



## NIH PUBLIC ACCESS

## Author Manuscript

*Psychol Violence*. Author manuscript; available in PMC 2014 July 02.

Published in final edited form as:

*Psychol Violence*. 2012 December ; 2(4): 325–338. doi:10.1037/a0029829.

## Changes in Youth's Experiences of Child Maltreatment Across Developmental Periods in the LONGSCAN consortium

**Miguel T. Villodas, PhD,**

University of California, San Francisco, Department of Psychiatry

**Alan J. Litrownik, PhD,**

San Diego State University, Department of Psychology

**Richard Thompson, PhD,**

Juvenile Protective Association

**Scott C. Roesch, PhD,**

San Diego State University, Department of Psychology

**Diana J. English, PhD,**

University of Washington, School of Social Work

**Howard Dubowitz, MD, MS,**

University of Maryland, School of Medicine

**Jonathan B. Kotch, MD, MPH, and**

University of North Carolina at Chapel Hill, Department of Maternal and Child Health

**Desmond K. Runyan, MD, DrPH**

The Kempe Center for the Prevention and Treatment of Child Abuse and Neglect

### Abstract

**Objective**—The present study applied person-centered data analytic techniques to identify groups of youth with allegations for combinations of maltreatment types during preschool, early and late childhood.

**Method**—Latent Class Analyses were conducted using officially reported child maltreatment data for five types of maltreatment (i.e., failure-to-provide and lack-of-supervision neglect, and physical, sexual and emotional abuse) from 788 youth in a large prospective study during preschool, early, and late childhood.

**Results**—Three similar classes were identified during preschool and early childhood, characterized by no maltreatment allegations, allegations for neglect and emotional maltreatment, and allegations for all maltreatment types. During late childhood, four classes were identified characterized by no maltreatment allegations, mixed patterns of maltreatment allegations, physical and emotional abuse allegations, and allegations for all maltreatment types. Youth in maltreated classes were more likely to be re-victimized during subsequent developmental periods, often by similar maltreatment combinations. Youth in maltreated classes characterized by physically violent maltreatment types had higher Externalizing and Total behavior problems at each age.

**Conclusions**—These findings confirm the vulnerability of maltreated youth to re-victimization, particularly by similar combinations of maltreatment. They also indicate that youth's susceptibilities to specific forms of maltreatment may vary across developmental periods.

### Keywords

Latent Class Analysis; Child Abuse; Neglect; Externalizing

---

Child maltreatment poses a major public health risk to developing children in the United States. Of the estimated 702,000 children in the United States that were victims of at least one form of child maltreatment in 2009, 25 percent had prior histories of maltreatment and many were determined to be victims of more than one type of maltreatment (i.e., physical, sexual, and emotional abuse and neglect; USDHHC, 2010). These data likely represent underestimates of the actual occurrence of child maltreatment as they only include children that have substantiated reports of maltreatment from official reporting agencies (Wolock, Sherman, Feldman, & Metzger, 2001), while a large proportion of maltreated children are unidentified or their cases are unsubstantiated. The purpose of the present study was to identify groups of youth who were characterized by specific combinations of maltreatment subtypes using latent variable models.

Herrenkohl and Herrenkohl (2009) reviewed the methodological struggles of previous researchers to accurately represent maltreatment experiences given the tendency for different types of maltreatment (i.e., physical or sexual abuse, emotional maltreatment, neglect) to co-occur. For example, they note that previous researchers have attempted to isolate specific effects of individual maltreatment types (Lau et al., 2005) or compare youth who have experienced multiple subtypes of maltreatment to youth who have experienced only one type of maltreatment (Higgins & McCabe, 2001). Herrenkohl and Herrenkohl recommended approaches that more accurately consider the co-occurrence of specific combinations of maltreatment experiences in order to clarify the consequences of these specific experiences. For example, Arata and her colleagues (2007) examined each combination of self-reported maltreatment experiences in adolescents and found that youth who reported combinations of physical and/or sexual abuse with neglect reported more problems across domains during adolescence.

Recently, researchers have applied person-centered latent variable analyses, such as Latent Class/Profile Analyses (LC/PA; Lanza, Collins, Lemmon, & Schafer, 2007), to identify unobserved groups of youth with similar histories of co-occurring maltreatment subtypes (Hazen, Connelly, Roesch, Hough, & Landsverk, 2009; Nooner et al., 2010; Pears, Kim, & Fisher, 2008). In contrast to the approach employed by Arata and her colleagues (2007), in which eight possible combinations of maltreatment subtypes were identified, the latent variable modeling approach allows researchers to identify only those combinations that occur most frequently. This approach may yield more manageable and useful results when examining the maltreatment experiences of at-risk samples in which higher rates of maltreatment and, potentially, more combinations of maltreatment subtypes could be observed.

Pears and her colleagues (2008) provided an example of this methodology, using official reports of the severity of specific maltreatment subtypes to identify four unobserved groups of young children in foster care that had substantiated occurrences of neglect and emotional abuse; neglect, sexual and emotional abuse; neglect, physical and emotional abuse; or neglect, sexual, physical, and emotional abuse. Hazen and her colleagues (2009) extended the findings from this child welfare sample to a sample of adolescents receiving mental health and social services identifying three groups of adolescents based on self-reported maltreatment experiences characterized by low overall maltreatment; neglect, physical and emotional abuse; or neglect, sexual, physical, and emotional abuse. As might be expected, Pears and colleagues identified more specific combinations of maltreatment experiences using a child welfare sample, which did not include children who had not been maltreated. In another application of this methodology, Nooner and her colleagues (2010) identified unobserved groups of youth based on indicators from retrospective self-report measures of physical and sexual abuse experiences among adolescents that were identified as being at a high-risk for early childhood maltreatment and identified four groups of early adolescents who self-reported (1) no history of physical or sexual abuse; (2) a history of high physical and low sexual abuse; (3) a history of moderate physical and sexual abuse; or (4) a history of high physical and sexual abuse.

While Nooner and her colleagues and Hazen and her colleagues both used retrospective self-report data, which have previously been noted to have limited validity (Everson et al., 2008), Pears and her colleagues used substantiated reports of maltreatment. Although officially reported data have advantages (e.g., presumably decreased recall bias), they also have notable disadvantages, such as decreased sensitivity (Everson et al., 2008). This has been found to be particularly true for child maltreatment substantiations, which have been found to exclude many children who have child welfare allegations or reports that could not be substantiated, in addition to the children who are not detected by child welfare agencies (Wolock et al., 2001). One solution to improve sensitivity is to use maltreatment allegations as an indicator of experience. Support for the use of allegations comes from research suggesting that there are no differences in behavioral and emotional outcomes (Hussey et al., 2005), or the likelihood of subsequent re-reports or removal (Kohl, Jonson-Reid, & Drake, 2009) for those children who have an alleged report versus a substantiated report. Although this approach remains controversial, restricting maltreatment indicators to substantiated reports could limit the identification of frequently co-occurring types of maltreatment that may be less easily substantiated.

One limitation of the studies reviewed above is that they did not consider the developmental timing of the maltreatment experiences. Previous researchers that have attempted to consider the timing of maltreatment experiences have typically been limited to comparisons between children who had experienced *any* maltreatment subtype and children with no maltreatment experiences (e.g., English, Graham, Litrownik, Everson, & Bangdiwala, 2005) or examinations of the effects of individual subtypes rather than combinations of subtypes (e.g., Manly, Kim, Rogosch, & Cicchetti, 2001). It is possible that youth are more susceptible to specific combinations of maltreatment subtypes during particular developmental periods and that these experiences affect their functioning differentially

depending on the period during which it occurred. For example, older children may be less susceptible to neglect as a result of increased autonomy, but more susceptible to sexual abuse as a result of physical maturation.

In an effort to better understand the consequences of different combinations of maltreatment and their timing, the present study had three aims. **Aim 1:** Identify unobserved groups (classes) of youth with similar patterns of officially reported allegations for maltreatment subtypes across three developmental periods: preschool, early, and late childhood. It was hypothesized that the identified class solutions would differ across the developmental periods as it was anticipated that youth might be more susceptible to particular types of maltreatment during different developmental stages. **Aim 2:** Examine the likelihood that youth were classified in the same or similar classes across adjacent developmental periods. It was hypothesized that youth would change maltreatment groups across developmental periods as a result of detection by child welfare services. And **Aim 3:** Determine the predictive validity of the identified classes by examining their relationship to subsequent mean differences in youth behavioral problems. Based on prior research it was hypothesized that groups with more alleged types of maltreatment would evidence more externalizing and internalizing behavior problems.

## Methods

### Sample

The present study utilized data from a large-scale consortium of ongoing prospective studies, the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN). LONGSCAN consists of five sites in the Southwestern, Northwestern, Eastern, Southern, and Midwestern U.S. dedicated to conducting longitudinal research examining the antecedents and consequences of child maltreatment. All sites used uniform measurement, data collection, data entry, and data handling protocols and were coordinated through a central coordinating center. Children and their caregivers were recruited to participate when the children were either 4 or 6 years old and were interviewed biannually between ages 4 and 14 using developmentally appropriate measures of the children, their caregivers, families, neighborhoods, and schools. Interviews were conducted face-to-face with caregivers and youth using laptop computers.

The total sample recruited for LONGSCAN included 1354 children across the five sites that were identified as being at varying levels of risk for child maltreatment. Specifically, the Northwestern and Southwestern sites recruited children that had been reported for maltreatment, the Eastern site recruited children attending pediatric clinics deemed high-risk for maltreatment based on demographic risk factors and the Southern and Midwestern sites recruited both children that had been reported for maltreatment as well as children who were considered high-risk for maltreatment (Runyan et al., 1998, describe the overall study design and site-specific recruitment procedures in more detail). The total sample was 48.5% male and ethnically/racially diverse including 26% Caucasian, 53% African American, 7% Hispanic, and 14% from mixed or other races. At baseline, 59% of the families earned less than \$15,000 per year and 37% were receiving government assistance. Criteria for inclusion in the present study (n=788) were completed caregiver interviews at ages 4, 8, and 12.

Analyses revealed that these youth did not significantly differ on the demographic variables listed above or the Child Behavior Checklist Total Behavior Problem score at baseline from those who were not included.

## Measures

**Sociodemographics**—A caregiver-report measure was developed by LONGSCAN including items that assess sociodemographic variables measured either at one time (i.e., youth gender and race/ethnicity) or at each interview (i.e., current household income level/number of dependents) in order to reflect changes in the home environment experienced by many youth.

**Child Protective Services records**—Each of the LONGSCAN sites systematically reviewed CPS records to identify reports of alleged maltreatment and coded the narratives using a modification of the Maltreatment Classification System (MMCS; Barnett, Manly, & Cicchetti, 1993; English & the LONGSCAN Investigators, 1997). Coders at each site were trained to use the MMCS by experienced coders until they reached 90% agreement with the gold standard. To further ensure reliable coding, coders at all five sites coded a subsample ( $n = 109$ ) of the CPS narratives that represented cases from each site. Kappas for MMCS codes by LONGSCAN coders were high (ranging from .73 for emotional maltreatment to .87 for physical abuse; English & the LONGSCAN Investigators, 1997). The present study used dichotomous indicators (i.e., 0 = not alleged, 1 = alleged) of maltreatment subtypes, including five types of maltreatment distinguished by the MMCS (i.e., physical abuse, sexual abuse, failure-to-provide neglect, lack-of-supervision neglect, and emotional maltreatment), for each of three four-year intervals including preschool (0–4), early childhood (4–8), and late childhood (8–12).

**Child Behavior Checklist (CBCL)**—The CBCL asks caregivers to report the frequency of 113 child and adolescent problem behaviors in which their child has engaged over the past six months on a three-point scale (0 = never true, 1 = sometimes true, and 2 = often true; Achenbach, 1991). The CBCL has well-established norms as well as extensively documented psychometric properties. The 113 items form a Total Behavior Problems score ( $\alpha = .94$  at age 4 in current sample), as well as two broadband scores comprised of 31 and 33 items respectively for Internalizing and Externalizing Behavior Problems ( $\alpha = .80$  and  $.90$  at age 4 in current sample, respectively). Caregivers completed the CBCL at the age 4, 8, and 12 interviews.

## Data Analysis

The present study used Latent Class Analysis (LCA; Lanza et al., 2007), a person-centered data analytic procedure that allows researchers to identify latent classes or subgroups of a categorical latent variable. The goal of LCA is to identify the minimum number of classes that maximize homogeneity within classes and heterogeneity between classes.

**Model selection and fit indices**—It is recommended that researchers examine multiple indicators of model fit in order to select the best-fitting model (Lanza et al., 2007; Roesch, Villodas, & Villodas, 2010). In exploratory studies, such as the present study, models with

increasing numbers of classes are fit sequentially and their fit indices compared. The Lo-Mendell-Rubin Adjusted Likelihood Ratio Test (LMRT; Lo, Mendell, & Rubin, 2001) provides an inferential statistical test of sequential fit of a model with  $k$  latent classes as compared to a model with  $k-1$  latent classes based on differences between two log-likelihood values (instead of using the  $\chi^2$  distributions). Thus, a significant LMRT test indicates that a more complex model (e.g., 3-class) provides superior fit to a less complex model (e.g., 2-class). The Akaike Information Criterion (AIC; Akaike, 1978) and sample size-adjusted Bayesian Information Criterion (BIC; Sclove, 1987) are based on the log likelihood function for individual models and can be compared across models of increasing complexity to identify the best fitting model as the model with the lowest value for each information criterion. Both penalize models for estimating excessive parameters and the BIC penalizes models for larger sample sizes. Finally, Entropy indexes how well classes can be distinguished based on posterior probabilities for individuals for each class. These posterior probabilities are a function of each individual's response pattern, the number of latent classes, and the proportion of individuals estimated to be in each class.

**Model parameters**—Researchers have suggested that the consideration of statistical fit indices is important in model selection only if the model parameters can be meaningfully interpreted (Lanza et al., 2007; Roesch et al., 2010). The basic LCA model includes two important parameters, Conditional Response Probabilities (CRPs) and Latent Class Probabilities (LCPs). CRPs are analogous to factor loadings, are estimated for each indicator of the latent variable in each class, and represent the probability that individuals in each class fulfilled a particular indicator (i.e., probability that an individual had an allegation for physical abuse). CRPs can be examined within and between classes in order to substantively interpret the identified classes. LCPs are assigned to each individual and indicate that individual's probability of being assigned to each class of the resulting solution. Average LCPs for each class are examined to determine classification accuracy for the analysis (e.g., the probability that are correctly assigned to classes). Although Roesch and his colleagues suggest that classes comprised of less than 5% of the sample are generally unreliable, they note exceptions to this guideline when the indicators have inherently low base rates, as in the present study.

**Proposed Model**—Exploratory LCA models were tested during the three time intervals (i.e., preschool, early childhood, late childhood) using dichotomous indicators of allegations for five types of maltreatment experiences. LCA models with increasing numbers of classes were sequentially fit to the data until the best-fitting model was identified based on the AIC, BIC, LMRT, and Entropy and substantive interpretation. After determining the best fitting models, changes in youth's class memberships across adjacent developmental periods were examined using multinomial logistic regressions. Also, in order to provide evidence of predictive validity, differences between classes identified during each developmental period in Externalizing, Internalizing, and Total Behavior problems measured after each period were examined using Analyses of Variance (ANOVAs). A family-wise error rate of  $p=.006$  was used and post-hoc between groups comparisons were made using Tukey's Honestly Significant Difference test.

## Results

### Aim 1: Identify classes of youth with similar patterns maltreatment subtype allegations

**Baseline Model Selection**—Two-, three-, and four-class models were fit to the data from each developmental period and a five-class model was additionally fit to the data from late childhood (see Table 1 for individual model fit statistics). A statistically significant LMRT indicated that the two-class model provided an improvement in overall model fit when compared to the one-class model for each developmental period. For the preschool and early childhood models, statistically significant LMRTs, relative decreases in AICs, and relative increases in entropy supported the improvement in model fit of the three-class model. For the early childhood model, the BIC also decreased, while this was not the case for the preschool model. For the late childhood model, a non-significant LMRT as well as a relative increase in BIC and decrease in Entropy indicated that the three-class model did not improve model fit as compared to the two-class model, despite a relative decrease in AIC. For the preschool and early childhood models, non-significant LMRTs as well as relative increases in both AICs and BICs indicated that the four-class model did not improve model fit as compared to the three-class model, despite relative increases in Entropy. Moreover, improved interpretability of model parameters further supported the selection of the three-class models. For the late childhood model, a significant LMRT and an increase in Entropy indicated that the four-class model improved model fit compared to the three-class model, despite relative increases in the AIC and BIC. Moreover, the AIC was equal to that of the 2-class model and the interpretability of the four-class model was substantially better than that of the three- or two-class models. Finally, a non-significant LMRT, relative increase in BIC, and lack of change in AIC indicated that the five-class model did not improve model fit as compared to the four-class model despite a relative increase in Entropy. Thus, the four-class model was identified as the best-fitting and most interpretable model. Descriptive statistics are presented in Table 2 indicating the percentages of the resultant classes that were female, from each site, and in each type of placement (i.e., with biological parents, adopted, in relative care, or in non-relative foster care) following each developmental period.

**LCA of Maltreatment Experiences During Preschool**—Three distinct classes of youth with similar maltreatment experiences were identified (see Figure 1 for the CRPs for each class). The first class consisted of 69% of the sample, was characterized by relatively low CRPs for all forms of maltreatment, and was labeled the “Low Maltreatment” class. The second class consisted of 15% of the sample and was characterized by relatively high probabilities of failure-to-provide and lack-of-supervision forms of neglect as well as emotional maltreatment and low probabilities of physical or sexual abuse. This class was labeled the “Neglect/Emotional Maltreatment” class. The third class consisted of 16% of the sample and all of the youth assigned to it had allegations of physical abuse and relatively high probabilities of failure-to-provide and lack-of-supervision forms of neglect as well as emotional maltreatment allegations. It should also be noted that this class had a .21 probability of having allegations of sexual abuse, which was substantial, relative to the other two classes and in consideration of the developmental period during which the maltreatment allegedly occurred. This class was labeled “Abuse/Neglect/Emotional Maltreatment”. Although there were similar proportions of boys and girls in each class, the percentages of

youth that were in out-of-home care after preschool were substantially higher in the two classes with maltreatment allegations.

**LCA of Maltreatment Experiences During Early Childhood**—Three distinct classes of youth with similar maltreatment experiences were identified (see Figure 2 for the CRPs for each class). The first class consisted of 73% of the sample and was characterized by relatively low CRPs for all forms of maltreatment. It was similar to the “Low Maltreatment” class that emerged during preschool, so this label was retained. The second class consisted of 10% of the sample and all youth in this class were characterized by allegations of failure-to-provide neglect as well as relatively high probabilities of lack-of-supervision neglect and moderate probabilities of emotional maltreatment allegations. This class was found to be most similar to the “Neglect/Emotional Maltreatment” class that emerged during preschool, so this label was retained despite an increased probability of having a physical abuse allegation relative to the analogous group identified during preschool. The third class consisted of 17% of the sample and was characterized by relatively high probabilities of physical abuse allegations as well as moderate probabilities of sexual abuse, failure-to-provide and lack-of-supervision neglect, and emotional maltreatment allegations. This class was found to be most similar to the “Abuse/Neglect/Emotional Maltreatment” class that emerged during preschool, so this label was retained, despite a relatively lower probability of physical abuse. There were higher proportions of boys in the two classes with maltreatment allegations and a higher percentage of youth in the Abuse/Neglect/Emotional Maltreatment class were in out of home care after this period.

**LCA of Maltreatment Experiences During Late Childhood**—Four distinct classes of youth with similar maltreatment experiences were identified in the sample (see Figure 3 for the CRPs for each class). The first class consisted of 81% of the sample and was characterized by relatively low CRPs for all forms of maltreatment. This class was similar to the “Low Maltreatment” classes identified during preschool and early childhood, so this label was retained. The second class consisted of 8% of the sample and was characterized by moderate probabilities of failure-to-provide and lack-of-supervision neglect and low to moderate probabilities of physical and sexual abuse allegations. This class was named the “Mixed Maltreatment” class, as it appeared to represent a heterogeneous group of youth that had maltreatment allegations, but no predominant pattern of subtypes. The third class consisted of 3% of the sample and was characterized by high probabilities of physical abuse and emotional maltreatment allegations and relatively low probabilities of allegations for all other types of maltreatment. This class was named the “Physical/Emotional Abuse” class. The fourth class consisted of 8% of the sample and all of the youth in it had emotional maltreatment allegations, high probabilities of failure-to-provide and lack-of-supervision neglect, and moderate probabilities of physical and sexual abuse. This class was found to be most similar to the “Abuse/Neglect/Emotional Maltreatment” class that emerged during the previous developmental periods, so this label was retained, despite relatively lower probabilities of physical and sexual abuse. There were higher proportions of boys in the Mixed and Physical/Emotional Maltreatment classes and a higher percentage of youth in the Physical/Emotional Maltreatment class were in out of home care after this period.



**Aim 2: Examine changes in maltreatment classes across adjacent developmental periods**

Two multinomial logistic regressions were conducted to test the relationship between maltreatment class memberships from adjacent developmental periods (model statistics, odd ratios, and confidence intervals are displayed in Table 3). In the first analysis, maltreatment class memberships during preschool significantly predicted maltreatment class memberships during late childhood and accounted for approximately 10% of its variance. From preschool to early childhood, youth in the two maltreatment classes were significantly more likely than youth in the Low Maltreatment class to be in one of the two maltreatment classes again rather than the Low Maltreatment class. Moreover, youth in the Abuse/Neglect/Emotional Maltreatment class were significantly more likely than youth in the Neglect/Emotional Maltreatment class to be in the Abuse/Neglect/Emotional Maltreatment class again rather than the Neglect/Emotional Maltreatment class during early childhood. Thus, from preschool to early childhood, youth with maltreatment allegations were more likely to have additional maltreatment allegations during the subsequent period, especially for similar combinations of maltreatment allegations.

In the second analysis, maltreatment class membership during early childhood significantly predicted maltreatment class memberships during late childhood and accounted for approximately 9% of its variance. From early to late childhood, youth in the Neglect/Emotional Maltreatment class were significantly more likely than youth in the Low Maltreatment class to be in the Mixed Maltreatment or High Maltreatment classes rather than the Low Maltreatment class. On the other hand, youth in the Abuse/Neglect/Emotional Maltreatment class were significantly more likely than youth in the Low Maltreatment class to be in the Physical/Emotional Abuse or Abuse/Neglect/Emotional Maltreatment classes rather than the Low Maltreatment class. Finally, youth in the Neglect/Emotional Maltreatment class during early childhood were significantly more likely than youth in the Abuse/Neglect/Emotional Maltreatment class to be in the Mixed Maltreatment class during late childhood rather than the Low Maltreatment class. Thus, from early to late childhood, youth in any maltreatment class were generally more likely to have additional remain in a maltreatment class during the subsequent developmental period, but not necessarily for the same combinations of allegations.

**Aim 3: Determine the predictive validity of classes for subsequent behavioral problems**

ANOVAs were performed to determine mean differences in Externalizing, Internalizing, and Total Behavior Problem raw scores between maltreatment classes at each age (model statistics, means, and effect sizes are reported in Table 3). Significant mean differences were found between maltreatment classes during Preschool for Externalizing and Total Problems at age 4. Specifically, youth in the Abuse/Neglect/Emotional Maltreatment class had significantly higher mean Externalizing and Total Problems than youth in the Low Maltreatment class. Significant mean differences were also found for maltreatment classes during early childhood for Externalizing and Total Problems at age 8. Specifically, youth in the Abuse/Neglect/Emotional Maltreatment class had significantly higher mean Externalizing and Total Problems than youth in the Low Maltreatment class. Finally, significant mean differences were found for maltreatment classes during late childhood for Externalizing, Internalizing, and Total Problems at age 12. Individuals in each of the three

maltreatment classes had significantly higher mean Externalizing and Total Problems than youth in the Low Maltreatment class. Also, youth in the Physical/Emotional Abuse class had significantly higher Internalizing Problems than youth in the Low Maltreatment or Abuse/Neglect/Emotional Maltreatment classes.

## Discussion

The present study demonstrated the utility of LCA for the characterization of co-occurring child maltreatment allegations across three developmental periods. These analyses revealed several patterns of alleged maltreatment with some differences across developmental periods and facilitated a more detailed and accurate characterization of youth's maltreatment experiences. Although the finding of maltreatment co-occurrences is not novel (see Herrenkohl & Herrenkohl, 2009 for review) the use of LCA facilitates the identification of unobserved groups of youth based on probabilities for specific maltreatment patterns. This methodology extends previous attempts to group youth by all possible combinations of maltreatment experiences by grouping youth with similar probabilistic patterns of maltreatment indicators.

The **first Aim** of the present study was to identify classes of youth with similar patterns maltreatment subtype allegations. Exploratory LCAs were conducted during each developmental period, which allowed the number and structure of classes to be freely estimated during each period and facilitated the identification of changes in these patterns as youth developed. The largest group identified across ages consisted of youth that were considerably less likely to have allegations for any maltreatment. Beginning in preschool and continuing into early childhood, two distinct maltreatment groups were characterized by high probabilities of allegations for combinations of emotional maltreatment, failure-to-provide, and lack-of-supervision neglect. These groups were most clearly distinguished by the relatively high probabilities of physical and sexual abuse allegations in the Abuse/Neglect/Emotional Maltreatment group and the absence of any physically violent forms of maltreatment in the Neglect/Emotional Maltreatment group.

The Abuse/Neglect/Emotional Maltreatment group was identified across all developmental periods, although there were some differences in the probabilities of specific types of maltreatment. Nevertheless, the predominant pattern in each group was for allegations of combinations of all of the maltreatment types. These groups were also consistent with the neglect, physical, sexual, and emotional abuse groups identified by Pears and her colleagues (2008) among preschool-aged children in foster care and Hazen and her colleagues (2009) among adolescents receiving mental health and social services. The prevalences of these groups in the present study were substantially higher compared to approximately 9% in each previous study. However, the previous studies identified a separate group characterized by physical abuse, emotional maltreatment and neglect, but not sexual abuse, that the present study did not identify.

Conversely, the emergence of a Neglect/Emotional Maltreatment group across preschool and early childhood was consistent with Pears and her colleagues' (2008) findings in preschool aged children. However, this group did not emerge during late childhood, which is

consistent with the findings of Hazen and her colleagues (2009) in an adolescent sample. It is possible that this group does not occur among older youth because they are more autonomous and theoretically less susceptible to, or less likely to be reported for, neglect relative to very young children. Finally, the Physical/Emotional Maltreatment group that emerged during late childhood was unique to the present study. Given the very clearly defined characteristics of this group, it is not surprising that it was smaller than other groups and was less easily detectable in other samples. Nevertheless, it could represent an important subpopulation of preadolescents whose maltreatment experiences are characterized by severely conflictual parent-child relationships.

The **second aim** was to examine changes in maltreatment classes across adjacent developmental periods. In addition to the well-established finding that maltreated youth are more likely to be re-reported for maltreated (e.g., English et al., 2005), the present study found that youth were also generally most likely to have allegations for similar combinations of maltreatment during subsequent developmental periods. Moreover, **third Aim**, to determine the predictive validity of classes for subsequent behavioral problems revealed that only the Abuse/Neglect/Emotional Maltreatment group had higher Externalizing and Total Behavior Problems during earlier developmental periods, which is consistent with the finding of Pears and her colleagues (2008) among preschool-aged children. On the other hand, following late childhood, all maltreatment groups had elevated levels of Externalizing and Total Problems, which is largely consistent with the findings of Hazen and her colleagues (2009) among adolescents. Moreover, only the Physical/Emotional Abuse group was at an increased risk for Internalizing Problems following late childhood.

### Limitations

The findings of the present study should be considered in the context of several limitations. First, the purpose of the present study was to *explore* commonly occurring patterns of maltreatment. It will be important for future researchers to confirm these findings using more rigorous confirmatory LCA models that account for potential covariates. Moreover, these results were based on maltreatment allegations during each developmental period. Although researchers have demonstrated replacing substantiations with allegations does not result in substantial differences in outcomes and actually may improve sensitivity (Hussey et al., 2005; Kohl et al., 2009), their use remains controversial and does not account for maltreatment that was not detected by child protection agencies (e.g., Everson et al., 2008; Wolock et al., 2001). Moreover, the present sample was considered to be at a very high risk for maltreatment, which indicates that the findings may not generalize to all youth.

It should be noted that the names assigned to the identified class solutions resulted from subjective interpretations of the resultant model parameters. Indeed this limitation is true of all LC/PAs, but should be considered when drawing conclusions from such results. For example, although the Abuse/Neglect/Emotional Maltreatment class was identified during each developmental period based on the predominant pattern of probabilities for the types of maltreatment allegations, the exact probabilities for each type were not identical across periods. Another inherent limitation of LC/PA models is that not all individuals can be accurately categorized into clearly defined groups, which occasionally results in a

miscellaneous or mixed group. In the present study, this was the case for the Mixed Maltreatment group during late childhood, which consisted of youth with probabilities for combinations of maltreatment types that could not be readily discerned, except that they did not include emotional maltreatment.

### Research Implications

Despite these limitations, the present study provides some meaningful implications for future researchers. Specifically, the failure in the present study to detect any single type of maltreatment in the absence of other forms underscores the importance of accurately characterizing specific combinations of maltreatment types experienced by youth whether using LC/PA or another methodology (see Herrenkohl & Herrenkohl, 2009). Moreover, these findings indicate that additive representations of maltreatment types ignore critical information about specific maltreatment combinations, which result in different child outcomes. Based on these findings and those of previous researchers (Hazen et al., 2009; Pears et al., 2008), it also appears that the specific combinations of maltreatment types experienced by youth differ by developmental period. This should be further explored by future researchers and could indicate that youth are more susceptible to particular types of maltreatment at different stages of development. Conversely, the changes in these combinations could be an artifact of officially reported maltreatment (i.e., older youth are less consistently reported for neglect) and should be replicated using self-report as well as officially reported data. The findings from the present study do not suggest that neglect and emotional maltreatment are not related to externalizing behavior problems, but rather that there may be something unique about the combined experience of these forms of maltreatment and abuse that influences the development of these problems. Future investigations should attempt to verify the continuity of re-reporting for similar combinations of maltreatment types across adjacent developmental periods and identify the consequences of these experiences. Researchers should also attempt to identify the developmental mechanisms and processes through which patterns of child maltreatment contribute to these problems and other domains of dysfunction.

### Clinical and Policy Implications

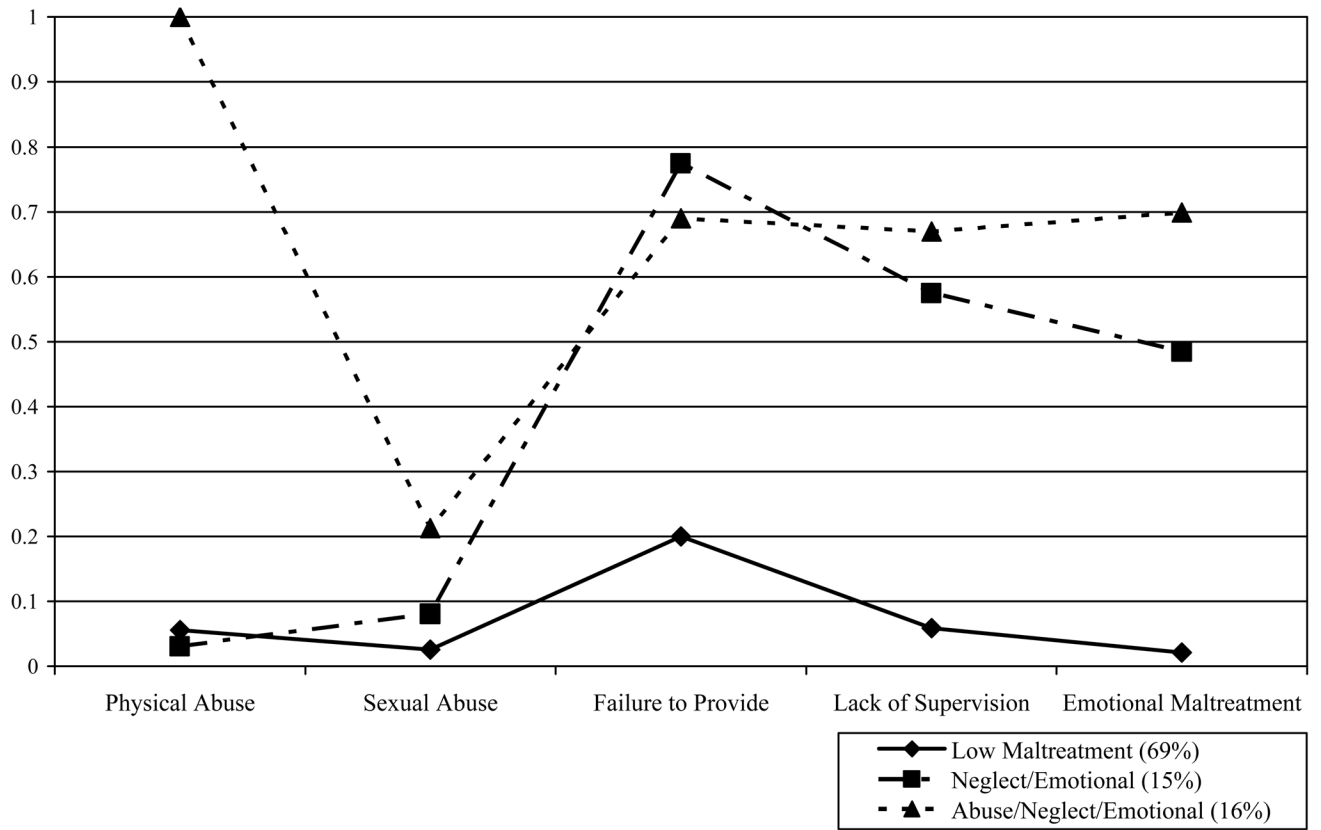
Although the present study was exploratory in nature, it does provide some potential clinical considerations for services and service providers. While it is unclear from the results of the present study whether or not these allegations were investigated, substantiated, or resulted in any type of child protective intervention, it seems that more effective investigation and or intervention is warranted to avoid future problems (i.e., reports). For example, when investigating neglect allegations in older youth, investigators should also focus on other forms of maltreatment, as neglect does not frequently occur in isolation among these youth. Also, given the behavioral consequences of youth with allegations that included physically violent forms of maltreatment, it seems that these youth should be assessed for behavioral problems and possibly referred for mental health services regardless of substantiation or child protective intervention decisions. It is likely that parent-training interventions could prevent future maltreatment as well as improve child behavior problems despite substantiation.

In conclusion, the findings from the present study underscore the importance of examining the consequences of specific combinations of maltreatment subtypes during different developmental periods. Although youth tended to be revictimized by similar combinations of maltreatment across developmental periods, the present study also identified changes in the combinations of maltreatment types that co-occurred during different developmental periods. This could indicate that youth are more or less susceptible to specific forms of maltreatment during particular developmental periods. However, it could also represent differences in the types of allegations that are typically reported during different developmental periods. Finally, youth that had allegations for any form of physically violent maltreatment appear to be at the greatest risk for behavioral maladjustment and should be targeted for intervention.

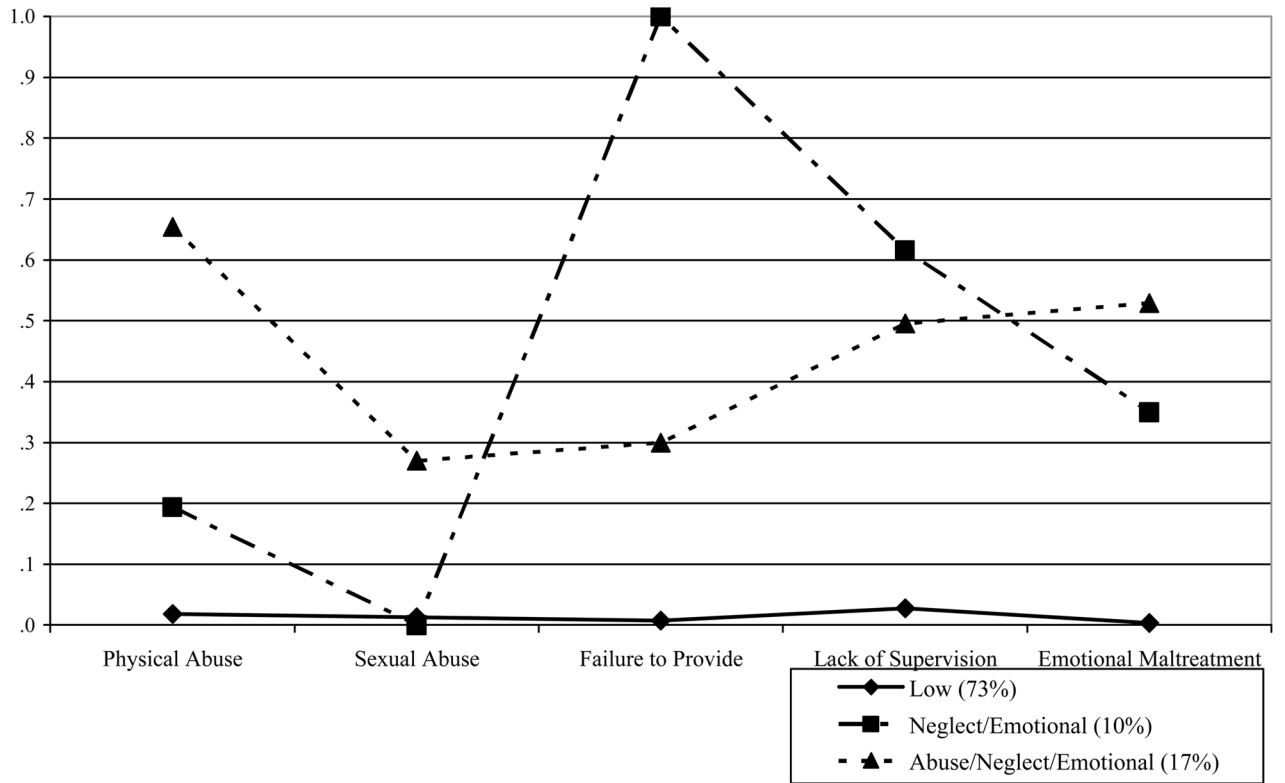
## References

- Achenbach, TM. Integrative Manual for the 1991 CBCL/4–18, YSR, and TRF profiles. Burlington, VT: University of Vermont. Department of Psychiatry; 1991.
- Akaike H. A new look at the statistical model identification. *IEEE Transactions on Automatic Control*. 1978; 19(6):716–723.10.1109/TAC.1974.1100705
- Arata CM, Langhinrichsen-Rohling J, Bowers D, O'Brien N. Differential correlates of multi-type maltreatment among urban youth. *Child Abuse & Neglect*. 2007; 31(4):393–415.10.1016/j.chiabu.2006.09.006 [PubMed: 17412420]
- Barnett, D.; Manly, JT.; Cicchetti, D. Defining child maltreatment: The interface between policy and research. In: Cicchetti, D.; Toth, SL., editors. *Advances in Applied Developmental Psychology: Child Abuse, Child Development and Social Policy*. Norwood, NJ: Ablex; 1993.
- English DJ, Graham JC, Litrownik AJ, Everson M, Bangdiwala SI. Defining maltreatment chronicity: Are there differences in child outcomes? *Child Abuse & Neglect*. 2005; 29(5):575–595.10.1016/j.chiabu.2004.08.009 [PubMed: 15970326]
- English, DJ. Investigators, t. L. Modified Maltreatment Classification System (MMCS). 1997. Retrieved from <http://www.iprc.unc.edu/longscan/>
- Everson MD, Smith JB, Hussey JM, English D, Litrownik AJ, Dubowitz H, Runyan DK. Concordance between adolescent reports of childhood abuse and Child Protective Service determinations in an at-risk sample of young adolescents. *Child Maltreatment*. 2008; 13(1):14–26.10.1177/1077559507307837 [PubMed: 18174345]
- Hazen AL, Connelly CD, Roesch SC, Hough RL, Landsverk JA. Child maltreatment profiles and adjustment problems in high-risk adolescents. *Journal of Interpersonal Violence*. 2009; 24(2):361–378.10.1177/0886260508316476 [PubMed: 18391059]
- Herrenkohl RC, Herrenkohl TI. Assessing a child's experience of multiple maltreatment types: Some unfinished business. *Journal of Family Violence*. 2009; 24(7):485–496.10.1007/s10896-009-9247-2 [PubMed: 20161642]
- Higgins DJ, McCabe MP. Multiple forms of child abuse and neglect: Adult retrospective reports. *Aggression and Violent Behavior*. 2001; 6(6):547–578.10.1016/S1359-1789(00)00030-6
- Hussey JM, Marshall JM, English DJ, Knight ED, Lau AS, Dubowitz H, Kotch JB. Defining maltreatment according to substantiation: Distinction without a difference? *Child Abuse & Neglect*. 2005; 29(5):479–492.10.1016/j.chiabu.2003.12.005 [PubMed: 15970321]
- Kohl PL, Jonson-Reid M, Drake B. Time to leave substantiation behind: Findings from a national probability study. *Child Maltreatment*. 2009; 14(1):17–26.10.1177/1077559508326030 [PubMed: 18971346]
- Lanza, ST.; Collins, LM.; Lemmon, DR.; Schafer, JL. *PROC LCA: A SAS Procedure for Latent Class Analysis*. Lawrence Erlbaum Associates; 2007. (Writers)
- Lau AS, Leeb RT, English D, Graham JC, Briggs EC, Brody KE, Marshall JM. What's in a name? A comparison of methods for classifying predominant type of maltreatment. *Child Abuse & Neglect*. 2005; 29(5):533–551.10.1177/10634266040120030201 [PubMed: 15970324]

- Lo Y, Mendell N, Rubin D. Testing the number of components in a normal mixture. *Biometrika*. 2001; 88:767–778.10.1093/biomet/88.3.767
- Manly JT, Kim JE, Rogosch FA, Cicchetti D. Dimensions of child maltreatment and children's adjustment: contributions of developmental timing and subtype. *Development And Psychopathology*. 2001; 13(4):759–782. [PubMed: 11771907]
- Nooner KB, Litrownik AJ, Thompson R, Margolis B, English DJ, Knight ED, Roesch S. Youth self-report of physical and sexual abuse: A latent class analysis. *Child Abuse & Neglect*. 2010; 34(3): 146–154.10.1016/j.chiabu.2008.10.007 [PubMed: 20207000]
- Pears KC, Kim HK, Fisher PA. Psychosocial and cognitive functioning of children with specific profiles of maltreatment. *Child Abuse & Neglect*. 2008; 32(10):958–971.10.1016/j.chiabu.2007.12.009 [PubMed: 18995901]
- Roesch SC, Villodas M, Villodas F. Latent class/profile analysis in maltreatment research: A commentary on Nooner et al., Pears et al., and looking beyond. *Child Abuse & Neglect*. 2010; 34(3):155–160.10.1016/j.chiabu.2010.01.003 [PubMed: 20207416]
- Runyan DK, Curtis PA, Hunter WM, Black MM, Kotch JB, Bangdiwala S, Landsverk J. LONGSCAN: A consortium for longitudinal studies of maltreatment and the life course of children. *Aggression and Violent Behavior*. 1998; 3(3):275–285.10.1016/j.chiabu.2004.06.01
- Sclove SL. Application of model-selection criteria to some problems in multivariate analysis. *Pyschometrika*. 1987; 52:333–343.10.1007/BF02294360
- U.S. Department of Health and Human Services, Administration on Children, Youth and Families, & Children's Bureau. *Child Maltreatment 2009*. 2010. Retrieved from [http://www.acf.hhs.gov/programs/cb/stats\\_research/index.htm#can](http://www.acf.hhs.gov/programs/cb/stats_research/index.htm#can)
- Wolock I, Sherman P, Feldman LH, Metzger B. Child abuse and neglect referral patterns: A longitudinal study. *Children and Youth Services Review*. 2001; 23(1):21–47.

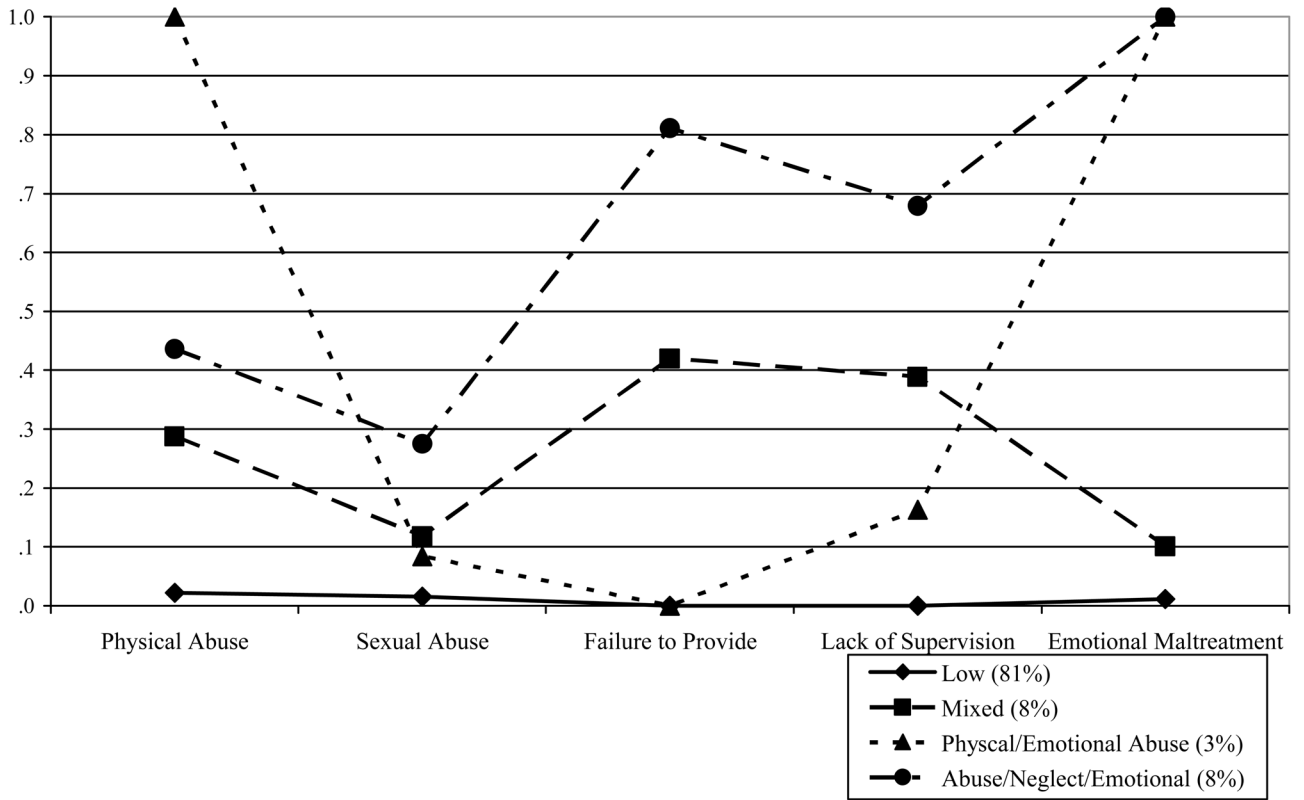


**Figure 1.**  
Conditional Response Probabilities for Maltreatment Allegation Classes During Preschool.



**Figure 2.**  
Conditional Response Probabilities for Maltreatment Allegation Classes During Early Childhood.





**Figure 3.**  
 Conditional Response Probabilities for Maltreatment Allegation Classes During Late Childhood.

**Table 1**

Fit Statistics for Maltreatment LCA Models.

	Model	AIC	BIC	LMRT	Entropy
Preschool maltreatment	2-Class	3542	3558	395.07***	0.717
	<b>3-Class</b>	<b>3537</b>	<b>3562</b>	<b>16.14*</b>	<b>0.765</b>
	4-Class	3543	3577	5.81	0.784
Early childhood maltreatment	2-Class	2514	2531	457.16***	0.799
	<b>3-Class</b>	<b>2499</b>	<b>2524</b>	<b>26.66**</b>	<b>0.846</b>
	4-Class	2505	2539	6.17	0.857
Late childhood maltreatment	2-Class	2119	2136	466.64***	0.856
	3-Class	2115	2140	15.48	0.839
	<b>4-Class</b>	<b>2119</b>	<b>2153</b>	<b>8.51*</b>	<b>0.852</b>
	5-Class	2119	2162	11.63	0.89

Note: Lower AIC and BIC values indicate better fit. Higher Entropy values (>.80) and significant LMRT (\*) values indicate better fit.

**Table 2**

Descriptive Statistics for Latent Classes.

Maltreatment Classes	Female	Percent from each site					Percent in each placement					
		Eastern	Midwestern	Southern	North- western	South- western	Bio/Step Parents	Adopted	Relative Care	Foster Care		
<u>Preschool</u>												
Low	52	22	25	23	17	13	80	4	11	5		
Neglect/Emotional	49	9	8	9	47	27	62	4	19	15		
Abuse/Neglect/Emotional	48	4	5	3	40	48	66	7	9	18		
<u>Early Childhood</u>												
Low	52	21	24	19	21	15	73	12	9	6		
Neglect/Emotional	41	10	10	16	31	33	77	4	14	5		
Abuse/Neglect/Emotional	45	5	5	12	37	41	59	10	17	14		
<u>Late Childhood</u>												
Low	52	20	23	17	22	18	71	13	11	5		
Mixed	39	13	8	24	23	32	65	9	20	6		
Physical/Emotional	40	4	0	24	52	20	48	24	16	12		
Abuse/Neglect/Emotional	52	3	5	15	42	35	65	10	17	8		

**Table 3**  
Multinomial Logistic Regressions Predicting Subsequent Maltreatment Experiences.

Maltreatment Classes	Early Childhood Maltreatment Classes			Late Childhood Maltreatment Classes		
	Neglect/Emotional	Abuse/Neglect/Emotional	OR(95% CI)	Mixed Maltreatment	Physical/Emotional	Abuse/Neglect/Emotional
<i>Preschool</i>						
Neglect/Emotional <sup>a</sup>	3.51(2.01–6.14)*	2.43(1.43–4.15)*	-	-	-	-
Abuse/Neglect/Emotional <sup>a</sup>	2.36(1.24–4.49)*	4.91(3.09–7.81)*	-	-	-	-
Abuse/Neglect/Emotional <sup>b</sup>	.67(.325–1.39)	2.02(1.11–3.68)*	-	-	-	-
<i>Early Childhood</i>						
Neglect/Emotional <sup>a</sup>	-	-	4.81(2.56–9.07)*	2.90(.92–9.16)	4.47(2.08–9.63)*	-
Abuse/Neglect/Emotional <sup>a</sup>	-	-	1.46(.70–3.03)	2.77(1.09–7.05)*	5.31(2.91–9.71)*	-
Abuse/Neglect/Emotional <sup>b</sup>	-	-	.30(.130–.706)*	.95(.27–3.42)	1.19(.54–2.63)	-

<sup>a</sup> relative to Low Maltreatment;

<sup>b</sup> relative to Neglect/Emotional Maltreatment.

All outcomes relative to Low Maltreatment.

**Table 3**

Mean Differences in Behavior Problems Between Maltreatment Classes.

Maltreatment Classes	Externalizing Problems	Internalizing Problems	Total Problems
<u>Preschool</u>	F(2,785)=8.57, $\eta^2=.02^*$	F(2,785)=2.91, $\eta^2=.01$	F(2,785)=8.33, $\eta^2=.02^*$
Low	12.25 <sub>a</sub>	5.20 <sub>a</sub>	28.92 <sub>a</sub>
Neglect/Emotional	13.65 <sub>ab</sub>	5.12 <sub>a</sub>	31.42 <sub>ab</sub>
Abuse/Neglect/Emotional	15.77 <sub>b</sub>	6.34 <sub>a</sub>	36.78 <sub>b</sub>
<u>Early Childhood</u>	F(2,785)=11.69, $\eta^2=.03^*$	F(2,785)=2.48, $\eta^2=.01$	F(2,785)=7.64, $\eta^2=.02^*$
Low	11.51 <sub>a</sub>	6.84 <sub>a</sub>	29.53 <sub>a</sub>
Neglect/Emotional	13.24 <sub>ab</sub>	7.62 <sub>a</sub>	33.32 <sub>ab</sub>
Abuse/Neglect/Emotional	15.69 <sub>b</sub>	8.21 <sub>a</sub>	37.69 <sub>b</sub>
<u>Late Childhood</u>	F(3,784)=11.16, $\eta^2=.04^*$	F(3,784)=7.36, $\eta^2=.03^*$	F(3,784)=10.67, $\eta^2=.04^*$
Low	11.10 <sub>a</sub>	7.02 <sub>a</sub>	28.16 <sub>a</sub>
Mixed	14.18 <sub>b</sub>	9.06 <sub>ab</sub>	36.77 <sub>b</sub>
Physical/Emotional	19.52 <sub>b</sub>	12.56 <sub>b</sub>	47.84 <sub>b</sub>
Abuse/Neglect/Emotional	15.15 <sub>b</sub>	8.42 <sub>a</sub>	37.40 <sub>b</sub>

Note: Means with different subscripts were significantly different from one another.