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Difficulties in the Transition to Adulthood: Using Propensity Scoring to Understand What Makes Foster Youth Vulnerable

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Research indicates that foster youth approaching adulthood fare poorly on a number of economic and social outcomes. Little is known, however, about whether negative outcomes stem from foster care or risk factors common among youth who have foster care experience. Using data from the National Longitudinal Survey of Youth 1997 and eight distinct matching schemes, this study compares outcomes of foster youth ($n = 136$) to those of other youth. These schemes are based on propensity scoring and Mahalanobis matching. Results locate similar outcomes for foster youth and youth matched on preplacement characteristics. Foster youth have more problematic outcomes than do youth in the general sample that is not matched. The results suggest that risk factors, and not foster care itself, contribute to difficulties that occur in the transition to adulthood. These findings must be cautiously interpreted in light of study limitations.

The period of transition from adolescence into adulthood is critical in a young person's life. The period encompasses the important school-to-work transition, the formation of adult relationships, the move to independent housing, the acquisition of the skills and capacity to function independently, and for many, the first experience of parenthood (Shanahan 2000). Although mastering tasks of the transition period is challenging for all youth, it is particularly difficult for youth with few economic and social resources (e.g., Duncan, Brooks-Gunn, and Klebanov 1994; Grubb 2002). Foster youth comprise one such subpopulation of vulnerable youth. Research indicates that, during the transition to adulthood, former foster youth experience poorer outcomes than do youth in the general population (e.g., Barth 1990; Cook, Fleishman,

and Grimes 1991; Courtney et al. 2001). The current study seeks to explore possible reasons for the relationship between foster care and negative transition outcomes.

There generally are three types of research studies in the literature on foster youth's transition to adulthood. The first type includes short-term longitudinal and cross-sectional studies that compare foster youth to youth in the general population (Festinger 1983; Barth 1990; Cook et al. 1991; Cook 1994; Courtney et al. 2001; Pecora et al. 2003; Courtney, Terao, and Bost 2004). The second includes analyses of nationally representative data that compare foster youth to matched comparison youth (Blome 1997; Buehler et al. 2000). The third type uses administrative data on youth who have been in the child welfare system (Goerge et al. 2002; Needell et al. 2002). All three types of studies point to negative outcomes in foster youth's transition to adulthood. In particular, such outcomes are related to schooling, employment, teen parenthood, housing, criminality, and substance use.

The literature generally is cautious about providing reasons for the negative outcomes experienced by former foster youth. The emancipation process may leave foster youth vulnerable. Experiences of parental separation, loss, or maltreatment may also make this period difficult. Foster youth may have problems surviving without family support during a stage in life when other youth are extremely dependent on such support. However, studies do not explicitly discuss potential reasons for foster youth vulnerabilities. The current study explores one possibility: the preplacement characteristics that put youth at risk for foster care involvement also place them at risk for negative outcomes in the transition to adulthood.

Difficulties in the School-to-Work Transition

The transition from school to work is an important part of a successful transition into adulthood. A successful transition includes high educational attainment and economic self-sufficiency. Research finds that the rate of high school dropout or of not completing a general equivalency diploma (GED) is higher for foster youth than for youth in the general population. Dropout rates vary from 24 to 55 percent for foster youth (Festinger 1983; Barth 1990; Cook et al. 1991); a rate of 11 percent is found for a national sample (U.S. Department of Commerce 1997). Youth in the Casey National Alumni Study, all of whom lived with a Casey Family Programs foster care family for 12 or more months, report high rates of high school or GED completion (86 percent), but the youth chose GEDs over high school diplomas at a rate higher than the national average (Pecora et al. 2003). Foster youth from the High School and Beyond survey drop out of high school at higher rates and complete GEDs at lower rates than do youth in the matched sample (Blome 1997).

As foster youth struggle with high school completion, they will continue to have low levels of postsecondary enrollment and college completion. Multiple studies find that foster youth attend college (Blome 1997; Courtney et al. 2001), earn college credits (Needell et al. 2002), complete college (Buehler et al. 2000), and receive bachelor's degrees (Pecora et al. 2003) at low rates.

Foster youth also have lower earnings and greater welfare use than non-foster youth do. Compared to other youth, former foster youth report higher poverty rates (Buehler et al. 2000; Goerge et al. 2002) and are more likely to report serious economic problems (Barth 1990). Thom Reilly's (2003) study of 100 emancipated foster youth in Nevada finds that 60 percent of them have an annual household income of \$10,000 or less. Low earnings lead many foster youth (at least 25 percent in some studies) to receive public assistance as they transition into adulthood (Festinger 1983; Cook et al. 1991; Courtney et al. 2001; Needell et al. 2002).

Homelessness

Securing independent living arrangements is another key task in the transition to adulthood. This is particularly true for foster youth (Barth 1990). Faced with impending emancipation and loss of current housing, foster youth may be at risk for difficulty with this transition. Estimates indicate that about 1 percent of the U.S. population is homeless for at least one night during a given year (Burt et al. 2001) but that much higher rates occur among emancipated foster care youth. Research suggests that between 12 percent (Courtney et al. 2001) and 22 percent (Pecora et al. 2003) of former foster youth are homeless for at least one night after emancipation. Researchers in another study estimate that almost 20 percent of former child welfare service users in New York entered the city's public shelters within 10 years of leaving the child welfare system (Park et al. 2004).

Early Parenthood

The transition to parenthood is another life task for many youth during the transition into adulthood. Two studies report that both rates of early childbearing and overall birth rates among foster youth are similar to those rates among comparison youth (Buehler et al. 2000; Needell et al. 2002). However, the Casey study (Pecora et al. 2003; 17 percent) and a multistate study in the Midwest (Courtney et al. 2004; 14 percent) report that rates of teen parenthood among former foster youth are higher than the national average. Recent research also reports that former foster youth have more children in their twenties than do youth who live in other family structures (Schmitz 2005).

Problem Behaviors in Emerging Adulthood

In the transition to adulthood, rates of problem behaviors are higher among foster youth than among other youth. Among foster youth, rates of criminal justice involvement and substance abuse exceed national averages. Studies report that they are arrested, spend time in jail, and are convicted of crimes at higher than average rates (Barth 1990; Reilly 2003; Courtney et al. 2004). Research using administrative data finds that 4 percent of emancipated foster youth (1 percent females; 6 percent males) enter state prison within 7 years of emancipation (Needell et al. 2002).

Rates of substance use for those ages 18–20 are estimated at 19 percent (SAMHSA 2001), but rates among the former foster care population are reported to be statistically significantly higher, exceeding 50 percent in some studies (Barth 1990; Cook et al. 1991). In one national study, former foster youth are more likely (12 percent) than a random sample (3 percent) to report that someone in their home had a substance abuse problem (Buehler et al. 2000).

Taken as a whole, the literature clearly indicates that foster youth face various negative outcomes during the transition to adulthood. However, this literature provides limited insight into reasons for such outcomes. Foster youth share many characteristics with other disconnected youth who struggle during the period of interest, but it is not clear whether foster care, existing risk factors, or a combination of these makes foster youth vulnerable to negative transition outcomes.

In theory, the best way to examine the relationship between foster care and outcomes is to randomly assign youth to foster care placement and to study their outcomes. In practice, of course, this is not possible. To understand the relationship between foster care and these outcomes, some researchers thus rely on matching strategies that compare outcomes for individuals who are similar on traits other than the variable of interest (e.g., Blome 1997; Buehler et al. 2000; Goerge et al. 2002). Although matching individuals according to demographic characteristics allows researchers to examine whether foster care or these characteristics contribute to transition outcomes, other preplacement characteristics may be responsible for youth outcomes. The inability to use random assignment and the limitations of simple matching strategies suggest that alternative matching approaches must be considered.

Two potential matching approaches to examining the relationship between foster care and transition outcomes are Mahalanobis matching (Cochran and Rubin 1973; Rubin 1976) and propensity scoring (Rosenbaum and Rubin 1983). Mahalanobis matching uses particular covariates to order subjects and create matches based on what is known as the Mahalanobis distance. Propensity scoring uses background traits to provide scores on the propensity to (in this case) experience foster

care. There are many techniques for matching on the basis of the propensity scores. Comparing youth with similar scores allows researchers to compare foster youth to youth who share many of their preplacement characteristics but who have not been in care. Using these statistical strategies to compare foster youth with others, this study begins to identify whether foster care placement or measured preexisting risk factors account for foster youth's difficulties in the transition to adulthood for foster youth.

Method

Data from the National Longitudinal Survey of Youth 1997 (NLSY97) are used for this study. The NLSY97 was designed to collect data related to the school-to-work experiences of a representative sample of U.S. residents born in the period from 1980 through 1984 ($N = 8,894$; U.S. Bureau of Labor Statistics 2003). In-person interviews were conducted with the eligible youth ($N = 8,894$) and a corresponding parent ($N = 7,942$) using a computer-assisted personal interviewing system. The parent was chosen using the following hierarchy: (1) biological mother; (2) biological father; (3) adoptive mother; (4) adoptive father; (5) stepmother; (6) stepfather; (7) guardian, relative; (8) foster parent; (9) other nonrelative with whom the youth lived for 2 or more years; (10) mother figure, relative; (11) father figure, relative; (12) mother figure, nonrelative, with whom the youth lived for 2 or more years; and (13) father figure, nonrelative, with whom the youth lived for 2 or more years. Parent interviews were conducted at round 1 of the study. Youth were also interviewed at round 1. Round 2 interviews occurred approximately 18 months after round 1 interviews. Subsequent rounds were conducted with youth only on an annual basis. The NLSY97 data were collected using confidentiality guidelines set forth by the U.S. Office of Management and Budget, the U.S. Bureau of Labor Statistics, and the U.S. Census Bureau (U.S. Bureau of Labor Statistics 2003). The current study uses data that come from rounds 1–8 and from both the parent and the youth interviews.

Samples

The NLSY97 relied on a stratified multistage sampling process in which sampling units (regions with 2,000 or more housing units) were selected to reflect an accurate representation of the U.S. population by race, income, and region (U.S. Bureau of Labor Statistics 2003). A subset of 95,512 housing units was selected from the sampling units and screened for the presence of eligible individuals (those between the ages of 12 and 16 who permanently lived in the household or were temporarily absent). Although 9,806 eligible household members were identified,

8,984 were interviewed for round 1 of the study. The response rate has remained between 87 and 93 percent for all rounds after round 1. The total NLSY97 sample ($N = 8,984$) includes both the cross-sectional sample designed to be representative ($n = 6,748$) and a supplemental sample that oversampled Hispanic and black youth ($n = 2,236$). Youth in the NLSY97 were between the ages of 12 and 18 at round 1. Ninety-four percent of respondents were between the ages of 12 and 16. By round 8, youth were between the ages of 19 and 25; 98 percent of the sample was between the ages of 20 and 24.

The sample for the current study derives subsamples from the NLSY97 participants, and the study compares respondents who indicate a history of being in foster care to those without that history. There are 136 youth in the data set who indicate a history of involvement in foster care. These youth say that, at some point, they lived with a foster parent, or they reported placement with a foster parent. Although youth in group living arrangements were excluded from the initial sample, youth interviewed at a later round could say that they live in a group home or treatment center. Youth who identify as living in group homes and treatment centers are excluded from the foster care sample here if they do not otherwise qualify as foster youth. This exclusion is necessary because the survey does not differentiate group placements and placements in other treatment facilities that are part of the child welfare experience from those that occur for other reasons (e.g., mental health or juvenile justice). Youth who report being adopted or having adoptive parents also are excluded from the foster care subsample, as the survey does not distinguish among adoption through the foster care system, private adoption, and international adoption.

There is variability in the experiences of youth who here are classified as involved with foster care. Over 35 percent of the sampled foster youth report being in care at multiple points in their lives. The majority (88 percent) were in placement at some point as teenagers, and over 50 percent report being in care at age 17 or above.

Rates of participation in foster care in this sample are consistent with rates of foster care involvement in the general population (USDHHS n.d.). However, the current sample may be biased because it excludes youth who were in group or residential care. Additionally, because the NLSY97 screening requires that a household have an informant who can provide accurate information on the eligible child and given that continued contact with survey staff is a requirement for participation in the study, youth in this sample may represent a set of foster youth who function at higher than average levels.

This study thus focuses on youth who report that they have been placed in foster care at any point. This categorization is inferior to a categorization that specifies a particular period of time youth spend in foster care or that limits the sample to youth in foster care until eman-

icipation. Still, I proceeded to analyze the sample because of the richness of the data set, which can provide much information about the transition to adulthood and can provide adequate youth for comparison purposes.

This study compares foster care youth to all youth in the data set (i.e., to an unmatched sample) and to youth who are matched. Two unmatched samples are used. The first includes all youth in the data set who are not foster youth ($n = 8,848$). The second includes all youth in the data set who are not foster youth and did not report being adopted, living in group homes, or living with kin ($n = 8,243$). The exclusions eliminate youth who may have been placed in foster care. The other subsamples used for comparison involve youth matched in ways described below.

Propensity Scoring and Mahalanobis Matching

Researchers suggest using multiple matching schemes to look for consistency among results and to achieve the most closely matched samples (Sosin 2002; Guo, Barth, and Gibbons 2006). This study uses Mahalanobis matching and propensity score matching. Mahalanobis metric matching is a way to match treatment and control subjects on particular covariates (Cochran and Rubin 1973; Rubin 1976). This method is used to randomly order treatment and control subjects who are then matched on what is known as the Mahalanobis distance. This distance incorporates values of variables used for matching and the covariance matrix for the matching variables from the control group. In this study, the variables used to create the Mahalanobis distances are those employed in the logistic regression for the propensity score. One drawback to this method is that, if many covariates are used, close matches become difficult to find (Guo et al. 2006). A second approach is to include the propensity score as a covariate in the calculation of the Mahalanobis distance. Such an approach is attempted in one of this study's schemes.

Another approach used here, propensity scoring, employs a particular set of covariates to calculate the conditional probability of being assigned to the treatment (foster care) group (Rosenbaum and Rubin 1983). That probability is called the propensity of exposure to the treatment. In a nonrandomized trial, the propensity score function is unknown and must be estimated from the observed data by using a model, such as the logit model. To estimate the propensity score with a logit model, the researcher selects variables that are thought to be covariates of the treatment condition (Dehejia and Wahba 1999). These covariates are used to estimate a logistic regression. Each respondent in the sample is then given a propensity score that is based on his or her scores on the covariates and the coefficients in the logistic regression. A comparison group is selected by including comparison cases with propensity

scores that are indicative of a high likelihood to be in the treatment condition.

Given the high rates of maltreatment among youth who are placed in care (see, e.g., USDHHS 2002), variables that predict foster care placement or maltreatment are used here to model the likelihood of being in care. The child's characteristics are captured through variables that examine race (Smith and Devore 2004), gender (USDHHS 2002), emotional and behavioral problems (Rosenfeld et al. 1997), physical health, and disabilities (Sullivan and Knutson 2000). Variables on the parent's characteristics measure socioeconomic status (Cox, Kotch, and Everson 2003), citizenship status (Needell and Barth 1998), age at child's birth (Needell and Barth 1998), number of children (Kotch et al. 1999), and single parenthood (Jackson et al. 1999). Variables on the home environment examine homelessness (USDHHS 1997), domestic violence or high levels of conflict (Cox et al. 2003), inconsistent care for the child or household (Crittenden 1999), and poor physical environment (Rosenfeld et al. 1997; Garbarino and Collins 1999). Neighborhood and community characteristics include a violent, poor, unsafe neighborhood (Rosenfeld et al. 1997) as well as the population size of the city (English et al. 1999). Data are not available on some key characteristics that are associated with foster care placement and therefore could not be included in the model, for example, parental substance abuse (National Center on Addiction and Substance Abuse at Columbia University 1999), parental mental health problems (Taylor et al. 1991), and parental incarceration (Young and Smith 2000).

Using the variables outlined above, a logit model predicts the likelihood of having foster care experience and develops the propensity scores. The propensity scores enable an examination of four different matching schemes. All the schemes employ what is called a nearest neighbor with caliper approach. This approach involves constructing propensity scores for each observation and matching each foster youth with the non-foster youth whose scores are the closest (Dehejia and Wahba 2002; Guo and Barth 2004). Caliper matching, which is used in this study, is a variation of the nearest neighbor approach. Here, a match is randomly selected among participants in the control group whose propensity score falls within some range of the treatment subject's (foster care youth) propensity score (.25 times the standard deviation of the propensity scores is often used; Rosenbaum and Rubin 1985; Guo and Barth 2004, 2005). A narrower than average caliper, 0.1 in this case, is also used to check for consistency of results. If there is no match within the set caliper, the researcher eliminates the treatment subject from the analysis, thus eliminating extreme cases.

In caliper and nearest neighbor matching, treatment subjects can be matched to one or more control group participants. By adding multiple control group participants for each treatment unit, the sample size is

increased (Dehejia and Wahba 2002). Conversely, by matching to only one control subject, the researcher optimizes the quality of the match for the propensity score. Of the four matching schemes employed here, two use a 1–1 match, and two use a 1–5 match. The study uses the PSMATCH2 module in STATA software (version 8.1).

Measures

Independent variable.—As the discussion noted, the primary independent variable is whether the respondent has foster care experience; it represents whether the youth reports that he or she ever lived in foster care or had a foster parent. The reporting periods include three time points prior to the survey period (ages 2, 6, and 12) and each round of the survey.

Covariates for the propensity score logit model.—The logit model includes covariates related to the child’s characteristics, the parents’ characteristics, the home environment, and the community. Measures for the child’s characteristics were collected at round 1. Data were taken from the youth interview for all child characteristics except health and disability. Data for health and disability variables are derived from the parent interview. Among child variables used for matching, child’s race is measured as white, black, and other. The analyses attempted to include Native American youth separately because they are represented disproportionately in the foster care system (USDHHS 2002), but this group is collapsed in the current analysis into the category “other” because of sample size. Gender is measured as male or female. Health and disabilities are measured using three indicators: having asthma, having a physical or emotional disability, and having a childhood illness, which includes asthma, heart disease, anemia, diabetes, cancer, epilepsy, infectious disease, kidney problems, and other chronic illnesses.

Socioeconomic status is measured by variables collected in round 1 from the parent and youth interviews. One of these indicates whether the youth reports that he or she attended Head Start, and a second examines whether the youth reports that he or she attended public school. These variables serve as a proxy for income level because Head Start is a program designed to serve economically disadvantaged children and their families (USDHHS 2005), and evidence suggests that people with lower socioeconomic status are less likely to send their children to nonpublic schools (Long and Toma 1988; Yang and Nihan 2004). The third variable measures the income-to-poverty ratio of the respondent’s current family (whether foster or biological) at round 1. These data are reported by the interviewed parent. Because no data are available on poverty or income prior to round 1 of the survey, the round 1 measures serve as proxies. Income level is often consistent throughout the life span (Brooks-Gunn, Duncan, and Maritato 1997; Corcoran and

Chaudry 1997), and foster youth who are economically disadvantaged at round 1 are likely to have been in a similar broad economic class earlier in their childhood.

Variables describing the biological parent and sibling composition were measured at round 1 of the survey. They use data from the parent and youth interviews. The parents' citizenship status is measured dichotomously by the responding parent's report of whether the youth's biological parents were both U.S. citizens. The mother's age when she gave birth to her first child is measured as a continuous variable that draws upon data from the youth interview. The number of siblings is measured as the number of siblings the youth identifies as full siblings. Whether the respondent's biological parent was single is measured using four variables. Two assess reports of whether the youth respondent's biological mother is deceased and whether the biological father is deceased. A third variable examines whether the respondent reports that he or she has no contact with the biological father, and the remaining one indicates whether the parent respondent reports that the child's birth certificate lists only a mother. The variables that assess single motherhood are particularly relevant because of the overrepresentation of children with single mothers in the child welfare system (Jackson et al. 1999). The biological parents' education is measured by continuous variables that indicate each parent's years of schooling as reported by the child.

The home environment is measured with several variables. One variable uses data from the parent interview to examine the parent's perception of whether the youth respondent lived through "hard times" during childhood. In this study, "hard times" refers to a list of hardships (i.e., he or she lives in a place without water or electricity or in a homeless shelter), and results indicate a perception that the youth experienced one or more of these hardships during childhood. The family home risk assessment, the physical environment risk assessment, and the enriching environment assessment also are included. These three indexes are created by the NLSY97 from a number of variables in both the youth and parent interview to assess the youth's environment at round 1 (Center for Human Resource Research 1999, 2002). The family home risk assessment is based on Bettye Caldwell and Robert Bradley's (1984) *Home Observation for Measurement of the Environment*. Their measure is also used to assess the youth's physical environment, family involvement with the youth, conflict in the household, and the youth-parent relationship (Center for Human Resource Research 1999). The physical environment risk assessment was developed by researchers at Child Trends to assess the youth's physical environment and neighborhood risks. Child Trends researchers also developed the enriching environment index to gauge the availability of enriching material in the youth's home (Center for Human Resource Research 1999).

The population size and quality of the respondent's neighborhood also are measured through variables from the youth interview data. Population size is measured as whether, at round 1, the respondent lived in a metropolitan statistical area (as defined by the U.S. Census Bureau 2000). Neighborhood safety is measured by variables that assess whether the youth experienced a robbery in his or her neighborhood and whether he or she witnessed a shooting in the neighborhood at anytime prior to round 1 of the survey.

Control variables for multivariate analysis.—Multivariate analyses control for groups of variables, whether or not matching strategies are used. The controls measure race, gender, income, and educational level. Data on these are taken from the youth and parent interviews. Youth respondents' race and ethnicity are categorized as black, white, or other. The respondents' poverty status is measured by the current (i.e., round 1) household income-to-poverty ratio as reported by the parent respondent, which is calculated from federal guidelines for 1996, the first survey year (U.S. Census Bureau 2007). The education variables are categorical, indicating whether the respondent dropped out of high school, completed high school, or enrolled in college. These variables are used in analyses that do not examine education outcomes. Age at round 1 is also controlled. Age is measured as a continuous variable.

Dependent variables.—The dependent, or outcome, variables represent youth's experiences during the transition to adulthood. Data for all outcome variables are taken from the youth interview. Variables measure education, use of public assistance, teen parenthood, homelessness, drug use, and criminal behavior. Data for all dependent variables were captured at each round of the survey. Variables concerning education measure whether the respondent ever received a high school diploma and also whether he or she attended any postsecondary education at a 2- or 4-year college. Another dichotomous variable measures whether the youth or the youth's spouse reportedly received public assistance during any of the years of the survey. Public assistance includes receipt of Aid to Families with Dependent Children; Temporary Assistance for Needy Families; food stamps; the Special Supplemental Nutrition Program for Women, Infants, and Children; public housing; and other assistance. Other assistance includes general assistance; Cuban, Haitian, or Native American assistance; and emergency assistance. The variable does not include public assistance received by other members of the household (e.g., parents).

Two measures consider teen parenthood. One categorizes youth as teen parents if they gave birth to or fathered a child prior to age 20. Youth are categorized as young teenage parents if they became parents (gave birth or fathered a child) while they were under age 18.

Homelessness is measured as a dichotomous variable. Youth are categorized as homeless if they report, at any survey point, that they have

no permanent residence, are homeless, live in a shelter, or live on the street. There are no data on homelessness between periods.

Drug use measures whether the respondent reports that he or she ever used any illegal drug. This includes marijuana, cocaine, and other so-called hard drugs. Alcohol use is not employed as a dependent variable due to limited variability; almost 80 percent of the sample reported consuming alcohol at some point.

Data on two measures of criminal behavior were collected at each survey round. One item measures whether the youth reports that, in the period between surveys, he or she was arrested for an illegal offense other than minor traffic violations. A second item measures whether the respondent reports that, in the same period, he or she was sentenced to jail after being convicted of a crime. Jail does not include juvenile corrections, reform school, or community service.

For all measures described above, attempts were made to fill in missing data where possible. For measures that rely on multiple years of survey data, data are used from available rounds. If missing data could not be obtained and the measure was taken from a single round, the measure is coded with a dummy variable to indicate that data are missing.

Data Analysis

The first step in data analysis is to develop the logistic model that predicts propensity scores. In the process, such bivariate tests as chi-square tests and *t*-tests are used to assess whether foster youth differ from youth in the rest of the sample on the included covariates. The second step is to conduct a sensitivity analysis (Guo et al. 2006) that compares the efficiency of the different matching schemes. Schemes are evaluated for their sample size and their ability to reduce the statistically significant differences between foster and matched youth.

In the third step, bivariate analyses are used to compare the outcomes of foster youth to those of youth in the matched and unmatched samples. These analyses employ all matching schemes, thereby determining whether results are consistent. Next, analyses are estimated using one matching scheme. These analyses use logistic regression to compare the transition outcomes of foster youth to those of matched non-foster youth. The multivariate models control for covariates, mentioned above, that are thought to influence a youth's ability to make a successful transition to adulthood (Duncan et al. 1994; Rich 1996; Duncan and Brooks-Gunn 1997; U.S. Department of Commerce 1997; Brown and Emig 1999; Wilson 1999).

Although many of these covariates are part of the propensity score model, that model only ensures equal representation of specific groups in the foster and comparison samples. Including these variables in the outcome analysis makes it possible to examine whether relevant char-

acteristics affect the relationship between foster care involvement and specific outcomes. Multivariate analyses thus are conducted for all outcomes except young teen parenthood, homelessness, and being sentenced to jail. The three excluded outcomes do not occur with sufficient frequency to allow for accurate analyses.

One issue is whether the analyses have sufficient statistical power to detect differences in outcomes between youth with foster care experience and members of the control group. Unfortunately, it is difficult to conduct power analyses in advance because it is unclear how large the actual difference in outcomes might be between foster youth and other vulnerable youth. In fact, the variability of the outcomes of interest is unknown. Still, some research suggests that as long as the treatment sample is larger than 50, there should be adequate power to conduct propensity scoring analysis (Guo 2005). Further, if the bivariate comparisons are used, it is possible to conduct a post hoc power analysis. In the current study, analysis is conducted for the nearest 1-.25 sample (scheme 2; this sample uses a nearest neighbor 1-5 match with a caliper equal to .25 times the standard deviation of the propensity score) to show how large group differences would need to be in order to be detected if the study had 80 percent power, .05 alpha, and 252 members. Analyses suggest that, for extreme events (that occur 10 percent or less or 90 percent or more of the time), group differences would need to be between 7 and 10 percent to be detected. For less extreme events, group differences would need to be between 10 and 15 percent. This suggests that the sample size in this study for that scheme ($n = 252$) is sufficient to detect moderate differences between groups. Recommendations related to logistic regression require a sample size of 100 and at least 10 subjects per predictor (Long 1997). Both the initial propensity score logit model and the subsequent outcome models meet the recommendations.

Results

Sample Description

Table 1 describes the sample and provides the results of a logistic model that predicts the propensity score for the whole sample ($N = 8,984$). Almost 60 percent of the sample is white, and 48 percent is female. Reported rates of various childhood illnesses and disability are below 12 percent. Respondents report that, on average, both their mothers and their fathers have just over 12 years of education. In results from four measures that capture single parenthood, 10 percent or less of respondents identified their mother or father as a single parent. Demographics not presented in table 1 include age and the percent of the sample living at or below the poverty threshold. The average age of the

Table 1

SAMPLE DESCRIPTION AND LOGISTIC MODEL PREDICTING PROPENSITY SCORE (N = 8,984)

VARIABLE	n	% OR MEAN FOR		BIVARIATE TEST (χ^2 or t-test)	LOGISTIC B
		Whole Sample	Foster Youth		
Race:					
White	5,232	58.2	34.6	31.8**	.44
Black	2,388	26.6	50.7	41.3**	1.14**
Other	1,364	15.2	14.7	.02	-.87
Female	4,385	48.1	49.3	.01	-.03
Asthma	682	7.6	8.8	.3	.40
Disability	1,060	11.8	14.7	1.1	.02
Childhood illness	183	2.0	2.2	.9	.02
Income-to-poverty ratio (round 1)	...	234.6 (244.5)	179.2 (254.3)	2.6**	.0002
Attended public school	8,267	92.0	91.9	.002	-.07
Attended Head Start	1,557	17.3	25.0	5.7*	.43
Bio. parents are both U.S. citizens	6,869	76.5	67.7	6.0*	.19
Bio. mother's age at first child's birth	...	25.0 (8.7)	33.1 (14.4)	-6.6**	.09**
Number of siblings	...	1.3 (1.2)	1.1 (1.4)	1.9*	-.18

Single parenthood:								
Bio. mother deceased	113	1.3	5.9	23.8**		.53		
Bio. father deceased	418	4.7	11.0	12.7**		.53		
Bio. father has no contact	753	8.4	25.7	54.2**		.15		
Birth certificate with mother only	900	10.0	19.1	12.7**		-.02		
Bio. mother's education (years)	...	12.5 (2.9)	10.9 (2.9)	5.1**		-.14*		
Bio. father's education (years)	...	12.6 (3.2)	11.5 (3.1)	2.5*		-.02		
Hard times	435	4.8	12.5	17.6**		.60*		
Experience robbery	1,345	15.0	21.3	4.4*		.33		
Witness shooting	975	10.9	18.4	8.1**		-.001		
Family home risk assessment	...	194.9 (190.9)	243.8 (242.5)	-2.3*		.001*		
Physical environment risk assessment	...	118.3 (104.8)	150.4 (113.3)	-3.5**		.0004		
Enriching environment assessment	...	41.2 (48.2)	41.4 (48.5)	-.03		.04		
Not metropolitan statistical area	1,578	17.6	13.2	1.8		.80		

NOTE. — Bio. = biological. For categorical variables, the sample size, the percent of whole sample, and the percent of foster youth are shown. For continuous variables, the mean for the whole sample and the mean for foster youth are shown, and the standard deviation is presented within parentheses. In bivariate comparisons of foster and non-foster youth, chi-square tests are conducted for categorical variables, and *t*-tests are conducted for continuous variables. The chi-square value or *t*-value is shown, as appropriate.

* $p < .05$.

** $p < .01$.

sample at round 1 is 14.1 years ($SD = 1.4$), and 16.9 percent of youth reported at round 1 that they live at or below the poverty threshold.

Bivariate relations suggest that foster youth are statistically significantly different ($p < .05$) from youth in the rest of the sample on many variables. Foster youth are more likely to be black, to have single parents, to live in a family with below-poverty earnings, to experience hard times, to witness shootings, and to experience robberies. Foster youth's parents are reported to have lower educational attainment than the parents of other sampled youth have. Foster youth report that, compared to the rest of the sample, they live in riskier homes and physical environments.

Sensitivity Analysis

Table 2 describes sensitivity analyses of the eight schemes used to compare outcomes of youth with foster care experience to those of other youth. The eight schemes include four that match samples using propensity scoring (schemes 1–4), two that use Mahalanobis metric matching (schemes 5 and 6), and two that make comparisons involving the whole data set (schemes 7 and 8). Results indicate that although 136 foster youth are available for matching, the propensity scoring and Mahalanobis methods reduced the number of eligible foster youth for analysis. Specifically, the Mahalanobis methods (schemes 5 and 6) both include only 113 youth with foster care experience, eliminating almost 17 percent of the sample. All four of the propensity scoring schemes (schemes 1–4) keep over 120 foster youth.

Reexamining the covariates from the logistic model, table 2 outlines, for each of the schemes, differences in scores on relevant covariates (from the logistic model) for youth with and without foster care experience. In the first two schemes, no covariate is statistically significantly different across groups after matching. By contrast, schemes 3 and 4, which rely on one-to-many matching, do not eliminate all group differences. The Mahalanobis matching schemes (schemes 5 and 6) evince an even greater number of statistically significant differences between the matched groups. The last two schemes (schemes 7 and 8) do not use matching but compare youth with foster care experience and youth in the larger sample. Not surprisingly, these schemes show differences in almost all covariates. This analysis suggests that the first two schemes create the most closely matched groups. Scheme 2 is used for multivariate analysis because it has a larger sample size.

Bivariate Results

Table 3 reports bivariate analyses that examine group differences on the measured outcomes between youth with and without foster care experience. These analyses use all matching schemes, thereby allowing for an examination of consistency among the schemes. Results for all

Table 2
RESULTS OF SENSITIVITY ANALYSIS

SCHEME	DESCRIPTION	N OF NEW SAMPLE		COVARIATE SIGNIFICANT AFTER MATCHING ($p < .05$)
		Foster	Match	
1	Nearest neighbor 1-1 with caliper = .1	123	123	None
2	Nearest neighbor 1-1 with caliper = .39 ($.25\sigma_p$)	126	126	None
3	Nearest neighbor 1-5 with caliper = .1	128	456	Bio. father has no contact, bio. mother's education, bio. father's education, bio. mother's age at first birth
4	Nearest neighbor 1-5 with caliper = .39 ($.25\sigma_p$)	133	458	Bio. father has no contact, bio. mother's education, bio. father's education, bio. mother's age at first birth
5	Use covariates from propensity score logistic to calculate Mahalanobis distances	113	113	White, bio. father has no contact, attended Head Start, number of siblings, bio. father's education
6	Mahalanobis distances with propensity score added	113	113	White, bio. father has no contact, disability, number of siblings, bio. father's education
7	Sample without youth who were adopted, live with kin, or were in group care	136	8,243	White, black, bio. parents are both U.S. citizens, hard times, bio. mother deceased, bio. father deceased, bio. father has no contact, birth certificate with mother only, experience robbery, witness shooting, attended Head Start, number of siblings, family home risk assessment, physical environment risk assessment, enriching environment assessment, bio. mother's age at first child's birth, bio. mother's education, bio. father's education, income-to-poverty ratio
8	Whole sample for comparison	136	8,848	White, black, bio. parents are both U.S. citizens, hard times, bio. mother deceased, bio. father deceased, bio. father has no contact, birth certificate with mother only, experience robbery, witness shooting, attended Head Start, number of siblings, family home risk assessment, physical environment risk assessment, enriching environment assessment, bio. mother's age at first child's birth, bio. mother's education, bio. father's education, income-to-poverty ratio

NOTE.—Bio. = biological.

of the matched samples show few group differences (see table 3). In the first two schemes, foster and matched youth are not found to differ to a statistically significant degree on any of the outcomes. In most of the other matched schemes, youth with foster care experience are found to have higher rates of public assistance use, arrests, and sentencing to jail than matched youth are. By contrast, when schemes 7 and 8 are used to compare youth with foster care experience to unmatched youth,

Table 3
 BIVARIATE COMPARISONS OF EMERGING ADULTHOOD OUTCOMES

SCHEME	PERCENT OF YOUTH WHO EXPERIENCE OUTCOME																	
	High School Diploma		College Attendance		Public Assistance		Teen Parent		Young Teen Parent		Homeless		Drug Use		Arrests		Sentenced to jail	
	FY	NON	FY	NON	FY	NON	FY	NON	FY	NON	FY	NON	FY	NON	FY	NON	FY	NON
1	64.2	66.7	30.9	41.5	46.3	35.8	19.5	22.0	10.6	8.1	4.9	4.1	54.5	58.5	41.5	30.9	13.8	8.9
2	64.3	66.7	31.8	41.3	45.2	35.7	19.1	22.2	11.1	8.7	4.0	4.0	53.2	57.9	41.3	31.8	12.7	8.7
3	64.8	69.1	32.0	39.9	46.9	33.1**	19.5	20.0	10.2	9.0	4.7	4.4	52.3	58.8	40.6	30.7*	14.1	7.2*
4	63.9	69.0	31.6	39.7	45.9	33.2**	19.6	20.1	10.5	9.2	4.5	4.4	52.6	58.7	40.6	31.0*	13.5	7.2*
5	62.8	65.5	30.1	38.1	43.4	23.9**	19.5	15.9	11.5	7.1	5.3	5.3	54.0	56.6	42.5	33.6	13.3	7.1
6	63.7	65.5	31.9	38.1	44.3	23.9**	19.5	15.9	10.6	7.1	4.4	5.3	53.1	56.6	42.5	33.6	13.3	7.1
7	63.2	76.6***	32.4	51.0***	44.9	22.9***	19.1	12.9*	10.3	5.0**	4.4	3.5	51.5	56.4	39.7	26.7***	13.2	5.1***
8	63.2	75.6**	32.4	49.9**	44.9	23.9**	19.1	13.4*	10.3	5.2**	4.4	3.7	51.5	56.5	39.7	27.3**	13.2	5.5**

NOTE.—FY = foster youth; NON = non-foster youth. Significance is based on χ^2 comparisons.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

LOGISTIC REGRESSION MODELS OF EMERGING ADULTHOOD OUTCOMES

Independent Variable	High School Diploma	College Attendance	Public Assistance	Teen Parent	Drug Use	Arrests
Foster care	.9 (.3)	.7 (.3)	1.5 (.3)	.8 (.4)	.7 (.3)	1.7 (.3)
Race:						
Black	.9 (.3)	.9 (.3)	.9 (.3)	1.5 (.4)	.6* (.3)	.8 (.3)
Other	1.2 (.4)	1.2 (.4)	.7 (.5)	.7 (.6)	.4* (.4)	.4 (.5)
Female	.9 (.3)	1.2 (.3)	5.4** (.3)	5.1** (.4)	.6* (.3)	.3** (.3)
Age	1.1 (.1)	1.2 (.1)	1.3* (.1)	.9 (.1)	1.2 (.1)	1.1 (.1)
At or below poverty threshold	.4** (.3)	.7 (.3)	1.2 (.3)	1.5 (.4)	.9 (.3)	.8 (.3)
Education:						
High school dropout			2.1* (.4)	4.2** (.4)	1.1 (.4)	5.3** (.4)
College			.3** (.4)	.3* (.5)	.7 (.3)	.8 (.3)

NOTE.—Results based on scheme 2; nearest neighbor 1–1 matching, with .25 times standard deviation of propensity score caliper; foster youth ($n = 126$); and matched youth ($n = 126$). Odds ratios are presented. Standard errors are in parentheses.

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

statistically significant differences emerge on almost all measured outcomes. In scheme 7, results suggest that, compared to youth with foster care experience, unmatched youth have higher rates of receiving a high school diploma ($\chi^2 = 13.2, p < .001$) and attending college ($\chi^2 = 16.5, p < .001$), as well as lower rates of public assistance use ($\chi^2 = 36.3, p < .001$), teen parenthood ($\chi^2 = 4.6, p = .03$), young teen parenthood ($\chi^2 = 8.0, p < .01$), arrests ($\chi^2 = 11.5, p < .001$), and sentencing to jail ($\chi^2 = 18.3, p < .001$). In general, results from all schemes suggest that the directions of differences on outcomes are similar across groups. However, if the samples of youth who differ on foster care experience are matched more closely, few statistically significant differences emerge. Comparisons on most measured outcomes reveal that this occurs even though youth with foster care experience do not fare as well as youth in the general population.

Multivariate Analysis

To investigate further the association between foster care experience and outcomes, I estimated a series of logistic regressions with control variables. Only scheme 2 is used. These analyses are shown in table 4.

Results suggest that having foster care experience is not associated to a statistically significant degree with any of the transition outcomes if analyses control for other variables and use well-matched samples. Instead, sociodemographic characteristics predict the outcomes. Poverty is negatively associated with receiving a high school diploma. The ed-

educational level is negatively associated with the odds of using public assistance, teen parenting, and being arrested. Female youth are found to be more likely than male youth to become teen parents and receive public assistance. They are less likely to use drugs or to be arrested.

Discussion

Researchers identify a link between having a history of foster care and having negative outcomes in the transition to adulthood (e.g., Festinger 1983; Barth 1990; Cook et al. 1991; Cook 1994; Collins 2001; Courtney et al. 2001), but definitive explanations for this relationship are lacking. Because foster youth share many characteristics with other youth who struggle during this period, it is unclear whether shared characteristics, foster care, or a combination of these two is responsible for foster youth's negative outcomes during emerging adulthood.

Using propensity scoring and Mahalanobis matching, this study compares youth with foster care experience to youth who lack such experience but share many of the preexisting characteristics that may affect both placement in care and outcomes in emerging adulthood. Results from the analysis that uses the most closely matched scheme (scheme 2) suggest that youth with foster care experience and matched youth do not differ to a statistically significant degree on any of the outcomes measured. This finding differs from the results of previous research, which suggests that many educational and employment outcomes are worse for youth with foster care experience than for other youth (see, e.g., Cook 1994; Blome 1997; Collins 2001). This study does not find such differences. To be sure, some matching schemes produce results that identify differences between groups, but results overall suggest that outcomes are tied to the whole set of characteristics used for matching and that youth with foster care experience fare similarly to youth who are most closely matched on other factors. These findings may suggest that negative outcomes are not predicted by foster care experience but by a set of individual, familial, and communal characteristics.

Although foster and matched youth fare similarly in the transition to adulthood, those in both groups are found to struggle more than youth in the general population. Compared to youth in the general population, foster and matched youth have higher rates of public assistance use, teen parenthood, and criminal involvement, as well as lower educational attainment. This suggests that youth with foster care experience and other vulnerable youth still require assistance in making the transition to adulthood.

Youth in poverty and youth with low educational attainment are found to be at risk for multiple negative outcomes. Poverty and low educational attainment apparently are key factors that hamper a youth's ability to transition successfully to adulthood. Results also suggest that there are

differential risks for male and female youth. In sum, these results suggest the importance of examining not only the experience of the foster care population in its transition to adulthood but also the broader needs of youth whose sociodemographic characteristics leave them vulnerable.

This study attempts to clarify the relationship between foster care and negative outcomes in the transition to adulthood. The results challenge the notion that foster care placement is uniquely responsible for negative outcomes. Given the similarities in outcomes between foster and matched youth, and the differences between these groups and the unmatched youth, vulnerabilities for foster youth seem to stem from characteristics that existed well before youth's placement in care. The combination of individual, familial, and communal characteristics that are associated with placement in care may be so salient in predicting negative trajectories that the effect of foster care placement pales in comparison; these multiple risk factors are so overwhelming that foster care placement may be unable to ameliorate or aggravate their effect.

Although this study has several important findings, they must be treated with caution due to multiple limitations. The crucial limitations may be those that stem from the use of propensity scoring in the child welfare context, the omission of particular variables, and the NLSY97's sample of youth with foster care experience.

The assumptions of propensity scoring may be questioned in the context of child welfare. Foster care can vary considerably in duration, type, and services, but the current study's methodology is flawed in that it treats all foster care as equivalent. Additionally, propensity scoring assumes that assignment to treatment is based only on the characteristics accounted for in the propensity score model (Sosin 2002), and it ignores unobservable characteristics that may contribute to placement in care. Although this limitation always exists, it does not necessarily affect the results (Dehejia and Wahba 1999; Torelli 2000; McCaffrey, Ridgeway, and Morral 2004). In addition, propensity methods provide some level of statistical correction to allow for an examination of a treatment that cannot be randomly assigned.

The omission of important variables in the propensity score model also poses problems (Shadish, Cook, and Campbell 2002; Michalopoulos, Bloom, and Hill 2004). The propensity score models used here cannot include important variables that may influence placement in foster care and measured outcomes. Such variables include parental substance abuse, parental incarceration, and the nature of child maltreatment; hidden bias can remain because no data are available (Shadish et al. 2002). For example, children in the matched sample may have experienced maltreatment or other preplacement factors that place them at risk for negative outcomes. Perhaps these factors, not foster care, predispose foster youth to negative outcomes. A more thorough examination of risk factors is needed to understand exactly what puts

foster youth and other vulnerable youth at risk for negative outcomes in emerging adulthood.

Although the study's strength lies in its ability to create between-group comparisons and use the vast NLSY97 sample to adequately match youth with foster care experience to those without it, the work is limited by the sample available. Data are not available on the duration of care, type of care, or reason for child welfare involvement. This study cannot determine how outcomes are affected by characteristics of the foster care experience; within-group variability in this experience might account for the variability in outcomes. Also, this study considers whether youth were ever in foster care at any time; it does not assess whether sampled youth were exiting from care at the time of the transition into adulthood. This limits conclusions about emancipation issues, which are stressed in relevant literature (e.g., Collins 2001; Courtney and Dworsky 2006). Finally, study results may not generalize to all foster youth because subgroups of foster youth (i.e., youth in kinship placements and group homes) are excluded.

Even with the limitations described above, this study helps to understand the relation of experience in foster care to outcomes occurring in the transition to adulthood. This study particularly suggests that the relationship between foster care and negative outcomes occurs because of characteristics that predict out-of-home placement rather than because of the experience of placement itself. This finding challenges the assumption that the unique experience of foster care creates difficulties for foster youth, and these difficulties cannot be explained by other risk factors.

Although this study is not able to guide policy makers toward effective programming, it does provide some early thinking about new directions for policy. Given the similarity of outcomes for foster youth and comparison youth in the propensity score models, it may be that policy would best be aimed broadly at vulnerable youth rather than solely at youth with foster care experience. For example, welfare legislation might be changed to provide vulnerable youth with additional support during this transition period, renewing the commitment to a policy that facilitates the school-to-work transition. Such changes may also widen the net of youth who receive information and services in preparation for independent living. Although research is still examining the efficacy of independent living skills programs, for example, findings suggest positive outcomes for foster youth who attend these programs (e.g., Timberlake et al. 1987; Scannapieco, Schagrin, and Scannapieco 1995; Mallon 1998; Lindsey and Ahmed 1999; U.S. General Accounting Office 1999). Because other vulnerable youth have negative transition outcomes that are similar to those of foster youth, it would seem that they could benefit from these services. Still, little is known about how to

design programs to compensate for many problematic background factors (Collins 2001).

This study takes an important step in understanding the experience of vulnerable youth as they approach adulthood. Still, further research is needed. Researchers should work to clarify the risk factors that hamper positive outcomes for foster youth and other vulnerable youth. They can further examine long-term outcomes, pathways to these outcomes for vulnerable youth, and the effect of services on outcomes. Finally, researchers can probe into the effect of moderating variables, thereby identifying subgroups of vulnerable foster youth. This examination of moderating factors can enhance understanding of how preplacement characteristics work in combination with foster care placement characteristics to create vulnerabilities.

Understanding pathways to adulthood and risk factors for problematic transitions may enable policy makers and practitioners to help youth during the important developmental period when they become adults. Gaining an understanding of the factors that hamper this transition and the factors that serve protective functions can facilitate the creation of policies and programs that serve all of the youth who require assistance to make this transition successfully.

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