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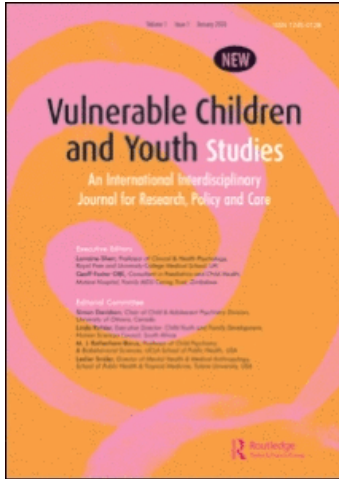
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## Trajectories of risk behaviors and exiting homelessness among newly homeless adolescents

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Using cluster analysis techniques, we identified two distinct clusters of newly homeless adolescents in Los Angeles ( $n = 261$ ): those who are protected and doing relatively well while out of home with more protective than risk factors, and those who are risky with more risk than protective factors. The objective of this study was to examine the trajectories of human immunodeficiency virus (HIV) risk behaviors and exiting homelessness among protected newly homeless adolescents, compared to those who are classified as risky. HIV risk behavior included unprotected sex, having multiple sex partners and hard drug use. Logistic regression mixed-effects models were used to evaluate the trajectories of HIV risk behaviors and exiting homelessness over time. The adolescents in the protected group reported significantly less unprotected sex ( $p = 0.0156$ ), being abstinent or monogamous ( $p < 0.0001$ ) and less hard drug use ( $p < 0.0001$ ) compared to the adolescents in the risky group. In addition, the protected group reported more “exiting homelessness”, compared to the risky group ( $p = 0.0007$ ). However, the differences in the level of unprotected sex between the protected and risky groups decreased over time. Our findings confirm the notion that newly homeless adolescents are indeed heterogeneous. Given that the risk behavior profiles of protected group merges to the risky group over time, our findings underscore the need to mount tailored interventions to be designed for the protected group early in the process.

**Keywords:** homeless adolescents; at-risk youth; risk-behavior trajectories

### Introduction

Current research on homeless adolescents reveals that homeless adolescents suffer from poor health status compared to the general adolescent population (Ensign & Santelli, 1998; Farrow, Deisher, Brown, Kulig, & Kipke, 1992; Sherman, 1992). Homeless adolescents have high rates of sexually transmitted diseases, human immunodeficiency virus (HIV), pregnancy, depression and injuries (Forst, 1994; Nelson & Wright, 1994; Rotheram-Borus, Koopman, Haignere, & Davies, 1991).

Current research on homeless adolescents suggests that newly homeless adolescents are distinct from experienced homeless adolescents and may require different types of interventions and services (Mallett, Rosenthal, Myers, Milburn, & Rotheram-Borus, 2004; Milburn, Rosenthal, & Rotheram-Borus, 2005; Milburn, Rotheram-Borus,

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Rice, Mallett, & Rosenthal, 2006). For example, newly homeless adolescents (who have been homeless for less than 6 months) are more likely to be younger, attending school, to not be engaging in high-risk sexual practices (e.g. unprotected sex), to not use drugs and to have never attempted suicide than experienced homeless adolescents (Milburn et al., 2006). They tend to be the homeless adolescents who are using services and avoiding high-risk behaviors such as unsafe sex practices and drug use (Mallett et al., 2004). Greater understanding of the heterogeneity of homeless adolescents could enhance services substantially for this population (Haber & Toro, 2004; Mallett et al., 2004).

In addition, there is evidence to suggest that newly homeless adolescents themselves are not homogeneous and may require tailored interventions and services (Mallett et al., 2004; Milburn et al., 2005, 2006). For example, some newly homeless adolescents are less likely to engage in high-risk sexual practices and hard drugs (Milburn et al., 2006). Using cluster analysis techniques, we identified two distinct clusters of newly homeless adolescents in Los Angeles: those who are protected and doing relatively well while out of home with more protective than risk factors, and those who are risky with more risk than protective factors (Milburn et al., 2009). Given the heterogeneous nature of newly homeless adolescents, HIV interventions should be better tailored to specific groups of newly homeless adolescents.

The objective of this study was to examine the trajectories of risk behaviors among two distinct clusters of newly homeless adolescents: those classified as “protected” compared to those classified as “risky”. Our focus was to ascertain whether the resilience of the “protected” group lasts. For instance, we will explore whether the “protected” group becomes more similar to those adolescents who are classified as “risky”. The sustainability of their resilience will have significant implications for when and how to provide tailored interventions to these homeless adolescents.

## Method

### *Background*

Overall sample demographics have been reported in the baseline cluster analysis (Milburn et al., 2009). The analyses presented here are limited to adolescents in Los Angeles who were newly homeless ( $n = 261$ ). We considered all the relevant variables (140) which had less than 15% missing responses characterizing newly homeless adolescents. First, we performed the iterative algorithm to determine the cluster membership using the K-means method with the prespecified number of clusters; secondly, we examined graphically whether the prespecified number of clusters, given the set of selected variables, was separated clearly. These two steps were performed iteratively to identify groups of relatively homogeneous participants based on the selected variables and the prespecified number of clusters. We started with all the selected variables as a completed set, followed by different subsets of selected variables. Based on the results found in the Milburn et al. (2009) study, these newly homeless adolescents were factored into two clusters: protected versus risky. At baseline, both groups had statistically similar female : male ratios and approximately 30% of the participants experienced physical or sexual abuse. Compared with the participants in the risky group [mean = 16.1, standard deviation (SD) = 1.71], those in the protected group were younger (mean = 15.0, SD = 1.82,  $p < 0.0001$ ).

## **Measures**

### *HIV-related risk behaviors*

HIV-related risk behaviors included behaviors such as whether the participants were having unprotected sex, whether they were abstinent or monogamous and whether they used any of the hard drugs, and whether they exited homelessness during the study. These variables were collected at baseline, 3, 6, 12, 18 and 24 months.

### *Unprotected sex*

Unprotected sex was scored “0” if the participant always used a condom while having vaginal/anal/oral sex or if the participant had never had vaginal/anal/oral sex; or “1” if they or their partner sometimes or never used a condom.

### *Abstinent or monogamous*

Abstinent or monogamous was constructed by asking the respondent how many different vaginal and anal sex partners they had had in the past 3 months.

### *Hard drug usage*

An overall score for hard drug usage, including the use of lysergic acid diethylamide, inhalants, stimulants, crack or heroin, was defined as “1” if participants used at least one of these drugs over the past 3 months or “0” if they did not use any of the hard drugs listed.

### *Exiting homelessness*

Exiting homelessness was defined as currently living in familial housing. Responses to a 21-choice item, “Where are you currently living?”, were categorized as familial housing (1) or non-familial housing (0). Familial housing required a parent or guardian being present, although for respondents aged 18 years and older an apartment also constituted familial housing. Responses that were classified as familial housing were: birth (biological) family home, foster family home, step-family home, grandparent’s house, relative’s house, family group home, boarding school, adoptive family home or own apartment. The responses classified as non-familial housing were: shelters [e.g. refuge, single-room occupancy hotel/motel, early adolescent unit, medium-term accommodation, secure welfare unit, caravan park (trailer park)], juvenile detention center/jail, psychiatric hospital, street/squat/abandoned building, friend’s house or Job Corps facility. Adolescents who were currently living in familial housing were categorized as exiting homelessness. Adolescents who were not currently living in familial housing were categorized as not exiting homelessness.

## **Data analysis**

Logistic regression mixed-effects models were used to evaluate the trajectories of engaging HIV-related risk behaviors and exiting homelessness over time. Covariates included time (measured in months), protected or risky groups and cubic-spline function of time  $\times$  group interaction. Models also included adolescent-level random effects to account for the correlation between repeated measures at baseline, every 3 months for the first half-year and every 6 months thereafter. Due to the dichotomous nature of the outcomes,

we used an adaptation of mixed-effects regression models that allows for the specification of a binomial error distribution (PROC GLIMMIX). Chi-square ( $\chi^2$ ) and *t*-tests were used to compare the differences between groups for categorical and continuous variables. All analyses were performed using SAS version 9.1 (SAS Institute Inc., Cary, NC, USA).

**Results**

The sociodemographic profile of newly homeless adolescents (*n* = 261) in our study were: 58% female, 23% African American, 43% Latino/Hispanic American and 20% European American, with ages ranging from 12 to 20 years (mean = 17.3; SD = 1.9).

**Unprotected sex**

Table 1 presents the comparison of protected versus risky groups regarding their HIV risk behaviors and exiting homelessness, using the estimated odds ratios (ORs) with 95% confidence intervals (CIs) from the final logistic regression mixed-effects models. Figure 1 shows the estimated probabilities of HIV risk behaviors and exiting homelessness for protected and risk group at each evaluation time-point. More than 37% of adolescents in the protected group did not engage in unprotected sex during the study, compared to 23% among the adolescents in the risky group ( $\chi^2 = 5.8, p = 0.0156$ ). Compared to the adolescents in the risky group, the adolescents in the protected group were less likely to engage in any unprotected sex during the study; the estimated ORs were lower than 0.39 before 12 months (*p* < 0.002) and increased slowly after 12 months (*p* = 0.0803 at 24 months). Figure 1(a) suggests that the difference in the level of unprotected sex between the protected and risky group decreases over time, indicated by the overlapping 95% CI.

Table 1. Comparison of protected versus risky group from mixed effects model: risk behaviors and exiting homelessness.

	<i>n</i> (%) <sup>a</sup>		Odds ratio (95% CI)	<i>p</i> -value
	Protected	Risky		
<b>Unprotected sex</b>				
Baseline	33 (21.7)	50 (46.7)	0.32 (0.19, 0.55)	<0.0001
12 months	34 (26.4)	39 (47.0)	0.39 (0.21, 0.70)	0.0020
24 months	38 (33.9)	36 (52.2)	0.58 (0.31, 1.07)	0.0803
<b>Abstinent or monogamous</b>				
Baseline	129 (84.9)	56 (52.3)	5.11 (2.84, 9.20)	<0.0001
12 months	106 (80.9)	49 (59.0)	2.80 (1.55, 5.03)	0.0007
24 months	88 (78.6)	47 (68.1)	1.46 (0.79, 2.69)	0.2263
<b>Hard drug usage</b>				
Baseline	31 (20.3)	59 (54.6)	0.21 (0.12, 0.36)	<0.0001
12 months	19 (12.4)	33 (30.6)	0.25 (0.13, 0.48)	<0.0001
24 months	9 (8.0)	22 (31.4)	0.20 (0.08, 0.48)	0.0004
<b>Exiting homelessness</b>				
Baseline	30 (19.6)	22 (20.4)	0.96 (0.51, 1.78)	0.8852
12 months	110 (84.0)	57 (68.7)	2.92 (1.58, 5.40)	0.0007
24 months	95 (84.1)	47 (67.1)	2.58 (1.34, 4.96)	0.0047

<sup>a</sup>Percentages were based on available data. CI, confidence interval.

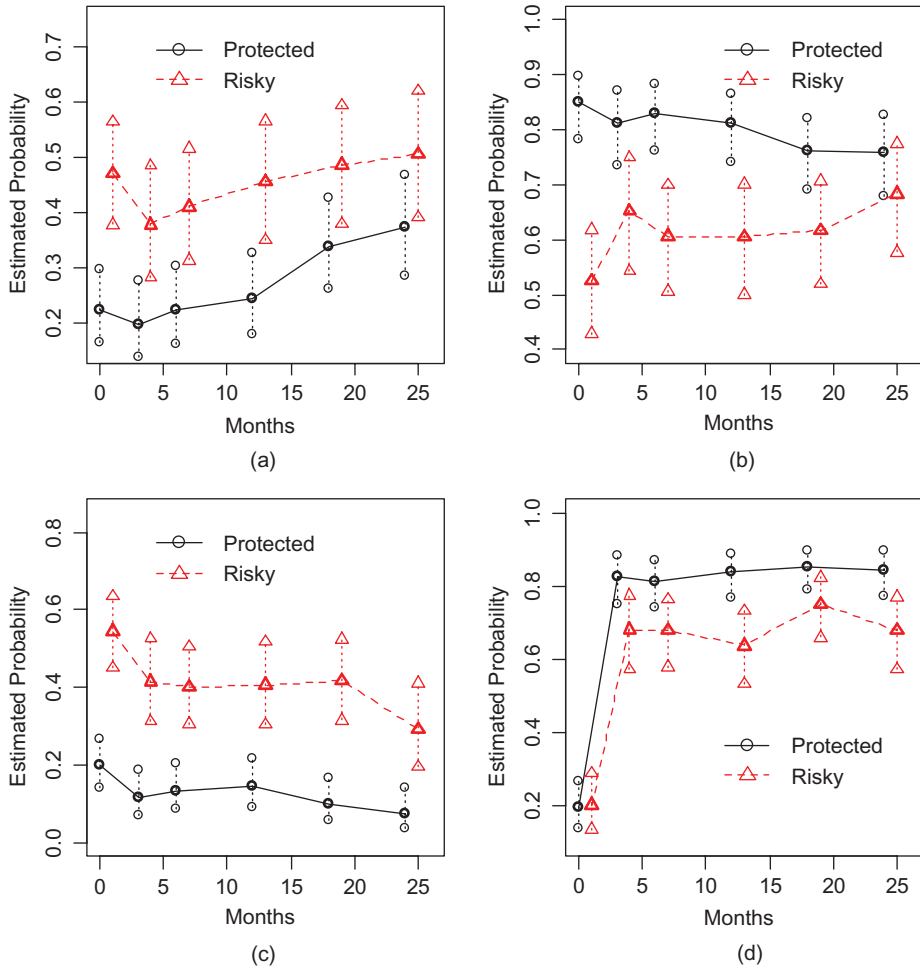


Figure 1. Estimated probabilities with 95% confidence intervals for (a) having unprotected sex, (b) no sexual partners or being monogamous during the study, (c) hard drug usage and (d) exiting homelessness.

**Being abstinent or monogamous**

Slightly more than 48% of the adolescents in the protected group reported being abstinent or monogamous during the study, twice as much as the risky group (24%,  $\chi^2 = 15.8, p < 0.0001$ ). The estimated odds for being abstinent or monogamous during the study were almost three times higher among the protected group than among the risky group at 12 months (95% CI: 1.55–5.03;  $p = 0.0007$ ); however, the rate decreased slowly after 12 months and the difference between the protected and risky groups was no longer significant by the end of the study (OR = 1.46; 95% CI: 0.79–2.69;  $p = 0.2263$ ). As shown in Figure 1(b), although the higher proportion of the adolescents in the protected group reported consistently being abstinent or monogamous, the difference decreases over time, indicated by the overlapping 95% confidence intervals.

**Hard drug use**

More than 60% in the protected group did not report using any hard drugs during the study, compared to 33% in the risky group ( $\chi^2 = 19.1, p < 0.0001$ ). Figure 1(c) shows that the adolescents in the protected group were significantly less likely to use any hard drugs; the estimated ORs of using any hard drugs for the protected over time were between 0.20 and 0.25 ( $p < 0.0004$ ).

**Exiting homelessness**

Only a few participants in the study had never exited homelessness (4.2% versus 7.5% for the protected and risky groups, respectively), indicating that the majority of the adolescents had been in and out of homelessness during the study. The estimated odds for exiting homelessness were almost three times higher among the protected group than among the risky group at 12 months ( $p = 0.0007$ ). As seen in Figure 1(d), the estimated time trend for the protected group remained steady after 3 months of the study.

**Discussion**

Our findings highlight the importance of distinguishing clearly subgroups of newly homeless adolescents and not viewing them as uniform in terms of their characteristics and needs. The newly homeless adolescents are, indeed, heterogeneous. Our findings are consistent with the investigation by Huntington, Buckner, and Bassuk (2008), who revealed two distinct clusters of homeless youth: “higher functioning” adolescents who do well despite the stresses they face during homelessness and “lower functioning” adolescents who experience significant challenges in terms of behavior problems, adaptive functioning and achievement.

Our findings revealing resiliency among the “protected” cluster of newly homeless adolescents are similar to those of prior research that also documented subgroups of adolescents doing relatively well in the face of hardships who have survived childhood cancer (Beardslee, 1981) or experienced parental illness (Compas, Worsham, Ey, & Howell, 1996) or parental depression (Beardslee, Keller, Lavori, Staley, & Sacks, 1993). The protected group reported significantly different trajectories of HIV risk behaviors and exiting homelessness compared to the adolescents in the risky group. We observed a clear distinction in HIV risk behaviors (lower unprotected sex, higher abstinence or being monogamous, less hard drug use and higher proportion exiting homelessness) among the protected group over the 2-year period compared to those classified as risky.

However, we also found that the risk profiles of adolescents in the protected group tended to converge to those adolescents in the risky group over time, indicated by their reported levels of unprotected sex and having multiple sexual partners. Furthermore, we found that the newly homeless adolescents tend to be a dynamic group, going in and out of homelessness over 2 years.

These findings have significant implications for mounting interventions targeting newly homeless adolescents. First, our findings underscore the importance of targeting the protected group early in the risk-behavior trajectories, before their profiles begin to converge to those in the risky group. Secondly, the design of the intervention for the protected group should take into account the dynamic nature of adolescents going in and out of homelessness. Our findings underscore the importance of targeting services to newly homeless adolescents based on their actual needs and abilities rather than assuming that all homeless



adolescents enter and exit the experience of homelessness in the same way. Interventions should consider the disparate needs of these two distinct subgroups of newly homeless adolescents. Such interventions could identify protected homeless adolescents when they are back in stable housing to prevent them from spiraling out of this stable environment.

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