

Increases in Social Support Co-Occur with Decreases in Depression and Substance Use Problems Among Adults in Permanent Supportive Housing: An 18-Month Longitudinal Study

Zhengqi Tan

University of North Texas Health Science Center <https://orcid.org/0000-0002-2297-2770>

Eun-Young Mun (✉ eun-young.mun@unthsc.edu)

University of North Texas Health Science Center <https://orcid.org/0000-0002-1820-615X>

Uyen-Sa D. T. Nguyen

University of North Texas Health Science Center

Scott T. Walters

University of North Texas Health Science Center

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Abstract

Background: Social support is a well-known protective factor against depression and substance use problems, but very few studies have examined its protective effects among Permanent Supportive Housing (PSH) residents. We utilized unconditional latent growth curve models (LGCMs) and parallel process growth models to describe univariate trajectories of social support, depression, and substance use problems, and to examine their longitudinal associations in a large sample of adults residing in PSH.

Methods: Participants were 653 adult PSH residents in North Texas (56% female; 57% Black, 35% White, 8% other; mean age: 51 years) who participated in a monthly health coaching program from 2014 to 2017. Their health behaviors were assessed at baseline and tracked every six months at three follow-up visits.

Results: Unconditional LGCMs indicated that over time, social support increased, whereas depressive symptoms and substance use problems decreased. However, their rates of change slowed over time. Further, in parallel process growth models, we found that at baseline, individuals with greater social support tended to have less severe depression and substance use problems (coefficients: -0.67 , $p < 0.01$; -0.52 , $p < 0.01$, respectively). Individuals with a faster increase in social support tended to have steeper rates of reduction in both depression (coefficient: -0.99 , $p < 0.01$) and substance use problems (coefficient: -0.98 , $p < 0.01$), respectively.

Conclusions: This study suggests that increases in social support, though slowing over time, still positively impact depression and substance use problems among PSH residents. Future PSH programs could emphasize social support as an early component as it may contribute to clients' overall health.

Introduction

People who are homeless are at higher risk for health problems, such as malnutrition, stress, communicable diseases, and violence [1]. The elevated health risks among people who are homeless contribute to significantly higher mortality rates, shorter life expectancy, and more frequent hospitalizations and acute care services utilization, compared with people in the general population [2-4]. In particular, depression is approximately three times more prevalent among adults who are homeless (20-25%), compared with 8.1% among the general adult population of the United States (US) [2, 5]. Moreover, over a third of homeless individuals experience alcohol and drug problems [6]. Some evidence suggests that social support is negatively associated with both depression and substance use problems among people who are homeless [7-12]. Meanwhile, permanent supportive housing (PSH), which combines a housing voucher with supportive services, has been recognized as an effective model for stabilizing the mental and physical needs of homeless adults [1, 13]. Hence, the number of PSH beds in the US has increased by 380% or 144,000 more since 2007 [14]. Despite this progress, a crucial knowledge gap remains: little empirical evidence exists to guide program decisions after homeless adults enter PSH. In particular, few studies have examined the longitudinal associations of social support with either depression or substance use problems among PSH residents with a history of homelessness.

Permanent Supportive Housing and Social Support

Though PSH residents are affected by many of the same issues that homelessness individuals experience, PSH may provide the opportunity to begin new and steady social relationships and to gain support through newly formed connections [15]. By providing stable housing and supportive case management services, PSH can be instrumental in breaking the negative reciprocal cycle that often exists between unstable housing, mental health, and substance use problems [16-19]. However, at the same time, PSH may also introduce new challenges to people who were once homeless [20, 21]. For example, some PSH residents experience social isolation after being housed in unfamiliar locations, while others feel stigmatized in environments without access to former peers [21]. However, very little longitudinal information on social support exists among the PSH residents. Furthermore, PSH residents can be quite heterogeneous in terms of their demographics, prior experiences and needs. Therefore, it remains an empirical question whether perceived social support increases in this population over time and whether changes in social support are related to health outcomes.

Social Support and Depression

In general, research conducted with PSH residents suggests that depression is negatively related to social support [22-24]. However, most of the available evidence is either cross-sectional [23, 24], or focuses on concurrent temporal associations without examining the individual variability in underlying growth curves [22]. A growth perspective over time, as well as its limits or individual differences in the growth, may provide more helpful information for the purpose of improving care services. Given the heterogeneity in the course of adaptation and outlook for PSH residents, it may be important to study how changes in social support over time are associated with depression trajectories, while simultaneously estimating individual trajectories to assess their boundaries of promotive effects of one behavior over the other. To our best knowledge, no prior study has examined this longitudinal association among PSH residents. Note that we use latent growth curve analysis interchangeably with trajectory analysis in the current study.

Social Support and Substance Use Problems

Similarly, there is a dearth of information on the longitudinal relationship between social support and substance use problems among PSH population. A recent randomized controlled trial of a “Housing First” PSH program on substance use problems among homeless individuals in Canada found an inconsistent effect of the housing intervention (vs. the treatment as usual group) on substance use problems over time [25]. Some aspects of substance use problems (e.g., interpersonal relationships) decreased over time, while other aspects (e.g., tolerance) did not decrease over the two years following their housing placement [25]. The scant research on this population suggests that there are important knowledge gaps that need to be addressed – that is, whether substance use problems tend to decrease over time and whether a concurrent increase in social support plays a protective role.

Findings from a few available studies suggest that substance use problems may continue even after housing has been provided [26, 27], and that more specific efforts to address stress and social support may be needed to help reduce substance use problems, especially if residents use substances to cope with stress [26]. For instance, it is possible that some PSH programs may inadvertently discourage residents from quitting alcohol and drugs if the program tolerates substance use, as discussed in a recent review [28]. The limited and inconsistent evidence on the natural course of substance use problems highlights a need for studies that can

help provide evidence-based guidance for this at-risk population. Documenting the related trajectories of social support, depression, and substance use over time would be the first step.

Measurement Limitations of Prior Research

In addition to the scant longitudinal evidence, the existing research on PSH residents has often encountered measurement limitations. Some of the measures used in previous studies were adapted from scales originally developed for other purposes without validation for this specific population. When used among people with more serious mental health conditions, this can cause interpretation challenges because of potential ceiling or flooring effects. Thus, it is possible that some of the inconsistent findings across existing studies may be attributed to inappropriate or weak measures. For example, the measure of social support used by Durbin et al. [26] consisted of subscales from three different instruments designed for community residents with chronic mental illness, hospitalized patients with chronic psychiatric disorders, and the general US population [29-31]. A similar approach was employed in Kirst et al. [25], where they measured the substance use problems with items from one subscale of the Global Appraisal of Individual Needs Short Screener (GAIN-SS) [32], a screening tool designed for general populations. A recent psychometric study showed that this subscale might not be suited for people at low and high levels of severity [33].

The current study addresses these measurement weaknesses and provides a more rigorous test of the longitudinal relationships of social support, depressive symptoms, and substance use problems. Using a latent variable modeling approach, we simultaneously test measurement models for these three constructs over time and examine their parallel trajectories. Additionally, by simultaneously tackling measurement models and growth models in one analysis, we more efficiently use all available data and gain precision in estimation, while accounting for measurement errors, testing measurement invariance over time, and handling missing data.

The Current Study

The current study used data from a technology-assisted health coaching program called “Mobile Community Health Assistance for Tenants” (m.chat). This program provided in-person health coaching to PSH residents as part of the Regional Healthcare Partnership (RHP 10) Medicaid Waiver program in the state of Texas [34]. In addition to the usual housing and case management services offered by the PSH programs, m.chat provided in-person health coaching to encourage PSH residents to adopt healthy behaviors, such as improved diet, exercise, recreation activities, or reducing substance use. Coaching visits were typically conducted in public locations, such as recreation centers, fast food restaurants, or the project office. Participants completed approximately one coaching visit per month for up to 18 months, and each visit lasted 52 minutes on average.

We used a growth modeling approach to better capture the extent of change over time, as well as to model individual differences at baseline and over time. We first conducted a confirmatory factor analysis for the measures of social support, depression and substance use problems and then utilized unconditional latent growth curve models [35] to examine the trajectories of social support, depression, and substance use problems over 18 months. We then used a parallel growth modeling approach [36, 37] to examine how social support trajectories were associated with corresponding trajectories of depression and substance use problems in two separate, bivariate longitudinal analyses. We hypothesized that in the context of monthly

health coaching, perceived social support would increase over time, whereas both depressive symptoms and substance use problems would decrease over time. We further hypothesized that individuals with lower levels of perceived social support at baseline would have higher levels of depression and substance use problems at baseline and show slower rates of growth in social support over time, which would, in turn, predict slower rates of decline in depressive symptoms and substance use problems.

Methods

Participants

Participants were 653 PSH residents (56% female; 57% Black, 35% White, 8% other; mean age: 51 years with a range 20-80) recruited from six local housing agencies in Fort Worth, TX, from 2014 to 2017. Table 1 describes the sample and measures. In this sample of 653 people, 70% (n=455) participated in the first follow-up (6 months after baseline), 46% (n=299) in the second follow-up (12 months after baseline), and 38% (n=249) in the third follow-up (18 months after baseline). All m.chat participants were Medicaid enrolled or low income uninsured, and self-reported one of the following mental health conditions in the past year: prescribed medication for psychological or emotional problems, experienced hallucinations, received a pension for a psychiatric disability, or scored greater than nine on a depression screener, the Patient Health Questionnaire-9 (PHQ-9) [38]. Exclusion criteria included: (1) residing in other types of housing not considered PSH (e.g., Transitional Housing or homeless shelter), (2) any physical or sensory impairment that would substantially limit program participation, (3) non-English-speaking, or (4) limited autonomy or decision-making capabilities (e.g., substantially neurologically or cognitively impaired). This project was approved by the North Texas Regional Institutional Review Board.

Measures

Depressive symptoms. Symptoms of depression were assessed with the Patient Health Questionnaire-9 (PHQ-9) [38]. The nine items on the PHQ-9 correspond to the nine criteria for major depressive disorder based on the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) [39]. The items ask how frequently the individual has experienced each symptom during the last two weeks and assigns a score of 0, 1, 2, and 3 for not at all, several days, more than half of the days, and nearly every day, respectively. Items are summed for a total PHQ-9 score, which can be categorized as follows: mild if the resulting sum score ranges from 5 to 9, moderate for 10 to 14, moderately severe for 15 to 19, and severe for 20 to 27 [38]. Cronbach's alpha for the current sample was 0.81.

Substance use problems. Substance use problems were assessed with a modified version of the Inventory of Drug Use Consequences (InDUC) [40]. The original version of the InDUC includes 50 items that evaluate both lifetime and recent (past three months) substance use problems from five domains: Physical, Interpersonal, Intrapersonal, Impulse Control, and Social Responsibility. In this study, the InDUC was modified by reducing the number of questions in each dimension from ten to three and by asking participants only about recent (last 90-day) problems. Response options were: 0 = Never, 1 = Once or few times, 2 = Once or twice a week, and 3 = Daily or almost daily. Cronbach's alpha for the current sample was 0.96.

Social support. Social support was assessed with a modified version of the Interpersonal Support Evaluation List (ISEL) [41, 42]. The original ISEL measures perceived social support across four primary domains, each consisting of 10 items: (1) Appraisal support, which is the perceived availability of other people to offer advice, guidance, and information, (2) Tangible support, which includes aid or instrumental support, (3) Self-esteem maintenance, which is the perceived availability of positive comparison to others, and (4) Belonging support, which is the perceived availability of others for companionship [41, 42]. Based on the feedback from a pilot survey of PSH residents, the ISEL was modified by removing the self-esteem maintenance domain, reducing the number of items in each domain from ten to three (nine items in total), and modifying some question statements to better reflect the real-life situations of the PSH residents. A series of statements about different aspects of social support (e.g., “When I feel lonely, I have people I can talk to,” “I could easily find someone to loan me \$10 if I needed it”) were self-rated on a 5-point scale from “Hardly ever” to “Almost always.” Cronbach’s alpha for the current sample was 0.87.

Data Analyses

All factor analyses and latent growth curve modeling were conducted using Mplus 8.4 [43]. We first conducted confirmatory factor analysis for measurement models to examine the structure and performance of social support, substance use problems, and depressive symptoms at each time point. We then used latent growth curve models (LGCM) to estimate changes in social support, depressive symptoms, and substance use problems at baseline, 6-month, 12-month, and 18-month post-baseline. We tested the longitudinal measurement invariance following recommendations and steps from Muthén and Christofferson [44], Meredith [45], and Widaman and Reise [46], which ensures that measures are comparable across time. We started with the least restrictive measurement model (configural invariance) and moved to test stricter invariance models [45] by increasingly constraining parameters (factor loadings, intercepts, and residual variances) across time. We used the chi-square test of model fit to determine whether the constraints on parameters still allowed the model to fit the data properly. We selected the strictest invariance model showing an acceptable fit.

We used the maximum likelihood estimator in the LGCM for social support and depression, and the robust maximum likelihood (MLR) estimator with robust standard errors for the LGCM of substance use problems. The scaled difference chi-square test statistic [47] was calculated accordingly for models using MLR. We subsequently modeled the parallel trajectories of social support and depressive symptoms, and the parallel trajectories of social support and substance use problems simultaneously as parallel processes [48] to examine the relationships of the parameters from one trajectory with those from the other trajectory [49]. We estimated the parameters using all available information under the full information maximum likelihood method for missing data [50]. The adequacy of model fit was examined using several absolute and relative fit indices, including the chi-square degrees of freedom ratio (χ^2/df), the root mean squared error approximation (RMSEA) [51, 52], and the comparative fit index (CFI) [53]. Chi-square to df ratios less than 3; RMSEA scores less than 0.08; and CFI scores greater than 0.90 are generally considered acceptable [54-58].

Results

Measurement models: Confirmatory factor analysis

Before fitting univariate growth curve models, we separately fitted measurement models for depression, substance use problems, and social support at baseline and follow-ups (6-month, 12-month, and 18-month post-baseline). [Table 1](#) provides a descriptive summary of the three health behaviors at the four assessment time points. All measurement models were fitted following the structure of the measurement tool for that health behavior (a single-factor model for depression, a 2nd order, five-factor model for substance use problems, and a 2nd-order, three-factor model for social support; see [Supplemental Figures 1-12](#)). Note that we slightly modified the measurement models to allow correlations among residual item variances (see detail in [Supplemental Figures 1-12](#), and measurement model fit indices for the three health behaviors across four waves in [Supplemental Table 1](#)). We kept these residual correlations in the subsequent univariate growth curve models. Overall, the model fit was adequate for all three behaviors, and all factor loadings were statistically significant, supporting the validity of the measurement models (full results available upon request).

Univariate unconditional latent growth curve analysis

We tested up to the 2nd polynomial term in all growth curve models. Based on our prior experience, we anticipated that participants would have non-zero values at baseline with a significant variance, suggesting significant individual differences at the study outset. We further expected that all three behaviors could be modeled by a linear growth term and a quadratic growth term to capture their change over time. [Table 2](#) presents the model fit information and the growth parameters of the univariate unconditional latent growth curve models of all three health behaviors. All three models fit the data adequately. The intercept represents the average baseline level, the linear growth term quantifies the linear rate of change, and the quadratic term quantifies the rate of change in the linear growth rate over time. Social support significantly linearly increased (.34) over time, with the *rate* of increase in social support slowing (–.09) over time ([Figure 1](#)). For depression, the negative linear growth term for depressive symptoms shows that they significantly decreased (–.51) over time; however, the positive and statistically significant quadratic term indicates that reductions in depressive symptoms slowed (.12) over time. For substance use problems, the negative linear growth term shows that they significantly decreased (–.08) over time, while the positive and statistically significant quadratic term indicates that the *rate* of reductions in substance use problems slowed (.02) over time. We constrained the variances of quadratic growth terms to zero, specifying that any individual differences for the quadratic terms are trivial, which is a common observation in growth analysis. Hence, there was no covariation between the quadratic terms and other growth parameters.

In the tests of invariance across time points, the LGCMs of social support and substance use problems both held the strong factorial invariance in which constraints were placed on the structures, the factor loadings, and the intercepts of the measured variables. The LGCM of depression held the configural invariance, in which the pattern of fixed and free factor loadings of measured variables remained the same across time points.

Parallel-process growth models

The associations between the growth parameter terms for social support and depressive symptoms, and for social support and substance use problems were simultaneously assessed in two separate parallel-process growth models ([Figure 2](#)). The intercept-to-intercept, slope-to-slope, and intercept-to-slope correlation

coefficients are presented in [Table 3](#). The initial status of social support was negatively related to the initial status of both depressive symptoms and substance use problems. The intercept-to-slope associations within the same behavior domain showed the same patterns as those reported in the previous section on univariate unconditional latent growth curve analysis. Cross-domain correlations in the intercept and slope were statistically significant and large in magnitude. Higher levels of social support at baseline were related to lower levels of depressive symptoms ($-.67$), and substance use problems ($-.52$) at baseline. After controlling for the baseline differences and within-domain associations, the rates at which social support grew almost entirely explained the rates at which depressive symptoms ($-.99$) and substance use problems ($-.98$) decreased.

We further included covariates, including age, gender, race, and length of stay in the current neighborhood in the models to examine whether the initial levels of the variables vary on these covariates (see Figure 3). Among all the covariates, women, compared to men, presented a significantly higher intercept level of social support in both models and a significantly lower intercept level of substance use problems. However, compared to the unconditional models, key growth parameters in the conditional models remained the same with a few negligible changes.

Discussion

The current study examined the trajectories of social support, depressive symptoms, and substance use problems in a sample of adult PSH residents over 18 months after entering a health coaching program. Over 18 months, significant improvements were observed in all three health behaviors. Specifically, perceived social support increased, whereas depressive symptoms and substance use problems decreased over time, although the rate of positive changes slowed over time. This is an encouraging finding given that PSH residents have a greater need for physical and mental health services when providing adequate professional care could be costly [4]. With monthly brief health coaching lasting for about an hour or less, residents' social support increased along with concurrent reductions in depressive symptoms and substance problems. This is an encouraging finding given that health coaching is a relatively inexpensive and feasible way to promote healthy behavior change.

More specifically, the findings highlight a sizable variability in perceived social support at baseline, with higher perceived social support associated with less severe depression and lower levels of substance use problems. The baseline associations suggest that it may be important for PSH case managers to consider the degree of social support received by their clients. As shown in this study, baseline social support was significantly correlated with the indicators of mental health and substance use problems. This may help case managers to develop need-based customized case management plans.

Furthermore, we found that the PSH residents with low social support at baseline showed increasing social support over time. The data show their rate of growth in social support was faster than those with higher levels of social support at baseline. In addition, PSH residents showed steeper rates of reduction in depression and substance use problems when their social support increased at faster rates, as we observed a negative association between the slopes of the trajectory of social support and depression and the trajectory of social support and substance use problems. The strong cross-domain correlations in the linear slopes suggests that

the benefit of improving social support among PSH residents provides non-disorder-specific overall support for behavior change and improved psychological well-being.

To the best of our knowledge, this is the first study to examine the association between rates of social support and depressive symptoms, as well as between social support and substance use problems among a PSH population using parallel-process growth models. Evidence from this study provides a strong rationale for working to improve social support for PSH residents with mental health and substance use problems. Because m.chat was not an experimental study, it is difficult to determine if positive changes were due to health coaching, other PSH supportive services, or natural changes over time. Nevertheless, the current study suggests that coaching and increased social support can help initiate positive changes in other areas of health.

To our knowledge, this is the most extensive longitudinal study of PSH residents participating in a health coaching program. The results suggest several important implications for the future design of supportive housing programs. First, programs should include regular follow-up to assess the status of related health behaviors among residents. Since improvements in social support and depression may not be consistent over time, regular follow-up may help case managers identify any emerging challenges or difficulties, and to offer corresponding services. Follow-up intervals may need to be even shorter than we used in this study to correctly identify the point where growth slows, and boosters may be desirable. Second, future programs could emphasize social support as an early component as it may bring a favorable prognosis on mental health and substance use problems. The findings from the current study further emphasize the importance of understanding the status and needs of social support among PSH residents, as stated in the classic work of Cohen and Wills [59]. The need for social support may be different based on the specific difficulties or stress events that people try to cope with [59]. Thus, a baseline social support survey is crucial to understand the specific support that PSH residents will need the most.

Similar directions of correlation between the growth pattern of social support and substance use problems were also observed in the other parallel process model. As expected, the statistically significant negative link between the baseline social support and the linear changing rate of substance use indicates that PSH residents who had higher perceived social support at baseline experienced faster improvements in substance use problems. Similarly, the negative link between the baseline substance use problems and the changing rate of social support indicates that PSH residents who had more severe substance use problems at baseline experienced a slower increase in social support. Some researchers have speculated that social support and substance use might be mutually exclusive strategies to cope with stress, such that greater social support might suppress substance use problems [8]. The findings from the current study may recapitulate the potential protective effect of social support on substance use problems, and emphasize the necessity of understanding the social support among PSH residents from the perspective of improving substance use problems.

Our findings should be interpreted with caution even in the context of PSH samples, given the significant variations among healthcare and case management services. Because all participants in this study received monthly health coaching, it is impossible to attribute their positive changes solely to health coaching. It is also possible that PSH residents with improving health may report greater social support, although the reported

interpretation of the association between social support and health behaviors is more consistent with the literature. Considering the findings from past studies indicating that PSH programs alone may not be sufficient to improve social support among PSH residents [20, 21], we believe that an experimental or quasi-experimental study is needed to confirm and verify the effects of social support on depression and substance use problems in this population over time.

Conclusions

This study is one of the few longitudinal studies to examine social support, depression, and substance use problems among PSH residents, an underserved group. With relatively frequent follow-ups over 18 months, this study reveals the pattern of change in two sets of health behaviors simultaneously using parallel process models. The use of latent variable models, including measurement models and latent growth curve models, allows us to formally test our measurement tools to assure good performance and stable properties across time as well as to maximize the available data to examine the research questions. The findings in this study suggest that social support, depression, and substance use problems are very likely to influence the trajectories of each other interactively. These findings suggest new ways to integrate these behavioral health targets in the future design and development of intervention and prevention programs for PSH residents.

Abbreviations

PSH: Permanent Supportive Housing

LGCM: Latent growth curve model

m.chat: Mobile Community Health Assistance for Tenants

MLR: Robust maximum likelihood

RMSEA: Root mean squared error approximation

CFI: Comparative fit index

PHQ-9: Patient Health Questionnaire-9

InDUC: Inventory of Drug Use Consequences

ISEL: Interpersonal Support Evaluation List

Declarations

Ethics approval and consent to participate

This project was approved by the North Texas Regional Institutional Review Board, and participants were given assurances of confidentiality. Informed consent was obtained from each study participant.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and analyzed during the current study cannot be made publicly available due to IRB restrictions, but may be available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests pertaining to the work.

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Authors' contributions

ZT and EYM developed the overall scope of this paper and drafted early versions of this manuscript. STW designed the original m.chat study and oversaw data collection and implementation of the m.chat study. ZT, EYM, USN, and STW reviewed and edited this manuscript over multiple rounds. All authors made substantial contributions to the interpretation of data, and critically revised the manuscript. All authors have approved the final version of the manuscript.

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Tables

Table 1. *Descriptive Statistics (N=653)*

Variables				
Age, mean (SD)	51.3	(10.0)		
Median (IQR)	53.0	(46-58)		
Gender	<i>n</i>	(%)		
Woman	366	(56.1)		
Man	287	(43.9)		
Race/ethnicity				
White	212	(32.5)		
Black	371	(56.8)		
Hispanic	39	(6.0)		
Other	31	(4.7)		
Length of living in the current neighborhood				
Less than 1 year	286	(43.9)		
1-3 years	222	(34.1)		
More than 3 years	144	(22.0)		
Social Support	<i>M</i>	(<i>SD</i>)	<i>n</i>	Range
BL	24.15	(8.72)	627	9-45
FU1	26.45	(9.20)	453	9-45
FU2	27.09	(9.27)	299	9-45
FU3	26.26	(9.51)	245	9-45
Depressive Symptoms				
BL	12.64	(6.31)	644	0-27
FU1	8.43	(5.74)	514	0-24
FU2	8.37	(5.81)	336	0-27
FU3	8.61	(5.93)	248	0-25
Substance Use Problems				
BL	5.25	(9.61)	636	0-42
FU1	3.86	(7.62)	506	0-42
FU2	3.85	(7.89)	332	0-43
FU3	4.47	(8.45)	249	0-43

Note. *M* = mean, *IQR* = interquartile range, *SD* = standard deviation, *BL* = Baseline, *FU1* = 6-month follow-up, *FU2* = 12-month follow-up, and *FU3* = 18-month follow-up.

Table 2. Model Fit and Estimated Parameters from the Univariate Unconditional Growth Models

Variable	Model Fit			Parameters					
	χ^2/df	RMSEA	CFI	Intercept	<i>SE</i>	Linear Slope	<i>SE</i>	Quadratic Slope	<i>SE</i>
Social support	1119.9/606	0.04	0.94	2.84**	0.05	0.34**	0.05	-0.09**	0.02
Depression	1020.8/563	0.04	0.92	1.49**	0.04	-0.51**	0.07	0.12**	0.02
Substance use problems	2858.1/1724	0.03	0.90	0.28**	0.02	-0.08**	0.02	0.02**	0.01

Note. *SE* = standard error; **p*<0.05, ***p*<0.01.

Table 3. Estimated Parameters and Standard Error (*SE*) of the Unconditional Parallel Process Latent Growth Models (also Shown in Figure 1)

Model: Social support and Depression	Estimate	SE
Prospective association		
(Intercept-to-slope)		
Social support - Social support	-0.51**	0.05
Social support - Depression	0.48**	0.06
Depression – Social support	0.83**	0.03
Depression - Depression	-0.81**	0.02
(Intercept-to-intercept) ^b		
Social support - Depression	-0.67**	0.05
(Slope-to-slope) ^c		
Social support - Depression	-0.99**	0.01
Model: Social support and Substance use problems		
Prospective association		
(Intercept-to-slope)		
Social support - Social support	-0.51**	0.06
Social support - Substance use problems	0.48**	0.08
Substance use problems - Social support	0.88**	0.02
Substance use problems - Substance use problems	-0.91**	0.01
(Intercept-to-intercept) ^b		
Social support - Substance use problems	-0.52**	0.07
(Slope-to-slope) ^c		
Social support - Substance use problems	-0.98**	0.01

Note. The estimates are standardized parameter estimates; *p<0.05, **p<0.01.

Figures

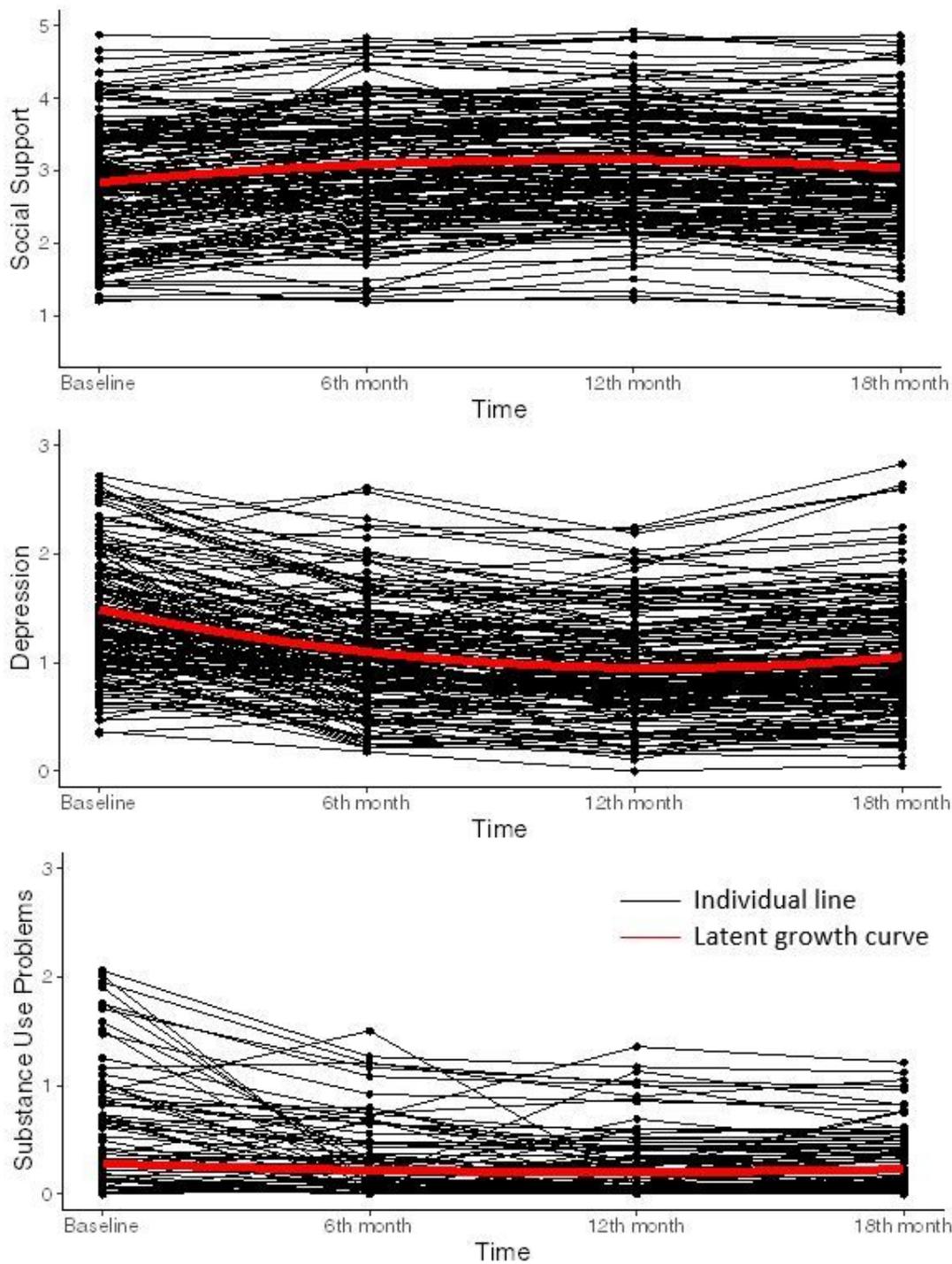


Figure 1

Estimated individual and average growth trajectories of social support (top), depression (middle), and substance use problems (bottom) for a randomly selected 25% sample. Y-axis values indicate the average item score of each measure. Social Support: 1 = hardly ever to 5 = almost always. Depression: 0 = not at all, 1 = several days, 2 = more than half of the days, and 3 = nearly every day. Substance Use Problems: 0 = never, 1 = once or few times, 2 = once or twice a week, and 3 = daily or almost daily.

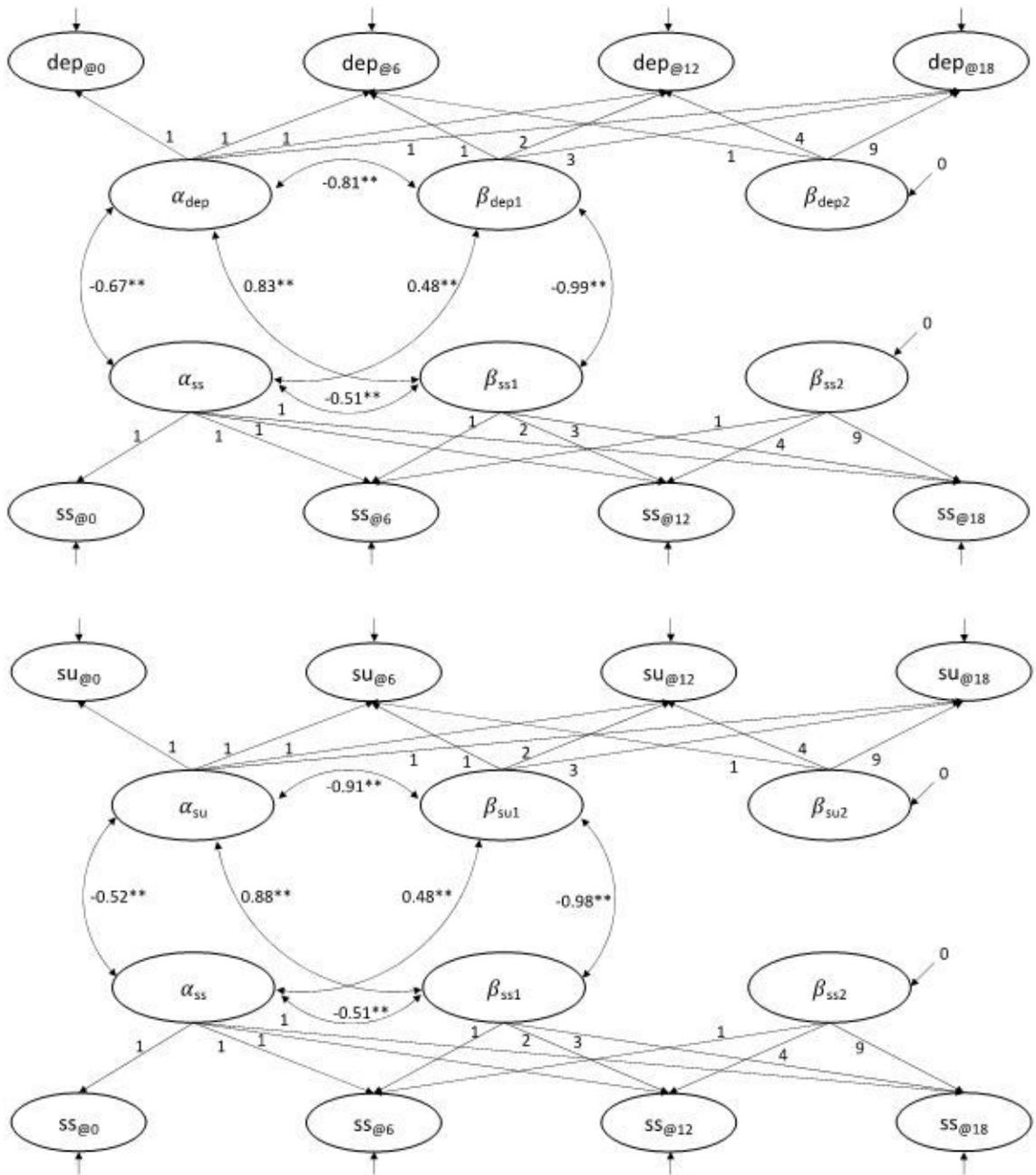


Figure 2

The unconditional parallel process growth curve models, examining the trajectories of social support and depression (top), and social support and substance use problems (bottom). α_{ss} : Intercept social support; β_{ss1} : linear slope social support; β_{ss2} : quadratic slope social support; α_{dep} : Intercept depression; β_{dep1} : linear slope depression; β_{dep2} : quadratic slope depression; α_{su} : Intercept substance use problems; β_{su1} : linear slope substance use problems; β_{su2} : quadratic slope substance use problems. $ss@0$ - $ss@18$, $dep@0$ - $dep@18$, and $su@0$ - $su@18$ represent data over four observations for social support, depression, and substance use problems. The residual variances (error variances) are not shown for better readability. * $p < 0.05$, ** $p < 0.01$.

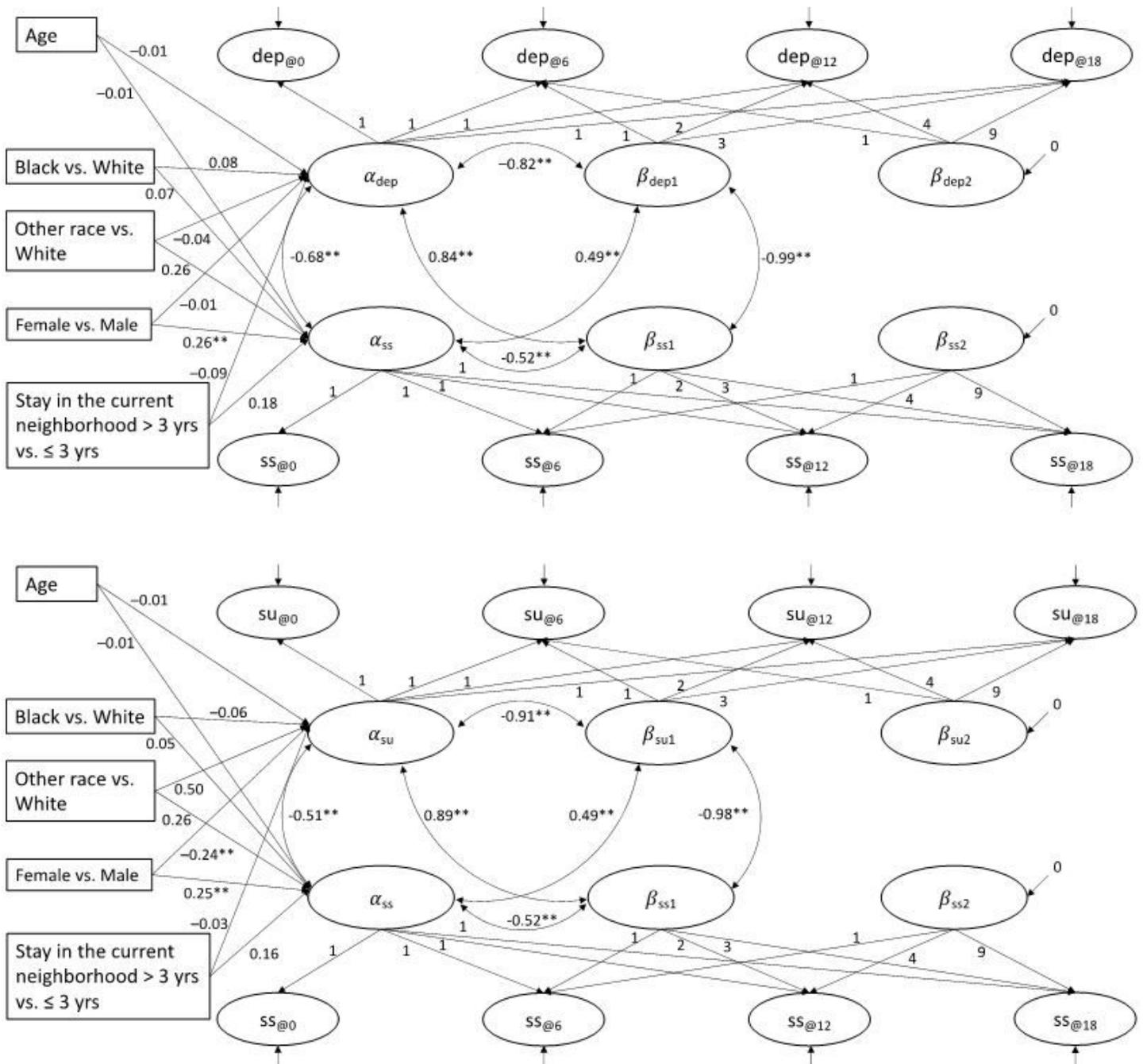


Figure 3

The conditional parallel process growth curve models, with the latent intercepts of social support and depression (top), and social support and substance use problems (bottom) regressed on age, race, gender, and length of stay in the current neighborhood. α_{ss} : Intercept social support; β_{ss1} : linear slope social support; β_{ss2} : quadratic slope social support; α_{dep} : Intercept depression; β_{dep1} : linear slope depression; β_{dep2} : quadratic slope depression; α_{su} : Intercept substance use problems; β_{su1} : linear slope substance use problems; β_{su2} : quadratic slope substance use problems. ss@0-ss@18, dep@0-dep@18, and su@0-su@18 represent data over four observations for social support, depression, and substance use problems. The residual variances (error variances) are not shown for better readability. * $p < 0.05$, ** $p < 0.01$.

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