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Abstract

Major national reports have highlighted the deleterious influence of risk factors that impact family stability on young children’s educational well-being. Guided by a developmental epidemiology framework, the purpose of the present population-based study was to examine the timing and influence of first experiences of substantiated child maltreatment and homelessness on children’s academic achievement and attendance at the end of second grade for an entire cohort of 12,045 second grade students in a large, urban school district. Information on first experiences of substantiated child maltreatment and homelessness, birth risks, demographics, and academic achievement and attendance outcomes were obtained and linked through an integrated data system. Event history analyses were used to examine the timing of first experiences of homelessness and substantiated child maltreatment in early childhood. A series of multiple regression models was used to examine the relationship between first experiences of child maltreatment and homelessness on second grade academic achievement and attendance, when controlling for demographics, poverty, and birth risks. Results showed that after controlling for birth risks, poverty, and demographics, different patterns emerged for the influence of timing of first substantiated child maltreatment and homelessness on academic achievement and attendance. Practice and policy implications were discussed.

Keywords: Child Maltreatment; Homeless; Academic Achievement; Early Childhood
Timing and Influence of Child Maltreatment and Homelessness on Children’s Educational Well-Being

In recent decades, major national reports have underscored the critical importance of early childhood experiences to children’s growth and academic achievement (Halle, Forry, Hair, Perper, Wander, Wessel & Vick 2009; National Research Council, 2000; 2001). These reports indicate that family risks in early childhood can have an adverse effect on children’s early school success. Recommendations from these reports have called for federal action to protect children from early family risks, and to ensure their educational well-being.

Two major pieces of legislation coming from this increased awareness are the McKinney-Vento Homelessness Assistance Act and the Adoption and Safe Families Act (ASFA). The McKinney-Vento Homelessness Assistance Act streamlined and institutionalized the process by which homeless children gain access to public schools and early intervention/education services. Similarly, ASFA mandated that public child welfare systems ensured that young children who have been maltreated are prioritized in receiving needed early intervention/education services. To guarantee the accountability of public child welfare systems for meeting these mandates, these systems were required to participate in comprehensive service reviews. Results from these reviews indicated that 78% of the states reviewed failed to meet the minimum educational well-being needs of young children in their child welfare systems (U.S. Department of Health and Human Services, 2002).

While these mandates have placed a premium on research that can more precisely identify and respond to the educational well-being needs of vulnerable young children. This research requires a comprehensive conceptual framework for understanding the wide-ranging influence of familial risk factors on children’s academic achievement (Costello & Angold, 2000).
This framework should account for event specific characteristics, stage salient developmental processes, and emphasis on stable relationships with epidemiology’s population-based research methods for understanding prevalence (Costello & Angold, 1995).

The developmental epidemiology is one such framework. Epidemiological aspects of this model emphasize the use of population-based data collected by public surveillance systems, such as child welfare systems, public housing, or school districts, for understanding prevalence (Buka & Lipsett, 1994). Social science studies can be categorized in four distinct categories according to their sampling methodology and data collection strategies: (1) Convenience samples not using data collected by frontline sentinels; (2) Convenience samples using data collected by frontline sentinels; (3) Population-based samples not using data collected by frontline sentinels; and (4) Population-based samples using data collected by key frontline sentinels. Studies in the first category (convenience samples not using data collected by frontline sentinels) may be limited by only being representative of those individuals experiencing the risk factor (no contrast group) AND of not validly/reliably measuring the experiences of those experiencing the risks. Studies in the second category may have more adequate measures, but they are still only representative of the experiences of those participating in the study. Studies in the third category are representative of the target population, but may employ naïve survey measures that are not valid/reliable for the population (an example of this is the ECLS). Finally, there are studies that are both population-based and employ data collected by frontline sentinels. Quantifying the prevalence of a risk factor requires precise measurement of those exposed to the risk event. Epidemiological researchers emphasize that while low-prevalence events are best quantified using population-based data collected by frontline sentinels, social science has historically relied on samples of convenience – restricting the population to which study results can be generalized (Buka &
Lipsett, 1994; Drake & Jonson-Reid, 1999; Virnig & McBean, 2001). This is particularly important for child maltreatment and homelessness research given their low frequency of occurrence. These sampling considerations are particularly important in the study of child maltreatment and homelessness.

Developmental epidemiology also draws from developmental science in its understanding of specific event characteristics, such as timing (Buka & Lipsett, 1994; Costello & Angold, 1995). The timing of the event refers to when in the course of development the risk event occurred (Costello & Angold, 1995). One way of defining this is the “age of onset” of a risk – or the age of the individual when the risk is first experienced (Costello & Angold, 1995). This concept can first provide information on whether individuals in particular developmental stages (such as infancy or toddlerhood) are more or less vulnerable to experiencing a particular risk factor. Additionally, it can also provide insight into how the timing of risk factors during specific developmental stages impacts children’s ability to meet current and future developmental challenges (Cicchetti, 2004; Masten & Wright, 1998).

This framework also recognizes the importance of a stable, nurturing environment for children’s development. Those relationships that are most proximal to the child (such as the parenting relationship) are most likely to exert the greatest impact on the child’s development (Cicchetti, 2004; Wulczyn, Barth, Yuan, Harden, & Landsverk, 2006). Research has demonstrated that children in stable, nurturing relationships are more likely to have their basic needs met (such as shelter and food) and thus more likely to have enhanced cognitive, physical, and emotional well-being (Berrick, Needell, Barth, & Jonson-Reid, 1998; Brazelton & Greenspan, 2000; Goldstein, Solnit, Goldstein, & Freud, 1996; Wulczyn et al., 2005). Children experiencing child maltreatment and homelessness are at increased risk for not having these
stable, nurturing relationships and/or having these relationships disrupted (Goldstein, et al., 1996).

Several reviews have documented the adverse impact of maltreatment on educational well-being (Cicchetti & Toth, 2005; Stone, 2007; Veltman & Brown, 2001). According to these reviews, children with a history of maltreatment evidenced poor academic achievement outcomes. When compared with their peers, these children were disproportionately more likely to have poor mathematics, reading, and language outcomes (Cicchetti & Toth, 2005; Stone, 2007; Veltman & Brown, 2001). Furthermore, they were more likely than their peers to be placed in special education (Veltman & Brown, 2001). These reviews also noted that children with a history of maltreatment were more likely than their peers to evidence poor behavioral outcomes as well (Cicchetti & Toth, 2005; Stone, 2007; Veltman & Brown, 2001). Finally, theoretical reviews of child maltreatment have noted that child maltreatment is not an isolated risk factor, but rather it often occurs in sequence or concurrently with other known risk factors – calling for the need to understand maltreatment in a multiple risk context.

A small number of research articles have examined the educational well-being of children with a history of homelessness. Similar to children with a history of child maltreatment, children with a history of homelessness have been found to be at increased risk for poor academic achievement relative to their peers (Fantuzzo & Perlman, 2007; Masten, Heisted, Cutuli, Herbers, Obradoic, Chan, Hinz, & Long, 2008; Rafferty, Shinn, & Weitzman, 2004). They are more likely to evidence learning disabilities, be below average intelligence, and perform poorly on standardized assessments of reading and math (Fantuzzo & Perlman, 2007; Rafferty, Shinn, Weitzman, 2004). A study by Masten and colleagues (2008) found that between second and fifth grade, homeless children consistently performed worse on standardized assessments of reading
and math. As with maltreated children, children with a history of homelessness are also more likely to evidence decreased academic engagement (Koblinsky, Gordon, & Anderson, 2000; Rescorla, Parker, and Stolley, 1991). These children are more likely to demonstrate behavioral problems and have lower rates of school attendance than their peers.

From a developmental epidemiology perspective, studies on the impact of homelessness have questionable external reliability. External validity is enhanced by the use of population-based samples because they include children who have experienced the risk event (homelessness) and those who have not. Studies including children who have experienced a risk event and those who have not are better able to isolate the impact of specific risk factors. A recent review of studies addressing the academic achievement of homeless children found that approximately half of the studies only included children who were homeless at the time of the study (with no comparison group) and the vast majority of studies were based on children in homeless shelter settings (Buckner, 2008). Furthermore, all but a few of the studies have relied heavily on the ability to garner informed consent for child participation from a parent/guardian – something that is not easily obtained within this population (Lutzker, Tymchuk, & Bigelow, 2001). These sampling limitations manifest into limitations of external validity by reducing the generalizability of study findings to those participating in the study and/or those for whom informed consent was obtained.

The homelessness literature is also conceptually limited by inadequate attention to context of child development. Most studies examining the impact of homelessness on academic achievement collapse broad age groups of children together into one study (Buckner, 2008). Although some studies may control for the impact of age, they lack a developmental context for understanding stage-specific developmental competencies – and what is needed to achieve those
competencies. Additionally, this body of research has not examined how age of first homeless experience relates to the child’s ability to master developmental competencies – and in spite of the rising number of preschool children with homeless experiences, studies have not examined how homelessness in the early childhood years impacts later school achievement.

Finally, while the co-morbidity of child maltreatment and homelessness has been well-documented (Culhane, Webb, Grim, Metraux, & Culhane, 2003; Park, Metraux, Brodbar, and Culhane, 2004; Park, Metraux, & Culhane, 2005; Zlotnick, Robertson, & Wright, 1999), only one study could be found that simultaneously accounted for the influence of both of these risk factors on children’s academic achievement. Fantuzzo and Perlman (2007) conducted a population-based study using administrative data that examined the prevalence and unique risk of child maltreatment, homelessness, and foster care on academic achievement for an entire cohort of second grade children. This study used a series of logistic regression analyses to examine the unique influence of foster care on academic achievement, when accounting for child maltreatment, homelessness, birth risks, poverty, and demographics. Findings demonstrated that when foster care was in the model by itself, it was associated with risk for poor academic achievement. This finding corroborated prior studies that found an association between foster care and poor academic outcomes. However, the multivariate examination of foster care in the context of children’s experiences of maltreatment, and homelessness revealed that the unique impact of foster care was eliminated when maltreatment and homelessness were entered into the model (Fantuzzo & Perlman, 2007). These findings suggest that foster care functioned as a proxy for experiences of child maltreatment and homelessness – and underscored the importance of further exploring the influence of maltreatment and homelessness on academic achievement.

The purpose of the present study was to extend the developmental epidemiological model
by exploring the timing of child maltreatment and homelessness in early childhood and how age of first occurrence relates to children’s academic achievement and truancy. The present study addressed three major research questions. First, what was the prevalence of child maltreatment and homelessness experiences within a cohort of second grade students in a large urban school district? Second, what was the distribution of age of first documented occurrence of substantiated child maltreatment and homelessness experiences in early childhood? Third, what is the relation between age of first occurrence of child maltreatment and homelessness and children’s educational well-being at the end of second grade?

**Method**

**Participants**

This study was conducted in a large northeastern county with an entire cohort of second grade children enrolled in the county public school system. The criteria for inclusion in this study were: (a) enrollment in the public school system in second grade during the 2004-2005 academic school year; (b) born in the municipality; and (c) complete data for at least one of the primary outcome measures. Only children born in the municipality were included in the present study to ensure that complete risk histories were available for children included in the study. There were 15,934 students enrolled in 2nd grade during this year and 76% of these students were born in the municipality \((n = 12,045)\). The number of students who had complete data for the 2nd grade outcomes ranged from 9871 – 10,639. Children were equally distributed between males (50.2%) and females (49.8%), with an average age of 8.5 years (SD 0.53) at the end of second grade. Sixty-eight percent were African American, 11% Caucasian, 16% Hispanic, and 5% Asian or Other.

**Procedure**
To develop an understanding of children’s early childhood risks, a large integrated dataset was created using citywide administrative data. Data for the study were obtained through the Kids Integrated Data System (KIDS) (Fantuzzo, Culhane, & Hadley, 2005). KIDS is a database infrastructure established by the University of Pennsylvania, under agreement with the participating city agencies and school district. Its purpose is to support integrated database research to inform practice and policies for children and youth. Participating agencies include the Department of Public Health [DPH] (Medicaid behavioral health, birth records, lead registry), the Department of Human Services [DHS] (child abuse and neglect, preventive services), the School District (attendance, achievement, standardized testing, special education), Behavioral Health System (mental health services) and the Office of Emergency Shelter and Services [OESS] (public shelter use). A Memorandum of Understanding between the City, State, and the University outlines the procedures under which the data may be used. These procedures ensure confidentiality under the Health Insurance Portability and Accountability Act (HIPAA) and Family Educational Rights and Privacy Act (FERPA). KIDS employs advanced methods to ensure data quality and integrity. Complex computer algorithms are used to match individuals and services across systems over time. Data management includes reliability and validity auditing of data elements and the maintenance of data standards.

For the present study, a linked dataset of the Department of Public Health (DPH), Department of Human Services (DHS), Office of Supportive Housing (OSH), and School District was obtained. All identifying information, such as names, addresses, etc., were used solely for matching purposes and the final data set was stripped of identifiers other than identification numbers. After the matching was completed, individual level data on each child were then extracted using identification numbers and appended to the core data set. Thus, a large
data set was formed that contained birth records, homeless experience, child maltreatment and out-of-home placement data, and school information for each child.

The matching process used to link the data into an integrated dataset was completed using a personal computer and Link-King software (2000). Data from each of the participating agencies were standardized prior to the matching process. Additionally, duplicate records were eliminated from each dataset prior to matching. Probabilistic and deterministic matching algorithms were used to link children across the datasets. Link-King software was used to create ‘unique identifiers’ that were matched probabilistically across data systems (Whalen, Pepitone, Graver, and Busch, 2000). Scores were generated for each pair of records indicating the likelihood of an accurate match. Matches that did not meet thresholds for accuracy were manually checked and errors corrected. Deterministic matching procedures were also used. This process involved identifying specific cutoff criteria to determine a “quality” match – such as requiring at least 75% of the name string to match. If matches were not reconciled through these methods, the record was deleted. Once the matching process was completed, observations for which there were possible false positive errors were identified. These observations comprised less than 1% of all matches in each dataset and were manually cross-referenced across each of the datasets to ensure accuracy. The resulting integrated dataset consisted of 12,045 second grade children. Of these children, 78.2% had complete birth records. To ensure that only children with complete risk histories were included in the study, only the 78.2% (n = 12,045) of children with complete birth records were included in analyses.

**Measures**

**Birth risks.** Birth risks data were provided by the Department of Public Health. The variable ‘birth risks’ was defined as whether or not a child experienced at least one of the
following risk factors: inadequate prenatal care, premature birth, or low birth weight. Each of these risk factors was recorded on the child’s birth certificate and entered into a larger birth record database. Children identified as having received no prenatal care, prenatal care only in the third trimester, or fewer than four prenatal visits were considered to have received inadequate prenatal care. Those whose mothers received more than four visits throughout the course of their pregnancies were identified as having received adequate prenatal care. Similarly, children born at less than 36 weeks gestation were considered to be premature. Those born after 36 weeks gestation were considered to be full-term. Lastly, children experiencing low birth weight were identified through their birth record. Typically, children weighing less than 2500 grams are considered to have low birth weight. A binary variable was created to determine the presence or absence of birth risks. Children who had experienced any one of these risks were considered to have experienced birth risks.

**Poverty.** Children were defined as having had an experience of poverty if they received a free or reduced school lunch. These data were recorded in a dataset maintained by the School District. A binary variable was created to determine the presence or absence of poverty. Children identified as qualifying for a free or reduced lunch either in second grade or in a prior year were considered to have experienced poverty.

**Child maltreatment.** DHS also provided data on substantiated child maltreatment. DHS maintains a database tracking system that archives each allegation of child maltreatment. Within the municipality, substantiated child maltreatment is designated by a Child Protective Services (CPS) or General Services Report (GPS) that is substantiated, indicated, or founded. Children with a history of at least one substantiated, founded, or indicated allegation of child maltreatment between birth through the end of second grade were considered to have experienced the risk
factor of child maltreatment. To create the age of onset variable, the child’s date of birth was subtracted from the date of first substantiated child maltreatment to determine the child’s age (in days) at the time of first substantiated child maltreatment. These ages were then categorized by developmental period. Children whose first substantiated allegation of maltreatment occurred in the first year of life were coded as ‘infant’ (i.e. the child was 365 days old or younger at the time of first substantiated allegation); children who experienced it in the second year or third year of life were coded as ‘toddler’ (i.e. the child was between 366 and 1096 days of age at the time of first allegation); children who experienced it in the third or fourth years of life were coded as ‘preschool’ (i.e. the child was between 1097 and 1826 days of age at the time of first substantiated allegation); and children who experienced it after that were coded as ‘elementary’ (i.e. children who were 1827 days or older at the time of first substantiated allegation).

**Homeless experience.** Homeless experience is defined as whether or not the child had ever been placed in a homeless shelter from birth through the end of second grade. Information regarding children’s homeless experiences was collected by both OESS and DHS. If a child’s parent was identified within the OSH database or a child was identified as having been placed in a DHS-funded homeless shelter, the child was considered to have had a homeless experience. To create the age of onset variable, the child’s date of birth was subtracted from the date of first homeless shelter entry to determine the child’s age (in days) at the time of first homeless experience. Children whose first homeless experience occurred in the first year of life were coded as ‘infant’ (i.e. the child was 365 days old or younger at the time of first homeless experience); children who experienced it in the second year or third year of life were coded as ‘toddler’ (i.e. the child was between 366 and 1096 days of age at the time of first homeless experience); children who experienced it in the third or fourth years of life were coded as
‘preschool’ (i.e. the child was between 1097 and 1826 days of age at the time of first homeless experience); and children who experienced it after that were coded as ‘elementary’ (i.e. children who were 1827 days or older at the time of first homeless experience).

**Academic Achievement.** The TerraNova, Second Edition (CTB/McGraw-Hill, 1997) is a group-administered achievement test considered to be among the most reliable and valid of all standardized achievement tests; it is also known as the California Achievement Tests, Sixth Edition. Standard scores are provided across three subtests related to reading: reading, vocabulary, and language. Standard scores were also provided for math and science subtests. The TerraNova was nationally standardized on a stratified sample of 114,312 students (grades 1-12) from 778 school districts during the fall of 1999 and another 149,798 students (grades K-12) in the spring of 2000. Stratification variables included geographic region, urbanicity, socioeconomic status, and special needs. The TerraNova demonstrates acceptable internal consistency, with Kuder-Richardson Formula 20 coefficients for all subtests and total scores ranging from the mid .80s to .90s. Extensive validity work has been conducted on the TerraNova. Items were carefully reviewed to ensure adequate content validity, comparisons with the Test of Cognitive Skills, Second Edition and with InView (CTB/McGraw-Hill, 2001) indicate evidence of construct validity, and correlations between subtests and total scores support criterion-related validity. Further, the publishers plan to correlate the TerraNova with the National Assessment of Educational Progress (NAEP), the Third International Mathematics and Science Study (TIMSS), and the SAT and ACT. Based on similar studies relating the California Achievement Tests with the SAT and ACT, the publishers expect strong relationships. For the present study, TerraNova scores on each of the subtests were dichotomized at the 25th percentile. Children scoring below the twenty-fifth percentile were coded as ‘at risk’ for inadequate school
performance. Children performing at or above the 25th percentile were coded as having adequate school achievement.

**Attendance.** Attendance data were provided by the School District through computerized records. The attendance variable was created by dividing the total number of days present across the year by the total number of days it was possible for the child to be in attendance.

**Data Analysis**

**Descriptive picture of the timing social risks in early childhood.** Two sets of analyses were run for each of the social risks. First, frequency analyses were run for both risk factors to examine the percentage of children who had experienced child maltreatment and/or homelessness by developmental period. Then life table analyses were used to provide a more detailed understanding of the timing of children’s first experiences of substantiated maltreatment and homelessness. These analyses produced two key statistics for understanding the timing distribution of these events: hazard functions and survival functions. The survival function describes the risk that the individual will not experience an event following a given time interval. All individuals are born not yet having experienced any of the social risks – and therefore, the survival function is 1.0 (that is, that the probability of not yet having experienced a social risk is 100%). As the children age the probability of not experiencing a given social risk event declines. The severity of the decline lends insight into the risk of experiencing a given social risk. For example, if the survival function for homelessness equaled 0.9745 for two year olds, and .9034 for three year olds, this could be interpreted as an increase in risk of experiencing homelessness from the end of the second year of life to the end of the third year of life.

The hazard function describes the rate of event occurrence within a given time period. For instance, if the daily hazard rate for first homeless experience is 0.000051 in the second year
of life, this means that the rate of first homeless experience for children in their second year of
life is .000051 per day. This daily rate could then be multiplied by 365 (the number of days/year)
to obtain an annual hazard rate of .02 – suggesting that 2% of children in their second year of life
will experience homelessness for the first time.

Impact of timing of homelessness and child maltreatment on academic achievement.
A third set of analyses were conducted to examine the relationship between age of onset of child
maltreatment and homelessness and academic achievement and attendance. Linear regression
analyses were used to examine the unique relationship between each of the categorical age
variables and the outcome variable, controlling for demographics, poverty, and birth risks. A
series of six regression models were run to examine how age of onset of homelessness and child
maltreatment (by category) impacts academic achievement, when controlling for demographics,
poverty and birth risks. This statistical technique was chosen because it permits exploration of
the relationship between the dependent variable and each independent variable, while controlling
for the influence of other variables (Allison, 1999). Additionally, examination of the beta
coefficients provides an understanding of the relative magnitude of the relationship (Allison,
1999).

Results

Prevalence and Characteristics of Social Risks

Frequency analyses and descriptive statistics were used to develop an understanding of
the prevalence of substantiated child maltreatment and homelessness (Table 1). Within this
cohort of children, approximately 12% had experienced substantiated abuse and 8% had
experienced homelessness by the end of second grade. Just over half the children had lived in
poverty or experienced one or more birth risks.
Age of onset for both child maltreatment and homelessness was examined by developmental period (Table 2). The average age at time of first substantiated maltreatment experience was 1.85 years. Of those children experiencing maltreatment, 17% experienced it for the first time as infants (< 12 months); 17% as toddlers; 18% as preschoolers and 48% as elementary school students. The average age of first homeless experience for children in this cohort was 1.25 years. Of those children experiencing homelessness, approximately 33% experienced it as an infant; 33% experienced it as a toddler; 23% experienced it as a preschooler and 11% experienced it in elementary school.

Descriptive Picture of the Timing of Children’s First Risk Experiences

Life table analyses provided a more detailed picture of children’s first experiences of substantiated maltreatment and homelessness (Figures 1 & 2). These analyses produced two key statistics for understanding the timing distribution of these events: hazard functions and survival functions. The survival function describes the risk that the individual will not experience a specific event for the first time in a given time interval. All individuals are born not yet having experienced child maltreatment or homelessness – and therefore, the survival function at birth is 1.0 (that is, the probability of not yet having experienced child maltreatment or homelessness is 100%). As the individual ages, the likelihood of not having experienced one or both of these events decreases. The slope of this decline lends insight into the timing of the risk event. For example, if the survival function for homelessness equaled .74 at 365 days (one year old), 0.52 at 1095 days (three years old) and .35 for 1825 days (five years old), this could be interpreted as a steady decrease in the survival function (i.e. there is steady ‘risk’ of experiencing homelessness from age one through age three). If there was sudden decrease in the survival function, it would suggest that the risk of experiencing homelessness for the first time at the
younger age was greater than at the older age.

Survival functions demonstrated unique risk trajectories for substantiated maltreatment and homelessness (Figure 1). The survival function for maltreatment steadily declined from birth through the end of second grade. This is interpreted as a low, but consistent risk of maltreatment from birth through the end of second grade. The survival rate for maltreatment at the end of second grade was .84 – indicating that the likelihood of ‘surviving’ through the end of second grade without experiencing substantiated maltreatment is 84%. The survival function for homelessness evidenced a moderate decline from birth through age five and then remained steady through the end of second grade. This suggests that children’s risk of experiencing homelessness was moderate from birth through age five and then stabilized thereafter.

The hazard function describes the rate of event occurrence within a given time period. For instance, if the daily hazard rate for first homeless experience is .000071 in the first year of life, it means that the rate of first homeless experience between in the first year of life is .000051 per day.

Hazard functions for substantiated maltreatment and homelessness were calculated in three month increments. Figure 2 demonstrates the rate of occurrence for both of these risk factors was highest in the first three months of life, but unique risk trajectories emerged across early childhood. The risk of experiencing homelessness decreased across time. For instance, the rate of homelessness was .000071/day during infancy – but then declined to .00003/day for a preschooler (ages 3-4). This means that a newborn infant has almost three-times the rate of first homeless experiences than a preschool age child. The risk pattern that emerged for child maltreatment varied significantly from homelessness. The rate of child maltreatment was highest at birth (.000058) and then declined steadily until the child reached elementary school. At that
time, the hazard function went from equaling .00003 as a preschooler to .00005 as an elementary age child.

**Age of First Occurrence and Academic Achievement / Attendance**

Categorical variables for age of onset of child maltreatment and homelessness were entered simultaneously into a regression model for children’s performance on Reading, Language, Vocabulary, Science, and Math. The unstandardized beta coefficients are reported in Table 3. Distinctive risk patterns emerged for age at time of first substantiated maltreatment and homeless experience. Age of first occurrence for child maltreatment in infancy, toddlerhood, and early elementary school was associated with a decrease in performance on each of the standardized academic achievement measures. For instance, children who experienced child maltreatment for the first time as infants on average scored six points lower on a standardized language, reading, and math assessments, relative to children who had not experienced child maltreatment. First experience of child maltreatment during toddlerhood exerted the greatest influence on standardized assessments of language, math, and science, whereas first experience of child maltreatment as a school age child exerted the greatest influence on reading and vocabulary.

Unlike child maltreatment, first experience of homelessness as a toddler was most consistently associated with adverse outcomes. Children who experienced homelessness for the first time as toddlers, on average scored between 4 and 6 points lower on standardized academic achievement outcomes, relative to children who had not experienced homelessness – with the greatest magnitude of risk being associated with language, reading, and vocabulary. Those who experienced homelessness as infants on average scored between 3.5 and 4 points lower on standardized language, reading, and math assessments.
The relationship between age of first experience of homelessness or child maltreatment was also explored for attendance (Table 4). First experiences of child maltreatment as a toddler, preschooler, or school age child was associated with a decrease in second grade attendance (relative to children who had not experienced child maltreatment). Homeless experience across infancy through preschool was associated with a decrease in second grade attendance. For both child maltreatment and homelessness, children who experienced these risk factors as school age children evidenced on average a 3% decrease in total school attendance relative to their peers who had not experienced these risk factors.

**Discussion**

The aim of the present study was to explore the timing of maltreatment and homelessness on academic achievement and attendance for an entire cohort of second grade children in a large, economically depressed county. Findings from this study indicated that 12% of this cohort had experienced a substantiated allegation of child maltreatment by the end of second grade and nearly 9% had experienced homelessness. Although significantly higher than national percentages of homelessness and maltreatment, these findings are similar to findings from other studies that examined the prevalence of homelessness and maltreatment in urban populations (Culhane, Webb, Grim, Metraux, & Culhane, 2003; Fantuzzo & Perlman, 2007; National Center on Family Homeless, 2009; McGuinness & Schneider, 2007).

Nearly half of all children who experienced maltreatment experienced it for the first time before entering school. The early peak in the life table analyses is consistent with national child maltreatment data that demonstrate that young children are at the greatest risk of experiencing child maltreatment. The later peak in these analyses occurs at around the age of five - coinciding with when children begin to enter into the public school system. This finding is commensurate
with national data that teachers represent one of the largest sources of child maltreatment reporting in the country – with nearly a fifth of all child abuse allegations being reported by educators (USDHHS, 2007).

This study is the first study to document age of first homeless experience in early childhood. Ninety percent of children experiencing homelessness in this cohort did so prior to entering elementary school. There was an even distribution of age of onset for homeless experiences across developmental categories – with a third of children having their first risk experience as infants, just over a third having their first experience as toddlers, just under a third as preschoolers and then 10% as school age children. National statistics on distribution of homelessness by age are harder to come by however; data suggest that between 25% - 40% of children who are homeless are five years of age or younger (Gargiulo, 2006).

The present study identified significant relationships between age of onset for homelessness and maltreatment and academic achievement outcomes. This first exploration of the impact of timing of first homeless experience on educational well-being found that homelessness experienced for the first time during the two youngest developmental stages had the greatest impact. Across all outcomes, children who experienced homelessness for the first time as a toddler evidenced poorer performance than their peers who had never been homeless. Likewise, children experiencing homelessness for the first time as infants evidenced worse language, reading, and math outcomes than their peers. Conversely, regardless of age of first occurrence children who experienced maltreatment evidenced poorer outcomes than their peers who had not – with those who experienced it as infants evidencing the worst outcomes.

This study also examined the relationship between age of first homeless experience and maltreatment to children’s second grade attendance. Both of these risk experiences were found to
be associated with decreases in percentage of school attendance. This may be in part connected to the fact that these children are at increased risk for experiencing school mobility. Research studies evaluating the relationship between school mobility and academic achievement/attendance have found a negative relationship between mobility and early academic achievement and attendance (Mantzicopoulos & Knutson, 2000; Temple & Reynolds, 2000). In essence, it is more difficult for children to learn the academic competencies they need to succeed in school if they do not show up.

Developmental science provides a context for understanding how and why specific risk factors may influence development across time. For instance, one of the key tasks in infancy is the development of a secure attachment relationship with an adult caregiver. This relationship then forms the cornerstone from which the child can begin to explore the world as he/she enters into the toddler years. Disruptions to proximal caregiver-child relationships have the potential to exert the most impact on the child’s present and future development (Cicchetti, 2004). Notably, children who experienced child maltreatment for the first time as infants on average evidenced poorer second grade outcomes than their peers who did not experience child maltreatment. Infants experiencing maltreatment are at increased risk for disruptions in their relationships with their caregivers. These disruptions can have long-lasting developmental outcomes. Additionally, although the development of these relationships is a key developmental competency in infancy, the importance of a positive and consistent caregiver relationship continues throughout childhood. Thus, while onset of maltreatment in later developmental stages does not exert as strong or pervasive an influence as it does in infancy, it continues to have a long term influence on stage-specific developmental competencies (such as language in the toddler years).

Developmental science can also be used to guide understanding on homelessness
findings. Unlike the maltreatment, the impact of age of onset of homelessness was fairly relegated to the younger developmental periods – particularly the toddler and preschool years. One of the key tasks throughout toddlerhood is to use the attachment relationship(s) developed in infancy as a ‘secure base’ to explore the world around them (Bowlby, 1969; Davies, 2004). Toddlers increased mobility and curiosity affords them a greater sense of independence and interest in exploring their environment. This exploration becomes interwoven with their cognitive development as the make sense of and learn about the world around them (Davies, 2004). Given the space restrictions of the shelter environment and the potentially limited availability of developmentally-appropriate toys (Reed-Victor, Popp, & Myers, 2003), homeless toddlers may be restricted in their exploration of the world around them. Given the importance of early learning experiences for future development, these early restrictions may play out several years later when these children enter school (National Research Council, 2000). A similar explanation could be offered for the influence of preschool homelessness on second grade literacy outcomes. Children’s ability to gain emergent literacy and language skills in the preschool years is predictive of their literacy success in the primary school years (National Research Council, 1998; 2001). Literacy-rich environments promote the literacy and language competencies of preschool children through exposure to print materials (such as books) and opportunities to engage with caregivers in literacy related activities (i.e. reading a book together) (National Research Council, 2001). As with toddlers experiencing homelessness for the first time, preschoolers experiencing homelessness for the first time may not have access to these kinds of resources. Shelters may not be equipped with books appropriate for preschoolers, and given the parental stressors associated with homelessness, parents may not be available to engage in emergent literacy-related activities with their children (National Research Council, 1998).
These environmental literacy limitations may leave homeless preschool children without the language and literacy competencies that they need to succeed in school (National Research Council, 1998).

Age at first maltreatment had a more pervasive influence on children’s academic achievement than homelessness – with first maltreatment experiences across all developmental periods evidencing an adverse association with at least one academic achievement outcome. This contrast may relate to the importance of key proximal relationships for children’s development, as well as the documented adverse impact of early maltreatment on young children’s brain development (Cicchetti, 2004; National Research Council, 2000). Although homelessness poses a risk for children’s development, its influence may be more distal than that of maltreatment’s influence. Whereas maltreatment speaks directly to the relationship between the child and his/her caregiver, homeless experiences speak to the context in which the child is developing. Although experiences of homelessness may influence child-caregiver relationships (through increased parental stress) this contextual risk factor does not deterministically lead to disruptions in the parent-child relationship (i.e. relationship risks). Conversely, child maltreatment experiences do have a direct influence on the nature of the relationship between the child and the caregiver because they speak directly to the parent’s ability to meet the needs of the child (Cicchetti, 2004; Erickson, Egeland, & Pianta, 1989). Prior research examining the relationship between age of maltreatment and developmental outcomes has demonstrated that early experiences of child maltreatment have a long-term, pervasive impact on children’s academic achievement (Berrick, Needell, Barth, & Jonson-Reid, 1998).

Future research should further explore specific event characteristics of child maltreatment and homelessness. A standard classification system that operationalizes key event characteristics
(such as the Maltreatment Classification System, Shonk & Cichetti, 2003) should be employed to
categorize relevant characteristics identified in the child maltreatment literature – such as type of
maltreatment, number of maltreatment events (dose), and length of time exposed to maltreatment
duration (Costello & Angold, 1995). Using such classification systems, the variability of event
characteristics could be explored within an entire population of children. The relationship
between these characteristics and multiple educational outcomes could then be studied to
develop a more comprehensive understanding of how maltreatment impacts educational well-
being. A similar process could be undertaken with homelessness to study how the dosage and
duration of homeless experiences relates to various indicators of educational well-being.

Additionally, given the disparate influence of timing of homelessness and maltreatment
on academic achievement, future research should also further explore the timing of these social
risk events to one another. While the present study examined the relationship between the age of
onset for homelessness and maltreatment on educational well-being, it did not examine how the
timing of each individual risk factor relates to the timing of other risks. Findings from this study,
as well as others indicate that there is a high degree of co-morbidity of these risk factors
(Culhane, Webb, Grim, Metraux, & Culhane, 2003; Fantuzzo & Perlman, 2007). Additionally,
prior research has also suggested that the homeless shelter system may function as a gateway to
the child welfare system (Culhane, Webb, Grim, Metraux, & Culhane, 2003). Further exploration
of the degree to which the timing of one risk factor relates to another risk factor could further
inform how to strategically target interventions for young children experiencing these risk
factors.

Policy and Practice Implications

Building capacity through administrative data. The present study demonstrates the
importance of using a comprehensive framework, like developmental epidemiology, to guide research on the influence of risk factors on educational well-being. Administrative data collected by key frontline sentinels provides the capacity for conducting this type of research. While administrative data can serve as an important resource for informing child welfare policy and practice, several concerns have been raised in the literature about the undisciplined use of administrative data systems (Cichetti, 2004; Waldfogel, 2000). These concerns include the scientific quality of the data and the challenges of linking administrative data across systems. Administrative data systems are created primarily for fiscal reporting and intra-agency client monitoring. There is not a routine system for auditing the data or for making sense of missing data, and as such, these data systems are not necessarily depositories for research ready data. In addition to the limitations of within system data quality, these data are not collected for the purposes of integration across systems. They do not include a common identifier for matching children across service providers. Typographical errors and transposed digits can make it difficult to create a common identifier across agency data systems.

The Kids Integrated Data System (KIDS), used in the present study, intentionally addressed these weaknesses. KIDS established scientific criteria to deal with missing data and changes in agency data coding across years. Variables with substantial or systematic missing data were excluded from the data system. Multiple years of the same data were checked for consistency in coding, trends, and outliers. KIDS also developed an advanced auditing system to ensure that only highly reliable and valid data elements are available for research. The validity of particular data elements was ascertained by comparing the data elements across datasets. KIDS also addressed the challenges of linking administrative data across systems by using probabilistic and deterministic matching procedures as outlined in the methods.
Provision of early intervention and early education. In addition to underscoring the utility of administrative data, findings from the present study also support the importance of early intervention and quality early childhood experiences for children who have experienced child maltreatment and homelessness. Current child welfare [Keeping Children and Families Safe Act], homelessness [McKinney-Vento Act], and early intervention [Individuals with Disabilities Act, Part C] policies mandate that infants and toddlers involved in the child welfare or public housing systems receive early intervention services (Jozefowicz-Simbini, Debra, & Israel, 2006; Mahoney, 2007; Ward, Yoon, Atkins, Morris, Oldham, & Wathen, 2009). This requires that professionals working with young children in child welfare and public shelter agencies know how to identify children with developmental delays and that they make the needed referrals to the early intervention system. A study conducted by Ward and colleagues (2009, April) found that child welfare providers failed to identify nearly 80% of children eligible for services. These findings suggest that child welfare and public shelter providers would benefit from training aimed at increasing their capacity to identify children with developmental delays (Ward, et al., 2009). Additionally, increased availability of developmental screening clinics like the Starting Young Program (see Silver, DiLorenzo, Zukoski, Ross, Amster, Schlegel, 1999 for a description) could support the identification and follow-up of children eligible for early intervention services. Once connected with the early intervention system, Court Appointed Special Advocates (CASA’s) could serve as liaisons between the social service systems and early intervention systems to ensure that children are receiving necessary services (Dicker & Gordon, 2006; Mahoney, 2007).

The current study’s findings on the relationship between early experiences of child maltreatment and homelessness also points to the importance of quality early childhood
education programs for these children. Access to quality early childhood education, such as Head Start, can promote educational well-being for children who have experienced child maltreatment or homelessness (Fantuzzo, Rouse, McDermott, Sekino, Childs, & Weiss, 2005; Jozefowicz-Simbini, Debra, & Israel, 2006). Some states, like Connecticut, are working towards ensuring that children in the child welfare and public shelter systems have priority access to quality early childhood programs – and that, in the event that children experience geographic mobility (due to housing or foster care placement) that they are able to retain their placement in their program (Grace Whitney, personal communication, September 5, 2007).

**Cross-agency collaboration and professional development.** The high co-occurrence of child maltreatment and homelessness, as well as the high risk of poor academic achievement associated with each of these social risks, underscores the importance of interagency collaboration and professional development. Increased collaboration among social service agencies provides the opportunity and context for ‘sustainable’ comprehensive and integrated service delivery to children and their families (Roussos & Fawcett, 2000). Collaboration between social service and education professionals also has the potential to inform service planning and help enhance educational well-being for children experiencing early childhood risks. Altshuler (2003) outlined concrete benefits of routine meetings between social service case managers and educators. For example, this contact could inform school personnel of any changes in a child’s living status that might affect the child’s school performance and provide an explanation for behavior change (Altshuler, 2003; Jozefowicz-Simbeni, Debra, & Israel, 2006). Additionally, professional development consisting of training both within professional discipline and across disciplines could increase awareness of the educational needs of children who have experienced homelessness or maltreatment (Altshuler, 2003; Jozefowicz-Simbeni, Debra, & Israel, 2006;
Research-practitioner partnerships create the opportunity for dialogue across agencies to address the complex needs of children with histories of child maltreatment or homelessness. Addressing these complex needs requires what Bier (2006) referred to as the “subtle weaving together of forces from a vast array of [systems]”. Recently, major national studies mandates are calling us to address the educational well-being of vulnerable young children. The McKinney-Vento Act makes public schools accountable for the academic proficiency of children in public shelter systems. Similarly, ASFA requires that public child welfare systems monitor the educational well-being of all children in its care. This requires that child welfare professionals connect with the public education system. To meet these national mandates, we are called to the difficult challenge of identifying ways to build bridges between systemic gaps. The current study provided an example of how research grounded in a developmental epidemiology framework that uses administrative data can create bridges between public child welfare systems and public school systems to address the educational well-being of vulnerable young children. Building these bridges requires a ‘common purpose’, ‘common language’, and ‘common procedures’ (Fantuzzo, McWayne, & Bulotsky, 2003). Social service professionals and early childhood educators share national mandates (‘common purpose’) of promoting the educational well-being of vulnerable children. Research findings from integrated data about shared clients provide a common language for informing collaborative interventions.

Common language developed in collaborative partnerships between researchers and practitioners informs the research process by shaping the research questions that are asked, determining which data are collected, and how they are collected. Findings generated from this partnership-based research can then be used to inform common procedures around future
assessment, intervention, and research endeavors. By fostering communication around a common purpose, this partnership-based research process provides the capacity to build bridges between agencies for more comprehensive, integrated service provision that addresses the complex needs of vulnerable young children.
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Table 1

*Prevalence of Child Characteristics and Social Risks*

<table>
<thead>
<tr>
<th>Child Characteristics</th>
<th>Cohort ((N = 12,045))</th>
<th>Maltreated ((n = 1438))</th>
<th>Homeless ((n = 906))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (male)</td>
<td>50.2</td>
<td>52.6</td>
<td>51.4</td>
</tr>
<tr>
<td>Caucasian</td>
<td>11.3</td>
<td>11.8</td>
<td>3.7</td>
</tr>
<tr>
<td>African American</td>
<td>68.0</td>
<td>73.8</td>
<td>91.0</td>
</tr>
<tr>
<td>Hispanic</td>
<td>16.2</td>
<td>13.4</td>
<td>5.3</td>
</tr>
<tr>
<td>Asian</td>
<td>3.7</td>
<td>1.0</td>
<td>0</td>
</tr>
<tr>
<td>Birth Risks</td>
<td>51.1</td>
<td>59.4</td>
<td>62.6</td>
</tr>
<tr>
<td>Poverty</td>
<td>56.2</td>
<td>68.0</td>
<td>71.9</td>
</tr>
<tr>
<td>Substantiated Maltreatment</td>
<td>12.0</td>
<td>-</td>
<td>37.0</td>
</tr>
<tr>
<td>Homeless Experience</td>
<td>8.0</td>
<td>26.6</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 2

*Age at Time of First Substantiated Maltreatment or Homeless Experience (percent)*

<table>
<thead>
<tr>
<th></th>
<th>Maltreatment (N = 1438)</th>
<th>Homeless (N = 906)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant</td>
<td>17</td>
<td>33</td>
</tr>
<tr>
<td>Toddler</td>
<td>17</td>
<td>33</td>
</tr>
<tr>
<td>Preschool</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Elementary School</td>
<td>48</td>
<td>11</td>
</tr>
</tbody>
</table>
Table 3

Regression model predicting academic achievement using age of onset of child maltreatment and homelessness, and controlling for demographics, poverty, and birth risks

<table>
<thead>
<tr>
<th>Risk factor/covariate</th>
<th>Language</th>
<th>Reading</th>
<th>Vocabulary</th>
<th>Math</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (Male)             &amp; -7.8****</td>
<td>-6.2****</td>
<td>-5.8****</td>
<td>-0.37</td>
<td>1.3**</td>
<td></td>
</tr>
<tr>
<td>African American          &amp; -13.8****</td>
<td>-15.3****</td>
<td>-14.8****</td>
<td>-17.4****</td>
<td>-17.6****</td>
<td></td>
</tr>
<tr>
<td>Hispanic                  &amp; -18.5****</td>
<td>-18.8****</td>
<td>-19.8****</td>
<td>-18.8****</td>
<td>-18.8****</td>
<td></td>
</tr>
<tr>
<td>Asian                     &amp; 0.51</td>
<td>-4.3**</td>
<td>-6.4****</td>
<td>-2.5</td>
<td>-10.1****</td>
<td></td>
</tr>
<tr>
<td>Poverty                   &amp; -5.8****</td>
<td>-5.3****</td>
<td>-5.6****</td>
<td>-4.9****</td>
<td>-5.3****</td>
<td></td>
</tr>
<tr>
<td>Birth risks               &amp; -5.6****</td>
<td>-5.4****</td>
<td>-5.0****</td>
<td>-5.1****</td>
<td>-4.3****</td>
<td></td>
</tr>
<tr>
<td><strong>Age of 1st Maltreatment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant                    &amp; -6.6****</td>
<td>-6.5****</td>
<td>-3.7*</td>
<td>-6.2****</td>
<td>-5.6****</td>
<td></td>
</tr>
<tr>
<td>Toddler                   &amp; -7.1****</td>
<td>-5.6***</td>
<td>-5.4**</td>
<td>-6.3***</td>
<td>-7.0****</td>
<td></td>
</tr>
<tr>
<td>Preschool                 &amp; -1.7</td>
<td>-2.6</td>
<td>-2.9</td>
<td>-4.1*</td>
<td>-2.0</td>
<td></td>
</tr>
<tr>
<td>Elementary                &amp; -6.1****</td>
<td>-6.8***</td>
<td>-6.3****</td>
<td>-5.6****</td>
<td>-4.7****</td>
<td></td>
</tr>
<tr>
<td><strong>Age of 1st Homeless</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant                    &amp; -3.9**</td>
<td>-4.1*</td>
<td>-2.8</td>
<td>-3.8*</td>
<td>-1.9</td>
<td></td>
</tr>
<tr>
<td>Toddler                   &amp; -5.3***</td>
<td>-5.6****</td>
<td>-5.4****</td>
<td>-4.8***</td>
<td>-4.5****</td>
<td></td>
</tr>
<tr>
<td>Preschool                 &amp; -4.0*</td>
<td>-4.0*</td>
<td>-5.5**</td>
<td>-3.3</td>
<td>-0.75</td>
<td></td>
</tr>
<tr>
<td>Elementary                &amp; -3.0</td>
<td>-3.5</td>
<td>-3.6</td>
<td>-3.0</td>
<td>-0.25</td>
<td></td>
</tr>
<tr>
<td>N                         &amp; 10,545</td>
<td>10,545</td>
<td>9786</td>
<td>10,388</td>
<td>10,339</td>
<td></td>
</tr>
</tbody>
</table>
Note. Unstandardized coefficients are reported.

*p < .05, **p < .01, ***p < .001, ****p < .0001.

Reference group for Gender is female; Reference group for race variables is Caucasian; Reference group for Poverty is Children who have not lived in poverty; Reference group for birth risks is children who did not experience birth risks; Reference groups for maltreatment and homelessness age categories are children who did not experience maltreatment and/or homelessness.
Table 4
Regression model predicting attendance using age of onset of child maltreatment and homelessness, and controlling for demographics, poverty, and birth risks

<table>
<thead>
<tr>
<th>Risk factor/covariate</th>
<th>Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Gender (Male) (^a)</td>
<td>0.004 **</td>
</tr>
<tr>
<td>African American</td>
<td>0.00</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.01 ****</td>
</tr>
<tr>
<td>Asian</td>
<td>-0.03 ****</td>
</tr>
<tr>
<td>Poverty</td>
<td>0.03 ****</td>
</tr>
<tr>
<td>Birth risks</td>
<td>0.01 ****</td>
</tr>
<tr>
<td><strong>Age of 1(^{st}) Maltreatment</strong></td>
<td></td>
</tr>
<tr>
<td>Infant</td>
<td>0.01</td>
</tr>
<tr>
<td>Toddler</td>
<td>0.02 ****</td>
</tr>
<tr>
<td>Preschool</td>
<td>0.02 ***</td>
</tr>
<tr>
<td>Elementary</td>
<td>0.03 ****</td>
</tr>
<tr>
<td><strong>Age of 1(^{st}) Homeless</strong></td>
<td></td>
</tr>
<tr>
<td>Infant</td>
<td>0.01 *</td>
</tr>
<tr>
<td>Toddler</td>
<td>0.01 ***</td>
</tr>
<tr>
<td>Preschool</td>
<td>0.01 *</td>
</tr>
<tr>
<td>Elementary</td>
<td>0.01</td>
</tr>
<tr>
<td>(N)</td>
<td>11016</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.07</td>
</tr>
</tbody>
</table>
Note. Unstandardized coefficients are reported.
*p<.05, **p<.01, ***p<.001, ****p<.0001.

\(^a\) Reference group for Gender is female; Reference group for race variables is Caucasian; Reference group for Poverty is Children who have not lived in poverty; Reference group for birth risks is children who did not experience birth risks; Reference groups for maltreatment and homelessness age categories are children who did not experience maltreatment and/or homelessness.
Figure 1. Survival functions of children’s first homeless and maltreatment experiences.
Figure 2. Hazard functions of children’s first homeless and maltreatment experiences.