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Poly-Victimization across Time in Juvenile Justice-Involved Youth Receiving Behavioral Health Treatment

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ABSTRACT

Diversion and community-based treatment for juveniles involved in the justice system is commonly used across jurisdictions as an alternative to incarceration. While evidence-based approaches to assessment have allowed courts and treatment providers to more accurately identify areas of treatment needs, studies have rarely examined how needs change during treatment. One specific area of treatment needs common to juvenile justice-involved youth is exposure to violence (ETV). This study extended a previous cross-sectional study that examined the importance of contextual location on conceptualizing ETV by examining how ETV changes during treatment for youth involved in the justice system. Using Latent Transition Analyses, the data revealed three stable groups: (a) low ETV, (b) Home and School ETV, and (c) Poly-Location ETV. While there was little interclass movement, family history of mental health problems predicted movement from the low ETV to another class. Results confirm the importance of examining the contextual location of the exposure, the relative stability of exposure during treatment, and the importance of providing family-based behavioral health treatment for JJI youth. These findings suggest that juvenile justice-involved youth receiving community-based treatment are likely to continue to experience ETV and that treatment approaches should address this area of need.

KEYWORDS

Adolescent victimization; juvenile justice; treatment; diversion programs

The juvenile justice system has undergone some major changes over the past several decades in an attempt to reduce the incarcerated population. These efforts have focused on promoting diversion and community-based treatment, as well as identifying assessment practices that match youth with services that best address the risks and needs of the individual (Andrews & Bonta, 2010; Harvell et al., 2016). There has been much interest around implementing the Risk Needs Responsivity (RNR) model in the juvenile justice system, which is designed to identify criminogenic risk in youth and match the intensity of treatment to specific needs to reduce risk for recidivism (Bonta & Andrews, 2007 Lipsey, Howell, Kelly, Chapman, & Carver, 2010; Schwalbe, 2007). While much of the literature has focused on how criminogenic risk changes during treatment and how to tailor treatment to these changes, little attention is paid to changes in factors that affect responsivity to treatment (Holloway, Cruise, Morin, Kaufman, & Steele, 2018; Taxman,
One specific area of need that affects responsivity to treatment for many juvenile justice-involved youth is exposure to violence (ETV). ETV is an issue that affects a large proportion of youth in the juvenile justice system and may place youth at risk for future justice system involvement (Wolff & Baglivio, 2016). Increasingly, juvenile justice systems have moved toward trauma-informed treatment to reduce incarceration and prevent recidivism (Griffin, Germain, & Wilkerson, 2012; Ko et al., 2008). However, to adequately implement treatment in juvenile justice-involved youth, we must first understand how youth experience violence exposure and how best to assess and identify issues around ETV.

The current study builds on a previous study (see Butcher, Holmes, Kretschmar, & Flannery, 2016), which used latent class analysis (LCA) to examine typologies of juvenile justice-involved youth exposed to violence. Data reported in the 2016 study indicated that the contextual location in which the violence exposure occurred is an important point of assessment for juvenile justice-involved youth. Building off of this finding, the current study uses latent transition analysis (LTA) to examine whether ETV based on the typologies defined in the previous study changes during community-based treatment for youth diverted from the juvenile justice system. Latent class modeling approaches are often used to find identifiable subgroups with similar characteristics within populations that are seemingly heterogeneous (McCutcheon, 1987). Subgroups refer to smaller clusters of individuals with similarities on a given variable such as ETV. Identifying these clusters can help tailor treatment approaches to target groups of youth who can most benefit from a given type of treatment. While the focus of the first study was to better understand the conceptualization of ETV, specifically around the importance of understanding where exposure to violence occurred, the current study looks to extend this knowledge by examining how ETV changes during treatment for youth diverted from the juvenile justice system. In the previous study, we found subgroups of youth who generally had low probabilities of violence exposure, those who had higher probabilities of violence exposure in homes and school, and those who had high probabilities of ETV in the home, school, and neighborhood (Butcher et al., 2016). Given these findings, the previous study had clear implications around including questions that are location specific when screening and assessing juvenile justice-involved youth for exposure to violence. Based on these conceptualizations from the previous study, the current study will examine whether youth move from subgroup to subgroup (e.g. from elevated probabilities of ETV in all three locations (home, school, and neighborhood) to low probabilities of violence exposure) during treatment and the variables that may predict this movement.

**Literature review**

Across the United States, youth report ETV across multiple social contexts including the home, school, and neighborhood (Butcher et al., 2016; Finkelhor, Turner, Shattuck, & Hamby, 2013; Stein, Jaycox, Kataoka, Rhodes, & Vestal, 2003; Turner, Shattuck, Finkelhor, & Hamby, 2016). Youth exposed to violence are at an increased risk of internalizing and externalizing problems (Ford, Elhai, Connor, & Frueh, 2010; Singer, Anglin, Song, & Lunghofer, 1995; Zarling et al., 2013). Particularly at risk are poly-victims who are exposed to multiple types of violent victimization and experience trauma symptomatology at a higher rate (Finkelhor, Ormrod, & Turner, 2007).
Conceptually, research on poly-victimization distinguishes itself from earlier conceptualizations of ETV by focusing on the cumulative effects of multiple types of violence exposure rather than the frequency of single types of exposure (Finkelhor et al., 2007). Further adding to the complexity of conceptualizing violence exposure, poly-victims experience violence both directly as victims and indirectly as witnesses and in locations such as the home, schools, and neighborhoods (Finkelhor et al., 2013). While males and females are at a similar level of risk for experiencing violence in neighborhoods and schools (Singer et al., 1995), females report higher levels of victimization in the home (Mitchell & Finkelhor, 2001). Factors such as family history of mental health issues also raise the risks of experiencing ETV in the home (Finkelhor, Ormrod, Turner, & Holt, 2009; Tossone et al., 2015). Poly-victimization is associated with trauma symptomatology which often negatively affects the ways in which youth can build and maintain positive social relationships, ultimately changing a youth’s responsiveness to treatment and increasing their risk for recidivism (Butcher, Galanek, Kretschmar, & Flannery, 2015; Holloway et al., 2018).

Widom’s (1989) work on the Cycle of Violence three decades ago has informed research around the effects of children’s maltreatment and ETV. Children who are exposed to violence are at a greater risk for perpetrating violence themselves (Maxfield & Widom, 1996; Widom, 1989) mediated by factors that can help to protect youth from the effects of ETV (Wright, Turanovic, O’Neal, Morse, & Booth, 2019). One theoretical approach to explaining the process in which ETV in youth increases the risk for violence perpetration is the social information-processing theory (Dodge, Bates, & Pettit, 1990; Widom & Wilson, 2015). Youth who experience violence directly and indirectly are more likely to misinterpret social cues and to respond aggressively (Dodge & Crick, 1990). Social interactions are also nested in the context in which they occur and interpretation and reaction to social cues takes into account the settings in which these interactions take place (Lösel, Bliesener, & Bender, 2007).

While there is generally an extensive literature around the impact of ETV, there is still considerable debate around conceptualizing ETV particularly as new and innovative methodologies are developed. Recently, researchers have utilized mixture modeling, a person-oriented analytical technique to classify youth based on their ETV and poly-victimization (Aebi, Giger, Plattner, Metzke, & Steinhausen, 2014; Bender, Ferguson, Thompson, & Langenderfer, 2014; Ford et al., 2010; Ford, Grasso, Hawke, & Chapman, 2013; Kretschmar, Tossone, Butler, & Flannery, 2017; Obsuth, Mueller-Johnson, Murray, Ribeaud, & Eisner, 2017; Reid & Sullivan, 2009; Tossone et al., 2015). Mixture modeling techniques including LCA are fairly familiar in violence research and can help researchers to identify subgroups within a study population (Nurius & Macy, 2008; Swartout & Swartout, 2012). Identifying subgroups can help researchers and practitioners to make sense of data by classifying youth into different groups based on the probability of experiencing a given phenomenon. For example, one study found six subgroups of adolescents exposed to violence, with four of these groups with a high likelihood of different types of polyvictimization (e.g. polyvictimization in the community; Ford et al., 2010). Youth who were identified as experiencing multiple types of abuse and assault are at a higher risk for delinquent behaviors (Ford et al., 2010). Studies have consistently found between 3 (e.g. Aebi et al., 2014; Charak et al., 2016) and 8 (Adams et al., 2016) distinguishable subgroups depending on how ETV was measured with poly-victimization consistently found to be associated with
behavioral health problems (Adams et al., 2016; Burns, Lagdon, Boyda, & Armour, 2016; Turner et al., 2016).

While previous studies incorporating LCA on ETV have consistently and accurately identified subgroups of youth exposed to violence, few studies have examined the importance of contextual location in the study of poly-victimization. Often, ETV occurs in multiple settings, which may be cumulative and particularly damaging as the threat of victimization can become pervasive in these youth’s lives (Mrug & Windle, 2010). Several studies have found subgroups of youth exposed to violence based on the contextual location in which the incidents occur (Butcher et al., 2016; Turner et al., 2016). Findings suggest that youth who experience ETV in multiple locations including the home, school, and neighborhood, termed poly-location victims, have higher levels of externalizing problems (Butcher et al., 2016). Conceptualizing ETV by contextual location may be particularly important as there may be a differential impact of ETV on childhood development based on the ecological context in which the violence occurs.

Bronfenbrenner’s (1974, 1994) work on the ecological models of human development argues that the effect of interpersonal interactions depends on factors nested in the environment. Specific to child maltreatment and violence exposure, Cicchetti and Lynch (1993) proposed the ecological-transactional model which examines the complex hierarchy of risk and protective factors that affects a youth’s susceptibility to violence in the home and community and its effects on child development. They argue that ETV at one level (e.g. community) does not necessarily affect the risk of violence in the home. However, the interaction of the risk and effects of violence in the community with the risk and effects of violence exposure in the home is important in developmental outcomes (Cicchetti & Lynch, 1993; Spano, Rivera, Vazsonyi, & Bolland, 2008).

Accurate assessment for ETV at intake and during treatment is of particular importance in juvenile justice-involved youth receiving community-based treatment. Studies have found that in comparison with community samples, juvenile justice samples consistently report higher prevalence rates of ETV (Ford, Hartman, Hawke, & Chapman, 2008; Wasserman & McReynolds, 2011; Wilson et al., 2013) with one study reporting that as many as 90% experience violent victimization either directly or indirectly (Abram et al., 2004). Females involved in the juvenile justice system are particularly at risk for poly-victimization (Ford et al., 2013). As part of decarceration efforts in the juvenile justice system, a number of states across the US have invested in strategies to divert youth from the justice system by providing evidence-based treatment while keeping youth away from costly and ineffective out of home placements (Harvell et al., 2016). Treating juvenile justice-involved youth in the community can potentially mean that youth who are exposed to violence in multiple settings continue to remain at risk for violence exposure during treatment. While treatment approaches should address issues around ETV (Cohen, Berliner, & Mannarino, 2000), treating juvenile justice-involved youth in nonresidential settings presents a unique challenge. Given that these youth may be at continued risk of experiencing violence during treatment, it is important that the research examines the ways in which ETV changes for youth during treatment and the factors that predict this change. Understanding ETV during treatment has strong implications for assessment, case planning, and treatment for juvenile justice-involved youth.

While studies that have identified subgroups of youth exposed to violence have important implications for understanding poly-victimization at a single time point, few
studies have examined how these subgroups change over time. This is particularly salient for juvenile justice-involved youth who are undergoing treatment as ETV is associated with factors that greatly affect an individual’s responsivity to treatment (Ford, Hawke, Alessi, Ledgerwood, & Petry, 2007). Latent Transition Analyses (LTA) which is an extension of LCA for longitudinal data have generally found that youth in community samples experience consistent levels of ETV over time. In a study of 543 African–American middle school students, Lambert, Nylund-Gibson, Copeland-Linder, and Ialongo (2010) found fairly little movement in youth exposed to violence. Students who reported either high or low levels of violence in 6th grade reported similar levels of ETV throughout middle school. Similarly, Choi and Temple (2016) found that among youth exposed to teen dating violence, there was little movement between classes over time. While these studies have examined subgroups of youth exposed to violence in community samples, little is known about how these models work in juvenile justice-involved youth undergoing treatment in the community. Understanding changes in ETV for juvenile justice-involved youth is particularly important as decarceration efforts have focused on treating youth in the community and ongoing ETV may affect approaches to treatment and recidivism. Therefore, research into the changes in ETV during treatment and the variables that predict these changes are essential to assessment and treatment planning.

Current study

In sum, juvenile justice-involved youth experience ETV and poly-victimization at a high rate. As the juvenile justice system has moved toward providing community-based treatment, it is important that we understand how youth experience ETV during treatment and how to identify those at risk for ETV during treatment. While recent studies have utilized person-oriented approaches such as latent class analysis to identify typologies of experiencing ETV, few studies have examined how these typologies change over time and during the course of treatment. The current study builds upon a previous study that conceptualized exposure to violence and polyvictimization as dependent on social context by examining the data over time to see whether subgroups of juvenile justice-involved youth based on ETV change during treatment. Further, we examine the variables that predict whether youth will transition from one subgroup to another. Understanding how to identify youth who are at risk for continued violence exposure during treatment is important to treatment planning and care. The current study examines the following research questions:

1. How do subgroups of youth exposed to violence change over time?
2. What is the probability that an individual will stay in the same subgroup or move to different subgroups across time?
3. Do family mental health history, gender, and age affect the probability of transitioning to different subgroups?

Method

Study population and design

The study population consists of 1,275 juvenile justice-involved youth who successfully completed participation in the Behavioral Health Juvenile Justice Initiative (BHJJ),
a community-based diversion program in multiple sites across a Midwestern state. Counties contracted with treatment providers to provide BHJJ youth with community-based behavioral health treatment that best serves their population. To be eligible for BHJJ participation, youth were required to have a history of juvenile justice involvement, be between 10 and 18 years old, and present with at least one *Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association, 2000)* diagnosis. Success in treatment often depended upon individual goals and treatment plans, and while there is no general definition, youth were required to attend treatment sessions and meetings with caseworkers, progress in therapy and comply with the terms of the treatment plan, in addition to other county and program-specific criteria. Progress in therapy depends upon individual needs and can include, for example, improving relationships with family members. County-specific criteria may include the terms of probation for counties that served youth on probation while program-specific criteria include programmatic goals such as increasing prosocial activities. Each juvenile court, with the help of their service providers, was asked to identify whether a youth had completed treatment successfully. Youth who did not successfully complete the program often failed to return to treatment providers to complete termination paperwork and therefore were removed from the total sample (n = 704). Table 1 presents the characteristics of the sample, with the majority of participants being male, white, and about 15 years old. Data for the present study were collected at the county level by a trained caseworker during intake and termination interviews with the participant. The average treatment time for participants was 7.32 months (Table 1). After appropriate assent and consent by partici-

### Table 1. Population characteristics

<table>
<thead>
<tr>
<th>Variable in Model</th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Latent Class Indicator</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victim of a Threat- Home</td>
<td>301 (25.5%)</td>
<td>170 (18.1%)</td>
</tr>
<tr>
<td>Witness a Threat- Home</td>
<td>211 (18%)</td>
<td>119 (9.3%)</td>
</tr>
<tr>
<td>Victim Slap, Hit or Punch- Home</td>
<td>438 (37.2%)</td>
<td>221 (23.6%)</td>
</tr>
<tr>
<td>Witness Slap, Hit or Punch- Home</td>
<td>360 (30.6%)</td>
<td>197 (21.2%)</td>
</tr>
<tr>
<td>Victim of Beating- Home</td>
<td>109 (9.3%)</td>
<td>50 (5.4%)</td>
</tr>
<tr>
<td>Witness Beating- Home</td>
<td>135 (11.5%)</td>
<td>67 (7.2%)</td>
</tr>
<tr>
<td>Victim of a Threat- School</td>
<td>398 (33.8%)</td>
<td>208 (22.2%)</td>
</tr>
<tr>
<td>Witness a Threat- School</td>
<td>582 (45.6%)</td>
<td>316 (24.8%)</td>
</tr>
<tr>
<td>Victim Slap, Hit or Punch- School</td>
<td>316 (26.9%)</td>
<td>166 (17.7%)</td>
</tr>
<tr>
<td>Witness Slap, Hit or Punch- School</td>
<td>685 (58.4%)</td>
<td>368 (39.4%)</td>
</tr>
<tr>
<td>Victim of Beating- School</td>
<td>85 (7.2%)</td>
<td>28 (3%)</td>
</tr>
<tr>
<td>Witness Beating- School</td>
<td>642 (54.6%)</td>
<td>354 (37.9%)</td>
</tr>
<tr>
<td>Victim of a Threat- Neighborhood</td>
<td>257 (21.8%)</td>
<td>165 (17.6%)</td>
</tr>
<tr>
<td>Witness a Threat- Neighborhood</td>
<td>391 (33.4%)</td>
<td>236 (25.3%)</td>
</tr>
<tr>
<td>Victim Slap, Hit, Punch- Neighborhood</td>
<td>225 (19.1%)</td>
<td>137 (14.7%)</td>
</tr>
<tr>
<td>Witness Slap, Hit, Punch- Neighborhood</td>
<td>482 (40.9%)</td>
<td>272 (29.1%)</td>
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<tr>
<td>Victim of Beating- Neighborhood</td>
<td>91 (7.7%)</td>
<td>46 (4.9%)</td>
</tr>
<tr>
<td>Witness Beating- Neighborhood</td>
<td>438 (37.4%)</td>
<td>270 (28.9%)</td>
</tr>
</tbody>
</table>

**Covariate**

<table>
<thead>
<tr>
<th>Variable in Model</th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Mental Health History</td>
<td>782 (66.5%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>723 (56.7%)</td>
<td></td>
</tr>
<tr>
<td>Treatment Time</td>
<td>7.32 Months (4.5 Months)</td>
<td></td>
</tr>
<tr>
<td>Age at Beginning of Treatment</td>
<td>15.1 Years (1.5 Years)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>723 (56.8%)</td>
<td></td>
</tr>
</tbody>
</table>

*Neighborhood Disorganization, Treatment Time and Age at Beginning of Treatment employ mean (standard deviation) – All others use frequency (rounded valid percent)*
pants and their caregivers, the counties sent de-identified data to researchers. The participating institution’s IRB approved all study protocols.

**Measures**

**Exposure to violence**

The Recent Exposure to Violence Scale (REVS) contains 26 items that use self-report to measure ETV in the past 12 months as a witness or victim in three locations (school, home, and neighborhood; Singer et al., 1999). Previous research indicates acceptable internal consistency for this scale (Butcher, Kretschmar, Lin, Flannery, & Singer, 2014; Singer et al., 1995). Because we were interested in only the location items (18 location-specific items), we only included those in the analysis, employing the same items as a previous latent class analysis on the REVS in the BHJJ population (Butcher et al., 2016). These items examine several forms of ETV, including experiencing or witnessing threats, being slapped, hit or punched, and beatings for each location. Responses ranged between 0 (Never) and 3 (Almost Every Day). Due to cell scarcity for the 1, 2 and 3 responses, we combined these responses to make each item a dichotomous variable – 0 being an absence of that item or 1 being a presence of that item. While the original scale included two items around witnessing and being a victim of sexual abuse, the frequency of youth who responded yes to these questions was low at intake (victim 6.0%, n = 134; witness 6.2%, n = 138) and at termination (victim 3.4%, n = 37; witness 3.3%, n = 36). Preliminary analyses were conducted with the sexual abuse items in the proposed models but convergence was not achieved indicating extreme values in those variables and were removed from the models presented here. Internal consistency testing employing Cronbach’s Alpha indicated that a dichotomized version (Time 1 $\alpha$ = .84, Time 2 $\alpha$ = .87) performs similarly to the original scale (Time 1 $\alpha$ = .86, Time 2 $\alpha$ = .88).

As described in a previous study (Butcher et al., 2016), ETV at intake was conceptualized as a latent construct composed of three latent classes or sub-populations in the study population. These three sub-populations were dependent upon the location of the exposure – home, school and/or neighborhood. The Low ETV class or sub-population consisted of participants who have a low probability of indicating yes to any of the ETV items. The Home and School ETV class consisted of participants who have a high probability of indicating yes to the home items and school items, particularly being a victim to or witnessing threats or slapping, hitting or punching. The Poly-Location ETV class consisted of participants who have a high probability of indicating yes to the neighborhood and school items, and a somewhat higher probability of indicating yes to the home items.

**Family mental health history**

Family mental health history was a combination of two items measured as part of the Caregiver Information Questionnaire administered during intake. The first item indicated the presence of depression in the participant’s biological family and the second item indicated the presence of any other mental health illness in the participant’s biological family. The Caregiver Information Questionnaire is administered to the participant’s caregiver. The family mental health history item was a dichotomous variable, 0 meaning no history of mental health issues and 1 being family mental health history (yes to clinical depression or yes to other mental health illness).
Other study covariates

Gender was coded as Female (1) or Male (0) and was a self-report item. Due to cell scarcity in some of the race categories, race was coded as a dichotomous variable, White (1) and Nonwhite (0). Nonwhite represented African-American, Hispanic, Asian, or Other. Age at the beginning of treatment was a continuous variable representing age in years at the start of treatment. Treatment time was a continuous variable representing time in months from the beginning date of treatment to the termination date of treatment.

Analysis

This analysis seeks to build upon a previous study that examined the subclasses of juvenile justice-involved youth exposed to violence at one time point to examine changes in subclasses during treatment. For the purposes of this paper and the analyses, subclasses refer to smaller clusters of individuals who share characteristics on a given variable, in this case, exposure to violence (McCutcheon, 1987). In the previous paper, we identified three underlying subclasses with a portion of the same population studied here (Butcher et al., 2016). The following sections will describe the results of a Latent Transition Analysis (LTA), a longitudinal mixture modeling technique that examines how subclasses change over time (Collins & Lanza, 2010; Graham, Collins, Wugalter, Chung, & Hansen, 1991).

LTA is the longitudinal extension of LCA, a cross-sectional, individual-based modeling approach that identifies a latent variable composed of observed categorical items within that latent variable that is represented by heterogeneous sub-populations (McCutcheon, 1987). In contrast with other types of latent variable modeling techniques that focus on variables that can be scaled to create a construct (i.e. factor analysis), the focus of the research is on identifying groups of individuals who experience a phenomenon similarly. Furthermore, the current analysis is intended to examine how these groups change over the course of community-based treatment. As Lambert et al. (2010) note, LTA modeling is useful for measuring the model change in ETV because it allows for the examination of violence exposure over time in addition to explaining the subclasses of youth experiencing ETV.

In the current study, the analyses sought to accomplish four objectives. First, we examined how well the model established in the previous paper fits the sample in this study at intake. The model established in the previous paper consisted of three classes of youth; low probability of ETV, higher probabilities of Home and School ETV, and higher probabilities of ETV in the Home, School, and Neighborhood. Second, the analysis sought to establish the model at termination by examining how well the intake model fits the data at termination. Third, we examined how subgroups of youth change from class to class from intake to termination. For example, youth may stay in the same ETV class from intake to termination while others move from a low probability of ETV to a high probability of ETV during treatment. Finally, the fourth objective of the analysis is to examine the factors that predict whether a youth moves or stays in a subgroup.

To accomplish these four objectives, we fit an LTA model using the three-step approach recommended by Nylund (2010) and Collins and Lanza (2010). We assessed how well the model fit by first including only the REVS variables, and then we added in the important covariates that were identified in the previous study. As with LCA, LTA relies on multiple indicators for assessing model fit, including relative information criteria, the Bayesian
Information Criterion (BIC), Akaike’s Information Criterion (AIC), and the adjusted Bayesian Information Criterion (aBIC), entropy, to compare models against each other while favoring the most parsimonious and interpretable class solution (Geiser, 2012). These fit criteria, in addition to the Bootstrap LR Difference Test, were also employed to compare between classes when fitting the time 2 LCA model before fitting the LTA model. All LTA models employed random start values to ensure that results are global rather than only local solutions. These random starts allow researchers to see whether estimating the model multiple times results in the same or a different solution.

We fit several LTA models. First, we fit one that did not include covariates in order to obtain the baseline transitional probabilities and classification of individuals into possible classifications. As with an LCA, we examined fit statistics to determine which model fits the data best. Another important aspect of fitting an LTA model is the examination of measurement invariance from Intake to Termination. LTA measurement invariance is defined as the models, including the number and nature of classes, being expressed similarly over a period of time (Collins & Lanza, 2010). While measurement invariance is desirable, it is not necessary as we can estimate using partial measurement invariance. To estimate measurement invariance, we compare the selected LTA model using all freely estimated parameters with the same model except one where all of the parameters are set to equal each other over time. Then, we can calculate the amount that these two agree by conducting an LRT test (Perra, 2012). If the $p$-value is < .05, then we cannot assume measurement invariance and will fit a model that is partially non-invariant by estimating which parameters should be fixed based on theory.

Following proper LTA model fit, the second LTA model included all covariates related to Time 1 membership: gender, family mental health history, age at beginning of treatment, race, and treatment time in months. We hypothesized that family mental health history and treatment time in months would be related to the transition probabilities from Time 1 to Time 2; therefore, the third model included statistically significant covariates affecting Time 1 membership (gender and family mental health history) and family mental health history and treatment time in months affecting Time 1 to Time 2 membership. The tables presented reflect the multinomial logistic regression analyses from the second model and third model. Only statistically significant results are presented from the third model. Analyses were conducted in MPlus version 7.2 (Muthén & Muthén, 1998/2014) and the SAS PROC LCA and LTA Macro Version 1.3.2 (Lanza, Dziak, Huang, Wagner, & Collins, 2015).

**Results**

Table 1 displays the population characteristics according to the 18 Recent Exposure to Violence Scale (REVS) class indicators employed in the LCAs and LTA, and the covariates employed in the LTA model. A total of 1,094 participants had all the covariates of interest in this study. Generally, the prevalence of each REVS variable decreased from Time 1 to Time 2. Nearly two-thirds (66.5%) of successfully completed youth had a family history of mental health issues as indicated by their caregivers. Most of the successfully completed population is male (56.7%) and white (56.8%). The average age at the beginning of treatment was 15.1 years. The average treatment time was 7.3 months. We examined differences in all ETV variables in the study for successful and unsuccessful completers at
intake and found no statistically significant differences. These population characteristics were also similar to the cross-sectional model presented previously (Butcher et al., 2016).

The original Time 1 LCA presented in a previous article was conducted on all youth enrolled in BHJJ (N = 2,124; see Butcher et al., 2016). Prevalence rates for all violence exposure items are nearly identical (see Butcher et al., 2016) suggesting that the two samples are similar to the variables of interest. Considering the population characteristics including the endorsement of the REVS latent indicators were very similar for the current analyses, we used the same LCA three-class model and found nearly identical fit statistics and conditional probability plot (Figure 1). The three classes are as such: Low ETV (low probability of endorsement on all items), Home and School ETV (high probability of endorsement on home and school items), and Poly-Location ETV (high probability of endorsement on home, school and neighborhood items). For more information on the measurement portion of the Time 1 LCA model, please see Butcher et al. (2016).

While the fit criteria for the Time 2 LCA indicated a superior fit (lower AIC, BIC, aBIC; Higher entropy) for a four-class model as opposed to a three class model, the interpretation of the fourth class was unclear and endorsement of the indicators were in the .4 to .5 range. This class may indicate a group of individuals that are guessing their answers, decreasing the interpretability of an optimal class solution (Geiser, 2012). Due to the poor interpretation of the fourth class, we opted to remain with the three-class solution determined in the Time 1 LCA. Figure 1 presents the Time 1 LCA (top figure) and Time 2 LCA (bottom figure) conditional probability plots for the study population. For the Low ETV class, endorsement of REVS indicators was lower at Time 2 than at Time 1. For Time 2, there appeared to be a clearer divide between the Poly-Location ETV class and the Home and School ETV class, particularly for the Home indicators.

We suspected that due to the shift in the home items and the neighborhood items for the Home and School ETV class that there might be partial measurement invariance from Time 1 to Time 2. To test for this, we compared the LTA with full measurement invariance and the LTA with freely estimated parameters and found that there was a statistically significant difference between the two models (p = .0003). Then, we compared the LTA with full measurement invariance and the LTA with freely estimated parameters for the home and neighborhood items (partial measurement invariance) and found that there was no statistically significant difference between the two models (χ² = 32.012, df = 36, p = .30). Therefore, we ran the model with constrained parameters on the School items, and freely estimated parameters on the home and neighborhood items.

According to the results of the LTA (no covariates), the prevalence of latent classes from Time 1 to Time 2 shifts (Table 2). In Time 1, the prevalence of the latent classes is about equal, with a larger prevalence in the Poly-Location ETV class (38.1%) than in the Low ETV (33.8%) or Home and School ETV class (28.1%). This changes by Time 2, where the majority of the prevalence is in the Low ETV class (53.9%), and the other two classes each experience a prevalence decrease of about 10%. This shift in prevalence is supported by the transition probabilities demonstrated in Figure 2 (Table 3). The highest probabilities are in the cells that represent no movement from one class to a different class (i.e. Low ETV to Low ETV). Following that, the highest probabilities are from the Home and School ETV and Poly-Location ETV to Low ETV (.39). Therefore, in this population, someone has a higher likelihood of remaining in the same class from Time 1 to Time 2 than of moving to another class, particularly if that
A person is in the Low ETV class (.85). If someone is in the Home and School ETV or Poly-Location ETV class, that person has about a 40% chance of moving to the Low ETV class.

Figure 1. Conditional item probability plots for 3-Class LCA models for Time 1 and Time 2.
Based on this model, there are nine statuses that can represent the spectrum of transitioning (or staying) from one class to another between Time 1 and Time 2 (Table 4). Staying in the Low ETV class represents 28.6% of the study population (n = 365). While staying in the other two classes represents 32.6% of the study population, moving from Home and School ETV or...
Poly-Location ETV to Low ETV represents about 26.1% of the study population. Additionally, few move from a lower ETV class to a higher ETV class (9.3%, n = 119).

After examining the baseline LTA model, we included covariates into the model using multinomial logistic regression analysis. Table 5 presents the results of the regression analysis of the impact of covariates on Time 1 class membership. Family mental health history compared to no family mental health history (p = .0039) and gender (female compared to male; p = .0188) significantly impacted Time 1 class membership. Of particular interest is family mental health history, where those who have family mental health history have higher odds of being in the Home and School ETV class (OR = 1.93) or Poly-Location ETV class (OR = 1.45) than being in the Low ETV class. Females had lower odds of being in the Poly-Location ETV class versus the Low ETV class (OR = 0.72); however, they had slightly higher odds of being in the Home and School ETV class versus the Low ETV class (OR = 1.15) compared to males.

While we examined the impact of both statistically significant variables on the transition from Time 1 to Time 2, we focused on the Odds Ratios for only family mental health history due to the interest of the study and because the data revealed generally null ORs (about 1.00) for each class comparison. Table 6 presents the Odds Ratios for family mental health history (compared to no family mental health history). Similar to the Time 1 LCA

<table>
<thead>
<tr>
<th>Table 3. Transition probabilities of latent class membership.</th>
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<tbody>
<tr>
<td>Time 1</td>
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<tr>
<td>--------</td>
</tr>
<tr>
<td>Low ETV</td>
</tr>
<tr>
<td>Home and School ETV</td>
</tr>
<tr>
<td>Poly-Location ETV</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Table 4. Classification of individuals based on the estimated model (N = 1,275).</th>
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<tbody>
<tr>
<td>Time 1 Class</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Low ETV</td>
</tr>
<tr>
<td>Low ETV</td>
</tr>
<tr>
<td>Low ETV</td>
</tr>
<tr>
<td>Home &amp; School ETV</td>
</tr>
<tr>
<td>Home &amp; School ETV</td>
</tr>
<tr>
<td>Home &amp; School ETV</td>
</tr>
<tr>
<td>Poly ETV</td>
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<td>Poly ETV</td>
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<td>Poly ETV</td>
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<th>Table 5. Multinomial logistic regression modeling Time 1 covariate impact.</th>
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<tbody>
<tr>
<td>Family Mental Health History(^b)</td>
</tr>
<tr>
<td>Gender(^c)</td>
</tr>
<tr>
<td>Treatment Time (^d)</td>
</tr>
<tr>
<td>Age at Beginning of Treatment (^d)</td>
</tr>
<tr>
<td>Race(^d)</td>
</tr>
</tbody>
</table>

\(^a\)Class 1 (Low ETV) is the Reference Group  
\(^b\)No Family Mental Health History is the Reference Group  
\(^c\)Male is the Reference Group  
\(^d\)Nonwhite is the Reference Group
covariate analysis, we find that those who go from the Low ETV class to a higher ETV class (Home and School ETV or Poly-Location ETV) have a higher odds of family mental health history (OR = 1.26 and 1.22, respectively) than those who stay in the Low ETV class. When examining the impact of family mental health history on transition probability and status membership (Table 7), we find that the transition probabilities are similar regardless of family mental health history. However, those with a family mental health history have a slightly higher probability of transitioning from Low ETV to Home and School ETV, Low ETV to Poly-Location ETV, Home and School ETV to Low ETV, Poly-Location ETV to Home and School ETV than those without a family mental health history.

Discussion

The current study extended a previous cross-sectional study by examining how subgroups of juvenile justice-involved youth exposed to violence change over time. As with the previous study (see Butcher et al., 2016), we found that location was an important distinguishing factor for youth experiencing ETV. Youth exposed to violence can be classified into three subgroups according to the contextual location in which the violence occurred: Low ETV, Home and School ETV, and Poly-Location ETV. Recent literature has shown that in addition to understanding the cumulative nature of violence exposure, conceptualizing ETV in youth should focus on the location in which the incidents occurred and the effects of victimization across

Table 7. Prevalence of latent class membership and transition probabilities according to family mental health history.

<table>
<thead>
<tr>
<th>Time 1 Class</th>
<th>Time 2 Class</th>
<th>Prevalence</th>
<th>Transition Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low ETV</td>
<td>Low ETV</td>
<td>Family Mental Health Hx</td>
<td>No Family Mental Health Hx</td>
</tr>
<tr>
<td>Low ETV</td>
<td>Home &amp; School ETV</td>
<td>187 (25.6%)</td>
<td>128 (34.8%)</td>
</tr>
<tr>
<td>Low ETV</td>
<td>Poly ETV</td>
<td>25 (3.4%)</td>
<td>14 (3.8%)</td>
</tr>
<tr>
<td>Low ETV</td>
<td>Low ETV</td>
<td>90 (12.3%)</td>
<td>27 (7.4%)</td>
</tr>
<tr>
<td>Home &amp; School ETV</td>
<td>Low ETV</td>
<td>106 (14.5%)</td>
<td>37 (10.1%)</td>
</tr>
<tr>
<td>Home &amp; School ETV</td>
<td>Home &amp; School ETV</td>
<td>30 (4.1%)</td>
<td>17 (4.6%)</td>
</tr>
<tr>
<td>Poly ETV</td>
<td>Low ETV</td>
<td>96 (13.1%)</td>
<td>63 (17.2%)</td>
</tr>
<tr>
<td>Poly ETV</td>
<td>Home &amp; School ETV</td>
<td>30 (4.2%)</td>
<td>8 (2.2%)</td>
</tr>
<tr>
<td>Poly ETV</td>
<td>Poly ETV</td>
<td>153 (20.9%)</td>
<td>69 (18.8%)</td>
</tr>
</tbody>
</table>

*Family Mental Health History compared to No Family Mental Health History*
multiple social contexts (Butcher et al., 2016; Turner et al., 2016). Data presented here also demonstrated the stability of this conceptualization of ETV across time. The current study was also restricted to using only youth who successfully completed programming, and therefore, the stability in the conceptual model further confirms the importance of contextual location as a factor in conceptualizing ETV in juvenile justice-involved youth.

Consistent with findings reported by Lambert et al. (2010) and Choi and Temple (2016), data presented here suggest that subgroups of youth who experience ETV change with fairly low probability during treatment. Particularly, the Low ETV class was the least likely to change from Time 1 to Time 2. It is encouraging that subgroups of youth with a low probability of ETV at intake into treatment are likely to remain at low risk for ETV throughout treatment. Similar to the finding for youth in the Low ETV class, there was a substantial probability that youth in Poly-Location ETV class at intake would continue to experience ETV in all three contextual locations throughout treatment. These youth present a challenge for treatment providers as ETV is likely to be ongoing.

While interclass movement was fairly low for all three subgroups of youth exposed to violence, family history of mental health issues predicted movement from the Low ETV class into either the Home and School ETV class or the Poly-Location ETV class. Previous studies have found that family history of mental health issues is a predictor of ETV class membership (Butcher et al., 2016; Tossone et al., 2015). The current study builds upon these previous studies by demonstrating the importance of family mental health problems in the dynamic nature of a youth’s experience with ETV.

**Strengths and limitations**

Several strengths of the current study are of note. Data from the current study represent a relatively large sample of youth involved with the juvenile justice system. Behavioral health problems in juvenile justice-involved youth are still a relatively understudied issue that can have a significant impact across child-serving systems. While there are a number of cross-sectional studies on ETV in this population, data at intake and termination are fairly unique. Youth in the juvenile justice system are more likely to be from areas of high structural disadvantage and are at an increased risk for ETV (Butcher et al., 2015). Therefore, the current study design allowed for an examination of youth who report high prevalence rates of ETV across social contexts and during treatment. High prevalence rates for each of these items allowed for a clear separation of latent classes. While the sample is restricted to youth in a Midwestern state, these youth represent 11 geographically diverse counties across the state.

While the current study has several strengths, findings reported here have several limitations. Youth are involved with the juvenile justice system so findings may not be generalizable to community samples. Further, ETV is a sensitive topic that participants may feel uncomfortable discussing. Self-report surveys on sensitive topics have the implicit limitation of underreporting or malingering (Butcher et al., 2014; Tourangeau & Yan, 2007). Due to data scarcity in cells, ETV items were dichotomized to reflect whether the youth had or had not experienced each type of incident in the past year. The items included in the REVS have been dichotomized in previous studies (e.g. Butcher et al., 2016). Data for this study were derived entirely of youth who successfully completed treatment. As youth often did not return to the juvenile court or treatment agency...
following their unsuccessful termination, we did not have the opportunity to collect data at the second time point. However, the LCA model at intake reported in this study fit the data similarly when compared to the Butcher et al. (2016) study which included all youth participating in the BHJJ program including those who would go on to complete the program unsuccessfully. Further, it is important to note that exposure to violence is experienced by the majority of juvenile justice-involved youth. Regardless of their program completion status, the prevalence of ETV at intake was similar. The current study also does not include questions around sexual violence. While we did collect these data, there were not enough youth who answered yes for the models to converge. Finally, while the current study is an examination of the effects of change in ETV during treatment, the average length of time between intake and termination was 7 months. Longer time periods between measurement may uncover a more meaningful change in latent profiles. However, several studies using latent transition analysis examining ETV class membership across time show that ETV class membership across time is fairly stable (Choi & Temple, 2016; Lambert et al., 2010).

Conclusions

Exposure to violence is an important challenge for juvenile justice-involved youth and treatment providers as more juvenile justice systems expand diversion programming. Research on juvenile justice-involved youth have consistently recommended screening for ETV and trauma as part of the intake and screening procedures (Branson, Baetz, Horwitz, & Hoagwood, 2017; Ford, Cruise, Grasso, & Holloway, 2018; Fox, Perez, Cass, Baglivio, & Epps, 2015; Ko et al., 2008). Screening procedures can help to identify treatment needs for youth and can help systems to reduce recidivism. The current study reinforces the importance of capturing the contextual location in which the violence exposure occurs by examining ETV at two time points. This finding supports previous research that examined location-based ETV using person-oriented approaches (Butcher et al., 2016; Turner et al., 2016).

While the purpose of the current study was to examine the conceptualization of ETV during treatment and to understand how subgroups of youth experience ETV, data presented here also have significant implications for family-based treatment in juvenile justice settings. The findings here suggest that family history of mental health was associated with ETV in multiple settings throughout treatment. This may support treatment models that involve both the youth and their caregivers to build and sustain supportive relationships. Evidence supported treatment models appropriate for juvenile justice-involved youth that have been successfully implemented in the community while maintaining fidelity include Multisystemic Therapy (MST), Functional Family Therapy (FFT), and Treatment Foster Care-Oregon (TFC-O, formerly Multidimensional Treatment Foster Care, MTFC; Henggeler & Sheidow, 2012). While these treatments do not target PTSD specifically, they do address associated and common behavioral and functional issues (Mahoney, Ford, Ko, & Siegfried, 2004). A major benefit of these types of treatments is that they coach caregivers to intervene in the multiple domains of their child’s life (school, peers, and community) to varying degrees. This makes these programs extremely well-positioned to address the youth’s complex need for safety, stability, and structure, in order for caregivers to best guide the child in navigating the
often fraught terrain of adolescence into adulthood. These treatment approaches often address issues beyond the reasons for referral, and target other co-occurring issues in order to build up protective factors that are needed to help the youth to achieve and sustain positive changes, including targeting the youth and caregivers’ substance abuse and mental health needs (Henggeler & Sheidow, 2012).

Validated and evidence-based treatments that have shown that they can reduce symptoms of mental health issues for caregivers are particularly worth consideration for use with juvenile justice-involved youth with violence exposure and a history of family mental health issues. Employing a treatment approach that addresses caregiver mental health needs can be powerful in activating protective parenting approaches that aid in a youth’s recovery and resiliency. Data here indicated that these youth are particularly vulnerable to repeated victimization and trauma and point to the importance of providing juvenile justice-involved youth with family-based treatment approaches.

While the current study has significant implications for the assessment of ETV during community-based treatment and the factors associated with ETV, future studies should examine the impact of ETV on treatment engagement and outcomes. Juvenile justice-involved youth are likely to experience ETV across multiple social and this can have an impact on treatment outcomes. Further, the data showed a fairly high likelihood that youth who experience ETV in multiple settings will continue to experience ETV throughout community treatment. Future studies should examine how well-specific treatment modalities can help youth to build resilience and how resilience affects both treatment outcomes and future justice involvement.

**Disclosure statement**

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