

The Effects of Runaway-Homeless Episodes on High School Dropout

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Abstract

This article uses data from the National Longitudinal Survey of Youth 1997 to examine the relationship between running away from home between the ages of 12 and 14 and dropping from high school among youth. Propensity score matching was conducted in estimating the effect of running away on high school dropout while controlling for confounding factors, such as familial instability and socioemotional health risks. The findings suggest that having runaway-homeless episodes have a detrimental effect on academic achievement.

Keywords

homelessness, high school dropout, propensity score matching

In the United States, there are an estimated 1 to 1.7 million children and youth who run away from home and are homeless each year (Fernandes, 2007). The McKinney-Vento Homeless Assistance Act defines homeless children and youth as those who do not have a fixed, regular, and adequate nighttime residence. This definition also includes those who share the housing of other persons and live in a private or public space that is not generally

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designed for or used as a regular sleeping accommodation for human beings (U.S. Department of Education, 2002). Thus, McKinney-Vento's definition is broad, and it comprises runaway youth who may not be on the street but who are "couch-surfing" or doubling up in a space with others. Homeless children and youth based on the federal definitions can be divided into four groups (a) runaway-homeless youths, who stayed away from home at least overnight without their parents' or guardians' permission; (b) "throwaway" youths who left home because their parents encouraged them to leave or locked them out of the home; (c) independent youth who feel that they have no home to return to due to irreconcilable familial conflicts or loss of contact with their families and (d) children and youth whose families are also homeless (Aratani, 2009).

Running away and homelessness during adolescence are associated with detrimental outcomes such as exposure to violence (Lee & Schreck, 2005), substance abuse (Greene, Ennett, & Ringwalt, 1997; U.S. Department of Health and Human Services, 2004; Van Leeuwen et al., 2004; Whitbeck, Hoyt, & Bao, 2000), and poor mental health (Whitbeck et al., 2000). In one report, 39 % of sheltered homeless children missed more than 1 week of school in the past 3 months prior to the study and had changed school between two and five times in the previous 12 months (Zima, Bussing, Forness, & Benjamin, 1997). Homeless children's reading, spelling, and mathematics scores are more often below grade level, unlike those of housed children (Rubin et al., 1996). According to one survey of runaway and homeless adolescents ($n = 602$) from Midwestern urban areas, most of the youth studied struggled to adjust to school; 52% of females and 75% of males had been suspended at least once from school. Furthermore, 47% of males and 21% of females had been expelled from school at least once, with more than 21% of males and about 30% of females eventually dropping out of school (Whitbeck, Crawford, & Johnson, 2009). Thus previous research suggests poor educational outcomes among runaway and homeless children and youth.

Yet estimates of the effect of runaway and homeless status on educational outcomes obtained from prior studies may have limited internal and external validity. First, previous studies were often based on selected geographical areas and there is potential selection bias (Witkin et al., 2005). Furthermore, there are several differences among runaway and homeless youth depending on the circumstances, the effect of running away and homeless would differ. For example, those who run away from home will have different family circumstances compared from those who are "throwaway" or those whose families are also homeless. Thus, in this article, we focus on youth with runaway episodes, which we define as "runaway-homeless" youth based on the McKinney-Vento Act. Those are youth who stayed away from home at

least overnight without their parents' or guardians' permission. We used a nationally representative longitudinal data set to examine how runaway-homeless episodes influence high school dropout. Since educational attainment is a significant determinant of socioeconomic well-being, it is important to understand the effect of runaway-homeless episodes on educational attainment. Despite potential long-term negative effects associated with runaway and homeless episodes during adolescence, few studies have carefully examined the effect of runaway-homelessness during adolescence on high school dropout. One of the difficulties in testing the effects of runaway and homeless episodes on educational attainment is self-selection. Runaway and homeless youth might be systematically different from those without runaway and homeless experiences. As such, the unobserved characteristics may be correlated with educational outcomes. Runaway-homeless youth are assumed to possess characteristics that are highly associated with poor educational outcomes, such as residential instability, familial instability, and behavioral problems. When examining the impact of the treatment (in this case, running away from home and becoming homeless), a random assignment is the gold standard for such an assessment. Randomized experimental studies however are not always possible. For example, it would be unethical to randomize a youth to a runaway-homeless condition. Yet, in nonexperimental settings such as observational studies, dependent variables (or outcomes) are affected by many factors other than those that can be observed, and controlling the resulting selection bias related to unobservable factors is difficult (Rosenbaum, 1984). It is therefore challenging to estimate the effect of runaway-homeless episode. So in this study, we use propensity score matching method, which is designed to simulate the random assignment feature of an experimental design using observational data. While propensity score matching does not control for unobserved characteristics, it is a useful method to address the selection problems when we have strong theoretical frameworks that allow us to identify relevant observed variables. In the next section, we will discuss the theoretical frameworks that will be used in this study.

Theoretical Frameworks: Family Instability, Socioemotional Health Risk, and Residential Instability Theses

There are three important theoretical frameworks with respect to educational outcomes of runaway-homeless youth: *family instability*, *socioemotional*

health risk, and *residential instability*. First, *family instability*, such as non-two-parent family structures or familial conflicts affect children's educational outcomes (Astone & McLanahan, 1994; Coleman, 1988; Raley, Frisco, & Wildsmith, 2005; Sandefur & Wells, 1999; Thompson & Massat, 2005). Sanderfur and Wells (1999) found that not growing up in a two-parent household leads to educational disadvantages, even taking into account unmeasured family characteristics. Furthermore, familial conflict affects children's educational outcomes (Biblarz & Gottainer, 2000; Raley et al., 2005; Sandefur & Wells, 1999). Parenting styles are significantly correlated with academic competence, with youth from authoritative (strict yet supportive) homes having a significantly higher school achievement than those from uninvolved homes (Lamborn, Mounts, Steinberg, & Dornbusch, 1991). This finding is relevant for understanding the effects of unstable family situations on youth, since research has suggested that single-parent households (Powers, Eckenrode, & Jaklitsch, 1990), unstable families, (Powers et al., 1990; Ringwalt, Greene, & Robertson, 1998; Tyler, Hoyt, Whitbeck, & Cauce, 2001), and lower levels of parental monitoring and support (Whitbeck, Hoyt, & Ackley, 1997), are themselves associated with runaway and homeless episodes. According to Powers et al. (1990), more than 60 % of participants in runaway-homeless youth programs reported their biological mothers as the main perpetrator of maltreatment. Ringwalt et al. (1998) also found youth with have run away are more likely to report fights or physical or emotional abuse from their family members than those who have not run away. Thus, we could assume that the effect of running away and homelessness on educational outcomes is highly correlated with family instability, youth relationship with parents, parenting styles and parental abuse.

According to the *socioemotional health risk* thesis, runaway-homeless youth are more likely to be depressed, have attempted suicide, or to have experienced serious mental health or substance abuse problems (Whitbeck et al., 2000; Yates, Mackenzie, Pennbridge, & Cohen, 1988). Furthermore, these socioemotional health risks are highly associated with academic underachievement (Hinshaw, 1992; Loe & Feldman, 2007; Mensch & Kandel, 1988). Mensch and Kandel (1988) argued that early initiation of drug use leads to a greater probability of dropping out of high school. Hinshaw (1992) discussed the complexity of determining the relationship between behavioral problems and academic underachievement due to the potential interactions among social, familial, linguistic and behavioral variables.

While runaway-homeless youth may possess the characteristics that negatively influence educational outcomes, other research suggests an effect of

homeless episodes on youth above and beyond these factors. *The residential stability thesis* argues that residential stability and frequency of moves influence youth's educational outcomes, particularly, high school completion. Prior studies found a strong positive effect of parental homeownership on offspring's high school graduation (Aaronson, 2000; Boehm & Schlottmann, 1999; Harkness & Newman, 2003), although the effect may depend on income level (Harkness & Newman, 2003). Aaronson's study (2000) most extensively tested the causal effect of parental homeownership on offspring's high school graduation using the Panel Study of Income Dynamics data. Aaronson argued that the positive effect of parental homeownership is partially due to residential stability. Residential stability is particularly important when offspring still reside with parents. Following the residential stability thesis, we hypothesize that runaway-homeless episodes have a significant effect on high school drop-out, even after controlling for self-selectivity. Furthermore, repeated runaway episodes are expected to have more detrimental effects on the educational outcomes of youth than one-time runaway-homeless episodes.

Data and Method

Data

Data from the National Longitudinal Survey of Youth 1997 (NLSY97), rounds 1 to 9 (1997-2005) were analyzed. NLSY97 is a national sample of American youth who were born between 1980 and 1984 ($N = 8,984$). In the first round of the survey (1997), dyads of youth and their parents participated in in-depth hour-long personal interviews, and the youth are interviewed separately on an annual basis. The NLSY97 documents youth's transition to young adulthood and collects extensive information about their educational and labor market experiences over time. For this study, we focused on youth between ages of 12 and 14 ($N = 4,834$). One of the advantages of the NLSY97 data set is that it contains information of youth's family background, which was collected from one of each youth's parents in the first round of the survey. In addition, NLSY97 contains a relatively large sample of youth who have run away. In NLSY97, among 4834 youth aged 12 to 14, there were 342 youth who reported ever running away from home in 1997 (7%) and between 1998 and 2000, there are 305 additional youth who ran away from home at least once. Finally, NLSY97 contains extensive information on youth's annual educational experiences since 1997. NLSY97 separately asks whether youth did not have place to live or have lived in a shelter for the homeless for two or more nights in a

row between 1998 and 2002. While about 50 youth reported this type of homeless episodes, the data do not allow us to differentiate youth who are part of a homeless family from homeless youth who were on their own. We excluded self-reported homeless youth from our sample for the following reasons. First, the factors that affect family homelessness may not be same as those who become runaway-homelessness on their own and the theoretical frameworks we presented earlier are more oriented toward explaining outcomes for youth who are homeless on their own. Second, the sample size was also extremely small (about 50 cases) which may result introduce more error using the propensity score matching (Zhao, 2004). For this article, we used the software IVEware based on the Sequential Regression Imputation Method (Raghunathan, Lepkowski, Hoewyk, & Solenberger, 2001). As a standard procedure for multiple imputations, we created five data sets and averaged the results based on Rubin's rules using STATA's MIM commands (Galati, Royston, & Carlin, 2007). Using Von Hippel's (2007) model, we deleted the cases with missing values on the dependent variable after we completed multiple imputation. Von Hippel argued that using imputed dependent variables would increase the biases in estimations and suggested deleting the cases with missing values for dependent variables after the imputations.¹

Propensity Score Matching

Self-selection bias presents a problem when investigating the effect of runaway-homeless episodes on educational outcomes of youth, and the propensity score matching estimation was developed to address such selection problems in observational studies. The goal of PSM is

to replicate a randomized experiment, at least with respect to the measured confounders, by making the treatment and comparison groups look as if they could have been randomly assigned to the groups, in the sense of having similar distributions of the confounders. (Stuart et al., 2009, p. 720)

The propensity score matching method is based on what Rosenbaum and Rubin called *strongly ignorable treatment assumption*. This is an assumption where treatment assignment is

strongly ignorable given the observed covariates x if (a) the responses (r_0, r_1, \dots, r_t) are conditionally independent of the treatment assignment

z given the observed covariates x , and (b) at each value of x , there is a positive probability of receiving each treatment. (Rosenbaum, 1984, pp. 42-43).

In propensity score matching, first we estimate the propensity score, which is the propensity toward exposure to a runaway or homeless episode given the observed covariates x . This can be estimated by logit regression. Youth were divided into three groups: (a) those who have no runaway and homeless episodes; (b) those who have only one runaway episode; (c) those who have repeated runaway episodes. In this study, the first group is the "control group," and two remaining groups are "treatment" groups. Each of two treatment groups is matched with the control group. Based on three theoretical frameworks, described earlier, we included all the characteristics available in 1997 or earlier that might influence youth's likelihood of running away from home or becoming homeless. Since we will use the 1997 information to estimate the propensity, we excluded respondents who had ran away before 1997 to make the causality clear ($N = 334$). Then we matched the units from each of the treatment groups and those from the control group that share the closest propensity score.

In this article, we used nearest matching both with and without replacement. Nearest matching method is one of the most commonly used matching methods, and in the matching with replacement method, to increase sample sizes, each person in the treatment groups was matched with nearest persons in the control group (youth without runaway-homeless episodes) whose difference in the propensity score were within 0.01. The advantage of matching with replacement is to be able to keep most of the sample, while matching without replacement will throw out a considerable number of cases that do not have close propensity scores, which can introduce biases. The matching was done for *each* treatment group (one-time and repeated runaway-homelessness). Persons in the control group were used more than once in matching with replacement method. Since we had a large pool of control groups from which we could draw, the matching with replacement method could retain a large number of control groups. In the matching without replacement method, each person in the control group will be matched only once with a person in each of the treatment groups who shares the closest propensity score. We conducted matching without replacement since only this matching method allowed us to conduct sensitivity analysis using Rosenbaum's bounding approach (2002).

Measures

The independent (treatment) variables were (a) one-time runaway-homeless episode, and (b) repeated runaway-homeless episodes. In this study, a runaway-homeless episode was defined as somebody under age 17 who left home and stayed away at least overnight without a parent's prior knowledge or permission.² The total number of runaway-homeless episodes is calculated, and we classified respondents as one-time and repeated runaway-homelessness. *The dependent variable was not completing high school or receiving GED by 2005.* Following a status attainment approach (Featherman & Hauser, 1978), we examined not completing high school or not receiving GED as a dependent variable.

We included the following covariates to measure family instability and socioemotional health. For the measurement of *family instability*, we used reports on family structures, parenting styles, and parent-youth relationships as proxy measures since we do not have measurements on parental abuse, violence, or child maltreatment. *Parenting style scales* were transformed to a series of dummy variables for (a) uninvolved (permissive and not very or somewhat supportive), (b) authoritarian (strict and not very or somewhat supportive), (c) permissive (permissive and very supportive), and (d) authoritative (strict and very supportive). These categories were based on the studies by Maccoby and Martin (1983) and Baumrid (1991), cited in Moore et al. (1999). Items and response categories for residential parents included (1) *When you think about how she or he acts toward you, in general, would you say that she or he is very supportive, somewhat supportive, or not very supportive?* (2) *In general, would you say that she or he is permissive or strict about making sure you did what you were supposed to do?* For those whose parents were not living with them, slightly modified questions were asked. The supportiveness responses were measured on a 3-point scale: 1 = *very supportive*; 2 = *somewhat supportive*; and 3 = *not very supportive*. The strictness responses were measured on a 2-point scale: 1 = *permissive* and 2 = *strict*. Parent-youth relationship-youth report for both residential and non-residential parents. Some of the questionnaires were adapted from responses that are developed by Rand Conger and K. Jewsbury Conger for use in the IOWA Youth and Family Project (IYFP). The question items included how highly the youth thinks of her or his parent; whether the parent is her or his role model, enjoying spending time with the parent, how supportive or critical he or she is of the youth or youth's idea; and how helpful the parent is, and so forth. It was measured on eight questionnaires that were asked to youth regarding their relationship with their parents. It was based on a

5-point scale, and it was summed. The scale ranged from 0 to 32. The scale measurements for both parenting styles and parent–youth relationship-reports have been tested for reliability and validity. For example, construct validity for parenting styles was demonstrated when the family process variable showed a significant association with the *same* family process construct measured differently. Cronbach's alpha for parent–youth relationship scales ranged from .75 to .83 and were considered good in terms of consistency and reliability. The higher scores indicate a more positive relationship. The detailed results can be found in Moore et al. (1999). *Family Structures* were measured as a set of dummy variables for single mother, and single father.³

Socioemotional health was measured by behavioral and emotional scale index and substance use index. *Behavioral and emotional problems youth report* was used to create the index by summing the responses to the four questions for a total maximum score of 8 points. Higher scores suggest more frequent and/or numerous behavior problems. Two of the four questions were different for boys and girls. The NLSY 97's measure of behavioral and emotional problems utilizes a set of six items developed as an indicator of children's mental health for the National Health Interview Survey (NHIS). The items for the behavioral and emotional problems indicator were chosen from the Child Behavior Checklist (CBCL), a standardized questionnaire used to obtain parents' ratings of their children's problems and competencies (Achenbach & Edelbrock, 1987, cited in Moore et al., 1999). Of the six items in the NLSY 97 questionnaire, the first four items were asked of both boys and girls. Two separate items were asked only of girls or only of boys. This procedure was also adapted from the NHIS procedures. *The substance use index* score was created by the total number of substances (cigarette, alcoholic beverage, and marijuana) the youth reported having ever tried, with a possible total score of 3. Higher scores indicate a use of more substances.

We included other control variables that have been found to be associated with runaway-homeless episodes among adolescence in prior research: age (Ringwalt, 1998), race and ethnicity (Mathews & Ilon, 1980; Thompson, Kost, & Pollio, 2003); parental socioeconomic status (Hilderbrand, 1968) to be measured by family income, education, assets, housing status; neighborhood characteristics (Hilderbrand, 1968); and parental marital status (Mathews & Ilon, 1980). *Parental housing structure* was measured as a dummy variable for homeowners. Neighborhood characteristics included urbanization (rural and nonrural) and, the proportion of Whites in the population in the county of residence. *Family poverty level in 1996* was included in addition to income, as a series of dummies for family income ratio to the federal poverty line. *Father's and mother's education* was coded as a series

of dummy variables for less than high school, high school graduate, some college, or higher. We also included gender coded as dummy with female as 1; male as 0. *Age* was coded as a series of dummies for age 12, 13, and 14 based on the report in the 1997 survey. *Race and ethnicity* were coded as a set of dummies for Blacks, Hispanics, Asians, Native Americans, and Whites based on the report in the 1997 survey.

Results

Table 1 displays the means and standard errors of individual and family socioeconomic characteristics, family instability measures and socioemotional health measures by runaway and homeless episodes. Among all youth in the survey, in 1997, about 6% of youth have run away at least once. This estimate is consistent with a previous study that used a different nationally representative youth sample and found that about 7% of youth had run away (Sanchez, Waller, & Greene, 2006). Based on the National Incidence Studies that described missing, abducted, runaway and "thrown away" children, in 1997, about 1.7 million children were estimated to have a runaway or "thrown away" experience, and this represented about 7% of youth between ages 12 and 17 (Hammer, Finkelhor, & Sedlak, 2002). However, when we looked at the same youth over time from 1997 to 2000, about 8% had run away from home once and 5% had run away multiple times, which is higher than the estimates from cross-sectional data. Thus our sample has a higher proportion of youth who had run away from home once or more, but this may be due to the longitudinal nature of the data. Overall, females were more likely to have had one-time or repeated runaway-homeless episodes.

In terms of housing and neighborhood characteristics, youth without runaway-homeless episodes are no different. Regarding family instability measures, nonrunaway youth were more likely to report a warmer relationship with a mother or father. We also found the lowest score on youth's report on their relationship with mother or father among youth with repeated runaway episodes. One-time and repeated runaway-homeless youth had a much higher proportion of mothers who show little or no involvement than those without runaway-homeless episodes. In terms of socioemotional health, parents of youth with repeated runaway-homeless episodes are most likely to report that their children had behavioral health problems. The substance use index was about twice as high among youth with runaway episodes compared to that of youth without runaway-homeless episodes. Furthermore, as we expected, youth with repeated runaway-homeless episodes were more likely to drop out of high school (35%) followed by one-time runaway-homeless episode (26%)

Table 1. Individual and Family Characterizes of Youth by Runaway-Homeless Status.

	Youth with one-time runaway- homeless episode		Youth with repeated runaway- homeless episodes		Non-runaway- homeless youth	
	183		122		2,305	
N (Min)	Mean	SE	Mean	SE	Mean	SE
Individual characteristics						
Age 12	0.315	0.035	0.297	0.044	0.347	0.010
Female	0.617	0.043	0.633	0.048	0.473	0.010
Hispanics	0.231	0.032	0.252	0.043	0.240	0.009
Black	0.209	0.032	0.200	0.046	0.215	0.009
Asian	0.022	0.011	0.008	0.008	0.018	0.003
Family SES						
50%-100%	0.196	0.031	0.182	0.045	0.152	0.009
101%-150%	0.100	0.024	0.147	0.037	0.117	0.009
151%-200%	0.131	0.031	0.120	0.030	0.101	0.007
More than 200%	0.479	0.042	0.435	0.049	0.527	0.011
Mother's education						
Less than HS	0.477	0.037	0.510	0.047	0.446	0.011
HS graduates	0.401	0.038	0.340	0.045	0.360	0.011
Some college or more	0.122	0.026	0.150	0.035	0.193	0.009
Father's education						
Less than HS	0.489	0.041	0.516	0.050	0.466	0.011
HS graduates	0.343	0.036	0.249	0.052	0.321	0.010
Some college or more	0.168	0.030	0.235	0.053	0.213	0.009
Housing and neighborhood characteristics						
Homeowners	0.379	0.037	0.402	0.056	0.314	0.010
Rural	0.157	0.028	0.203	0.037	0.202	0.009
Mostly mobile home	0.056	0.040	0.102	0.060	0.088	0.050
% of Whites in the county of residence (Census 1990)	0.790	0.011	0.780	0.015	0.777	0.003
Family conflict measures						
Family structures						
Single mom	0.226	0.031	0.273	0.043	0.209	0.008
Single dad	0.008	0.007	0.018	0.013	0.023	0.003
No. of children under age 18 in HH	2.523	0.096	2.745	0.112	2.561	0.026
Youths' report on relationship with mom	24.50	0.396	23.22	0.567	25.57	0.108

(continued)

Table 1. (continued)

N (Min)	Youth with one-time runaway- homeless episode		Youth with repeated runaway- homeless episodes		Non-runaway- homeless youth	
	183		122		2,305	
	Mean	SE	Mean	SE	Mean	SE
Mother no involvement	0.191	0.032	0.157	0.035	0.098	0.006
Mother permissive	0.248	0.034	0.289	0.042	0.329	0.010
Mother authoritative	0.139	0.027	0.184	0.035	0.112	0.007
Mother authoritarian	0.422	0.039	0.371	0.046	0.461	0.010
Mother monitoring	10.04	0.252	9.586	0.338	10.596	0.069
Youth's report on relationship with dad	19.61	0.744	17.50	0.971	21.63	0.201
Father no involvement	0.306	0.034	0.337	0.047	0.249	0.009
Father permissive	0.164	0.030	0.149	0.035	0.244	0.009
Father authoritative	0.196	0.030	0.281	0.041	0.155	0.008
Father authoritarian	0.333	0.038	0.233	0.039	0.353	0.010
Father monitoring	6.228	0.353	5.415	0.427	7.138	0.098
Socioemotional health						
Behavioral Problems Index-Youth Report	2.436	0.119	2.503	0.144	1.901	0.031
Behavioral Problems Index-Parents Report	1.718	0.122	1.937	0.146	1.324	0.030
Substance Abuse Index	0.874	0.073	0.844	0.096	0.471	0.017
Educational outcomes						
Not completing HS	0.257	0.034	0.350	0.047	0.164	0.006

and youth without any runaway-homeless episodes (16%). Next, we employed the logit regression to estimate the propensity score, separately for one-time runaway-homelessness and repeated runaway-homelessness. The results are shown in Table 2.

The likelihood of having runaway-homeless episodes seems to be highly correlated with socioemotional health risk, and especially with substance use. We conducted propensity score matching for each group. Thus we estimated the propensity score for having one-time runaway-homelessness episode and repeated runaway-homelessness, and we matched each person in treatment groups with a person from the control group (youth with no runaway and

Table 2. Logit Regression in Estimating the Propensity Score of One-Time Runaway-Homelessness and Repeated Runaway-Homeless Episodes.

	One time runaway-homeless episode		Repeated runaway-homeless episode	
	2,497		2,440	
Min (N)	Coef.	SE	Coef.	SE
Age12	-0.068	0.175	-0.188	0.234
Female	0.706	0.199	0.780	0.221
Hispanics	-0.076	0.251	-0.204	0.312
Black	-0.269	0.263	-0.501	0.388
Asian	0.369	0.590	—	—
Native American	—	—	-0.865	1.105
Family SES [Reference group: Family poverty level: Less than 50%]				
50%-100%	0.318	0.349	0.111	0.482
101%-150%	-0.227	0.411	0.105	0.510
151%-200%	0.221	0.404	0.220	0.520
More than 200%	-0.068	0.334	0.074	0.479
Mother's education [Reference group: Mother's education: Some college or more]				
Less than HS	0.453	0.289	0.331	0.355
HS Graduates	0.585	0.278	0.243	0.333
Father's education [Reference group: Father's education: Some college or more]				
lths_dad97	0.061	0.291	-0.305	0.349
hsgd_dad97	0.144	0.248	-0.544	0.420
Housing and neighborhood characteristics				
Homeowners	0.171	0.202	0.253	0.305
Rural	-0.154	0.231	0.153	0.252
Mostly mobile home	-0.567	0.419	0.126	0.375
% of Whites in the county of residence (Census 1990)	0.651	0.620	-0.476	1.405
Family structures				
Single mother	-0.455	0.342	-0.324	0.396
Single father	-1.962	1.041	-1.295	0.902
N of children under age 18 in household 1997	-0.058	0.074	0.111	0.077
Parenting [Reference group: Mother parenting: No involvement]				
Mother parenting styles: Permissive	-0.753	0.318	0.000	0.000
Mother parenting styles: Authoritarian	-0.655	0.329	0.195	0.383
Mother parenting styles: Authoritative	-0.631	0.305	-0.017	0.363

(continued)

Table 2. (continued)

Min (N)	One time runaway-homeless episode		Repeated runaway-homeless episode	
	2,497		2,440	
	Coef.	SE	Coef.	SE
Mother's monitoring youth reported	0.000	0.000	0.063	0.379
Youths' report on relationship with mom	-0.007	0.023	0.063	0.024
Parenting [Reference group: Father parenting: No involvement]				
Father parenting styles: Permissive	-0.050	0.287	0.398	0.321
Father parenting styles: Authoritarian	0.196	0.318	0.034	0.396
Father parenting styles: Authoritative	-0.006	0.035	-0.010	0.041
Father's monitoring youth reported	0.023	0.033	0.013	0.038
Youth's report on relationship with dad	-0.199	0.346	-0.174	0.457
Socioemotional health	0.098	0.061	0.061	0.069
Behavior Scale Youth Report	0.143	0.060	0.199	0.070
Behavior Scale Parent Report	0.399	0.093	0.299	0.106
Substance Use index 1997	-3.110	0.885	-0.951	2.075
Constant	-3.283	0.729	-1.985	1.488

homeless episodes) that shared a similar propensity score. We used both matching with replacement and without replacement.

The success of matching was assessed by comparing the means of background variables across matched groups (Hill, Waldfogel, & Brooks-Gun, 2002). To test the balance between the comparison groups (how similar the comparison groups are), we calculated *t*-statistics for the differences in all the covariates across treatment and control groups. The smaller the *t*-statistic, the better the balance between the treatment and control groups the matching has achieved. Therefore, determining whether including each covariate in a model to estimate the propensity score was based on the statistical significance of the covariate and how well the balance was while having the covariate in the model or not. Table 3 shows the matching results from the matching with and without replacement.

Table 3. Balance Among Unmatched and Matched Samples.

N (MIN)	Onetime runaway-homeless episode				Repeated runaway-homeless episode			
	2,497	1,644	Matched with replacement	Matched without replacement	2,440	1,265	Matched with replacement	Matched without replacement
Age 12	-0.86	-0.12	0.14	0.14	-1.06	-0.18	-0.11	-0.11
Female	3.11	0.07	-0.15	-0.15	3.03	0.13	-0.49	-0.49
African American	-0.27	-0.22	0.09	0.09	0.26	-0.33	0.01	0.01
Hispanic	-0.17	0.26	-0.12	-0.12	-0.32	0	-0.01	-0.01
Asian	0.33	-0.12	0	0	-0.26	-0.14	-0.75	-0.75
Native American	— ^a	— ^a	— ^a	— ^a	-0.82	-1.01	0	0
Family poverty level: 50%-100%	1.48	0.09	-0.19	-0.19	0.71	0.03	0.08	0.08
Family poverty level: 101%-150%	-0.6	0.16	0.08	0.08	0.81	-0.04	0.09	0.09
Family poverty level: 151%-200%	0.93	0.19	0.75	0.75	0.68	0.01	-0.09	-0.09
Family poverty level: Above 200%	-1.14	-0.24	-0.29	-0.29	-1.8	0.07	0.02	0.02
Mother's education: Less than HS	0.79	0.04	-0.02	-0.02	1.33	0.03	0	0
Mother's education: HS Graduates	1.07	-0.08	0.16	0.16	-0.43	-0.09	0.06	0.06
Father's education: Less than HS	0.52	0.06	0.04	0.04	1	-0.04	-0.25	-0.25
Father's education: HS Graduates	0.58	-0.15	0.2	0.2	-1.25	-0.06	0.19	0.19
% of Whites in the county: 1990	1.01	0.12	0.01	0.01	0.15	0.47	0.05	0.05
Parent homeowner	1.77	0.09	0.13	0.13	1.54	-0.02	0.02	0.02
Rural residence 97	-1.41	0.26	-0.07	-0.07	0.03	0	-0.34	-0.34
Single mother/mother figure	0.54	0.16	-0.08	-0.08	1.57	0	0.22	0.22
Single father/father figure	-1.2	0.04	-0.06	-0.06	-0.4	-0.26	0.32	0.32
N of children under age 18 in household	-0.37	-0.02	-0.09	-0.09	1.51	-0.15	0.33	0.33
Youth's report on relationship with mother	-2.54	-0.32	0.24	0.24	-4.65	-0.25	-0.27	-0.27

(continued)

Table 3. (continued)

	Onetime runaway-homeless episode		Repeated runaway-homeless episode	
	2,497	1,644	366	244
N (MIN)	Unmatched	Matched with replacement	Matched without replacement	Unmatched
Youth's report on relationship with father	-2.63	-0.15	-0.15	-4.25
Mother parenting styles: permissive	-2.12	0.01	0.27	-0.89
Mother parenting styles: authoritarian	1.05	0.08	-0.13	2.4
Mother parenting styles: authoritative	-0.93	-0.2	0.03	-1.86
Father parenting styles: permissive	-2.19	0.34	0.19	-2.17
Father parenting styles: authoritarian	1.46	0.08	0.06	3.59
Father parenting styles: authoritative	-0.47	-0.43	-0.08	-2.64
Monitoring youth reported by father	-2.08	-0.15	0.01	-3.19
Monitoring youth reported by mother	-2.35	-0.2	-0.38	-3.91
Behavior Scale Youth Report	4.43	0.09	-0.03	4.23
Behavior Scale Parent Report	3.52	0.28	0.02	4.68
Substance Use index 1997	6.06	0.48	0.18	4.69
Average t-statistics	0.23	0.02	0.02	0.07
				-0.03
				-0.02

^aDue to the small sample size, it was dropped from the analysis.

In the unmatched samples, high t -statistics were found in most of the dummy variables for family structures, parenting styles, and the parental report of youth–parent relationship. All the variables that measured socioemotional health such as substance use and behavior scale reports by both youth and parents had very high t -statistics between the treatment and control groups before matching. However in matched samples, all the t -statistics were under critical values for one-time and repeated runaway-homeless episodes, and they were mostly close to zero. Overall, there are no major differences in the t -statistics by matching methods for both runaway-homeless groups. We also obtained the average t -statistics of all covariates that were used to estimate the propensity score matching for both unmatched and matched groups. It is expected that the t -statistic would have a normal distribution with a mean of zero in a randomized experiment setting with a large enough sample size, which is used as a benchmark to assess the balance (e.g., Hill et al., 2002). The average t -statistics for both runaway episodes were very close to zero, and we achieved a good balance across treatment and control groups in matched samples for both matching methods.

The Effects of Runaway-Homeless Episodes

Table 4 indicates the effect (average treatment effect) of one-time and repeated runaway-homelessness on the likelihood of not graduating from high school. The first four columns on the left present the results for the samples matched with replacement. For those that were matched with replacement, we obtained standard errors using weighted samples for those that were matched more than once. The last column is the results for the sample that was matched without replacement, and we obtained standard errors using bootstraps with 1000 repetitions. We estimated the effect of one-time and repeated runaway-homeless episodes. Differences in means and the regression estimates of youth's probability of not completing school (except for the sample without replacement) are presented. For the sample matched with replacement, we estimated differences in regression estimates of the probability of not completing high school while controlling for all the covariates that we used to estimate a propensity score. Regression estimates that control for pretreated covariates aim to achieve more precision in the results because it is possible that matching may not have caught differences between the treatment and control groups.

We found that among matched samples, regardless of matching methods, there was a significant effect of one-time runaway-homeless episode on not graduating from high school. This indicates that if youth had not run away

Table 4. Estimated Effects of One-Time Runaway-Homeless and Repeated Runaway-Homeless Episodes on the Probability of Not Completing High School.

One-time runaway-homeless episode						
Matched with replacement					Matched without replacement (One-to-one matching)	
Diff. Means		Regression			Diff. Means	
N (min)		1,644			366	
H.S.	t.e.	t	t.e.	t	t.e.	t
Graduation	0.10*	2.52	0.10*	3.04	0.09*	1.99
Repeated runaway-homeless episodes						
Matched with replacement					Matched without replacement (One-to-one matching)	
Diff. Means		Regression			Diff. Means	
N(min)		1265			244	
H.S.	t.e.	t	t.e.	t	t.e.	t
Graduation	0.17**	3.44	0.16**	3.75	0.13*	2.28

Note: t.e indicates causal effects, and t indicates t-statistics. Bold indicates the statistical significance, ** at 1%; * at 5%.

once from home, the likelihood of the youth graduating from high school would have been 10% higher. We also found a consistent strong positive effect of having repeated runaway episodes, while the effect slightly varies by matching methods. If youth had not run away from home multiple times, the likelihood of not completing high school would have been about 13% to 16% higher.

Sensitivity Analysis

Since the estimation of the treatment effects with matching estimators was based on the aforementioned ignorability assumption, it still does not control for unobserved variables. Therefore, the matching estimators are not robust against “hidden biases.” In particular, there are critical variables that are not available in NLSY97, such as parental substance use or parental maltreatment or abuse on youth, which are known as significant determinants of youth’s running away from home and becoming homeless (Powers et al., 1990; Ringwalt et al., 1998); thus, there is potential for hidden biases. For this reason, we conducted a sensitivity analysis for those who had significant treatment effects using Rosenbaum’s bounding approach (2002). The sensitivity

analysis tests how strongly an unobserved variable must influence the selection process in order to undermine the assumptions about the matching estimation. The details of this application can be found in Aakvik (2001) and Caliendo and Kopeinig (2006). If we have a positive (unobserved) selection, meaning that if those youth who are more likely to have runaway-homeless episodes or are more likely to drop out of high schools due to unobserved characteristics, the estimated treatment effects are overestimated. We tested for unobserved bias related both to different levels of selection bias and different levels of treatment.

The Mantel-Haenszel statistics (Q_{mh+}) assuming overestimation of the effect of runaway-homelessness at significance level was estimated by simulating the situations that assume the different levels of unobserved selection biases. These are expressed by e^y , ranging from 1, 1.5 to 2. For example, $e^y = 1$ assumes that there is no unobserved selection bias. When $e^y = 1.50$, it means that even though NLSY97 youth were evenly distributed across observed socioeconomic characteristics, treatment and control groups would differ in terms of unobserved characteristics and that the odds of having one-time or repeated runaway-homeless episodes are higher among treatment group than control groups by 50 percent (or 1.5 times). Furthermore, $e^y = 2$ means that even among the youth who are evenly distributed across observed characteristics, the odds of running away from home would be higher among the treatment group than the control group by 100% (or 2 times) due to unobserved variables (an extreme scenario). This sensitivity analysis does not indicate the existence of biases in this study, rather it demonstrates the robustness of matching estimators using the simulations (Aakvik, 2001). Using this test, we found that the significance levels of the Mantel-Haenszel statistics for $e^y = 1, 1.5$, and 2 , were 0.000 , 0.007 , and 0.190 for one-time runaway-homeless episode. This shows that the estimated treatment effects are insensitive to a bias that would have increased the likelihood of having one-time runaway-homeless episode by up to 50% ($e^y = 1.5$) but sensitive to the biases that would have doubled the odds. Thus, even if there are unobserved characteristics that would have increased the odds of having one-time runaway-homeless episode by 50%, our estimates of one-time runaway episode are still robust.

For repeated runaway-homeless episodes, the significance level of the Mantel-Haenszel statistics for $e^y = 1, 1.5$, and 2 , were 0.000 , 0.000 , and 0.001 . This means that the estimated treatment effects are still robust even if there are unobserved characteristics that would have increased the likelihood of having repeated runaway-homeless episodes by up to 100% (or 2 times). In both scenarios, the results remain insensitive to the varying assumptions

about the unobserved factors. Thus, based on the sensitivity analysis, the findings in this study provide some evidence that the treatment effects we found are fairly robust, and that there is a significant detrimental effect of having both one-time runaway-homeless and repeated runaway-homeless episodes on youth's educational outcomes.

Discussion and Conclusion

In this article, we examined the effect of runaway-homeless episodes on high school graduation using a nationally representative data of youth in the United States. The findings of this study show a long-term impact of runaway episodes on educational attainment, thus confirming previous research that similarly found poor educational attainment of these at-risk youth (Rafferty, Shinn, & Weitzman, 2004; Rubin et al., 1996; Whitbeck et al., 2009; Zima et al., 1997). Furthermore, the use of propensity score matching, the findings of this study indicated that even after controlling for the other characteristics that lead to runaway episodes, both one-time and repeated runaway-homeless experiences themselves have significant detrimental effects on youth's educational outcomes; therefore, provided support for residential instability thesis (Aaronson, 2000). The effect of one-time runaway appeared to be smaller yet still significant, and we found a larger effect of repeated runaway-homeless episodes as expected. For youth that had run away from home multiple times, the likelihood of dropping out of high school would increase by about 18%. Youth with one-time runaway-homeless episode could be considered as an at-risk group, as we found a smaller but detrimental effect on youth's educational attainment. Thus, while runaway-homeless youth have behavioral health problems and a higher level of substance use which are associated with poor educational outcomes, this study suggests that *runaway-homeless episodes themselves* lead to poor educational outcomes in the long term.

This study has some limitations. First, the NLSY97 lacks a more direct measurement of parental abuse, parental substance use or child maltreatment. Since propensity score matching estimations are based on observed characteristics, we still have not solved the problem of omitted variable biases. However, a simulation study by Drake (1993) showed that treatment effects are fairly robust to the misspecification of a propensity score. Furthermore, the sensitivity analysis showed that even accounting for possible unobserved characteristics, our estimates were fairly robust. Second, due to the small sample size of youth who reported being on the street and being in the homeless shelter, and not being able to differentiate homeless youth who are on

their own from being a member of homeless families, we did not investigate this potentially most vulnerable homeless youth. There is a need to conduct a national survey of runaway and homeless youth and obtain detailed information with regard to their family background and family characteristics such as parental substance use and evidence of child maltreatment and abuse. Finally, NLSY97 does not have information on service usage among youth who reported runaway episodes. Future research should examine the patterns of runaway and homeless episodes, and the utilization of mental health or housing services and how such service usage possibly affects educational outcomes of youth when data are available. The increased likelihood of runaway-homeless episodes to have a negative effect on school success suggests the need for strategies designed to prevent recurrence of episodes of running away and homelessness.

Despite data limitations, this study is one of the first to use a national longitudinal survey to examine the effect of runaway-homeless episodes on educational outcomes of youth. Given the fact that runaway-homeless youth are more likely to drop out of school, educational policy makers must work in concert with social welfare policy makers to develop and implement empirically supported programs, including behavioral health interventions to youth since those with behavioral health problems are more likely to run away from home. These interventions should be delivered in supportive and accessible settings such as schools and youth-focused drop-in centers.

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Notes

1. For details, please see Von Hippel (2007).
2. We excluded youth who had moved out of from a parent's home by 2000.
3. Originally, other family structures such as adoptive parents or stepparents were included in preliminary analysis and results were robust with and without those additional family measures and for the purpose of simplifying results, only single mother and single father were included.

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