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ORIGINAL ARTICLE

Patterns of Poly-Victimization in a Sample of At-Risk Youth

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Abstract Youth involved in the juvenile justice and child welfare systems are at especially high risk for exposure to violence. Research finds that poly-victims, youth who experience multiple types of victimizations, have worse outcomes than youth who experience one type of violence. We employed Latent Class Analysis to examine patterns of poly-victimization in a sample of at-risk youth ($N = 467$) participating in a program to reduce the effects of childhood exposure to violence and how those patterns impact self-reported violent behavior and primary mental health diagnosis. Results indicated that 96 % of the sample reported any past year violence exposure and 87 % reported at least two past year exposures. Three victimization classes emerged: low victimization, peer and physical assault, and high violence exposure. Class membership predicted violent behavior, while results related to class membership and primary mental health diagnosis were less clear. Implications for screening, assessment, and treatment are discussed.

Keywords Victimization · Juvenile justice · Child welfare · Mental health · Trauma

Nearly sixty percent of children and adolescents report exposure to violence in the past year as either a witness or victim (Finkelhor et al. 2013). Childhood exposure to violence (CEV) is linked to a host of negative consequences, including poor mental health (Osofsky 1995; Paolucci et al. 2001; Singer et al. 1995; Turner et al. 2006), re-victimization as adults (Desai et al. 2002; Widom et al. 2008), violent behavior and delinquency (Farrell and Bruce 1997; Fowler et al. 2010; Singer et al. 1999) and poor academic outcomes (Bowen and Bowen 1999; Delaney-Black et al. 2002; Schwartz and Gorman 2003). Recent research reports that children and adolescents who experience multiple types of victimizations (e.g. child maltreatment, physical assaults, sexual assaults, etc.), known as "poly-victims", demonstrate worse outcomes than those who experience one type of violence, even if this violence is persistent (Finkelhor et al. 2007), 2009.

Compared to non-victims or those who have experienced a single type of violence, poly-victims report greater psychological distress (Espelage et al. 2012; Gustafsson et al. 2009; Holt et al. 2007; Turner et al. 2010), suicide ideation (Bhatta et al. 2014; Turner et al. 2012), and behavior problems including future delinquency (Ford et al. 2010; 2011). In a recent study, Turner et al. (2012) found that poly-victimization accounted for a large portion of the variance in the relationship between CEV and trauma symptomatology.

Recently, researchers have examined not only the prevalence of poly-victimization, but also the sub-populations, or classes of poly-victims and how these class memberships impact outcomes. Several researchers employed latent class analysis to identify sub-groups, or latent classes, of poly-victims (Aebi et al. 2014; Bender et al. 2014; Ford et al. 2009, 2010, 2013; Grasso et al. 2013; Reid and Sullivan 2009; Tossone et al. 2015). Using both national samples and more targeted populations of children and adolescents, researchers have reported anywhere from two (Tossone et al. 2015) to six (Ford et al. 2010) classes of poly-victims.

In one study of a national sample of adolescents, Ford et al. (2010) found six distinct classes of poly-victims: sexual

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abuse/assault, physical abuse/assault, witnesses to assault, community violence, accident/disaster victim, and assault. Generally, poly-victim classes were more likely to report post-traumatic stress symptoms and co-occurring substance abuse issues than classes characterized by predominantly one type of victimization. Youth in the poly-victimization classes were also more likely than youth in single-type victimization classes to report participating in delinquency. In a sample of youth participating in the Developmental Victimization Survey (DVS; Turner et al. 2007), Reid and Sullivan (2009) identified three distinct classes: minimally victimized youth, victims of bullying, and universally victimized youth. Older youth, youth who received less parental supervision, and youth who experience greater levels of family adversity were more likely to be classified as universally victimized.

Children and adolescents involved in the juvenile justice, child welfare, and behavioral health systems are at especially high risk for exposure to violence and trauma (Arroyo 2001; Caufman et al. 1998; Ford et al. 2007; Hennessey et al. 2004; Kretschmar et al. 2013, 2014; Wasserman and McReynolds 2011). In a sample of juvenile justice-involved youth, Ford et al. (2013) identified three classes: poly-victims, moderate adversity, and low adversity. The authors found that youth in the poly-victim class had the highest likelihood of reporting severe emotional and behavioral problems. Grasso et al. (2013) examined poly-victimization in a sample of maltreated children from families enrolled in the Navy Family Study. They found three classes of victimization: poly-victimization, high rates of physical abuse and witnessing intimate partner violence, and high rates of physical abuse only. Results indicated that the poly-victimization class was at the highest risk for alcohol and substance use, self-reported delinquency, and meeting criteria for posttraumatic stress disorder and depression.

While most of these studies focused on class membership as a possible predictor of exposure to a variety of outcomes (Aebi et al. 2014; Bender et al. 2014; Ford et al. 2010, 2013; Grasso et al. 2013), few examined predictors for class membership (Tossone et al. 2015). Previous research established that factors such as gender, age, and race have implications for childhood exposure to violence (Finkelhor et al. 2007, 2009a). This study adds to the literature on predictors for class membership by examining gender, age, and race as hypothesized predictors for latent class membership.

In addition, while previous studies have focused on either national samples or a specific subpopulation (e.g. psychiatric patients, juvenile justice-involved youth), the current sample is composed of at-risk youth involved in one or more child serving systems, including child welfare, juvenile justice, and behavioral health. This allows for a more comprehensive and inclusive investigation of victimization class membership in an at-risk sample. Furthermore, person-centered analyses (such as latent class analysis), increase applicability to several psychiatric and social work fields to understand victimization and violence prevention (Swartout and Swartout 2012). Using these analyses in a sample of system-involved children and youth will allow us to better understand the patterns of victimization and related mental health and behavioral outcomes, which can lead to improved treatment for this population.

Previous research examined the impact of class assignment on mental health diagnosis, although results are inconsistent. In one study of male juvenile offenders, class membership was related to the likelihood of certain psychiatric disorders (Aebi et al. 2014) while a study of children with psychiatric impairment revealed no statistically significant relationship between class assignment and diagnosis (Ford et al. 2009). The current study attempts to provide additional clarity around the relationships between class membership and mental health diagnosis by employing DSM IV diagnoses to improve measurement accuracy. In addition, the current sample contains both at-risk males and females involved in one or more child serving systems (child welfare, juvenile justice, behavioral health) to provide a more complete picture of this association.

Furthermore, while several studies employed Latent Class Analysis (LCA) to measure victimization as well as determine the correlates to victimization, there are analytical gaps in the literature. First, relatively few studies have examined the relationship between victimization class membership and hypothesized outcomes using updated statistical procedures that increase estimation accuracy. This is namely the relatively newer distal outcome analysis employing the Lanza Method (Lanza et al. 2013). Previous studies assumed class membership as a static categorical variable that can then be associated with an outcome (such as PTSD or depression) using MANOVA and ANOVA (Ford et al. 2013; Grasso et al. 2013), chi-square tests (Aebi et al. 2014), or generalized linear or logistic regression models (Aebi et al. 2014; Bender et al. 2014; Ford et al. 2010). This is not an accurate assumption, as class membership is a probability, and if the model has a relatively low distinction between classes (entropy), then a case may have a 50 % or higher chance of misclassification, increasing the risk of Type I Error. The Lanza Method takes this probability of being in a class into account during the test of association. To our knowledge, only one study examining victimization employed this method (Tossone et al. 2015). However, their sample was limited (N = 260) and focused only on youth with severe behavioral health issues. Furthermore, they focused on harmful behaviors (suicide, self-harm, and aggression) as the outcome rather than mental health diagnosis and violent behavior. This study adds to the literature by focusing on DSM IV diagnosis and violent behavior as distal outcomes of class membership using this updated analytic technique.

Therefore, our research questions are as stated:

1. How many sub-populations exist in the sample based on victimization typology?
2. How do gender, race, and age predict victimization class assignment?
3. Is class assignment associated with DSM IV diagnosis and violent behavior outcomes?

Method

Sample

The sample contains 467 at-risk children and adolescents involved in Cuyahoga County, Ohio's Defending Childhood Initiative (DCI). The Defending Childhood Initiative is a Department of Justice funded program designed to reduce or eliminate childhood exposure to violence and the consequences associated with that exposure. The Cuyahoga County DCI involves screening, assessing, and treating children and youth involved in one or more of several child serving systems (e.g. child welfare, juvenile justice, behavioral health agencies) for childhood exposure to violence and trauma. The project serves children from birth to 18 years of age. Two screening forms are used: a caregiver report for children aged 0 through 7, and a self-report for youth aged 8 and over. Depending on the type of agency, screenings are generally facilitated by trained caseworkers, probation officers, or clinicians. Prior to the start of the initiative, several training sessions were held with the screening agencies to describe the purpose of the initiative and provide instructions on the proper way to conduct screenings.

Youth can be referred for more comprehensive assessment in two ways. First, youth who indicate high levels of exposure to violence or trauma based on established scoring criteria on the screener are referred for a voluntary diagnostic assessment, which may then lead to referral into trauma-informed behavioral health treatment. Youth may also be referred for a full diagnostic assessment if the individual conducting the screening feels the youth has likely experienced elevated rates of violence and trauma even though it may not be indicated on the screening instrument. Youth or caregivers may not always feel comfortable admitting sensitive information such as trauma exposure, and thus members of the DCI evaluation and treatment committees felt that an override option was important.

All diagnostic assessments were conducted by trained, Masters-level clinicians from one local behavioral health agency. As part of the diagnostic assessment, information related to violence exposure and violence perpetration was collected. Self-reported violent behaviors were collected only for children 8 years of age and older. If treatment was recommended, referrals were made to one of several behavioral health agencies in Cuyahoga County that offered trauma-informed interventions. All services provided through DCI are free to the youth and family.

While the program serves children aged 0 to 18, the analyses presented here are limited to the data collected from children aged 8 and older. The data gathered from this group are self-report, and while CEV data was gathered from all children taking part in the program, this is the only group from whom self-reported violent behavior information was collected. All evaluation activities were approved by the Case Western Reserve University Institutional Review Board.

Instrumentation

Childhood Exposure to Violence Past year exposure to violence was measured using an abbreviated version of the Juvenile Victimization Questionnaire (JVQ). The full JVQ is composed of 34 items designed to assess five general victimization types: conventional crime, maltreatment, peer and sibling victimization, sexual victimization, and witnessing and other exposures to violence (Finkelhor et al. 2005). There are several versions of the JVQ, including a brief 12-item instrument that correlates highly with the full version (Finkelhor, Hamby, Turner, & Ormrod, 2011). All items are dichotomous with response options including 'yes' and 'no'.

The Cuyahoga County DCI chose the shortened, 12-item version of the JVQ and added three additional items from the full version. The shortened JVQ contains items from all five general victimization types contained in the full version. The additional items included questions related to a child: being hit or hurt by an adult, being picked on by another child, and knowing someone who was murdered. These additional items were selected by clinicians and researchers involved in the project and were chosen for their relevance to DCI and its mission. An Exploratory Factor Analysis showed that the 5-factor solution fit best compared to one through seven factors ($P = 0.0013$), with a CFI of .994 (cutoff value > .95) and a RMSEA of 0.016 (cutoff value > .05). The 5-factor solution showed that items fit in the same constructs as the original JVQ. However, it should be noted that while the JVQ may be considered a five-construct victimization measure, the emphasis placed on the constructs should be limited as this is not a psychological measure, but rather a measure of actual life events (Finkelhor et al. 2005), and how these items relate to each other may not be as important as how they relate to the sub-populations presented in the analysis. Thus for this analysis, we used the items separately and not the constructs that each item represented. These data were collected during the diagnostic assessment. Table 1 provides the 15 JVQ items employed in the analysis.

Table 1 Victimization characteristics

Variable	Frequency (%)
Victimization variable[a]	
Witness parent physically abused	139 (29.7 %)
Witness anyone attacked with weapon	131 (28.0 %)
Witness people being shot, bombs, rioting	162 (34.6 %)
Known anyone murdered	95 (20.3 %)
Attacked by peer	248 (53.0 %)
Verbal abuse by peer	194 (41.5 %)
Picked on by peers	104 (22.2 %)
Theft	223 (47.6 %)
Attacked by gang	90 (19.2 %)
Attacked with weapon or object	107 (22.9 %)
Attacked without weapon or object	268 (57.3 %)
Adult verbal abuse	187 (40.0 %)
Known adult sexual abuse	60 (12.8 %)
Unknown adult sexual abuse	21 (4.5 %)
Physical abuse by adult	101 (21.6 %)
Number of victimization types[b]	
0 types (No victimization)	18 (3.9 %)
1 Type	41 (9.0 %)
2 Types	95 (20.8 %)
3 Types	150 (32.9 %)
4 Types	134 (29.4 %)
5 Types	18 (3.9 %)

[a] Category percentage does not equal 100 due to overlapping in categories; [b] "Types" defined as Conventional Crime (75 % of sample), Maltreatment (48.2 % of sample), Peer and Sibling Victimization (75.5 % of sample), Sexual Victimization (15.8 % of sample) and Witnessing or Exposure to Violence (73.6 % of sample)

Violent Behaviors Violent behaviors over the past year were measured by asking children and youth to respond to five items used in previous research on exposure to violence (Flannery et al. 2001; Song et al. 1998): threatening to harm others, hitting someone before the other person hit them, hitting someone after the other person hit them, beating someone up, and attacking someone with a knife. Each item was scored on a 4-point Likert scale, from 0 (*Never*) to 3 (*Almost every day*). Based on response distribution and for analysis purposes, each item was dichotomous with response options including 'yes' and 'no'.

Primary DSM-IV Diagnosis Primary DSM-IV diagnosis was obtained from the behavioral health agency responsible for conducting all diagnostic assessments for the DCI. Diagnostic structured assessments were conducted by Masters-level clinicians and were conducted either in the office or in the field, typically at a client's home. Due to sample size restrictions for certain diagnoses, primary diagnoses were aggregated into five classifications for the purposes of this analysis: Trauma Disorders, Mood Disorders, Anxiety Disorders, Adjustment Disorders, and Externalizing Behavior Disorders. These classifications are found in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association 2000).

The Anxiety Disorder classification included: Anxiety Disorder (16.4 %, n = 77). The Mood Disorder classification included: Major Depressive Disorder (19.4 %, $n = 91$), Mood Disorder (1.1 %, $n = 5$), Bipolar Disorder (0.4 %, $n = 2$), and Dysthymic Disorder, (0.2 %, $n = 1$). The Externalizing Behavior Disorder classification included: Attention Deficit Hyperactivity Disorder (7.2 %, $n = 34$), Oppositional Defiant Disorder (6 %, $n = 28$), Disruptive Behavior Disorder (1.1 %, $n = 5$), and Conduct Disorder (2.6 %, $n = 12$). The Trauma Disorder classification included Post-traumatic Stress Disorder (28.6 %, $n = 134$). The Adjustment Disorder classification included Adjustment Disorder Unspecified, With Anxiety, With Depressed Mood, With Disturbance of Conduct, With Mixed Anxiety and Depressed Mood, and With Mixed Disturbance of Emotions and Conduct (4.9 %, $n = 23$).

Analysis

Model Fit The current study employs Latent Class Analysis (LCA) to identify number and type of sub-populations of victims within the study population (Lazarsfeld and Henry 1968; McCutcheon 1987). There are two parts to exploratory LCA modeling: The first is selecting the best-fitting class model. We hypothesize that the best class-solution will be between 2 and 6 classes based on previous studies' latent class modeling of poly-victimization (Aebi et al. 2014; Ford et al. 2009, 2013; Grasso et al. 2013; Reid and Sullivan 2009; Tossone et al. 2015). Therefore, we fit the model with between 1 and 6 class solutions.

We judged relative model fit based on five fit indices: The Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), the sample-size-adjusted Bayesian Information Criterion (aBIC), Entropy, and the Bootstrap LR Test. The AIC, BIC, and aBIC are all information criteria based on comparing models taking into account the estimated number of parameters and parsimony of the model (Nylund et al. 2007). For all three information criteria, a smaller value indicates better fit compared among classes. Entropy measures the ability of a latent class model (or other type of mixture models) to create distinct classes (Celeux and Soromenho 1996). It is a standard rule of thumb to strive for an Entropy value close to 1.00, the value of 1.00 always given to a 1-class solution. The Bootstrap LR difference test compares the model with a number of classes, and 1 minus that number of classes. For example, it will compare whether the model fits better with a 3 class versus a more parsimonious

two class solution (Nylund et al. 2007). The Boostrap LR difference test produces a log likelihood and corresponding p-value that, if $P < .05$, indicates the model fits better than the lower class model.

In addition to fit indices, we examined each class solution for extreme boundary parameter estimates. Boundary estimates display themselves as values of 0 or 1 and can indicate global maxima issues, namely local maximum problems, or that too many classes are being extracted from the solution. In general, this issue can imply that the model does not fit accurately, leading to model estimation bias (Geiser 2013). In addition to judging relative model fit and boundary parameter estimates, we also examined the selected best-fitting class solution for model convergence and identification based on Maximum-Likelihood (ML) estimation that there is a single class solution that fits the model best rather than many (McCutcheon 1987). Finally, we ran the model several times with increasing start values [100 (10) 500 (20), 1000 (100), 2000 (200)] to avoid local maxima issues.

Following selection of the best-fitting class solution, the second part of an LCA is interpreting the classes based on the probability estimates produced. An LCA produces the count and proportion of populations assigned to each class based on probability estimates produced, the average latent class probabilities of individuals assigned to each class, and a probability plot displaying the conditional probabilities for each class. It is ideal that for the average latent class probabilities of individuals assigned to each class, the proportion of individuals assigned to a class that are correctly specified in that same class should be close to 1.00, with a minimum cutoff value of .80 (Rost 2006). The probability plot shows the percentage of individuals endorsing (answer "yes" to the question's corresponding variable) that victimization variable belonging to a certain class.

Regression Analysis Predicting Class Assignment A categorical latent variable multinomial logistic regression analysis determines whether demographic explanatory variables (gender, age, and race) predict victimization class assignment. This analysis utilized the 3-step ML procedure (Vermunt 2010). The 3-step method is as follows (Asparouhouv and Muthen 2013):

1. LCA is performed to determine number of classes using only the latent class indicators
2. The most likely class variable is created using posterior distribution during the first step
3. The most likely class variable computed is used as a latent class indicator, as well as the explanatory variable of interest

Using the 3-step method is more efficient in that it takes out the work of estimating and re-estimating the LC measurement model when one uses another method such as the 1-step method (Vermunt 2010). Furthermore, the 3-step method works well with a model that has moderate entropy and increases accuracy of the LC measurement model due to including the explanatory variables after the measurement model has been constructed (Vermunt 2010). Furthermore, the 3-step ML procedure corrects for the underestimation of association between explanatory variables and class membership that may occur during standard 3-step procedures. Finally, the 3-step method outperforms other methods such as the Pseudo Class method, where a multiply imputed latent class variable is analyzed with the explanatory variables (Asparouhouv and Muthen 2013).

The latent variable multinomial logistic regression analysis produces a likelihood estimate, standard error, and corresponding p-value comparing classes. Odds ratios and 95 % confidence intervals were calculated from the likelihood estimate and corresponding standard error for each predictor variable. For gender, male is the reference category. For race, non-white is the reference category. Age, measured as continuous, is interpreted as when age increases, there is a certain amount of change in class assignment.

Tests of Association for Distal Outcomes To test the association between latent class association and the outcome variable of interest, the Lanza Method for predicting distal outcome as a result of class association is used. Similar to predicting class assignment, the Lanza Method is a 3-class method to estimate the association between latent class and distal outcome variables (Lanza et al. 2013). Distal outcome variables are variables that may be affected by belonging to a certain latent class. The Lanza Method corrects for the issues that former methods presented and assumes conditional independence as well as takes into account the conditional distribution of a distal outcome given the latent class variables as well as membership.

The Lanza Method produces three Wald Tests for Differences Across Class Proportions: An overall test of association between latent class membership and the distal outcome variable, tests of between-class association, and probability of each distal outcome variable category given latent class assignment. All analyses were conducted using MPlus Version 7.11 (Muthen and Muthen 2014). In the case of this distal outcome analysis, six variables were used: DSM IV diagnosis and five variables that indicate violent behavior (threatening to hurt others, hitting someone before attacked, hitting someone after attacked, beating someone up, and stabbing someone).

Results

The sample contains 467 youth who were an average age of 12.3 years old. The majority of the sample was female

(58.3 %, $n = 273$) and non-white (69.2 %, $n = 324$; see Table 2). Ninety-six percent of the sample reported exposure to at least one type of victimization, and 87 % of the sample reported exposure to at least two different types of victimization (see Table 1). The items that received the lowest endorsement were related to sexual abuse by an unknown adult, followed by sexual abuse by known adult. The items that received the highest endorsement were 'being attacked without a weapon' followed by 'attacked by peer'. The most common primary diagnosis category was Trauma Disorder (36.9 %, $n = 172$), followed by Mood Disorder (23.6 %, $n = 110$), Anxiety Disorder (23.6 %, $n = 110$), Externalizing Behavior Disorder (20.5 %, $n = 96$), and Adjustment Disorder (4.9 %, $n = 23$).

While the entropy, AIC, BIC, and aBIC favor a higher number class solution (4 or more classes), a solution with 4 or more classes indicated a local maxima issue, in that there were several boundary parameter estimates that reached 0 or 1 (Table 3). Additionally, we found reduced interpretability of a class solution with four or more classes. Because of these two reasons, we favored a three-class solution, which demonstrated a higher entropy value (0.69) than the two-class solution (0.64), and a lower AIC and aBIC than the two-class solution. Furthermore, the Bootstrap LR Test favored a three-class solution over a two-class solution as indicated by the statistically significant P-value produced. Repeated estimation of the 3-class solution using a different number of random starts produced the same values; and the classification probabilities for most likely class membership were 0.856, 0.895, and 0.808, all of which are above the 0.80 cutoff for ideal specification of each class (Rost 2006). These results also indicated the three-class solution to be the best fitting solution for the sample.

Figure 1 presents the three-class solution probability plot of each endorsed (said "yes") variable. The first class demonstrates generally low endorsement of all variables (<0.30), indicating generally "low victimization" of all types ($n = 108$, 22.7 %). The second class demonstrates moderate to high endorsement on variables, namely attacked without weapon, hit by peer/sibling, and verbal peer/sibling victimization. This class indicates "peer and physical assault" victimization. The majority of the sample is in this victimization class (54.2 %). Lastly, the third class demonstrates high endorsement on nearly all items, including much higher endorsement than the other classes on: Witness parent physically abused, witness attack, witness riots, physical abuse by adult, and know someone murdered. This class indicates "high violence exposure", namely high endorsement on multiple types of victimization (witnessing or exposure to violence, conventional crime, and maltreatment; $n = 116$, 23.1 %).

The categorical latent variable multinomial regression analysis predicting class assignment using gender, race and age is depicted in Table 4. The results are stratified by comparison of the outcome (high violence exposure versus low victimization, peer and physical assault versus low victimization, and high violence exposure versus peer and physical assault). Being female compared to being male produced a 0.34 lower relative odds ($p = 0.003$) of being in the high violence exposure class versus the low victimization class. Similarly, those who are white have 0.37 lower relative odds of being in the high violence exposure class versus low victimization class than those who are non-white ($p = 0.024$). Also, compared to the peer and physical assault class, whites have lower odds of being in the high violence exposure class ($p = 0.002$). Those who are older had greater odds of being in the high violence exposure class versus those in low (1.15 OR; $p = 0.044$) or peer and physical assault (1.32 OR; $p = 0.000$) victimization classes.

The chi-square tests of association between class membership and DSM IV diagnosis group (Table 5) indicated an overall significant relationship ($p < 0.001$). This is mainly due to the chi-square difference values between the low victimization versus high violence exposure comparison ($p = 0.002$) and the high violence exposure versus peer and physical assault comparison ($p = 0.026$). The within-class probabilities of DSM IV diagnosis group in Fig. 2 show that those in the low victimization class have the highest probability of Anxiety Disorders of any class (24.5 %), those in the high violence exposure class have the highest probability of Mood Disorders of any class (30.9 %) as well as Externalizing Behavior Disorders (28 %), and those in the peer and physical assault class have the highest probability of Trauma Disorders of any class (38.4 %). Those in the low and peer and physical

Table 2 Population characteristics by class assignment

Variable	Low victimization	Peer and physical assault	High violence exposure	Total
Mean Age[a]	12.5 (2.8)	11.8 (2.7)	13.2 (2.6)	12.3 (2.7)
Gender				
Female	71 (65.7 %)	148 (58.2 %)	54 (50.0 %)	273 (58.3 %)
Male	34 (34.3 %)	106 (41.8 %)	54 (50.0 %)	194 (41.5 %)
Race				
White	33 (31.4 %)	90 (36.2 %)	20 (17.5 %)	143 (30.6 %)
Non-White	72 (68.6 %)	158 (63.8 %)	94 (82.5 %)	324 (69.2 %)

[a] Mean (Standard deviation)

Table 3 Latent class model fit statistics

No. of classes	Entropy	AIC	BIC	aBIC	Bootstrap LR test log likelihood	Local maxima issues
1 Class	1	7853.51	7915.74	7868.13	N/A	No
2 Classes	0.64	7552.02	7680.63	7582.24	−3911.76[a]	No
3 Classes	0.69	7488.3	7683.28	7534.11	−3745.01[a]	No
4 Classes	0.75	7546.2	7717.55	7517.6	−3697.15[a]	Yes
5 Classes	0.76	7437.9	7765.63	7514.9	−3665.1[a]	Yes
6 Classes	0.73	7425.47	7819.58	7518.07	−3639.95[a]	Yes

[a] $P < .0001$

assault classes have about equal the probability of Adjustment Disorders (7 and 7.2 %, respectively).

Table 5 also demonstrates the tests of association between class membership and the five violent behaviors. The overall test demonstrates a significant association between class membership and each violent behavior assessed ($p = 0.000$ for all variables). In regards to 'threatening to hurt someone', the relationship is significant in the low victimization versus high violence exposure and peer and physical assault versus high violence exposure classes. The chi-square values indicate the largest difference between the low victimization versus high violence exposure class comparison. For the 'hit before someone hits you' variable, while all levels were significant, the highest value was found in the low victimization versus high violence exposure comparison. This is also true for the 'beat someone up' variable. With respect to the 'hit someone after they hit you' variable, the largest difference is in the low victimization versus peer and physical assault test, although a large difference is also present in the low victimization versus high violence exposure test. Stabbing someone was statistically significant in the low victimization versus high violence exposure and low victimization versus peer and physical assault category, but not in the high violence exposure versus peer and physical assault class comparison. However, there are two times more cases classified as high violence exposure who stab others (8 %) than classified as peer and physical assault class (4 %).

Figure 3 demonstrates the distribution of probability of violent behavior variables given latent class assignment. Those in the high violence exposure class had the highest probability of all of the violent behaviors while those in the low victimization class had the lowest. As shown in Fig. 3, zero percent of the members in the low victimization class qualified for the stab variable category.

Discussion

Previous research on CEV in a national sample indicated that nearly 58 % reported at least one past year victimization and 48 % reported more than one past year victimization (Finkelhor et al. 2013). The current study, using a sample of at-risk youth from three child-serving agencies (i.e. child welfare, juvenile justice, and behavioral health) found 96 % of the sample reported experiencing at least one type of victimization in the past year and 87 % reported at least two types of victimizations. These findings are consistent with previous research that has found at-risk youth samples report higher rates of victimization than community samples of youth (Abram et al. 2008; Aebi et al. 2014; Ford et al. 2010;

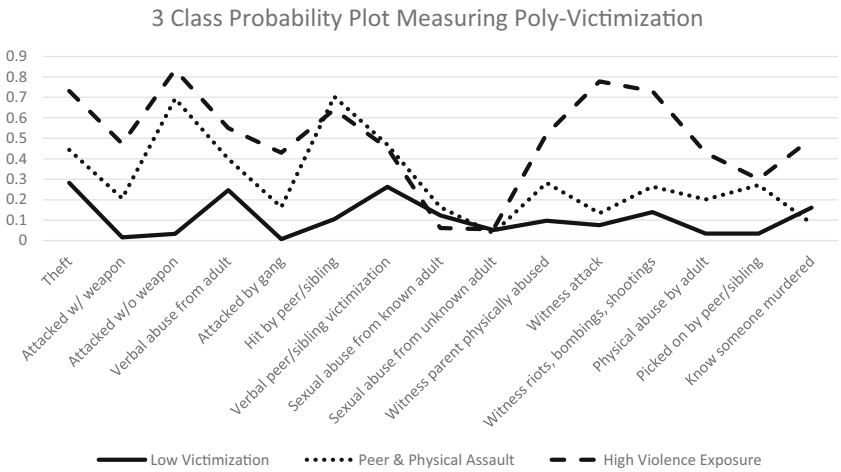

Fig. 1 3 Class probability plot measuring victimization ($N = 478$)

Table 4 Categorical latent variable multinomial logistic regression analysis predicting class assignment

Variable	Estimate	S.E.	Odds ratio	Lower 95 % CI	Upper 95 % CI	P-value
	High violence exposure versus *low victimization*					
Female[a]	−1.065	0.358	0.3445	0.1709	0.6953	0.003
White[b]	−0.987	0.437	0.3727	0.1582	0.8776	0.024
Age[c]	0.138	0.068	1.1479	1.004	1.3116	0.044
	Peer and Physical Assault Versus *Low Victimization*					
Female	−0.424	0.34	0.6544	0.3351	1.2743	0.212
White	0.363	0.328	1.4376	0.7558	2.7343	0.268
Age	−0.143	0.059	0.8667	0.7721	0.973	0.016
	High Violence Exposure Versus *Peer and Physical Assault*					
Female	−0.641	0.342	0.5267	0.2694	1.0297	0.061
White	−1.35	0.446	0.2592	0.1081	0.6213	0.002
Age	0.281	0.066	1.3244	1.1637	1.5073	0.000

[a] Male is reference category; [b] Non-White is reference category; [c] Higher age versus younger age

Grasso et al. 2013; Widom 2003). While higher rates of CEV compared to community samples were expected, the finding that 96 % of the sample reported at least one past year exposure is noteworthy. We are unaware of another study involving similar populations that found such high rates of CEV.

Results indicated support for three general and distinct classes of victimization: low victimization, peer and physical assault, and high violence exposure. The low victimization class was characterized by relatively low probability of endorsing nearly all of the items on the JVQ. Compared to the low victimization class, the peer and physical assault class had higher odds of endorsement on nearly all JVQ items, with particularly higher probability on three items: 'attacked without a weapon,' 'hit by peers or siblings," and "verbal peer/sibling victimization." The high violence exposure class had the highest odds of endorsement on nearly all JVQ items, with particularly high probability of endorsement on: 'witnessing a parent physically abused,' 'witnessing an attack on others,' 'witnessing shootings or riots,' 'being physically abused by an adult,' and 'knowing someone who was murdered.' In general, non-whites, males, and older youth had higher odds of being in the high violence exposure class. These results are generally consistent with other investigations into class membership using either national or specific at-risk samples of youth (Aebi et al. 2014; Bender et al. 2014; Ford et al. 2009, 2010, 2013; Grasso et al. 2013; Reid and Sullivan 2009; Tossone et al. 2015). While exposure to violence in the sample was generally high, the types of violence experienced or witnessed led to differential outcomes on several variables of interest.

Class membership predicted self-reported violent behavior. Results indicated that as victimization class membership progressed from low victimization to high violence exposure, self-reported violent behaviors increased. Youth in the high violence exposure class reported the highest endorsement of all five violent behavior items. Strong differences existed in the low victimization versus high violence exposure classes with respect to self-reported violent behavior, but there were also significant differences between the low victimization vs. peer and physical assault classes and the peer and physical assault vs high violence exposure classes on nearly all of the items. These results are consistent with research on poly-victimization that found the number of different types of violence exposures has a significant impact on behaviors, in this case, self-reported violence (Aebi et al. 2014; Grasso et al. 2013; Tossone et al. 2015).

Table 5 Chi-square overall tests of association and between-class association with distal outcomes

Test	Variable					
	DSM IV diagnosis	Threaten	Hit before	Hit after	Beat	Stab
Overall test	30.39[a]	24.18[a]	25.46[a]	73.05[a]	55.70[a]	19.11[a]
Low victimization VS high violence exposure	11.41[a]	23.08[a]	23.12[a]	35.36[a]	41.99[a]	7.50[a]
Low VS peer & physical assault	5.14	4.18	8.33[a]	46.13[a]	15.55[a]	8.05[a]
High violence exposure VS peer & physical assault	11.02[a]	14.06[a]	8.82[a]	5.64[a]	11.41[a]	1.118

[a] $P < .05$

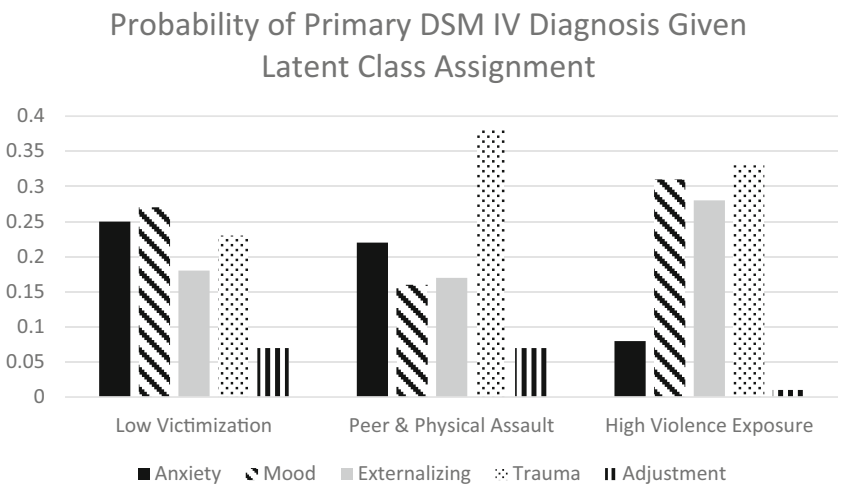

Fig. 2 Probability of primary DSM IV diagnosis category given latent class assignment ($n = 422$)

Results related to class membership and primary DSM IV diagnosis were less clear. Compared to youth in other classes, those in the low victimization class had the highest probability of having a primary Anxiety Disorders (e.g. generalized anxiety disorder). Youth in the peer and physical assault class had the highest probability of a primary Trauma Disorders (i.e. PTSD), while youth in the high violence exposure class had the highest probability of a primary Mood Disorder (e.g. depression) and Externalizing Behavior Disorders (e.g. conduct disorder). It is unclear why the peer and physical assault class had the highest probabilities of primary Trauma Disorders (i.e. PTSD). In their study, Grasso et al. (2013) found that the poly-victimization group was the most likely victimization class to meet criteria posttraumatic stress disorder. One possible explanation for this finding involves class composition. Females were more likely to be assigned to the peer and physical assault class and previous research has found that females are more likely to report symptoms of and be diagnosed with PTSD than males (Christiansen and Elklit 2012; Christiansen and Hansen 2015; Kessler et al. 1995; Tolin and Breslau 2007; Tolin and Foa 2006).

Consistent with previous research, the youth assigned to the high violence exposure class had the highest probability of both primary mood diagnosis and externalizing behavior diagnoses. Exposure to violence has been found to increase depressive symptoms in youth (DuRant et al. 1995; Kennedy et al. 2010; Latzman and Swisher 2005; Singer et al. 1995; Wolfe et al. 2001). In addition, exposure to violence has been found to increase externalizing problems in youth, including behavior problems (Cooley-Quille et al. 1995; Edleson 1999; Evans et al. 2008; McFarlane et al. 2003; Sternberg et al. 2006; Youngstrom et al. 2003).

The results presented here indicate that understanding both the amount and type of violence exposure is important, as it has implications related to mental health outcomes and violent behavior perpetration. Elevated levels of violence exposure do not affect all youth in similar ways. Not all youth in the high violence exposure class were diagnosed with PTSD. In fact, the class with the highest percentage of youth diagnosed with PTSD was the peer and physical assault class. We need to be aware of and thoughtful about these nuanced differences when designing or implementing models that address youth

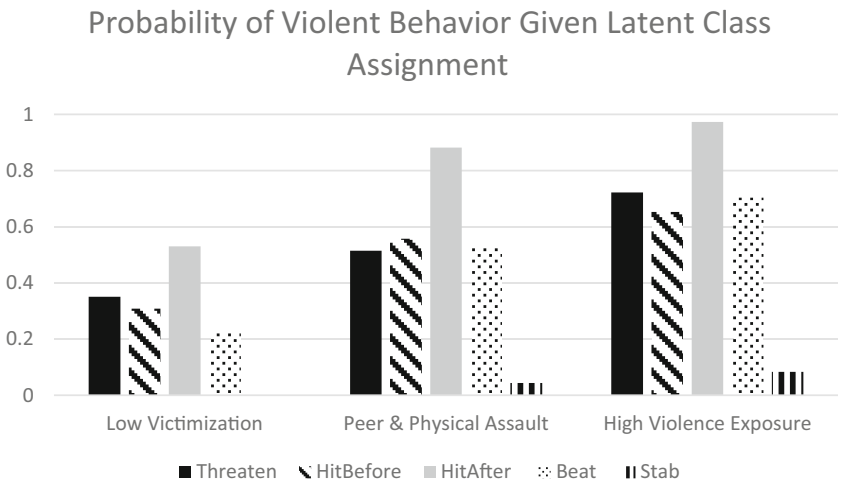

Fig. 3 Probability of violent behavior given latent class assignment ($n = 446 – 448^{a}$)

violence exposure. If these violence exposure programs have a treatment component, it may be wise to offer several evidence-based treatment options. Youth exposed to violence present with many types of behavioral health diagnoses. A model ideal for treating PTSD may not be as effective for other types of diagnoses related to a youth's violence exposure.

Limitations

It is important to note the limitations of the current study. First, the data were all obtained from an at-risk sample of youth who were screened for violence exposure and trauma as part of the Cuyahoga County Defending Childhood Initiative. Therefore, the results should be interpreted with respect to at-risk youth and caution should be applied generalizing any results to other populations of youth. Another limitation is related to the method of data collection. All data associated with exposure to violence and violent behavior was collected via self-report. Although self-report data is a common way to measure CEV and violent behaviors, issues such as accuracy and social desirability can influence reporting, especially with respect to sensitive topics (Rosenbaum et al. 2006; Sugarman and Hotaling 1997; Tourangeau and Yan 2007; van de Mortel 2008).

The measure of violence exposure in this study was a shortened version of the full JVQ. Agencies elected to use a shortened version of the 34-item full JVQ to reduce provider and family burden as it related to data collection. While the full JVQ would provide additional information related to exposure to violence, the 12-item version correlates highly (0.87) with the complete JVQ (Finkelhor, et al. 2011). The version used here includes all 12 items found on the original shortened version of the JVQ plus an additional three items requested by Defending Childhood stakeholders. In addition, these data were collected as part of an in-person diagnostic assessment, where the therapist had access to the responses on the surveys. It is possible that youth may have responded differently if the instruments were collected anonymously. While self-report data may be subject to biases, relying on official records of violence exposure or violent behavior results in significant underreporting.

Another limitation is related to sample size restrictions. This impacted categorization of DSM IV diagnoses the most, where we were forced to collapse categories into Mood, Anxiety, Trauma, Adjustment, and Externalizing Behavior. This means that we may have missed important differences in the distinct diagnoses that comprise a category. Similarly, due to few responses in the "All the time" category of self-reported violent behaviors, we collapsed the responses into binary responses, which may mask the differences between "Often" and "All the time".

Finally, while we call this a "distal outcome" analysis, we cannot say temporally which came first- the victimization or the DSM IV diagnosis/behavior. A longitudinal study would improve temporality. However, we can say that the predictive covariates- gender, age and race- are most likely temporal due to the nature of these demographic variables. This improves the predictive assumptions we can make about victimization class membership.

Implications

The results presented here have clear implications for childhood exposure to violence. First, nearly all youth in the sample reported at least one past year exposure to violence episode. While results from national surveys indicate the majority of youth report at least some exposure to violence, at-risk samples report higher levels of CEV. In addition, the data indicated there were three classes of victimization: low victimization, peer and physical assault, and high violence exposure. Class assignment was related to both self-reported violent behavior and primary mental health diagnosis. This highlights the importance of thorough screening and assessment for CEV, especially for at-risk youth. Screening and assessing for CEV can provide useful diagnostic information and can facilitate referral into appropriate mental health treatment, which can reduce the associated negative consequences of such exposure. However, many child-serving systems, including child welfare and juvenile justice, do not consistently screen or assess for CEV. Practitioners need to be trained in screening and assessment for CEV, and be familiar with the types of mental health treatment that are most effective at improving outcomes for youth who have experienced trauma and victimization, including trauma-focused cognitive behavioral therapy (Butler et al. 2006; Cohen et al. 2006; Mannarino et al. 2014). Those implementing programs designed to provide services to youth exposed to violence need to be aware of the ways in which violence exposure can manifest itself and the types of mental health issues and behaviors that youth demonstrate in order to provide the most appropriate services and programming.

While there are evidence-based treatment approaches for youth who have experienced CEV, the funding for these programs lags behind the need for services. Child-serving agencies often have to make difficult decisions about how to allocate scarce dollars. While nearly all of the youth in our sample reported exposure to at least one item on the JVQ, youth in the high victimization class reported significantly more self-reported violent behaviors and had higher probabilities of primary mood and externalizing behavior disorders. While many youth exposed to violence may benefit from appropriate mental health treatment, when resources are limited, it may be advantageous to focus treatment efforts on youth in the high violence exposure class. Focusing on the high violence

exposure class can not only benefit the youth by addressing their internalizing and externalizing problems, but it can also make the community safer by addressing the associated violent behaviors reported by youth in the high violence exposure class. However, if referrals into services are based on certain diagnoses, like PTSD, a large percentage of youth who experience significant amounts of victimization and who report violent behaviors will be overlooked. A comprehensive approach to screening, assessment, and referral into treatment is recommended.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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