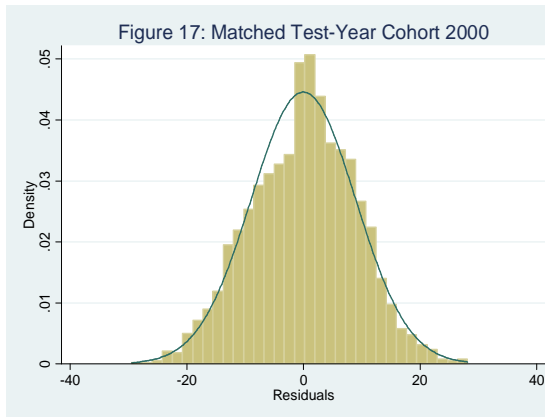
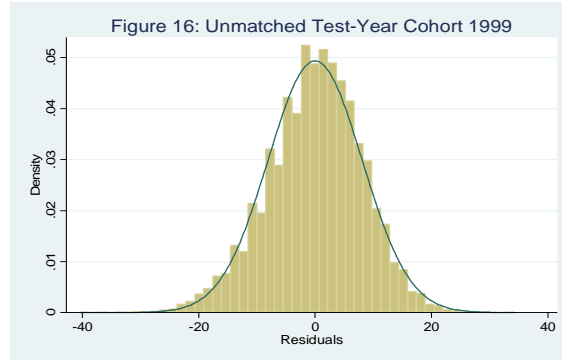
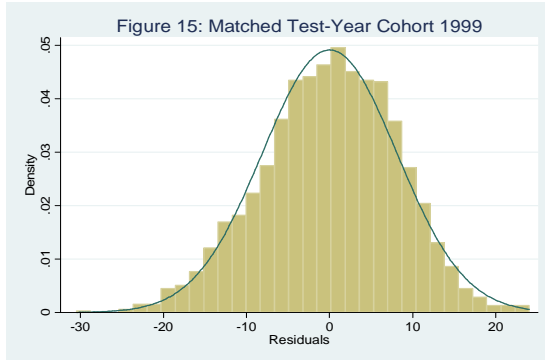
Note: HS stands for High school; The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: Reference group for Foster care experience and Work First experience are youth who did not participate nor receive those services

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

Appendix VIII

Histograms of Dependent Variable (Algebra I Scores) on Residuals for Matched and Unmatched Test-year Cohorts



Appendix IX

Table 21

Algebra I Test Scores by Test-year Cohorts (Full and Matched)

	1999	2000	2001	2002
Full Cohort (unmatched)	<i>N=966</i>	<i>N=1134</i>	<i>N= 1300</i>	<i>N= 1633</i>
Foster care Youth	Mean= 53 Median= 53	Mean= 54 Median= 54	Mean= 56 Median= 56	Mean= 57 Median= 57
Full Cohort (unmatched)	<i>N=87623</i>	<i>N=90119</i>	<i>N= 93008</i>	<i>N= 98824</i>
Non-Foster Care Youth	Mean= 58 Median= 59	Mean= 59 Median= 60	Mean= 61 Median= 61	Mean= 62 Median= 63
Matched Cohort Foster Care Youth	<i>N=965</i> Mean= 53 Median= 53	<i>N=1134</i> Mean= 54 Median= 54	<i>N=1298</i> Mean= 56 Median= 56	<i>N=1631</i> Mean= 57 Median= 57
Matched Cohort Non-foster Care Youth	<i>N= 965</i> Mean= 55 Median= 55	<i>N=1134</i> Mean= 55 Median= 56	<i>N=1298</i> Mean= 57 Median= 57	<i>N=1631</i> Mean= 59 Median=59

Appendix X

Table 22

*Odds Ratio for Matched Samples and Unmatched Samples Test-year Cohort Groups
(dependent variable Test Score Above Threshold of 55)*

		1999		2000		2001		2002	
Characteristics		Matched N=1930	Unmatched N=88,589	Matched N=2,268	Unmatched N=91,253	Matched N=2,596	Unmatched N=94,306	Matched N=3,262	Unmatched N=94,306
Age when test taken		0.55*** .02	0.53*** .003	.57*** .02	.52*** .003	0.62*** 0.02	0.53*** .003	.58*** .02	.54*** .003
Gender									
<i>(Male)</i>									
Female		1.50*** .16	1.04*** .01	1.06 .10	1.07*** .01	1.06 .09	1.08*** .01	1.20** .09	1.15*** .01
Race									
<i>(Black)</i>									
White		2.57*** .27	2.42*** .04	2.59*** .24	2.73*** .04	2.83*** .25	2.99*** .05	2.73*** .23	2.74*** .04
Other		1.65* .35	2.23*** .07	2.03*** .40	2.02*** .06	1.96*** .34	1.98*** .06	2.01*** .32	1.93*** .06
Parent Education									
<i>(Non-HS graduate)</i>									
HS graduate		1.57*** .21	1.69*** .04	1.61*** .21	1.86*** .05	1.81*** .21	1.91*** .05	1.81*** .19	1.98*** .05
Enroll in Bus/trade		1.56 .41	1.78*** .07	1.70*** .33	2.38*** .08	2.32*** .39	2.61*** .09	2.00*** .29	2.80*** .09
Grad Bus/trade		2.19*** .30	2.12*** .05	2.04*** .29	2.32*** .08	1.81*** .25	2.65*** .07	1.97*** .26	2.83*** .08
Grad of 4-year college or grad school		2.00** .51	2.87*** .10	1.98*** .28	2.84*** .08	1.77*** .22	2.89*** .08	2.04*** .24	3.17*** .09
Foster Care exp		0.77* .07	0.70*** .05	.76*** .07	.72*** .04	.73*** .06	.65*** .04	.74*** .05	.70*** .04
Work First exp		0.76* .09	0.81*** .02	.76** .08	.84*** .02	.98*** .09	.77*** .02	.86 .07	.79*** .02
# of times test taken									
<i>(1)</i>									
2		1.48* .29	1.41*** .03	1.51** .23	1.46*** .04	1.32* .18	1.35*** .03	1.20 .15	1.32*** .03
3		0.79 .70	1.70*** .15	3.10* 1.5	2.05*** .20	1.08 .47	1.88*** .18	1.39 .49	1.84*** .15

Note: Standard Error reported under odds ratio

Note: Reference group in parenthesis

Note: HS stands for High school

Note: The 3rd and 4th categories under Parent education includes: (3rd) Enrolled in Business school or trade school; (4th) Graduated from one of the following: trade school, business school, community college, technical college, and junior college

Note: Reference group for Foster care experience and Work First experience are youth who did not participate nor receive those services

*p<.05, **p<.01, ***p<.001

Appendix XI

Table 23

Matched and Unmatched Threshold Above 55 Scores by Test-year Cohorts

	1999	2000	2001	2002
(Unmatched) Foster care Youth	<i>N</i> =966	<i>N</i> =1,134	<i>N</i> = 1,300	<i>N</i> = 1,633
<i>Score</i>	Y (43%)	Y (48%)	Y (55%)	Y (60%)
<i>Above Threshold</i>	N (57%)	N (52%)	N (45%)	N (40%)
(Unmatched) Non-Foster care Youth	<i>N</i> =87623	<i>N</i> =90119	<i>N</i> = 93008	<i>N</i> = 98824
<i>Score</i>	Y (65%)	Y (68%)	Y (75%)	Y (78%)
<i>Above Threshold</i>	N (35%)	N (32%)	N (25%)	N (22%)
(Matched) Foster care Youth	<i>N</i> =965	<i>N</i> =1,134	<i>N</i> =1,298	<i>N</i> = 1,631
<i>Score</i>	Y (43%)	Y (48%)	Y (55%)	Y (61%)
<i>Above Threshold</i>	N (57%)	N (52%)	N (45%)	N (39%)
(Matched) Non-Foster care Youth	<i>N</i> =965	<i>N</i> =1,134	<i>N</i> = 1,298	<i>N</i> =1,631
<i>Score</i>	Y (48%)	Y (53%)	Y (61%)	Y (67%)
<i>Above Threshold</i>	N (52%)	N (47%)	N (39%)	N (33%)

Note: Score above threshold indicates a score above the threshold of 55 for consistent performance.

Note: Y indicates Yes, N indicates No

Appendix XII

Table 24

Regression Coefficients of Foster Care Characteristics on Algebra I Scores by Test-year Cohort

Characteristics	Test-Year Cohorts			
	1999 <i>N= 896</i>	2000 <i>N=1064</i>	2001 <i>N=1218</i>	2002 <i>N=1540</i>
Age	-.001***	-.0008**	-.001***	-.0007***
Gender				
<i>(Male)</i>				
Female	1.58**	0.12	0.58	0.58
Race				
<i>(Black)</i>				
White	4.43***	4.93***	5.14**	5.13***
Other	1.66	1.21	2.72***	3.05***
Reason for placement				
<i>(Neglect)</i>				
Physical or sexual abuse	.31	1.31	.42	-.18
Child behavior	-1.69	-1.02	-1.08	-.88
Other	-.50	.11	-1.05	-1.00
Length of time in care at test time				
<i>(one year or less)</i>				
1-2 years	-.74	-1.89*	-1.06	-.02
2-3 years	-1.54	-.72	-2.03**	-1.33*
3-5 years	-2.57**	-2.72**	-2.69***	-1.25
5 yrs or above	-3.44**	-2.92**	-3.01***	-1.33
Number of placements settings				
<i>(1)</i>				
2	.006	-.30	-.32	-1.34*
3	-.66	-.66	-.27	-1.08
4	-1.51	.85	.23	-.32
5 and above	-1.78*	-1.56	-1.21	-1.67*
Subsets				
<i>(First and only spell)</i>				
Before placement	-4.06*	-4.03*	-3.87**	-3.15**
Multiple spells	1.45	.12	2.06*	-.32
Between spells	7.39**	-2.48	3.29	1.77
After final spell	.30	-.20	-.322	-.81

Note: Characteristics are based on where the child was prior to when test was taken

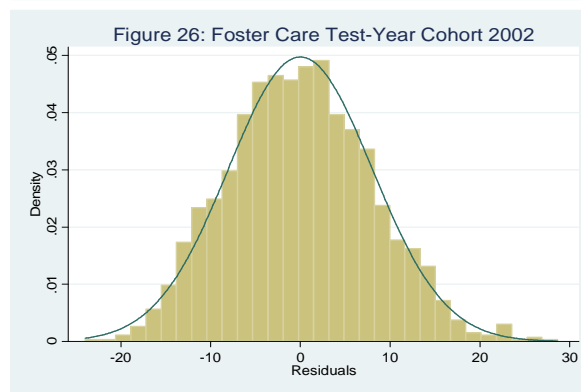
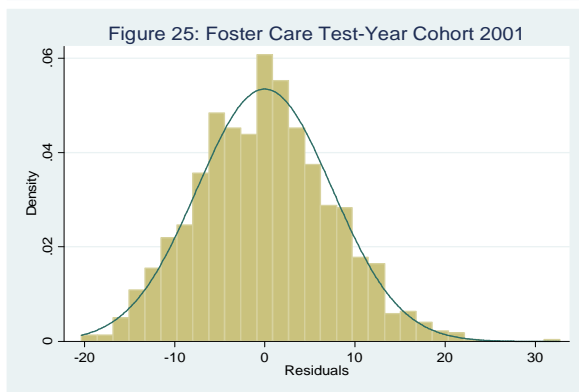
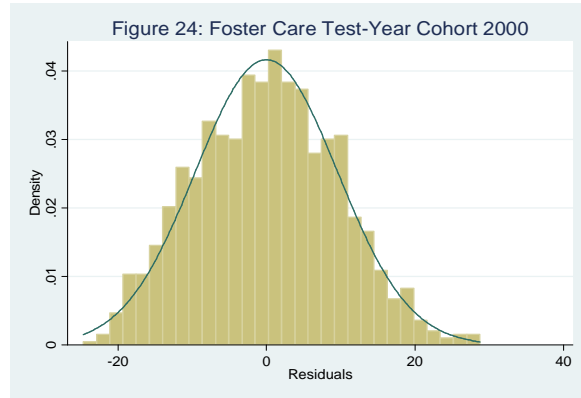
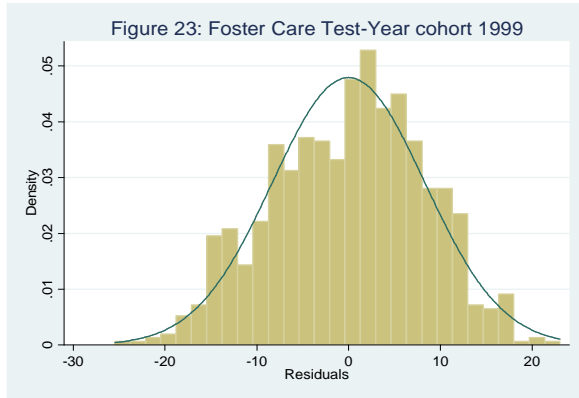
Note: Age is age at time of most recent placement at test time

Note: Child behavior includes alcoholism and drug abuse

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

Appendix XIII

Histograms of dependent variable (Algebra I Scores) on Residuals for Foster Care Test-year Cohorts



Appendix XIV

Table 25

*Odds Ratio of Foster Care Characteristics on Algebra I Scores by Test-year Cohort
(dependent variable Test Score Above Threshold of 55)*

Characteristics	1999 <i>N= 964</i>	2000 <i>N=1134</i>	2001 <i>N=1295</i>	2002 <i>N=1629</i>
Age	.99**	.99***	.99***	.99***
Gender	.00	.00	.00	.00
<i>(Male)</i>				
Female	1.51**	1.24	1.18	1.30**
	.22	.16	.14	.14
Race				
<i>(Black)</i>				
White	2.35***	2.28***	2.79***	2.93***
	.34	.30	.35	.33
Other	1.26	1.50	1.80*	1.96**
	.38	.39	.43	.42
Reason for placement				
<i>(Neglect)</i>				
Physical or sexual abuse	.96	1.58**	1.14	1.09
	.18	.27	.19	.17
Child behavior	.67	.95	.80	.62*
	.18	.23	.17	.12
Other	.96	1.28	.95	1.00
	.22	.26	.18	.18
Length of time in care at test time				
<i>(one year or less)</i>				
1-2 years	.96	.65**	.79	.91
	.20	.12	.13	.14
2-3 years	.98	.96	.62*	.71
	.25	.21	.13	.13
3-5 years	.76	.61*	.62*	.80
	.19	.14	.14	.15
5 yrs or above	.57	.45**	.63	.65*
	.17	.11	.15	.14
Number of placements settings				
<i>(1)</i>				
2	.87	.90	.87	.73
	.17	.17	.15	.12
3	1.11	.76	.87	.82
	.28	.16	.17	.15
4	.72	1.02	.91	.84
	.19	.25	.21	.18
5 and above	.66*	.73	.65*	.75
	.14	.14	.12	.13
Subsets				
<i>(First and only spell)</i>				
Before placement	.60	.33**	.35	.29***
	.28	.13	.13	.09
Multiple spells	1.20	.91	1.70	1.02
	.36	.24	.48	.26
Between spells	5.00	.39	1.35	1.36
	3.47	.22	.60	.57
After final spell	1.12*	.70	1.03*	.76
	.22	.13	.19	.13

Note: Number underneath odds ratio is standard error

Note: Characteristics are based on where the child was prior to when test was taken

Note: Age is age at time of most recent placement at test time

Note: Child behavior includes alcoholism and drug abuse

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

References

- Alexander, P. C. (1992). Application of attachment theory to the study of sexual abuse. *Journal of Consulting and Clinical Psychology, 60*, 185-195.
- Allison, P. D. (1999). *Multiple regression*. Thousand Oaks, CA: Pine Forge Press.
- Altshuler, S. J. (1997). A reveille for school social workers: Children in foster care need our help! *Social Work Education, 19*, 121-126.
- Arbona, C. (2000). The development of academic achievement in school aged children: Precursors to career development. In S. D. Brown & R. W. Lent (Eds.), *Handbook of counseling psychology* (3rd ed., pp. 270-309). New York: Wiley.
- American Academy of Pediatrics (2009) (<http://www.aap.org>).
- Bae, Y., Choy, S., Greddes, C., Sable, J. & Snyder, T. (2000). *Trends in educational equity of girls and women* (Washington, D. C., National Center for Education Statistics).
- Baker, D. P., & Stevenson, D. L. (1986). Mothers' strategies for children's school achievement: Managing the transition to high school. *Sociology of Education, 59*, 156-166.
- Barber, B. L., Eccles, J. S., & Stone, M. R. (2001). Whatever happened to the jock, the brain, and the princess? Young adult pathways linked to adolescent activity involvement and social identity. *Journal of Adolescent Research, 16*, 429-455.
- Barnard, W. M. (2004). Parent involvement in elementary school and educational attainment. *Child and Youth Services Review, 26*, 39-62.
- Beckwith, L., Howard, J., Espinosa, M., & Tyler, R. (1999). Psychopathology, mother-child interaction, and infant development: Substance-abusing mothers and their offspring. *Development and Psychopathology, 11*, 715-725.
- Benedict, M. I., Zuravin, S., Stallings, R. Y. (1996). Adult functioning of children who lived in kin versus nonrelative family foster homes. *Child Welfare, 75*, 529-549.
- Blome, W.W. (1997). What happens to foster kids: Educational experiences of a random sample of foster care youth and a matched group of non-foster care youth. *Child and Adolescent Social Work Journal, 14*, 41-53.
- Bowen, N. K., & Bowen, G. L. (1999). Effects of crime and violence in neighborhoods and schools on the school behavior and performance of adolescents. *Journal of Adolescent Research, 14*, 319-342.
- Bowlby, J. (1973). *Attachment and loss: Vol. 1. Attachment*. New York: Basic Books.

- Bowlby, J. (1988). *A secure base: Clinical applications of attachment theory*. London: Routledge.
- Bretherton, I., & Mulholland, K. A. (1999). Internal working models in attachment relationships: A construct revisited. In J. Cassidy & P. Shaver (Eds.), *Handbook of attachment* (pp. 89-111). New York: Guilford Press.
- Bronfenbrenner, U. (1979). *The ecology of human behavior: Experiments by nature and design*. Cambridge, MA: Harvard University Press.
- Buehler, C., Orme, J. G., Post, J. & Patterson, D. A. (2000). The long term correlates of family foster care. *Children and Youth Services Review*, 22, 596-625.
- Burley, M., & Halpern, M. (2001). *Educational attainment of foster youth: Achievement and graduation outcomes for children in state care*. Olympia: Washington State Institute for Public Policy.
- Byng-Hall, J. (1995). Creating a secure family base: Some implications of attachment theory for family therapy. *Family Process*, 34, 45-58.
- Carlson, V., Cicchetti, D., Barnett, D., & Braunwald, K. (1989). Disorganized/disoriented attachment relationships in maltreated infants. *Developmental Psychology*, 25, 525-531.
- Casey Family Programs. (2003). *Assessing the effects of foster care: Early results from the Casey national alumni study*. Seattle, WA: Author.
- Chambers, E. A. & Schreiber, J. B. (2004). Girls' academic achievement: Varying associations of extracurricular activities. *Gender and Education*, 16, 327-346.
- Chand, A. (2000). The over-representation of black children in the child protection system: Possible causes, consequences, and solutions. *Child and Family Social Work*, 1, 67-77.
- Chase-Lansdale, P., Lindsay, R. A., Moffit, B. J., Lohman, A. J., Cherlin, R. L., Coley, L. D., et al. (2003). Mothers' transitions from welfare to work and the well-being of preschoolers and adolescents. *Science*, 299, 1548-1552.
- Chipunga, S.S. & Bent-Goodley, T.B. (1004). Meeting the challenges of contemporary foster care. *The Future of Children*, 14(1). Retrieved on July 15, 2007 from http://www.futureofchildren.org/information3862/information_show.htm?doc_id=211285
- Christian, S. (2003). *Educating children in foster care*. Denver, CO: National conference of State Legislatures Children's Policy Initiative.

- Cokley, K. O. (2004). What do we know about the motivation of African American students? Challenging the 'anti-intellectual' myth": Correction. *Harvard Educational Review*, 73 (4), 524-558.
- Comstock, G. (1991a). Television and the American Child. San Diego: American Press.
- Comstock, G., Chaffee, S., Katzman, N., McCombs, M., & Roberts, D. (1978). Television and human behavior. New York: Columbia University Press.
- Conger, D., & Finkelstein, M. J. (2003). Foster care and school mobility. *Journal of Negro Education*, 1, 97-103.
- Conger, D., & Rebeck, A. (2001). How children's foster care experiences affect their education. New York, New York: New York City Administration for Children's Services and Vera Institute of Justice.
- Cook, R. J. (1994). Are we helping foster care youth prepare for their future? *Children and Youth Services Review*, 16, 213-229.
- Cooper, H., Lindsay, J. J., Nye, B., & Greathouse, S. (1998). Relationships among attitudes about homework, amount of homework assigned and completed, and student achievement. *Journal of Educational Psychology*, 90, 70-83.
- Copper, H., Valentine, J. C., Nye, B., & Lindsay, J. J. (1999). Relationships between five after-school activities and academic achievement. *Journal of Educational Psychology*, 91, 369-378.
- Courtney, M. E., & Barth, R. P. (1996). Pathways of older adolescents out of foster care: Implications for independent living services. *Social Work*, 41, 75-83.
- Courtney, M. E., Terao, S., & Bost, N. (2004). *Midwest evaluation of the adult functioning of former foster youth: Conditions of youth preparing to leave state care*. Chicago: Chapin Hall Center for Children.
- Courtney, M. E., Roderick, M., Smithgall, C., Gladden, R. M., & Nagaoka, J. (2004). *The educational status of foster children*. Chicago: Chapin Hall Center for Children.
- Crozier, J. C. & Barth, R. P. (2005). Cognitive and academic functioning in maltreated children. *National Association of Social Workers*, 27, 197-205.
- Deslandes, R., Royer, E., Potvin, P., & Leclerc, D. (1999). Patterns of home and school partnership for general and special education students at the secondary level. *Exceptional Children*, 65, 496-506.
- Dodge, K. A., Pettit, G. S., & Bates, J. E. (1994). Effects of physical maltreatment on the development of peer relations. *Development and Psychopathology*, 6, 43-55.

- Dozier, M., Albus, K., Fisher, P. A., & Sepulveda, S. (2002). Interventions for foster parents: Implications for developmental theory. *Development and Psychopathology, 14*, 843-860.
- Dryfoos, J. G. (1990). *Adolescents at risk: Prevalence and prevention*. New York: Oxford University Press.
- Dubowitz, H., Zuravin, S., Starr, R. H., Feigelman, S., & Harrington, D. (1993). Behavior problems of children in kinship care. *Developmental and Behavioral Pediatrics, 14*, 386-393.
- Dubowitz, H. & Sawyer, R. J. (1994). School performance of children in kinship care. *Child Abuse and Neglect, 18*, 587-597.
- Duncan, G. J., Brooks-Gunn, J., & Klevbanov, P. (1994). Economic deprivation and early childhood development. *Child Development, 62*, 292-318.
- Duncan, D.F., Kum, H.C., Flair, K.A., Stewart, C.J., Weigensberg, E.C. (2007). *NC Child Welfare Program*. Retrieved [August 10, 2007], from University of North Carolina at Chapel Hill Jordan Institute for Families website. URL: <http://ssw.unc.edu/cw/>
- Duncan, G. J., & Yeung, W. J. (1994). Extent and consequences of welfare dependence among America's children. University of Michigan, Survey Research Center. Unpublished paper.
- Duncan, G. J., & Brooks-Gunn, J. (1997). *Consequences of growing up poor*. New York, NY: Russell Sage Foundation.
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256-273.
- Eccles, J. S. (1994). Understanding women's educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *Psychology of Women Quarterly, 18*, 585-609.
- Eccles, J. S., & Harold, R. E. (1993). Parent-school involvement during the early adolescent years. *Teachers College Record, 94*, 568-587.
- Eccles, J. S., & Midgley, C. (1990). Changes in academic motivation and self-perception during adolescence. In R. Montemayor, G. R. Adams, & T. P. Gullottia (Eds.), *From childhood to adolescence: A transitional period?* (pp. 134-155). Newbury Park, CA: Sage.
- Eckenrode, J., Laird, M., & John, D. (1993). School performance and disciplinary problems among abused and neglected children. *Developmental Psychology, 29*, 53-62.

- Eckenrode, J., Laird, M., & Brathwaite, J. (1995). Mobility as a mediator of the effects of child maltreatment on academic performance. *Child Development, 66*, 1130-1142.
- Elder, G. H., Nguyen, T. V., & Caspi, A. (1985). Linking family hardship to children's lives. *Child Development, 56*, 361-375.
- Elder, T. E., Lubotsky, D. H. (2009). "Kindergarten entrance age and children's achievement: Impacts of state policies, family background, and Peers" forthcoming, *Social Science and Medicine*, 2009.
- Elicker, J., Englund, M., & Sroufe, L. A. (1992). Predicting peer competence and peer relationships in childhood from early parent-child relationships. In R. D. Parke & G. W. Ladd (Eds.), *Family-peer relationships: Modes of linkage*. Hillsdale, NJ: Erlbaum.
- Emerson, J. & Lovitt, T. (2003). The educational plight of foster children in schools and what can be done about it. *Remedial and Social Education, 199- 203*.
- Emery, R. E. (1989). Family violence. *American Psychologist, 44*, 321-328.
- Epstein, J. L. & Van Voorhis, F. L. (2001). More than minutes: Teachers' roles in designing homework. *Educational Psychologist, 36*, 181-193.
- Erikson, E.H. Identity and the Life Cycle. New York: International Universities Press, 1959.
- Evans, L. D. (2001). Interactional models of learning disabilities: Evidence from students entering foster care. *Psychology in the Schools, 36*, 381-390.
- Fanshel, D., Finch, S. S., & Grundy, J. F. (1990). Foster children in a life course perspective. New York: Columbia University Press.
- Furstenberg, F. F. (1993). How families manage risk and opportunity in dangerous neighborhoods. In W. J. Wilson (Ed.), *Sociology and the public agenda* (pp. 231-258). Newbury Park, CA: Sage.
- Ge, X., Best, K., Conger, R. D., & Simons, R. L. (1996). Parenting behaviors and the occurrence and co-occurrence of adolescent symptoms and conduct problems. *Developmental Psychology, 32*, 717-731.
- Geary, D. C., Hoard, M. K., Byrd-Craven, J., Nugent, L., & Numtee, C. (2007). Cognitive mechanisms underlying achievement deficits in children with mathematical learning disability. *Child development, 4*, 1343-1359.
- Gilligan, R. (1998). The importance of schools and teacher in child welfare. *Child and Family Social Work, 3*, 13-25.

- Government Accountability Office. (2007). African American children in foster care: Additional assistance needed to help states reduce the proportion in care [Data file]. Available from the Government Accountability Office Website, <http://www.gao.gov/new.items/d07816.pdf>
- Greenberg, M. T., Speltz, M. L. & DeKlyen, M. (1993). The role of attachment in the early development of disruptive behavior problem. *Development and Psychopathology*, 5, 191-213.
- Greenwood, C. R. (1991). A longitudinal analysis of time to learn, engagement, and academic achievement in urban versus suburban schools. *Exceptional Children*, 57, 521-535.
- Gujarati, D. N. (1995). *Basic Econometrics* (3rd ed.), New York: Mc Graw-Hill.
- Guo, S., Barth, R. P., & Gibbons, (2006). Propensity score matching strategies for evaluating substance abuse services for child welfare clients. *Children and Youth Services Review*, 28, 357-383.
- Guo, S., Fraser, M. W. (2009). *Propensity score analysis: Statistical methods and applications*. Thousand Oaks, CA: Sage Publications Inc.
- Harker, R. M., Dobel-Ober, D., Lawrence, J., Berridge, D., & Sinclair, R. (2003). Who takes care of education? Looked after children's perceptions of support for educational progress. *Child and Family Social Work*, 8, 89-100.
- Haveman, R., Wolfe, B., & Spaulding, B. (1991). Childhood events and circumstances influencing high school completion. *Demography*, 28, 133-157.
- Meehl, P. E. (1997). The problem is epistemology, not statistics: Replace significance tests by confidence intervals and quantify accuracy of risky numerical predictions. In L. Harlow, S. Mulaik, & J. Steiger (Eds.), *What if there were no significance tests?* (p. 404). Mahwah, NJ: Lawrence Erlbaum Associates.
- Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin*, 112, 64-105.
- Hedley, C. N., Antonacci, P., & Rabinowitz M. (1995). *Thinking and literacy. Television and the American Child*. NJ: Lawrence Erlbaum Associates Publishers.
- Hetherington, M., Camara, K. A., & Featherman, D. L. (1983). Achievement and intellectual functioning of children in one-parent households. In J. Spence (Ed.), *Achievement and achievement motives* (pp. 205-284). San Francisco: Freeman.

- Heyns, B. (1985). The influence of parental work on children's school achievement. In S. B. Kamerman & C. D. Hayes (Eds.), *Families that work: Children in a changing world* (pp. 229-267). Washington, DC: National Academy Press.
- Hines, A. M., Merdinger, J., & Wyatt, P. (2005). Former foster youth attending college: Resilience and the transition to young adulthood. *American Journal of Orthopsychiatry, 75*, 381-394.
- House, J. D. (1999). Self-beliefs and background variables as predictors of school withdrawal of adolescent students. *Child Study Journal, 4*, 247-267.
- House, J. S. (1981). *Work, stress and social support*. Reading, MA: Addison-Wesley.
- Howe, D., Brandon, M., Hinings, D., & Schofield, G. (1999). Attachment theory, child maltreatment, and family support. Mahwah, NJ: Macmillan Press.
- Hyde, J. S., Fennema, E., Ryan, M., Frost, L. A., & Hopp, C. (1990). Gender comparisons of mathematical attitudes and affect. *Psychology of Women Quarterly, 14*, 299-324.
- Jackson, S. & Martin, P. (1998). Surviving the care system: Education and resilience. *Journal of Adolescence, 21*, 569-583.
- Jencks, C., & Mayer, S. (1990). The social consequences of growing up in a poor neighborhood. In L. Lynn & M. McGeary (Eds.), *Inner-city poverty in the United States* (pp. 111-186). Washington, DC: National Academy Press.
- Jonson-Reid, M., & Barth, R. P. (2000). From placement to prison: The path to adolescent incarceration from child welfare supervised foster or group care. *Children and Youth Services Review, 22*, 493-516.
- Joseph, A. (1998). The impact of tracking: An examination of outcomes. *Journal of Poverty, 1*, 1-21.
- Kao, G., & Thompson, J. S. (2003). Racial and ethnic stratification in educational achievement and attainment. *Sociological Annual Reviews 29*, 417-442.
- Kendall-Tackett, K., & Eckenrode, H. (1996). The effects of neglect on academic achievement and disciplinary problems: A developmental perspective. *Child Abuse and Neglect, 20*, 161-169.
- Kotnenkamp, K., & Ehrle, J. (2000). The well being of children involved with the child welfare system: A national overview. Washington, D. C.: The Urban Institute.
- Kutner, M. H., Neter, J., & Nachtsheim, C. J. (2004). *Applied Linear Statistical Models*. Columbus, OH: McGraw-Hills Companies.

- Lerner, D. G., & Kruger, L. J. (1997). Attachment, self-concept, and academic motivation in high school students. *American Journal of Orthopsychiatry*, 67, 485-492.
- Leventhal, T., & Brooks-Gunn, J. (2000). The neighborhoods they live in: Effects of neighborhood residence upon child and adolescent outcomes. *Psychological Bulletin*, 126, 309-337.
- Levinson, D. (1986). A conception of adult development. *American Psychologist*, 1, 3-13.
- Loeber, R., & Stouthamer-Loeber, M. (1986). Family factors as correlated and predictors of juvenile conduct problems and delinquency. In M. Torny & N. Morrois (Eds.), *Crime and Justice: An Annual Review of Research*. Chicago: University of Chicago Press.
- Luster, T., & McAdoo, H. (1996). Family and child influences on educational attainments: A secondary analysis of the High/Scope Perry Preschool data. *Developmental Psychology*, 32, 26-39.
- Ma, X. (1999). Dropping out of advanced mathematics: The effects of parental involvement. *Teachers College Record*, 101, 60-81.
- Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parental child interaction. In E. M. Hetherington (Ed.), *Handbook of Child Psychology, Vol. 4*. New York: John Wiley and Sons.
- Magura, S., & Laudet A. B. (1996). Parental substance abuse and child maltreatment: Review and implications for intervention. *Children and Youth Services Review*, 18, 193-220.
- Matas, L., Arend, R. A., & Sroufe, L. A. (1978). Continuity of adaptation: The relationship between quality of attachment and later competence. *Child Development*, 47, 511-514.
- Marsh, H. W. (1992). Extracurricular activities: Beneficial extension of the traditional curriculum or subversion of academic goals. *Journal of Educational Psychology*, 84, 533-562.
- Marsh, H. W., & Kleitman, S. (2002). Extracurricular school activities: The good, the bad, and the non-linear. *Harvard Educational Review*, 72, 464-514.
- Marcon, R. A. (1999). Positive relationships between parent school involvement and public school inner-city preschoolers' development and academic performance. *School Psychology Review*, 28, 395-412.
- Mayer, S. E. (1991). How much does a high school's racial and socioeconomic mix affect graduation and teenage fertility rates? In C. Jemcks & P. E. Peterson (Eds.), *The Urban Underclass* (pp. 321-341). Washington, DC: Brookings Institute.

- McLoyd, V. C. (1990). The impact of economic hardship on black families and children: Psychological distress, parenting and socioemotional development. *Child Development, 61*, 311-346.
- McMillen, C., & Tucker, J. (1999). The status of older adolescents at exit from out-of-home-care. *Child Welfare, 78*, 339-360.
- Mensch, B. S., & Kandel, D. B. (1988). Dropping out of school and drug involvement. *Sociology of Education, 61*, 95-113.
- Miedel, W. T., & Reynolds, A. J. (1999). Parent involvement in early intervention for disadvantaged children: Does it matter? *Journal of School Psychology, 37*, 370-402.
- Moffit, T. E., & Caspi, A. (2001). Childhood predictors differentiate life-course persistent and adolescence-limited antisocial pathways among males and females. *Development and Psychopathology, 13*, 355-375.
- Murphy, P. K., & Alexander, P. A. (2000). A motivated exploration of motivation terminology. *Contemporary Educational Psychology, 25*, 3-53.
- Nash, J. K. (2002). Neighborhood effects on sense of school coherence and educational behavior in students at risk of school failure. *Children and Schools, 24*, 73-89.
- Neuman, S. (1988). The displacement effect: Assessing the relation between television viewing and reading performance. *Reading Research Quarterly, 23*, 414-440.
- North Carolina Research Center (2007). N.C. Research Data Center. Retrieved January 2, 2007, from Child and Family Policy Website: [http:// childandfamilypolicy.duke.edu/ep/nceddatacenter/index.html](http://childandfamilypolicy.duke.edu/ep/nceddatacenter/index.html)
- Oaks, J. (1985). Keeping track: How schools structure inequality. New Haven: Yale University Press.
- Parsons, L. S. (2001). Reducing bias in a propensity score matched-pair sample using greedy matching techniques [SAS SUGI paper 214-226]. Proceedings of the 26th annual SAS Users' Group International Conference, Cary, NC: SAS Institute, Inc. Retrieved March 22, 2009, from <http://www2.sas.com/proceedings/sugi26/p214-226.pdf>
- Peng, C. J., Lee, K. L., & Ingersoll, G. M., (2002). An introduction to logistic regression analysis and reporting. *The Journal of Education Research, 96*, 3-14.
- Peters, H. E., & Mullins, N. (1997). *The role of family income and sources of income I n adolescent achievement*. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of Growing Up Poor*. New York: Russell Sage Foundation.

- Perez, C.M. Widom, C.S. (1994). Childhood victimization and long-term intellectual and academic outcomes. *Child Abuse and Neglect*, 18, 617-633.
- Piaget, J. (1983). "Piaget's theory". In P. Mussen (ed). *Handbook of Child Psychology*. 4th edition. Vol. 1. New York: Wiley.
- Powers, P., & Stotland, J. (2002). *Lost in the shuffle revisited*. Philadelphia: The Educational Law Center.
- Ramey, C. T., & Campbell, F. A. (1991). Poverty, early childhood education, and academic competence: The abecedarian experiment. In A. S. Huston (Ed.), *Children in poverty: Child development and public policy* (pp. 190-221). Cambridge: Cambridge University Press.
- Randolph, K. A., Rose, R. A., Fraser, M. W., & Orthner, D. K. (2004). Promoting school success among at risk youth. *Journal of Poverty*, 8, 1-22.
- Red, Z., Brooks, J., & McGarvey, A. M. (2002). Educating America's youth: What makes a difference. Washington, DC: Child Trends
<http://www.childtrends.org/PDF/K4Brief.pdf>.
- Reynolds, A. J. (1991). Early schooling of children at risk. *American Educational Research Journal*, 28, 392-442.
- Richman, J. M., & Bowen, G. L. (1997). School failure: An ecological- interactional- developmental perspective. In M. W. Fraser (Ed.), *Risk and resilience in childhood: An ecological perspective* (pp. 95-112). Washington, DC: NASW Press.
- Robertson, A. S. (2005). Including parents, foster parents and parenting caregivers in the assessments and interventions of young children placed in the foster care system. *Children and Youth Services Review*, 28, 180-192.
- Rogosch, F. A., Cicchetti, D., & Aber, J. L. (1995). The role of child maltreatment in early deviations in cognitive and affective processing abilities and later peer relationship problems. *Development and Psychopathology*, 7, 501-509.
- Romans, S. (1995). Factors that mediate between child sexual abuse and adult psychological outcome. *Psychological Medicine*, 25, 127-142.
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of propensity score in observational studies for causal effects. *Biometrika*, 70, 41-55.
- Rosenbaum, P. R., & Rubin, D. B. (1984). Reducing bias in observational studies using subclassification on the propensity score. *Journal of the American Statistical Association*, 79, 516-524.

- Rubin, D. B., & Thomas, N. (1996). Matching using estimated propensity scores: Relating theory to practice. *Biometrics*, 52, 249-264.
- Santrock, J. W. (2001). *Child development*. New York: McGraw-Hill.
- Sharif, I., & Sargent, J. D. (2006). Association between television, movie, and video game exposure and school performance. *Pediatrics*, 4, 1055-1060.
- Schiff, R., Barminger, N., & Toledo, I. (2009). Analogical problem solving in children with verbal and nonverbal learning disabilities. *Journal of Learning disabilities*, 42, 3-13.
- Slavin, R. E., & Braddock, J. H. (1993). Ability grouping: On the wrong track. *College Board Review*, 168, 11-17.
- Smithgall, C., Gladden, R., Howard, E., George, R., & Courtney, M. (2004). Educational experiences of children in out-of-home placement care. Chicago: Chapin Hall Center for Children at the University of Chicago.
- Sroufe, L. A. (1983). *Infant-caregiver attachment and patterns of adaptation in preschool: The roots of maladaptation and competence*. In M. Perlmutter (Ed.), *The Minnesota Symposia on Child Psychology*, 16, 41-83.
- Stern, S. B., Smith, C., & Jang, S. J. (1999). Urban families and adolescent mental health. *Social Work Research*, 23, 15-27.
- Stone, S. (2007). Child maltreatment, out-of-home placement and academic vulnerability: A fifteen-year review of evidence and future directions. *Children and Youth Services Review*, 29, 139-161.
- Stone, S., D'Andrade, A., & Austin, M. (2007). Educational services for children in foster care: Common and contrasting perspectives of child welfare and education stakeholders. *Journal of Public Child Welfare*, 2, 53-70.
- Swanson, C. B. (2006). *Diplomas Count: An essential guide to graduation*. Retrieved {May 3, 2007} from Editorial Projects in Education Website at <http://www2.edweek.org/info/about/research.html/>
- Teachman, H. E., Paasch, K. M., Day, R. D., & Carver, K. P. (1997). Poverty during adolescence and subsequent educational attainment. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 382-418). New York: Russell Sage Foundation.
- U. S. Census Bureau (2007). *Income and poverty data sources*. Retrieved April 12, 2007, from <http://www.census.gov/hhes/www/poverty/newguidance.html>.

- U. S. Department of Health and Human Services, Administration for Children, youth and Families, Children's Bureau. (2006). *AFCARS report: Current estimates as of September 2005*. Washington, DC: Author.
- Warren, J. R. (1996). Educational inequality among white and Mexican-origin adolescents in the American Southwest: 1990. *Sociological Education*, 69, 142-158.
- Warrington, M. & Younger, M. (2000). The outer side of the gender gap, *Gender and Education*, 12, 493-508.
- Westat Inc. (1991). A national evaluation of Title IV-E foster care independent living programs for youth Phase 2 final report. Washington, DC: Author.
- White, M. J., & Kaufmann, G. (1997). Language usage, social capital, and school completion among immigrants and native born ethnic groups. *Sociological Science Quarterly*, 78, 385-398.
- Wolfe, D. A. (1999). *Child abuse: Implications for child development and psychopathology* (2nd ed.): Vol. 10. *Developmental clinical psychology and psychiatry*. Thousand Oaks, CA: Sage.
- Yonezawa, S. (2000). Unpacking the black box of tracking decisions: Critical tales of families navigating the course of placement process. In M. G. Sanders (Ed.), *Schooling students placed at risk: Research, policy, practice in the education of poor and minority adolescents* (pp. 109-140). Mahwah, NJ: Erlbaum.
- Zetlin, A., Weinberg, L., & Kimm, C. (2004). Improving education outcomes for children in foster care: Intervention by an education liaison. *Journal of Education for Students Placed at Risk*, 9, 421-429.
- Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, 25, 82-91.
- Zuravin, S. J. (1988). Child maltreatment and teenage first births: A relationship mediated by chronic socio-demographic stress? *American Journal of Orthopsychiatry*, 58, 91-103.