EMPIRICAL RESEARCH

Running Away From Home: A Longitudinal Study of Adolescent Risk Factors and Young Adult Outcomes

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Abstract Little is known about the adolescent risk factors and young adult health-related outcomes associated with running away from home. We examined these correlates of running away using longitudinal data from 4,329 youth (48% female, 85% white) who were followed from Grade 9 to age 21. Nearly 14% of the sample reported running away in the past year at Grade 10 and/or Grade 11. Controlling for demographics and general delinquency, running away from home was predicted by lack of parental support, school disengagement, greater depressive affect, and heavier substance use at Grade 9. In turn, runaways had higher drug dependence scores and more depressive symptoms at age 21 than non-runaways, even after taking these antecedent risk factors into account. Runaway status did not predict alcohol dependence risk at age 21. Results highlight the importance of substance use and depression, both as factors propelling adolescents to run away and as important long-term consequences of running away.

Keywords Runaway · Substance abuse · Depression · Longitudinal

Introduction

It is challenging at best to estimate the percentage of adolescents who run away from home, but national surveys suggest that 6–7% of adolescents do so in any given year (SAMHSA 2004; Sanchez et al. 2006; Tyler and Bersani 2008). Most runaways are gone for less than a week and stay within 50 miles of home (Hammer et al. 2002), eventually returning to their parents or guardian (Milburn et al. 2007). Nonetheless, being on their own for even a short period of time may exacerbate the problems that caused the youth to run away in the first place, as well as increase their likelihood of engaging in high-risk behavior, being exploited or victimized by others, and resorting to illicit activities in order to secure basic necessities such as food and a place to stay while away from home (Chen et al. 2007; Kipke et al. 1997; Wagner et al. 2001). Better understanding the risk factors for running away from home and the long-term consequences of this behavior is necessary in order to better serve these at-risk youth.

Perhaps the most commonly cited reason why adolescents run away from home is to escape a negative family environment (National Runaway Switchboard 2008; Van der Ploeg and Scholte 1997). High rates of family physical or sexual abuse among runaway and homeless youth are well-documented (Kipke et al. 1997; Whitbeck et al. 1997). In a rare study of runaway adolescents and their parents, Safyer et al. (2004) found that 41% of the adolescents attributed their runaway behavior to a poor relationship dynamic with their parents. Interestingly, only 7% of parents agreed and most (89%) believed that their child was solely to blame for the runaway episode. Although studies typically ask runaways to retrospectively recall the reasons why they left home, prospective studies indicate that poor parenting practices and physical abuse increase the likelihood that a child will run away (Tyler and Bersani 2008; Tyler et al. 2008). Despite the importance of family environment, adolescents who run away from home report doing so for a variety of reasons.

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Much of what is known about the risk profiles of runaway youth comes from studies that focus on a larger population that includes both runaway youth and homeless youth. These studies highlight the multifaceted problems that many of these youth face, which extend beyond dysfunctional family relationships. Disengagement from school is a widespread problem in this population (Thompson and Pillai 2006). A recent analysis of over 15,000 records of youth using crisis shelters and transitional living programs found that 47% had irregular school attendance and 22% had dropped out or been expelled from school (Thompson and Pollio 2006). These youth also commonly suffer from mental health problems (Farrow et al. 1992). Rates of serious mental disorders (e.g., depression, mania, psychosis) range from 19–50%, with depression being the most common disorder (Robertson 2004). Rates of alcohol and drug use are extremely high in this population as well (Wenzel et al. in press), with two-thirds or more of youth meeting DSM diagnostic criteria for substance abuse or dependence (Baer et al. 2003; Johnson et al. 2005; Kipke et al. 1997). Having a history of substance abuse is more likely among youth who repeatedly run away from home compared to those who run away only once (Thompson and Pillai 2006). Such profiles suggest that the risk factors for running away from home may encompass both family and school environments, behavioral problems such as substance abuse, and intrapersonal vulnerability such as depression.

Establishing such cross-sectional profiles of runaway youth is critically important to understanding this population and how best to meet its need for services. However, prospective research is necessary in order to begin unraveling whether these characteristics directly contribute to running away from home, simply co-occur with the true causes of running away (e.g., family conflict), or are a consequence of youth being away from home and on their own for a period of time. Empirically addressing this issue has been challenging because it requires identifying a sizable group of runaway youth, tracking their psychosocial development over time (both prior to and after a runaway episode), and comparing them in a reasonable way to youth who have not run away from home. Despite these challenges, a small number of prospective studies of runaway behavior have been conducted, each with its strengths and limitations.

Two studies using data from the National Longitudinal Study of Adolescent Health (Add Health) have examined predictors of running away during the past year. One study focused exclusively on sociodemographic risk factors, finding that adolescents who were female, older, from a disrupted or single-parent family, attending a school in an urban environment, or living in the Western part of the U.S. were at increased risk for running away (Sanchez et al.

2006). The other study focused additionally on non-demographic risk factors, finding that runaway behavior was more likely among adolescents who had been exposed to violence, had poorer parent–child relationship quality, had a history of delinquent behavior, had more depressive symptoms, and earned poorer grades in school (Haynie et al. 2009). A third study using Add Health data examined the impact of running away on girls' sexual onset, finding that runaways were 1.7 times more likely than non-runaways to report sexual onset over the one-year follow-up (Thrane and Chen 2010). A prospective study using data from the National Longitudinal Survey of Youth (NLSY) examined parenting practices, environmental risks, and problem behaviors as predictors of running away (Tyler and Bersani 2008). Multivariate analyses indicated that running away was more likely among those reporting low parental monitoring, direct or indirect exposure to victimization, suspension from school, and delinquent behavior. Interestingly, harsh punishment, exposure to deviant peers, and early onset of alcohol use were unrelated to running away in this analysis. Windle (1989) used data from the NLSY to examine young adult outcomes associated with running away. Three groups of 14–15 year olds were compared on substance use and dropping out of school 4 years later: non-runaways, one-time runaways, and repeat runaways. Both groups of runaways were considerably more likely than non-runaways to drop out of school. However, the potential effects of running away on substance use were less clear (varying by gender and whether the adolescent was a repeat vs. one-time runaway) and limited by the reliance on lifetime measures of drug use rather than specifically on young adult consumption and dependency symptoms. Finally, one of the very few studies to examine both the predictors and consequences of running away used data from the National Survey of Child and Adolescent Well-Being (Tyler et al. 2008). Predictor variables focused exclusively on family dynamics and neighborhood quality, finding that less positive parenting practices and physical abuse at baseline predicted running away from home 18 months later. In terms of consequences, adolescents who ran away from home reported greater engagement in delinquent behavior 18 months later, but not greater victimization or lesser well-being.

Hypotheses

The present study adds to this small body of literature by examining runaway behavior in a longitudinal cohort of 4,329 youth followed from Grade 9 to age 21, with a special focus on the potentially important roles of substance use and depressive symptoms as both antecedents and long-term consequence of running away from home.

This study had the following three goals: to identify adolescent risk factors associated with running away from home; to understand whether running away from home increases an adolescent's risk for substance abuse and depressive symptoms at age 21; and to examine whether the risk factors and outcomes associated with running away differed for low- versus high-frequency runaways. Consistent with existing evidence that family dysfunction is a common reason for running away, we hypothesized that adolescents who initially perceived lower parental support would be more likely to subsequently run away from home. However, we also expected that substance use and depressive symptoms, as well as school disengagement, would emerge as additional unique predictors of running away after adjusting for the level of perceived parental support. In terms of young adult outcomes, we hypothesized that the experience of running away from home during adolescence would in turn increase the likelihood of later substance abuse and depressive symptoms at age 21, even after accounting for the antecedent risk factors just mentioned. Although we are controlling for these antecedent factors, we do not have any formal hypotheses regarding the associations between Grade 9 predictors and age 21 outcomes. Finally, in light of evidence that repeat runaways differ from one-time runaways on a range of psychosocial characteristics (Thompson and Pollio 2006; Windle 1989), we conducted exploratory analyses to determine whether the risk factors and outcomes associated with running away differ for low- versus high-frequency runaways.

Method

Participants

Participants were part of the Project ALERT field trial conducted in South Dakota and designed to test the middle school version of Project ALERT, which was implemented for students in Grades 7 and 8, and an expanded version (ALERT Plus) that augmented the original curriculum with booster lessons during Grades 9 and 10 (Ellickson et al. 2003). Project ALERT is a social-influence-based intervention based on a synthesis of several theories of behavioral change. The Project ALERT curriculum, which is delivered to all students during regular school hours, seeks to help adolescents recognize that most people do not use drugs or approve of doing so, understand the benefits of not using, develop reasons not to use, and understand the immediate and long-term consequences of drug use. It also seeks to build drug resistance self-efficacy by helping adolescents identify and resist both internal and external pressures to use drugs, and by providing role models for

non-use. A total of 5,857 seventh-grade students from 62 middle schools were enrolled in the study.

Students completed annual paper-and-pencil surveys in school at Grades 7 through 11 and completed two additional surveys by mail or via the internet approximately two and four years after completing high school. Trained staff administered the in-school surveys. Parental consent for participants under age 18 was solicited via procedures approved by RAND's Human Subjects Protection Committee. Students were asked to assent at each survey administration. Project staff conducted make-up survey sessions in school and mailed surveys to movers and chronic absentees to minimize attrition.

Sample, Missing Data and Attrition

The analyses reported in this article are based on 4,329 baseline (Grade 7) respondents. We excluded 1,528 baseline respondents (26%) who failed to meet the following conditions: completing a survey in Grade 9 ($n = 592$), completing either the Grade 10 or 11 surveys ($n = 403$), providing sufficient information at the Grade 10–11 surveys to determine the youth's runaway status ($n = 526$), and having complete data for the Grade 9 deviance measure ($n = 7$).

Respondents in the analytic sample differed from those who were excluded on several baseline characteristics. For example, relative to attriters, respondents in the analytic sample were more likely to be white (90% vs. 74%) and from an intact nuclear family (73% vs. 50%), and less likely to have tried alcohol (59% vs. 64%). To allow inferences back to the baseline sample, we generated analytic weights for the raw data from the 4,329 individuals in the analytic sample based on results from a stepwise regression procedure implemented with SAS v.9.1 (SAS Institute 1990). These weights successfully balanced the analytic sample so that it matches the full baseline sample on important demographic and personal characteristics measured at baseline. Specifically, after weighting, the two samples looked very similar with respect to gender, age, ethnicity, parental education, intact nuclear family, lifetime alcohol and drug use, deviance, and grades in school.

The 4,329 participants had sufficient data to be included in the analyses involving data from Grades 9–11, but 34% of the participants in the main analytic sample of 4,329 did not complete the final survey; thus associations involving the age 21 outcomes are based on a reduced sample of 2,841. By using the maximum likelihood estimation for incomplete data method provided in Mplus (Muthén and Muthén 1998–2004), which assumes the data are missing at random (Little and Rubin 2002), we were able to account for the study attrition within the analyses. That is, in the final models that included Grade 9 predictors, runaway

status, and age 21 outcomes, the relationships between the Grade 9 predictors and runaway status were estimated based on data from the full analytic sample whereas the associations between runaway status and the age 21 outcomes were estimated based on the reduced sample. The maximum likelihood estimation also accounted for the small amount of item-level missing data for the Grade 9 latent variables and age 21 outcomes within study waves. However, approximately 2% of participants ($n = 91$) had missing values for SES and/or number of schools attended as of Grade 9. Because these were exogenous variables (covariates in the model), the missingness could not be handled within the maximum likelihood estimation and would result in list-wise deletion. Rather than exclude these participants from the analyses, we used SAS PROC MI to generate imputed values for these two exogenous variables.

Measures

Substance Use at Grade 9

Substance use was measured with a latent variable comprised of three indicators: a continuous measure of alcohol misuse in the past year (Edelen et al. 2009); a 4-category item asking about frequency of marijuana use in the past year ($0 = none$ to $4 = more$ $than$ 20 $times$); and a dichotomous indicator of weekly cigarette use during the past year (alpha = .70).

Depressive Affect at Grade 9

Depressive affect was measured with a latent variable comprised of three likert item indicators querying the amount of time in the past month the respondent has felt depressed, blue, and down in the dumps ($0 = all$ of the $time$ to $5 = none$ of the $time$) (alpha = .90).

Lack of Parental Support at Grade 9

Lack of parental support was measured with a latent variable comprised of three likert item indicators assessing the respondents' extent of agreement ($1 = strongly$ $agree$ to $4 = strongly$ $disagree$) with statements characterizing supportive interactions with their parents (e.g., my parents say good things to me when I do well in school) (alpha = .81).

School Disengagement at Grade 9

School disengagement was measured with a latent variable based on five items that included grades in school ($1 = mostly$ $A's$ to $5 = mostly$ $F's$), the highest level of school the respondent intended to complete ($1 = I$ $plan$ to

go to graduate school to $5 = I$ may not $finish$ $high$ $school$), and three attitudes toward school – whether the respondent looks forward to school most mornings and likes his/her classes ($1 = definitely$ yes to $4 = definitely$ no), and how much of what is learned in school is a waste of time ($1 = none$ of it to $4 = all$ of it). To create a latent variable, we used three indicators: the mean of the three attitude items, grades and intentions (alpha = .69).

Runaway Status at Grades 10 and 11

We focused on past year runaway episodes reported at Grade 10 or 11 in order to capture the most common ages for running away (15–17 years; Hammer et al. 2002). Responses to the question "In the past year how often have you run away from home for overnight or longer?" were used to classify respondents as follows: individuals who responded "not at all" at both time points were non-runaways; those who responded "1–2 times" at one assessment and "not at all" in the other were low frequency runaways; and those who responded "3–5 times" or greater at either wave or "1–2 times" at both waves were high frequency runaways. The response options for this item did not allow us to identify those who had run away just once.

Alcohol Dependence Risk at Age 21

Alcohol dependence risk was measured with the AUDIT (Bohn et al. 1995), which has been shown to have good psychometric properties and performance in predicting DSM-IV alcohol diagnoses (Allen et al. 1997; Chung et al. 2000). The observed continuous scale score ranges from 0 to 36, with values of 4 and above indicative of alcohol abuse or dependence.

Drug Abuse/Dependence at Age 21

Drug abuse/dependence was operationalized as the observed sum of seven problems experienced in the past year because of using drugs other than alcohol. The seven problems are based on DSM-IV criteria (e.g., experienced withdrawal, tried to cut down but could not, neglected children or partner) (D'Amico et al. 2005).

Depressive Symptoms at Age 21

We measured depressive symptoms with eight observed items from the CES-D (Radloff 1977). The subset of items were chosen from the full CES-D inventory based on an item response theory analysis that identified the optimal 8-item set to maximize precision of measurement from very low to very high values of the depressive symptom construct.

Model Covariates

All models included Grade 7 (baseline) observed measures of region, enrollment (a study design variable), ethnicity and gender as control variables. Additional covariates included observed Grade 9 measures of age, family composition (whether living in a two-parent household), SES (as operationalized by the ratio of household rooms to family members), number of schools attended, and a measure of deviance. Deviance was operationalized as the proportion of 5 items endorsed as experienced in the past year (i.e., broke into a house, school or place of business; stole something from a store; been sent out of classroom for causing trouble; damaged someone else's property or possessions; hit or threatened to hit someone). Finally, preliminary analyses demonstrated that relative to being in the control condition, being in the Alert Plus treatment condition was associated with lower Grade 9 substance use and less likelihood of being in the high frequency runaway group. Therefore, we included indicators of treatment condition (ALERT and ALERT Plus, with Control as the comparison condition) as covariates in all models.

Analytic Approach

We used structural equation modeling implemented with Mplus to examine whether the four latent variables (LVs) measured at Grade 9 were predictive of runaway status, and whether runaway status, in turn, was predictive of each of the observed age 21 outcomes. Figure 1 is a representation of our conceptual model. All models employed attrition weights and controlled for clustering. Because there were several ordinal variables in the analyses, all models used the WLSMV estimator. We followed Hu and Bentler's (1999) guidelines for evaluating model fit, using CFI and NNFI values greater than .95 and RMSEAs less than .05 as indicators of excellent fit. The WLSMV chi-square difference test, calculated with the Mplus software, was used to compare the fit of nested models (i.e., to examine effect of equality constraints on model fit).

Establishing Measurement Model for Grade 9 LVs and Grade 10–11 Runaway Status

The first step established a measurement model for the four Grade 9 LVs, controlling for the model covariates. After confirming a well-fitting measurement model, we added predictive paths from each of the Grade 9 LVs to the two runaway status indicators (low and high frequency runaways). We also estimated paths from each of the covariates to the two runaway status indicators. Because the disposition of the main study hypotheses might vary depending on whether the predictors' and outcomes'

associations with runaway status differed for low vs. high frequency runaways, we chose to examine these differences in a series of model building steps before evaluating the main study hypotheses.

Evaluating Equality of Covariates and LVs' Associations with High vs. Low Runaway Status

Accordingly, in our next modeling step, we examined the fit of nested models to establish whether the covariates and each of the four LVs differentially predicted low and high frequency runaways. The nested model comparisons were conducted as follows: the effects of all the model covariates on runaway status were tested as a group with an 8 df model comparison test; and each of the four LVs' associations with runaway status were tested one at a time, with 1 df model comparison tests for depressive affect, lack of parental support, school disengagement, and substance use in that order.

Incorporating Age 21 Outcomes and Evaluating Equality of High vs. Low Runaway Status with Each Outcome

Our next model building step integrated the age 21 outcomes in three separate models by estimating the predictive paths from the runaway status indicators to each of the age 21 outcomes in turn. As with the associations between Grade 9 predictors and runaway status, we chose to first evaluate the equality of low vs. high runaway status' associations with each outcome in order to establish three final outcomes models that incorporated all observed equalities. Thus we examined, with 1 df nested model comparison tests for each outcome, whether low and high frequency runaway status was differentially related to each of these outcomes. The final models included Grade 9 predictors, Grade 10–11 runaway status, and each of three age 21 outcomes, and incorporated all observed equality constraints resulting from the low and high frequency equality tests. The main hypotheses were evaluated based on these final models.

Results

Table 1 provides descriptive information about the sample with comparisons according to Grade 10–11 runaway status. Over the two-year period spanning Grades 10–11, 13.7% of adolescents reported running away. This rate may be higher than the 6–7% reported in other studies (e.g., Substance Abuse and Mental Health Services Administration (SAMHSA) 2004) due to the fact that we used a two-year reporting period rather than a one-year reporting period. The full weighted analytic sample of 4,329 students

Fig. 1 Conceptual model of the hypothesized associations
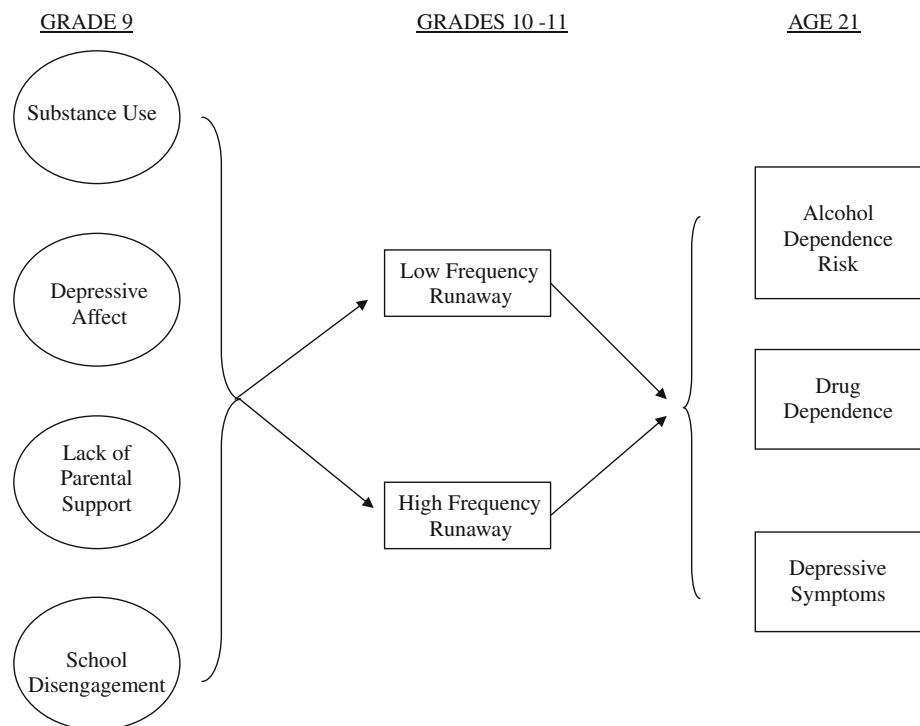
was 48% female, with 85% white, 8% Native American, 5% other race/ethnicity and 2% of unknown ethnicity. The age of Grade 9 survey participants ranged from 13 to 17 years (median = 15). Sixty-four percent of participants were living in two-parent households at Grade 9. Average household SES was 1.57 (SE = .012), reflecting the ratio of household rooms to family members. As can be seen from the table, the distribution of ethnicity differed according to runaway status, with white respondents being over-represented in the non-runaway group. Similarly, non-runaways were more likely to come from an intact nuclear family and have higher SES. High frequency runaways reported attending a significantly higher number of schools than non-runaways. With respect to the outcomes at age 21, non-overlapping confidence intervals indicate that high frequency runaways had higher alcohol dependence risk scores and more depressive symptoms than non-runaways; both runaway groups had higher drug dependence scores than non-runaways.

Establishing Measurement Model for Grade 9 LVs and Grade 10–11 Runaway Status

The measurement model for the four latent variables fit the data very well: $\chi^2_{(21,n=4329)} = 181.638$, $p < .001$, CFI = .979, NNFI = .979, RMSEA = .042. As can be seen in Table 2, all model indicators had strong and significant loadings on their respective LVs. The four LVs were modestly but significantly correlated with one another. Extending the model to include runaway status at Grades

10–11, with predictive paths from each of the Grade 9 LVs to each runaway status indicator also resulted in excellent fit to the data: $\chi^2_{(21,n=4329)} = 170.48$, $p < .001$, CFI = .977, NNFI = .976, RMSEA = .041. This model also included predictive paths from the model covariates to each of the runaway status indicators.

Evaluating Equality of Covariates and LVs' Associations with High vs. Low Runaway Status

In the next model building step, a series of nested model comparison tests revealed that low and high frequency runaways were not differentially predicted by any of the model covariates (tested as a group, $\chi^2_{\text{diff}(8,n=4329)} = 2.302$, $p = .9703$), depressive affect ($\chi^2_{\text{diff}(1,n=4329)} = .001, p = .9783$), lack of parental support ($\chi^2_{\text{diff}(1,n=4329)} = .017, p = .8958$), or school disengagement ($\chi^2_{\text{diff}(1,n=4329)} = 2.376$, $p = .1232$). However, although substance use was positively associated with both high and low frequency runaways, it was significantly more strongly related to high frequency runaway status ($\chi^2_{\text{diff}(1,n=4329)} = 6.422$ $p = .0113$). A final test revealed that 7 of the 8 paths from the LVs to high and low frequency runaway status (the exception being the path from substance use to high frequency runaway status) were not significantly different from one another ($\chi^2_{\text{diff}(2,n=4329)} = 2.207, p = .3318$). Thus it was determined that a single value was sufficient to characterize 7 of the 8 path coefficients representing predictions of the four LVs to high and low frequency runaway status and a separate value was necessary to characterize the path from substance use to

Table 1 Descriptive information for full sample and according to grade 10–11 runaway status

Variable	Full sample (N = 4,329) (%)	Grade 10–11 Runaway Status		
		Never (n = 3,822; 86.3%) (%)	Low frequency (n = 281; 7.2%) (%)	High frequency (n = 226; 6.5%) (%)
Gender				
Male	48.5	48.1	53.1	48.3
Female	51.5	51.9	46.9	51.7
Ethnicity[a]				
White	84.5	86.4	74.1	71.5
Native American	8.4	7.1	14.6	18.2
Other	5.1	4.6	8.4	8.0
Unknown	2.0	1.9	2.9	2.3
Nuclear family, grade 9[b]	63.9	66.6	51.7	41.4
	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
Age, grade 9	14.83 (14.82–14.85)	14.83 (14.81–14.85)	14.84 (14.78–14.90)	14.90 (14.82–14.98)
SES, grade 9	1.57 (1.55–1.59)	1.59 (1.56–1.61)	1.46 (1.38–1.54)	1.42 (1.30–1.54)
Schools attended, grade 9	1.67 (1.64–1.69)	1.64 (1.62–1.67)	1.77 (1.66–1.88)	1.86 (1.72–2.00)
Deviance, grade 9	0.24 (0.23–0.25)	0.21 (0.20–0.22)	0.38 (0.34–0.42)	0.47 (0.43–0.52)
Alcohol AUDIT, age 21	7.08 (6.86–7.30)	6.92 (6.69–7.15)	7.67 (6.75–8.58)	8.79 (7.51–10.06)
Drug dependence, age 21	0.30 (0.26–0.34)	0.23 (0.20–0.27)	0.64 (0.41–0.87)	0.91 (0.58–1.26)
Depressive symptoms, age 21	4.32 (4.14–4.51)	4.15 (3.97–4.34)	4.73 (3.98–5.49)	6.44 (5.19–7.69)

Note: All tabulated percentages are weighted to reflect back to the baseline sample

[a] Ethnic composition varies significantly according to runaway status: $\chi^2_{(6)} = 108.6$, $p < .0001$

[b] Intact nuclear family varies significantly according to runaway status: $\chi^2_{(2)} = 126.7$, $p < .0001$

Weighted means and 95% confidence intervals are reported for continuous outcomes. Non-overlapping CIs indicate mean is significantly different at $p < .05$ (e.g., SES for non-runaways is lower than SES for low and high runaways)

high frequency runaway status. This constrained model fit the data well ($\chi^2_{\text{diff}(21,n=4329)} = 135.17$, $p < .001$, CFI = .982, NNFI = .981, RMSEA = .035) and was a substantial improvement over the unconstrained version.

Incorporating Age 21 Outcomes and Evaluating Equality of High vs. Low Runaway Status with Each Outcome

We incorporated the age 21 outcomes to this base model with a final series of models that examined whether the three age 21 outcomes were significantly predicted by runaway status after controlling for the influence of the Grade 9 LVs. Therefore, these models included paths from runaway status to each outcome as well as separate paths from each of the Grade 9 LVs to each outcome. All three initial models fit the data well ($\chi^2_{\text{diff}(21,n=4329)} = 140.087$, $p < .001$, CFI = .980, NNFI = .979, RMSEA = .036 for alcohol dependence risk; $\chi^2_{\text{diff}(21,n=4329)} = 126.802$, $p < .001$, CFI = .982, NNFI = .981, RMSEA = .034 for drug dependence; and $\chi^2_{\text{diff}(21,n=4329)} = 123.469$, $p < .001$, CFI = .983, NNFI = .982, RMSEA = .034 for depressive symptoms).

As with the previous stage of model building, we first evaluated whether high and low runaway status had differential impact on each age 21 outcome. Despite the significant bivariate associations of runaway status with alcohol dependence risk scores and depressive symptoms reported earlier, the model-based tests of differences between low and high frequency runaway status as it relates to the age 21 outcomes were not significant for any of the three outcomes ($\chi^2_{\text{diff}(1,n=4329)} = .025$, $p = .8753$; $\chi^2_{\text{diff}(1,n=4329)} = .037$, $p = .8480$; and $\chi^2_{\text{diff}(1,n=4329)} = 2.198$, $p = .1382$; for alcohol dependence risk, drug dependence and depression, respectively). Thus, all final model results are reported for the constrained versions that estimate identical values for low and high runaway status' relationships with outcomes. These constrained models fit the data well and offered a slight improvement in model fit: ($\chi^2_{\text{diff}(21,n=4329)} = 139.225$, $p < .001$, CFI = .980, NNFI = .979, RMSEA = .036 for alcohol dependence risk; $\chi^2_{\text{diff}(21,n=4329)} = 125.735$, $p < .001$, CFI = .982, NNFI = .981, RMSEA = .034 for drug dependence; and $\chi^2_{\text{diff}(21,n=4329)} = 122.872$, $p < .001$, CFI = .983, NNFI = .982, RMSEA = .033 for depressive symptoms).

Table 2 Measurement model indicator loadings (SE), standardized loadings, and correlations among latent variables (in italics)

Latent variable	Indicator loading (SE)	Standardized loading	Depressive affect	Lack of parental support	School disengagement
Substance use			*0.078*	*0.067*	*0.360*
Alcohol misuse	1.000 (0.000)	0.776			
Marijuana use	1.941 (0.069)	0.849			
Weekly cigarette use	2.044 (0.081)	0.882			
Depressive affect				*0.305*	*0.279*
Depressed	1.000 (0.000)	0.877			
Sad, blue	1.026 (0.009)	0.898			
Down in the dumps	1.027 (0.009)	0.899			
Lack of parental support					*0.373*
Tell me when I do a good job	1.000 (0.000)	0.919			
Calmly tell me what I have done wrong	0.746 (0.012)	0.698			
Say good things when I do well in school	0.992 (0.017)	0.912			
School disengagement					
Grades	1.000 (0.000)	0.723			
Academic intentions	0.716 (0.033)	0.540			
School attitudes	0.524 (0.026)	0.673			

Evaluating Hypotheses of Grade 9 Predictors on Runaway Status

The final models are presented in Fig. 2a–c. For ease of presentation, model covariates and factor indicators are not depicted, and only significant paths are included in the figure, although all paths were estimated as described above. With respect to hypotheses regarding Grade 9 predictors of runaway status, the model portrayed in Fig. 2 shows that, consistent with our expectations, Grade 9 lack of parental support, substance use, depressive symptoms, and school disengagement were all significantly and positively associated with runaway status. The coefficient for 7 of the 8 paths was .116 ($SE = .012$, $p < .0001$) and the standardized coefficients ranged from .056–.107. The coefficient for the remaining path from substance use to high frequency runaway status had a value of .736 ($SE = .094$, $p < .0001$) with a standardized estimate of .335. The paths from the Grade 9 LVs to Grades 10–11 runaway status in the models depicted in Fig. 2a–c portray these results.

Evaluating Hypotheses of Runaway Status on Young Adult Outcomes

Figure 2a–c display all significant paths leading to each of the age 21 outcomes; all estimated paths leading to the outcomes, regardless of significance, are reported in Table 3. With respect to hypotheses regarding associations between runaway status and young adult outcomes, contrary to expectations, Grade 10–11 runaway status was not

associated with age 21 alcohol dependence risk. However, in line with our expectations, Grade 10–11 runaway status was predictive of both drug dependence and depressive affect at age 21. These associations with runaway status were found even after controlling for the Grade 9 risk factors.

Although we did not have any formal hypotheses about the relationships between Grade 9 predictors and age 21 outcomes, we note that lack of parental support at Grade 9 was not directly related to any of the age 21 outcomes and depressive affect at Grade 9 was related only to depressive symptoms at age 21. School disengagement at Grade 9 was positively associated with age 21 measures of drug dependence and depressive symptoms, but was not associated with alcohol dependence risk. Finally, Grade 9 substance use was significantly associated with all three age 21 outcomes, although in a negative direction for age 21 depressive affect. Given the substantial positive indirect effect of substance use on depressive symptoms through low and high runaway status, and the fact that the bivariate association between these two variables was positive, we concluded that the model based estimate of this direct effect is a suppression effect and thus we are not interpreting it further.

Discussion

In 2002, an estimated 1.6 million youth between the ages of 12–17 reported running away from home and sleeping on the street during the past 12 months (Substance Abuse and

Fig. 2 Results of structural equation models showing associations between grade 9 psychosocial variables, runaway status at grades 10–11, and age 21 alcohol dependence risk (**a**), substance use (**b**), and depressive symptoms (**c**). *Notes* Indicator variable loadings and uniquenesses for Grade 9 latent variables are omitted for ease of interpretation. Coefficients from Grade 9 variables to runaway status are based on a model that excludes age 21 outcomes. Associations of Grade 9 variables and runaway status with age 21 outcomes were estimated with three separate models (one for each age 21 outcome). All models controlled for several covariates (ethnicity, gender, age, number of schools, nuclear family, SES, deviance, treatment condition, design variables) by including paths from these covariates to the Grade 9 variables and runaway status. These covariate estimates are excluded from the figure for ease of interpretation. All models controlled for clustering, and estimates were weighted to generalize back to the baseline sample
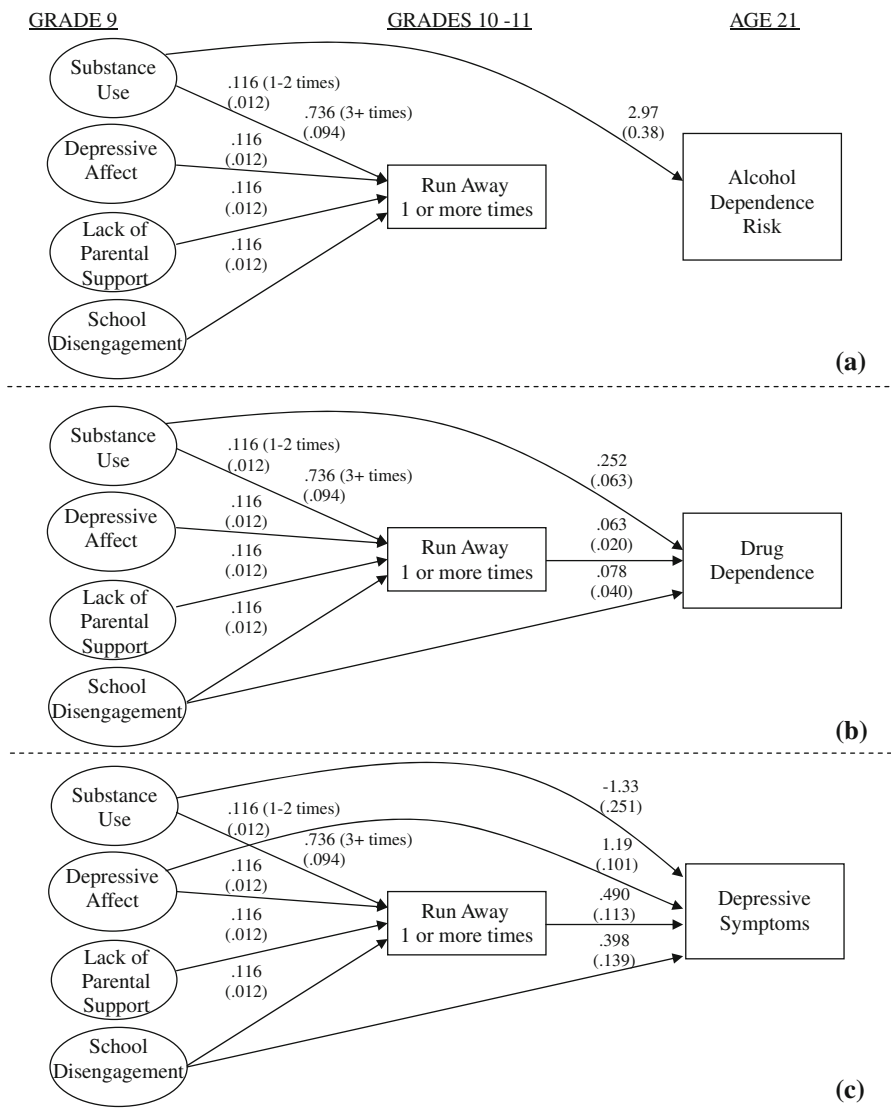
Mental Health Services Administration (SAMHSA) 2004). Given the large number of adolescents and families that are affected by runaway behavior each year, it is important to better understand the adolescent precursors and young adult outcomes associated with running away from home. The present study is one of the few to simultaneously examine such precursors and outcomes, with a particular focus on substance use and depressive symptoms as problems that may both contribute to an adolescent's decision to run away and be exacerbated by the adolescent's experience of running away.

In examining risk factors for running away, our results indicated that adolescents who perceived less parental support in 9th grade were more likely to run away from home 1–2 years later. However, even after adjusting for the level of parental support (as well as general delinquency, family structure, and demographic factors), several other factors emerged as significant predictors of future runaway behavior: school disengagement, substance use, and depressive affect. This finding is consistent with a larger literature indicating that poor family dynamics is an important risk factor for running away from home (Kipke et al. 1997), but certainly not the only risk factor (Ennett et al. 1999; Thompson et al. 2004). For some runaways, the reason for leaving home may be less driven by a strained parent–child relationship than by other problems the child is experiencing. Indeed, one qualitative study of runaways using shelter services, for example, found that one-third of these youth believed that their runaway behavior was mainly caused by problems that resided within themselves, such as their drug use, rebelliousness, or hanging out with the wrong crowd (Safyer et al. 2004). A strength of the present study is showing that these other problems, which often co-occur with each other and with poor family functioning, are risk factors in their own right for running away from home.

Table 3 Model based estimates (SE) and standardized associations (in italics) of grade 9 latent variables and grade 10–11 runaway status with age 21 outcomes

Predictor variables	Ages 21 outcomes		
	Alcohol dependence risk	Drug dependence	Depressive symptoms
Substance use	2.973 (0.378)*	0.252 (0.063)*	−1.334 (0.251)*
	0.271	*0.136*	*−0.147*
Depressive affect	−0.139 (0.130)	−0.007 (0.025)	1.194 (0.101)*
	−0.023	*−0.007*	*0.240*
Lack of parental support	−0.203 (0.105)	0.005 (0.026)	0.057 (0.109)
	−0.035	*−0.005*	*0.012*
School disengagement	0.191 (0.213)	0.078 (0.040)	0.398 (0.139)*
	0.027	*0.067*	*0.070*
Low frequency runaway	0.066 (0.147)	0.063 (0.020)*	0.490 (0.113)
	0.012	*0.070*	*0.113*
High frequency runaway	0.066 (0.147)	0.063 (0.020)*	0.490 (0.113)
	0.013	*0.075*	*0.120*

Note: * indicates significance at $p < .05$

A unique feature of this study is its ability to examine depressive symptoms and substance use as potential consequences of running away from home, addressing the important question of whether running away has long-term health-related consequences. The answer to this question appears to be a qualified "yes." Four to five years later, when these adolescent runaways have become young adults, they are more dependent on drugs and have more depressive symptoms than non-runaways. These associations are found even when controlling for early substance use, depressive symptoms, lack of parental support, school disengagement, general delinquency and demographic characteristics. Controlling for these other factors bolsters confidence that it is the experience of running away from home that contributes to these young adult problems. In terms of alcohol abuse, prior research has indicated that the larger difference in substance use between runaway/homeless youth and housed youth occurs for illicit drug use rather than alcohol consumption (Greene et al. 1997). Nonetheless, it was somewhat surprising that running away was not associated with a higher alcohol dependence risk in young adulthood, given the negative repercussions and diminishing life choices that can result from this behavior (Young et al. 1983). The impact of running away on alcohol dependence risk may be limited to certain subgroups, as suggested by Windle's (1989) finding that runaway status predicted young adult alcohol consumption and dependency symptoms only among males who had run away multiple times. It may also be the case that alcohol misuse is so ubiquitous during young adulthood, with more than 40% of those in their early 20 s reporting binge drinking (Johnston et al. 2008), that there is little added effect due to runaway status or that the effects of running away are not apparent until after these peak years of heavy drinking. Exploring these possibilities was beyond the scope of this study, but may be a useful direction for future research.

Prior research suggests that repeat runaways are more likely than one-time runaways to have a history of substance abuse and family dysfunction (Thompson and Pollio 2006), and may be prone to greater substance use problems in young adulthood (Windle 1989). In this study, however, only one of the four adolescent antecedents differentiated between low and high frequency runaways. None of the young adult outcomes varied with the number of times an adolescent ran away. Adolescent substance use, the exception, predicted both low and high frequency of running away, but was more strongly linked with high frequency. The general lack of differences between these runaway groups may have been due to our measure, which could not distinguish running away only once and doing so twice or more (which may be a critical distinction). It may also be the case that adolescents had subsequent runaway episodes after the Grade 11 assessment, weakening any differences between these two groups in terms of young adult outcomes. Regardless, the fact that family and school problems, substance use, and depressive symptoms each predicted multiple runaway episodes raises the important issue of how to address the problem of recidivism. Although crisis shelter services for runaway youth can be successful in achieving family reunification (Pollio et al. 2006), this success may be short-lived if the underlying reasons why the adolescent ran away in the first place are not adequately addressed (Baker et al. 2003). Involvement of both the adolescent and family in follow-up services after reunification may be key to deterring future runaway episodes (Nebbitt et al. 2007).

This study has a number of strengths, perhaps the most important being the use of longitudinal data to identify precursors and consequences of running away from home. Although the correlational nature of the data preclude us from determining cause and effect, use of these data brings us a step closer to understanding the temporal nature of these associations. Another strength is the ability to control for Grade 9 delinquency, substance use, and depressive affect (as well as a host of other demographic and psychosocial variables) in examining the associations of running away with the young adult outcomes at age 21. Doing so helps to isolate the unique contribution of running away from home on substance use and depressive symptoms over time. Given that much of the previous work on runaway youth has used small convenience or clinical samples, the use of a large school-based cohort that allowed for the comparison of runaways and non-runaways is another strength of this study.

Despite the above strengths, the study has several limitations. For example, the sample is comprised exclusively of youth living in a certain geographic region of the U.S. (South Dakota) and attrition occurred during the study period. Both of these factors may limit the generalizability of our findings. Although our data set included information on family support, the lack of available information on adverse family conditions (e.g., parental physical/sexual abuse, neglect, substance abuse, mental health problems) is another important limitation of the study. Finally, our inability to derive a more fine-grained assessment of runaway "severity" is a limitation of the study. The general lack of differences we found between the low- and high-frequency runaway groups, for example, may have been due to our inability to isolate adolescents with a single runaway episode from those who had run away on multiple occasions. Further, being able to capture the heterogeneity of runaway experiences (e.g., running away to a friend's home for one night vs. running away for several weeks and living on the streets) would have significantly enriched the study.

Findings from this longitudinal study of runaway behavior point to two critical research priorities. One priority is to identify programs that are effective in deterring adolescents from running away from home in the first place. Early school-based programs designed to foster positive youth development, such as the Raising Healthy Children Project (Brown et al. 2005), have the potential to reduce runaway behavior through their impact on adolescent substance use, mental health problems, and other risk factors such as school disengagement. It is important for future evaluations of such programs to determine whether they have a positive impact on runaway behavior and (if so) the mechanisms through which this occurs. The other research priority is to identify strategies for better addressing the special needs of runaway adolescents in order to reduce recidivism and improve long-term outcomes. Developing family-based interventions for runaway youth may be a particularly promising approach, given that runaway youth typically return home for significant amounts of time (Hammer et al. 2002; Milburn et al. 2007), and would have the added benefit of being able to address problematic family dynamics in addition to reducing the adolescent's own risk behaviors. Findings from this study highlight the importance of addressing substance use and depression in the context of both research priorities—as risk factors that may propel adolescents to run away from home and as consequences of running away that may require evaluation and treatment.

References

Allen, J. P., Litten, R. Z., Fertig, J. B., & Babor, T. (1997). A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcoholism, Clinical and Experimental Research, 21*, 613–619.

Baer, J. S., Ginzler, J. A., & Peterson, P. L. (2003). DSM-IV alcohol and substance abuse and dependence in homeless youth. *Journal of Studies on Alcohol, 64*, 5–14.

Baker, A. M. L., McKay, M. M., Hans, C. J., Schlange, L., & Auville, A. (2003). Recidivism at a shelter for adolescents: First-time versus repeat runaways. *Social Work Research, 27*, 84–94.

Bohn, M. J., Babor, T. F., & Kranzler, H. R. (1995). The alcohol use disorders identification test (AUDIT): Validation of a screening instrument for use in medical settings. *Journal of Studies on Alcohol, 56*, 423–432.

Brown, E. C., Catalano, R. F., Fleming, C. B., Haggerty, K. P., & Abbott, R. D. (2005). Adolescent substance use outcomes in the Raising Healthy Children Project: A two-part latent growth curve analysis. *Journal of Consulting and Clinical Psychology, 73*, 699–710.

Chen, X., Thrane, L., Whitbeck, L. B., Johnson, K. D., & Hoyt, D. R. (2007). Onset of conduct disorder, use of delinquent subsistence strategies, and street victimization among homeless and runaway adolescents in the Midwest. *Journal of Interpersonal Violence, 22*, 1156–1183.

Chung, T., Colby, S. M., Barnett, N. P., Rohsenow, D. J., Spirito, A., & Monti, P. M. (2000). Screening adolescents for problem drinking: performance of brief screens against DSM-IV alcohol diagnoses. *Journal of Studies on Alcohol, 61*, 579–587.

D'Amico, E. J., Ellickson, P. L., Collins, R. C., Martino, S., & Klein, D. J. (2005). Processes linking adolescent problems to substance use problems in late young adulthood. *Journal of Studies on Alcohol, 66*, 766–775.

Edelen, M. O., McCaffrey, D. M., Ellickson, P. L., Tucker, J. S., & Klein, D. J. (2009). Creating a developmentally sensitive measure of adolescent alcohol misuse: An application of Item Response Theory. *Substance Use and Misuse, 44*, 835–847.

Ellickson, P. L., McCaffrey, D. F., Ghosh-Dastidar, B., & Longshore, D. L. (2003). New inroads in preventing adolescent drug use: Results from a large-scale trial of Project ALERT in middle schools. *American Journal of Public Health, 93*, 1830–1836.

Ennett, S. T., Federman, B., Bailey, S. L., Ringwalt, C. L., & Hubbard, M. L. (1999). HIV-risk behaviors associated with homelessness characteristics in youth. *Journal of Adolescent Health, 25*, 344–353.

Farrow, J. A., Deisher, R. W., Brown, R., Kulig, J. W., & Kipke, M. D. (1992). Health and health needs of homeless and runaway youth. *Journal of Adolescent Health, 13*, 717–726.

Greene, J. M., Ennett, S. T., & Ringwalt, C. L. (1997). Substance use among runaway and homeless youth in three national samples. *American Journal of Public Health, 87,* 229–235.

Hammer, H., Finkelhor, D., & Sedlak, A. J. (2002). *Runaway/ thrownaway children: National estimates and characteristics.* Office of Juvenile Justice and Delinquency Prevention: U.S. Department of Justice.

Haynie, D. L., Petts, R. J., Maimon, D., & Piquero, A. R. (2009). Exposure to violence in adolescence and precocious role exits. *Journal of Youth and Adolescence, 38,* 269–286.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1–55.

Johnson, K. D., Whitbeck, L. B., & Hoyt, D. R. (2005). Substance abuse disorders among homeless and runaway adolescents. *Journal of Drug Issues, 35,* 799–816.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2008). *Monitoring the Future national survey results on drug use, 1975–2007: Volume II, College students and adults ages 19–45 (NIH Publication No. 08–6418B).* Bethesda, MD: National Institute on Drug Abuse.

Kipke, M., Palmer, R., LaFrance, S., & O'Connor, S. (1997a). Homeless youths' descriptions of their parents' child-rearing practices. *Youth & Society, 28,* 415–431.

Kipke, M. D., Simon, T. R., Montgomery, S. B., Unger, J. B., & Iversen, E. F. (1997b). Homeless youth and their exposure to and involvement in violence while living on the streets. *Journal of Adolescent Health, 20,* 360–367.

Little, R. J. A., & Rubin, D. B. (2002). *Statistical analysis with missing data.* New York: Wiley.

Milburn, N. G., Rosenthal, D., Rotheram-Borus, M. J., Mallett, S., Batterham, P., Rice, E., et al. (2007). Newly homeless youth typically return home. *Journal of Adolescent Health, 40,* 574–576.

Muthén, L. K., and Muthén, B. O. (1998–2004). *Mplus users guide,* (3rd edn). Los Angeles, CA: Muthén & Muthén.

National Runaway Switchboard.(2008). *NRS Call Statistics.* Retrieved electronically on April 18, 2008 at [http://www.1800runaway.org/news_events/call_stats.html].

Nebbitt, V. E., House, L. E., Thompson, S. J., & Pollio, D. E. (2007). Successful transition of runaway/homeless youth from shelter care. *Journal of Child and Family Studies, 16,* 545–555.

Pollio, D. E., Tobias, L., Reid, D., & Spitznagel, E. (2006). Longitudinal outcomes for youth receiving runaway/homeless shelter services. *Journal of Youth and Adolescence, 35,* 859–866.

Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1,* 385–401.

Robertson, M. (2004). Homeless youth. In D. Levison (Ed.), *Encyclopedia of homelessness* (Vol. 1). Thousand Oaks, CA: Sage.

Safyer, A. W., Thompson, S. J., Maccio, E. M., Zittel-Palamara, K. M., & Forehand, G. (2004). Adolescents' and parents' perceptions of runaway behavior: Problems and solutions. *Child and Adolescent Social Work Journal, 21,* 495–512.

Sanchez, R. P., Waller, M. W., & Greene, J. M. (2006). Who runs? A demographic profile of runaway youth in the United States. *Journal of Adolescent Health, 39,* 778–781.

SAS Institute. (1990). *SAS/STAT user's guide* (Vol. 1). Cary, NC: SAS Institute, Inc.

Substance Abuse and Mental Health Services Administration (SAMHSA). (2004). *Substance use among youths who had run away from home.* The NSDUH Report. Rockville, MD: Office of Applied Studies.

Thompson, S. J., & Pillai, V. K. (2006). Determinants of runaway episodes among adolescents using crisis shelter services. *International Journal of Social Welfare, 15,* 142–149.

Thompson, S. J., & Pollio, D. E. (2006). Adolescent runaway episodes: Application of an estrangement model of recidivism. *Social Work Research, 30,* 245–251.

Thompson, S. J., Zittel-Palamara, K. M., & Maccio, E. M. (2004). Runaway youth utilizing crisis shelter services: Predictors of presenting problems. *Child & Youth Care Forum, 33,* 387–404.

Thrane, L. E., & Chen, X. (2010). Impact of running away on girls' sexual onset. *Journal of Adolescent Health, 46,* 32–36.

Tyler, K. A., & Bersani, B. E. (2008). A longitudinal study of early adolescent precursors to running away. *Journal of Early Adolescence, 28,* 230–251.

Tyler, K. A., Johnson, K. A., & Brownridge, D. A. (2008). A longitudinal study of the effects of child maltreatment on later outcomes among high-risk adolescents. *Journal of Youth and Adolescence, 37,* 506–521.

Van der Ploeg, J. D., & Scholte, E. M. (1997). *Homeless youth.* Thousand Oaks, CA: Sage.

Wagner, L. S., Carlin, L., Cauce, A. M., & Tenner, A. (2001). A snapshot of homeless youth in Seattle: Their characteristics, behaviors and beliefs about HIV protective strategies. *Journal of Community Health, 26,* 219–231.

Wenzel, S. L., Tucker, J. S., Golinelli, D., Zhou, A., & Green, H. D. Jr. (in press). Personal network correlates of alcohol, cigarette, and marijuana use among homeless youth. *Drug and Alcohol Dependence.*

Whitbeck, L., Hoyt, D., & Ackley, K. (1997). Abusive family backgrounds and later victimization among runaway and homeless adolescents. *Journal of Research on Adolescence, 7,* 375–392.

Windle, M. (1989). Substance use and abuse among adolescent runaways: A four-year follow-up study. *Journal of Youth and Adolescence, 18,* 331–344.

Young, R. L., Godfrey, W., Matthews, B., & Adams, G. R. (1983). Runaways: A review of negative consequences. *Family Relations, 32,* 275–281.

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