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EDUCATION

2012 **Ph.D.,** University of Maryland, Baltimore, Maryland

1997 **Master of Social Work,** Florida International University, Miami, Florida

1992 **Bachelor of Social Work,** Salisbury State University, Salisbury, Maryland

TEACHING EXPERIENCE

Spring 2009 **Adjunct Instructor** (Teaching Fellowship)
SOWK 670 Social Work Research

Fall 2008 **Adjunct Instructor** (Teaching Fellowship)
SOWK 670 Social Work Research

Spring 2008 **Supervised Teaching Practicum**
SOWK 360: Social Welfare Policy
Faculty Mentor: Caroline Tice, PhD

RESEARCH EXPERIENCE

2011 – present **Research Specialist**
Ruth H. Young Center for Families and Children
University of Maryland, Baltimore, Maryland

MPM Family Kin Connections Study

- Collect and analyze administrative and research data to understand outputs and outcomes for kinship caregivers and their children participating in the Kinship Navigator Programs (KNP) in seven counties, and prepare semi-annual reports with other team members.
- Developed survey for kinship families to understand the nature of services kinship families received through the KNP and their perception of the impact of the program on their families.
- Administered computer-facilitated research interviews with grandparents and other caregivers in their homes for the Family Kin Connections study in two of the counties.

- Coordinated scheduling of research interviews with caregivers in two counties, randomly assigned families to control and intervention groups, and collaborated with staff in the local departments of social services.
- Developed computer facilitated interviews for initial and closing research interviews using MediaLab and html coding.
- Programmed MS Excel spreadsheet to produce Family Profiles, automatically scoring all clinical assessment measures immediately after the research interviews.
- Developed and managed the project's Management Information System (MIS) using MS Access.
- Provided training for Research Assistants to administer computer facilitated research interviews, back up the data, and enter data into the MIS.

The Family Tree Enhanced Positive Parenting Program Study
Project Coordinator

- Collaborate with agency administrators and program staff to implement a randomized trial to evaluate attendance, completion, and parenting outcomes for parents participating in the Positive Parenting Program.
- Coordinate and administer consent meeting process for PPP enrollees interested in participating in the research, including random assignment to classes.
- Implement and oversee ongoing data management for administrative and research data.
- Provide research related training to TFT staff, interns and UMB research staff regarding research procedures, privacy and confidentiality.
- Analyze administrative and research data to assess parenting outcomes, attendance and completion rates among parents in the Positive Parenting Program.
- Provide technical assistance on research related tasks as needed.

Washoe County Family Connections Project

- Develop computer facilitated interviews for research interviews using MediaLab and html coding.
- Develop Family Profiles in Excel to provide individual family scores on mental health, child behavior, life stress, and other assessments generated from computer facilitated interview data.

2006 – 2009 **Graduate Research Assistant**
Ruth H. Young Center for Families and Children
University of Maryland, Baltimore, Maryland

The Family Tree (TFT) Positive Parenting Program
Research Fellow, Project Coordinator

- Evaluated a parenting training program, using administrative data from the private agency providing services and the public child welfare agency to examine short-term and long-term outcomes for parents participating in the program and their children.
- Conducted project management tasks including participation in initial meetings with TFT administrators and board members, drafting a statement of work, development of a work plan, and submitting quarterly reports.
- Developed a logic model, in conjunction with TFT administrators and staff, describing the program purpose, underlying assumptions, inputs, outputs and desired intermediate and long term outcomes of the Positive Parenting Program.
- Developed the study plan, including literature review and methodology, to conduct a retrospective evaluation of the outcomes of the program.
- Drafted and submitted the IRB protocol and a request to DHR for CPS data.
- Responsible for implementing the study, cleaning and analyzing data (including repeated measures analysis of variance and survival analyses), collaborating with staff to interpret the data, and writing research reports,
- Presented study findings for the TFT administrators, Strategic Planning Committee, and staff.
- Wrote a grant proposal, in collaboration with UMB and TFT staff, to the CDC to implement the evidence-based Triple P Positive Parenting program using a rigorous research design (including random assignment) to compare outcomes to TFT's parenting services for families at risk of child maltreatment

Family Connections and Grandparent Family Connections
Research Assistant

- Administered computer-facilitated research interviews with grandparents and parents in their homes for Grandparent Family Connections and Family Connections.
- Assessed caregiver and child outcomes for program participants using repeated measures and other analyses.
- Prepared reports and presentations for the Children's Bureau and Maryland Department of Human Services, the federal and state funders of the program.

Research to Practice Conference Planning and Evaluation
Research Assistant, Conference Coordinator

- Facilitated initial planning for a research to practice conference in partnership with Maryland Department of Human Resources; drafted proposals, facilitated planning meetings with state and local child welfare employees to identify conference topics, drafted conference schedule and initial budget.

- Prepared report summarizing results of conference evaluations and participants "key take home points" (next steps); used qualitative data software to analyze "take home points" and identify key themes.
- Developed and administered follow up survey to assess the degree to which conference participants were able to apply what they learned at the conference to their work.

Technical Assistance for Continuous and Comprehensive Services,
Baltimore County Office of Community Conservation
Project Coordinator

- Conducted a literature review of best practices in preventive services for young children, in conjunction with an MSW Research Scholar.
- Located and summarized data regarding the county and neighborhood population under study
- Prepared report for the project, including analysis and synthesis of the following information: service inventory for a neighborhood in Baltimore County, best practices in preventive services, assessment of service availability and continuity, and synopsis of the proposed Maryland Children's Zone.

Other Projects
Research Assistant

- Prepared and analyzed data, including data from the Multistate Foster Care Data Archive, U.S. Bureau of the Census, Family Connections and other data sets.
- Cleaned and assisted with initial analysis of data from one county that used family team decision-making in selected child welfare cases.
- Coordinated the development and maintenance of the web site and other materials for the newly formed Ruth H. Young Center; designed logo for the RYC.
- Drafted a proposal for a Maryland Children's Zone in Baltimore City, in conjunction with the school's Dean and a community partner.

2004 – 2006 **Assistant Director, National Data Analysis System (NDAS)**
Child Welfare League of America, Washington, DC

- Supervised staff on database related tasks, performed quality assurance and managed content for NDAS web site.
- Resolved database related technical issues and software bugs on NDAS web site in collaboration with contractor.

- Provided training and presented child welfare data and information. Planned benchmarking sessions with other leading child welfare organizations.
- Developed, implemented and published results from surveys relevant to child welfare data and policies in partnership with state child welfare agencies and researchers.
- Served as project manager for the National Working Group to Improve Child Welfare Data.

2001 – 2006 **Project Manager, National Working Group to Improve Child Welfare Data**
Child Welfare League of America, Washington, DC

- Coordinated and facilitated meetings and work groups with child welfare agency representatives, researchers, the Children's Bureau and others to identify patterns and differences in child welfare outcome data and definitions, and to work toward standard definitions of selected elements.
- Developed, implemented and published results from surveys for the National Working Group, including topics such as placement stability, reunification and child maltreatment in foster care.
- Drafted common definitions, recommendations, and papers regarding child welfare data.
- Drafted responses to notices in the federal register, collaborating with states and CWLA staff to gain general consensus on the issues.
- Developed and implemented work plan for National Working Group related tasks.
- Presented national child welfare data and information as needed, including the following topics: child abuse and neglect, foster care, overrepresentation of children of color in care, adoption, and national data quality issues.

1997 – 2000 **Research Associate and Program Manager, National Data Analysis System (NDAS)**
Child Welfare League of America, Washington, DC

- Managed the NDAS project, including project planning, prioritization and assignment of tasks, collaboration with child welfare agencies, screening and selection of job applicants, training and daily supervision of staff, and quality assurance.
- Presented the National Data Analysis System and data issues to a wide range of audiences, including child welfare directors, agency representatives, and researchers.
- Designed and implemented two surveys to collect aggregated state child welfare data.

- Prepared text, tables and graphs for the NDAS, Stat Book, and other publications.
- Administered a complex relational database containing more than 100,000 data records.
- Collaborated with contractor to develop and implement the on-line NDAS application and upgrades.
- Designed the prototype NDAS system to present state level child welfare statistics in customizable tables and graphs, providing data sources and essential notes.

1996 **Graduate Assistant**
The Institute on Children and Families at Risk, Florida International University, Miami, Florida

- Assisted in the development of the Intake and Assessment Instrument and other forms designed to evaluate a program providing peer counseling and support to substance abusing mothers and their families to prevent the abandonment of infants and children.
- Entered data, created tables and performed statistical analysis of data. Trained and supervised two students to help with retrospective data collection.

1994 – 1995 **Graduate Student Researcher**
National Child Welfare Research Center, University of California, Berkeley, California

- Created tables and graphs for California's Performance Indicator Report on children in the foster care system, working in conjunction with two Ph.D. students.
- Assisted Ph.D. students/staff with data compilation on two other projects.
- Trained MSW students to assist with projects, including creation of tables and graphs.

SOCIAL WORK PRACTICE EXPERIENCE

1997 **Social Worker, Foster Care Unit**
Family and Child Services of Washington, DC, Washington, DC

- Provided case management services for children in foster care, their foster parents and birth parents.
- Supervised family visits, accompanied children to appointments and made home visits.

- Prepared case plans and court reports, attended court hearings and administrative reviews.

1997 **Social Work Intern**
Gladstone Center for Girls, CHARLEE of Dade County, Miami, Florida

- Provided case management services for girls who have been severely physically or sexually abused.
- Co-facilitated weekly therapeutic groups with latency-aged girls and adolescent girls to address issues related to sexual abuse, loss, and age-appropriate topics.
- Completed psychosocial histories for girls entering the facility.
- Provided individual therapy for two girls.

1994 – 1995 **Social Work Intern**
Youth Service Bureau, San Pablo, California

- Provided case management services to children, youth, and their families.
- Provided counseling for children and youth, primarily those displaying behavioral problems.
- Co-facilitated adolescent discussion groups for students expelled for possession of weapons.
- Conducted intakes for children and families in need of services.

1993 – 1994 **Social Work Assistant, Foster Care Unit**
Family and Child Services of Washington, DC, Washington, DC

- Coordinated monthly family visiting days at the agency.
- Supervised family visits, accompanied children to appointments, and made home visits as needed.
- Oriented new foster care workers to procedures in the program, shared resources, and performed administrative duties.
- Prepared Lifebooks with foster children.

PROFESSIONAL PUBLICATIONS

Refereed Journal Articles

Woodruff, K., & Lee, B. (2011). Identifying and predicting problem behavior trajectories among pre-school children investigated for child abuse and neglect. *Child Abuse and Neglect, 35,* 491-503.

Fakunmoju, S., Woodruff, K., Kim, H, LeFevre, A., & Hong, M. (2010). Intention to leave a job: The role of individual factors, job tension, and supervisory support. *Administration in Social Work*, *34*, 313-328.

Hayward, R. A., DePanfilis, D., & Woodruff, K. (2010). Parental methamphetamine use and implications for child welfare intervention: A review of the literature. *Journal of Public Child Welfare*, *4*, 25-60.

Technical Reports

Woodruff, K. (August 2009). Evaluating Outcomes for At-risk Families Participating in The Family Tree's Positive Parenting Program: A Retrospective Study. Part II: Long Term Outcomes, Summary and Conclusions. Report prepared for The Family Tree of Maryland.

Woodruff, K. (February 2009). Evaluating Outcomes for At-risk Families Participating in The Family Tree's Positive Parenting Program: A Retrospective Study, Interim Report. Report prepared for The Family Tree of Maryland.

Woodruff, K. (January 2009). Place Matters in Maryland: Achieving Outcomes through Data-Driven Best Practices, Evaluation of the April 2008 Conference. Baltimore: University of Maryland, Ruth H. Young Center for Families and Children.

Woodruff, K., & White, M. (April 2008). Toward continuous and comprehensive services for young children in Maryland communities: Technical assistance project (Final report). Baltimore: University of Maryland, Ruth H. Young Center for Families and Children.

Child Welfare League of America (September 2005). Defining reunification for consistent performance measurement. *National Working Group Highlights*. Washington, DC: Child Welfare League of America. Available online at http://ndas.cwla.org.

Child Welfare League of America, National Working Group to Improve Child Welfare Data. (August 31, 2004). *Placement Stability Definitions to Promote Consistency in State Data Reporting For the Federal Outcome Measure. First Edition*. Washington, DC: Child Welfare League of America.

Child Welfare League of America (October 2003). Can states be compared based on child welfare data? *NDAS Issue Brief*. Washington, DC: Child Welfare League of America. Available online at http://ndas.cwla.org.

Child Welfare League of America (October 2002). Child maltreatment in foster care: Understanding the data. *National Working Group Highlights*. Washington, DC:

Child Welfare League of America. Available online at http://ndas.cwla.org.

Child Welfare League of America (April 2002). Placement stability measure and diverse out-of-home care populations. *National Working Group Highlights*. Washington, DC: Child Welfare League of America. Available online at http://ndas.cwla.org.

Child Welfare League of America (June 2001). Child abuse and neglect fatalities. *National Working Group Highlights*. Washington, DC: Child Welfare League of America. Available online at http://ndas.cwla.org.

Needell, B., Webster, D., Barth, R.P., Monks, K.,[1] & Armijo, M. (1995). *Performance Indicators for Child Welfare Services in California: 1994*. Berkeley, CA: University of California at Berkeley, School of Social Welfare, Child Welfare Research Center.

Books

Petit, M.R., Curtis, P.A., Woodruff, K., Arnold, L., Feagans, L., & Ang, J. (1999). *Child Abuse and Neglect: A Look at the States, 1999 CWLA Stat Book.* Washington, DC: CWLA Press.

PRESENTATIONS

Conference Presentations

Woodruff, K., DePanfilis, D., & Strieder, F. (January, 2009). Changes in child behavior following Family Connections intervention as reported by parent versus grandparent caregivers. *Society for Social Work & Research 13th Annual Conference– Research that Promotes Sustainability and Rebuilds Strengths.* New Orleans, LA, January 16-18, 2009.

Woodruff, K., & Tice, C. (November 2008). Integrating web-based resources into social welfare policy courses. *Council on Social Work Education 54th Annual Meeting, Social Work Policy and Practice: Linking Theory, Methods, and Skills*. Philadelphia, PA: October 30 – November 2, 2008.

DePanfilis, D., Gary, H., Pettaway, S., Watkins-Tribbitt, T., & Woodruff, K. (April, 2008). Identifying and overcoming barriers to reunification and adoption. *Place Matters in Maryland: Achieving Outcomes through Data-driven Best Practices*. Linthicum, MD, April 15-18, 2008.

Hayward, R. A, Woodruff, K., & Berry S. (July, 2007). Exploring CPS screening decisions at the local level: Characteristics associated with quality decisions. *10th National Data and Technology Conference, Making IT Work: Linking Data to Practice and Outcomes*, Washington, DC, July 18-20, 2007.

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[1] Kristen Woodruff, nee: Monks

DePanfilis, D., Hayward, R. A., & Woodruff, K. (June 2007). Using data to inform our practice: Examples from Chapin Hall's multi-state foster care data archive. Maryland Department of Human Resources, Social Services Administration Western Region *Local Department of Social Services Regional Conference,* Hagerstown, MD, June 27, 2007.

Woodruff, K. (Feburary/March 2006). Collaborating for better outcome measurement, brighter outcomes for children: National Working Group to Improve Child Welfare Data. *Children 2006: Securing Brighter Futures*, Child Welfare League of America National Conference, Washington, DC, February 27-March 1, 2006.

Friedman, C. & Woodruff, K. Data quality: The foundation for good evidence of good practice. *Making IT Work: Using Data to Measure and Improve Outcomes.* Sixth National Child Welfare Data Conference, Arlington, Virginia, April 9-11, 2003.

Ohm, J. & Woodruff, K. Children of Color in the Child Welfare System. *Children 2003: Imagine an America,* Child Welfare League of America National Conference, Washington, DC, March 7-9, 2003.

Woodruff, K. & Arnold, L. Working Together to Improve National Child Welfare Data: Moving Toward Better Practice. *Children 2002: Making Children a National Priority*, Child Welfare League of America National Conference, Washington, DC, March 6-8, 2002.

Poster Presentations

Woodruff, K., & Lee, B. (August 30, 2011). Identifying and predicting behavior trajectories among preschool children investigated for child abuse and neglect. *2011 National Child Welfare Evaluation Summit.* U.S. Department of Health and Human Services Children's Bureau Conference, Washington, DC, August 29-31, 2011.

Woodruff, K., Murray, K., Cronin, P., & Finney, C. (July, 2011). Evaluating child safety outcomes for TFT's Positive Parenting Program. *19th Annual APSAC Colloquium.* American Professional Society on the Abuse of Children, Philadelphia, PA, July 13-16, 2011. [Prepared poster but surgery prevented my attendance]

Other Presentations

Woodruff, K. The Positive Parenting Program: Exploration of the Impact of PPP on Intermediate and Long-term Outcomes. *TFT Program and Research Committee Board Meeting*, Baltimore, MD, October 2, 2009.

DePanfilis, D., Strieder, F., Woodruff, K., & Daining, C. Family Connections with Intergenerational Families: Preliminary Outcome Analyses & Brief Reflections About Lessons Learned. *OCAN Prevention Replications Final Grantee Cluster Meeting*. Arlington, VA, July 24-25, 2008.

DePanfilis, D., Hayward, R. A., & Woodruff, K. Using data to understand trends in out-of-home placement: Examples from Chapin Hall's multi-state foster care data archive. *Maryland Department of Human Resources, Social Services Administration Quality Assurance Advisory Committee Meeting*, Baltimore, MD, June 21, 2007.

Woodruff, K. Placement stability and other outcomes: What can we learn from CFSR results and AFCARS data? *Public and Private Foster Care Agency Benchmarking Session*, sponsored by Casey Family Programs and Child Welfare League of America, Washington, DC, March 2, 2006.

Woodruff, K. Defining placement stability within the federal context. *New England public and private foster care agency benchmarking session on placement stability*, sponsored by Casey Family Programs and Child Welfare League of America, Lowell, Massachusetts, November 2, 2005.

Woodruff, K. Comparing state data: Results from National Working Group surveys. *Child Welfare Data at the State Level: Potential Utilization by KIDS COUNT*, Annie E. Casey Foundation, Baltimore, Maryland, May 17, 2005.

Woodruff, K. & Testa, M. Defining placement stability within the federal context. *Public and Private Foster Care Agency Benchmarking Session on Placement Stability*, sponsored by Casey Family Programs, Child Welfare League of America and Girls and Boys Town, Washington, DC, March 8, 2005.

Woodruff, K. Foster Parent and Residential Facility Staff Perpetrators. *NCANDS State Advisory Group Meeting*, Washington, DC, November 13, 2002.

UNIVERSITY SERVICE

2007 – 2009	*Search Committee for Research Assistant Professor*. Ruth H. Young Center for Families and Children, University of Maryland School of Social Work.
2008	*Volunteer*. Reviewed MSW program applications, Spring 2008. University of Maryland School of Social Work.
2007 – 2008	*Doctoral Program Committee*. University of Maryland School of Social Work.

AWARDS AND HONORS

2011-2012	*Graduate Plus Award.* University of Maryland Baltimore Graduate School.
2010-2011	*Graduate Plus Award.* University of Maryland Baltimore Graduate School.
2009-2010	*Graduate Plus Award.* University of Maryland Baltimore Graduate School.
2008-2009	*Teaching Fellowship.* University of Maryland Baltimore Graduate School.
May 2008	*Selected Participant.* National Data Archive on Child Abuse & Neglect (NDACAN). Summer Research Institute, Cornell University.
2006 – 2007	*Merit Award.* University of Maryland Baltimore Graduate School.
1992	*Achievement Key Award.* Salisbury State University.
1989 – 1992	*Dean's List.* Salisbury State University.

PROFESSIONAL ORGANIZATIONS

2012	Student member. Society for Social Work and Research (SSWR).
2008 – 2009	Student member. Society for Social Work and Research (SSWR).
2008 – 2009	Student member. Council on Social Work Education (CSWE).

Abstract

Title of Dissertation: Assessing Developmental Pathways of Young Children Investigated for Neglect and Predictors of Persistent Problems

Kristen Woodruff, Doctor of Philosophy, 2012

Dissertation Directed by: Dr. Donna Harrington, Professor and PhD Program Director, School of Social Work; and Dr. Richard Barth, Professor and Dean, School of Social Work

Background: Young neglected children are at high risk for behavior problems, yet little is known about the diversity of these children or the predictors of behavior problems. The purpose of this dissertation was to identify subgroups of children following different behavioral trajectories, describe these groups and predictors of membership, and explore the association between receipt of child welfare services (CWS) and development.

Methods: A sample of 2- and 3-year-olds reported for neglect who remained home (*n*=236) were selected from the National Survey of Child and Adolescent Well-being (NSCAW). Externalizing and internalizing behaviors, measured by the Child Behavior Checklist (Achenbach, 1991, 1992), were examined over time using latent class growth analysis to assess the optimal number of classes of children following distinct trajectories. Using weighted data, bivariate and multivariate analyses were used to describe the children and identify predictors of group membership from the caregiving environment and CWS.

Results: Four subgroups of children following distinct externalizing behavior paths and two subgroups following distinct internalizing behavior paths were identified. Most children scored in normal range, but one in seven (14.7%) exhibited borderline clinical externalizing behaviors at age 2 or 3 and followed a *worsening* path into clinical range

over five or six years. A small group (0.5%) exhibited high levels of externalizing problems that remained in clinical range over time. Two-thirds (66.1%) consistently demonstrate normal-range internalizing behaviors during these five or six years, while the other third (33.9%) exhibit borderline clinical behaviors.

Parent-reported physically assaultive behaviors and non-minority status predicted membership in the persistent externalizing problem and borderline clinical internalizing behavior groups. Lower household income predicted membership in the persistent externalizing problem groups. Neither outcome of investigation nor receipt of services predicted membership.

Implications: Children reported for neglect should be screened for behavior problems in order to ensure appropriate referral for early intervention, averting persistent problems over time. Two affordable methods of brief screening are discussed. Children most at risk could be referred to early intervention, special education, or early mental health services for more thorough screening, evaluation, and treatment.

Assessing Developmental Pathways of Young Children Investigated for Neglect and Predictors of Persistent Problems

by
Kristen Woodruff

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, Baltimore in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2012

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I would like to thank my dissertation chairs Dr. Donna Harrington and Dr. Richard Barth for guiding me through the dissertation process, helping me to clarify my research questions and focus, and providing me with insight and support over the last several years. They, through the PhD Program, also provided tremendous support by granting the software necessary for the analyses, including *M*plus and SAS/SUDAAN. My dissertation committee members provided incredible expertise, and I thank each for their guidance and feedback on my dissertation. Dr. Bethany Lee taught me the analytic technique, latent class growth analysis, that helped me identify patterns of development within a vulnerable but diverse population, and has often provided me with guidance and support. Dr. Diane DePanfilis provided insightful feedback, and also opportunities to develop other research skills beyond my dissertation during my time at the Ruth H. Young Center for Families and Children. Dr. Maureen Black shared her expertise and guided me to explore internalizing behavior paths as well as externalizing behaviors. Finally, I thank my husband, Travis Woodruff, and our children for their support and patience over the last six years.

NDACAN Acknowledgement

This document includes data from the National Survey on Child and Adolescent Well-Being, which was developed under contract with the Administration on Children, Youth, and Families, U.S. Department of Health and Human Services (ACYF/DHHS). The data have been provided by the National Data Archive on Child Abuse and Neglect. The information and opinions expressed herein reflect solely the position of the authors.

Nothing herein should be construed to indicate the support or endorsement of its content by ACYF/DHHS.

Table of Contents

List of Tables

List of Figures

Chapter 1. Introduction: Developmental Pathways of Young Children Investigated for Neglect and Predictors of Persistent Problems

Introduction and Problem Statement

High rates of behavioral and developmental problems have been documented among our nation's youngest children referred to child welfare services (Barth, Scarborough, Lloyd, Losby, Casanueva, & Mann, 2008; Casanueva, Cross, & Ringeisen, 2008; Rosenberg & Smith, 2008; Stahmer et al., 2005). Young children who experience neglect are particularly vulnerable and more likely than other children to have cognitive delays and behavioral problems (Hildyard & Wolfe, 2002; Shonkoff & Phillips, 2000). Despite the high level of need, relatively few services are provided to address the developmental needs of young maltreated children (Burns et al., 2004; Stahmer et al., 2005). Child welfare agencies do, however, provide services to many parents to help improve parenting skills in order for children to remain in the home (Barth et al., 2005). According to the transactional model[2], intervening with the parents has great potential to impact the child's development as parent and child interact with one another over time (Sameroff, 2009), but the impact of child welfare services on the developmental pathways of young neglected children has not yet been fully examined.

In order to ensure that young neglected children achieve optimal well-being, child welfare practitioners and policy-makers need to understand the developmental pathways that neglected children follow over time, identify the children most at risk of following problematic pathways, and implement services that will best avert behavioral and developmental problems and their negative consequences. The current study aims to fill a gap in the child welfare literature by identifying distinct developmental trajectories,

[2] The transactional model will be discussed in detail in Chapter 2.

predictors of developmental trajectory groups, and the association between child welfare services and these pathways in a nationally representative sample of young children whose families were investigated for child maltreatment. Specifically, the study examines two developmental outcomes: externalizing behaviors and internalizing behaviors[3]. This study focuses on 2- and 3-year-old (24.0 through 47.9 months) children investigated for neglect who remained home with their families after investigation, including those who received and did not receive ongoing services. The data were explored to identify subgroups of children investigated for neglect who follow different developmental pathways (i.e., trajectories) over the following five or six years, until the children are between ages 7 and 9 years. Factors from the caregiving environment were tested as potential predictors of membership in different developmental trajectory groups in this population. After controlling for these predictors, the association between child welfare services and developmental trajectories was explored. An understanding of these developmental pathways and the relations with the caregiving environment and provision of child welfare services will help child welfare practitioners identify the children most at risk and may strengthen efforts to support their caregivers to nurture the healthy development of these young children.

This chapter contains a definition of child neglect and discussion of its prevalence, an overview of the prevalence of developmental risk in the child welfare population, and the substantial impact of early delays on long term well-being. Next, the

[3] The final dissertation focuses on internalizing and externalizing behavior development. The initial proposal also included cognitive development. Cognitive data were modeled using LCGA, but were excluded from the main text of the dissertation due to measurement issues. The literature summary, measurement information, and LCGA results related to cognitive development are available in Appendix C. The results of the LCGA analyses for cognitive data must be viewed cautiously due to the change in instrumentation and, related to this, the difficulty in interpreting the slope and quadratic terms.

discussion addresses services available to young neglected children at risk of developmental problems. The dissertation goes on to clarify the relevance of this problem to social work. Finally the chapter includes the specific aims of the study. The second chapter reviews the research and theory relevant to the problem, culminating in a model tested in the study. The third chapter describes the methods used to explore the developmental trajectories, characteristics of children in each trajectory group, and the association between child welfare services and the developmental pathways followed by children whose families are investigated for neglect. Chapter 4 presents the results of the study, and chapter 5 discusses these results, including implications for policy and practice.

Definition of Child Neglect

Child neglect is a complex phenomenon that has been defined in many ways and encompasses a variety of subtypes (DePanfilis, 2006; Dubowitz et al., 2005). According to the U.S. Department of Health and Human Services (2010), child neglect refers to "the failure by the caregiver to provide needed, age-appropriate care although financially able to do so or offered financial or other means to do so" (p. 112). Specific definitions of child neglect vary across states, jurisdictions, and research studies ("Child Abuse Prevention and Treatment Act," 1974; Connell-Carrick, 2003; Wells, Fluke, & Brown, 1995). For the purpose of the current study – using data and definitions from the National Survey of Child and Adolescent Well-Being (NSCAW) – child neglect refers to "alleged or substantiated negligent treatment or maltreatment, including failure to provide adequate food, clothing, shelter or care" (NSCAW, 2007, p. III-A-14). Two broad categories of neglect are used in the NSCAW and are included in the current study:

physical neglect and failure to supervise the child. Physical neglect, or failure to provide for the child, refers to situations in which the child does not have adequate shelter, food, or medical, dental, or mental health care; the child does not have adequate hygiene due to caregiver neglect; or the child does not have clothing that is sanitary, appropriate for weather, and permits the child freedom of movement (NSCAW, 2005; NSCAW Codebook). Failure to supervise includes the child being left unsupervised for periods of time (supervision), failure to ensure the child is playing in a safe area (environment), and failure to provide adequate substitute care arrangements (NSCAW, 2005; NSCAW Codebook).

Prevalence of Child Neglect among 2- and 3-year-old Children

Young children are particularly vulnerable to neglect, experiencing neglect at higher rates than older children in the United States (US DHHS, 2010) and most often remaining home following investigation (Stahmer et al., 2005). According to an annual census of children referred to child welfare services, in just one year 78,442 two- and three-year-old children in the United States were identified as victims of child neglect, representing 71% of the 98,079 victims in this age group (US DHHS, 2010, calculation by K. Woodruff). That is, approximately 12 of every 1,000 children age 2 and 3 years old were found to be victims of child neglect (US DHHS, 2010, calculation by K. Woodruff). The number of neglected children in the United States is actually greater, as this annual census does not include children who are neglected but never reported to child welfare services, and the number of victims includes only those children for whom allegations were substantiated by the child protection agency (see US DHHS, 2010 for more information). The National Incidence Study of Child Abuse and Neglect (NIS-4; Sedlak et al., 2010) estimates that 295,300 children experienced physical neglect (including inadequate supervision, nutrition, clothing and other physical care) during the study year (2005-2006).

In addition to affecting a large number of children, neglect is the form of maltreatment most likely to persist over time and come to the attention of authorities through recurrent contacts with child welfare services (Bolger & Patterson, 2001; Depanfilis & Zuravin, 1999; Fluke, Shusterman, Hollinshead, & Yuan, 2008). A study of approximately 500,000 children in eight states found a 22% re-referral rate and 7% recurrence (substantiation of re-referral) rate (Fluke et al., 2008). In sum, child neglect affects a substantial number of 2- and 3-year-old children and often persists over time.

Prevalence of Developmental Delays among Young Neglected Children

Children who experience neglect in their early years are at high risk for poor developmental outcomes, exhibiting more cognitive delays (Hildyard & Wolfe, 2002; Shonkoff & Phillips, 2000), problems with language development (Hildyard & Wolfe, 2002; Katz, 1992), aggression (Hoffman-Plotkin & Twentyman, 1984), and poor academic performance (Eckenrode, Laird, & Doris, 1993; Kendell-Tackett & Eckenrode, 1996) compared to their peers who were not maltreated. An NSCAW study focusing on children age 2 to 5 documents behavior problems (22% to 33.1%, or 26% overall) among children remaining home after investigation, depending on age (age 2 and younger vs. ages 3 to 5) and case status (active child welfare case or not) (Stahmer et al., 2005). Compared to the general population, these young children involved with child welfare services exhibit higher rates of behavior problems (Burns et al., 2004; Stahmer et al., 2005) than children in the general population. These developmental problems appear to persist over time (Barth et al., 2008; McCrae, 2009). Infants and toddlers investigated for neglect, compared to physical or sexual abuse, may be particularly vulnerable to persistent problems, as evidenced by the greater likelihood of receiving special education services once they reach school-age (Scarborough & McCrae, 2010).

Not all young maltreated children will face these developmental challenges, but as the number of risk factors experienced by maltreated children increases their risk for developmental delay also increases (Crozier & Barth, 2005; Barth et al., 2008). The risk of delay and need for services is evident regardless of substantiation status or placement – as demonstrated by similar rates of delay among children with substantiated and unsubstantiated reports, and among children who remained home with parents compared to those who were placed into out-of-home placements (Rosenberg & Smith, 2008). With the substantial number of maltreated children at risk for developmental delay – including many who may not receive services – it is important to be aware of the long term consequences this population may face.

Impact of Early Problems with Behavior and Development

When the caregiving environment does not nurture the growth and development of young children they are likely to fall behind developmentally, which may set the course for an array of long-term consequences (Shonkoff & Phillips, 2000). Researchers in the field of neuroscience suggest that early adversity – including abuse and neglect – may affect the development of neural processes such as attention- and emotion-regulatory abilities, which in turn may affect behavior and cognitive developmental trajectories (Shackman et al., 2008). When children have elevated behavior problems early in life, often these problematic behaviors persist throughout elementary school and into middle school (Keiley, Howe, Dodge, Bates, & Pettit, 2001). Children with elevated aggressive and rule-breaking behaviors often exhibit poor academic performance and social skills (Campbell, Spieker, Burchinal, & National Institute of Child Health and Human Development (NICHD) Early Child Care Researh Network (ECCRN), 2008) and are at greater risk of dropping out of school (Lochman et al., 2008).

An array of other long-term consequences are also associated with elevated aggressive and rule-breaking behaviors, including conduct problems (Campbell & Ramey, 1994), delinquency in adolescence (Green, Gesten, Greenwald & Salcedo, 2008; Lochman et al., 2008; Schaeffer, Petras, Ialongo, Poduska, & Kellam, 2003), use of drugs and alcohol (Lochman et al., 2008), mental health problems (Schaeffer et al., 2003), early and repeat admissions to inpatient psychiatric facilities (Fite, Stoppelbein, Greening, & Dhossche, 2008), and the commission of violent acts (Lochman et al., 2008) and other criminal behaviors (Schaeffer et al., 2003). Despite the high risk for negative consequences of early developmental issues, it is critically important to note that the adverse outcomes of maltreatment on child outcomes can be mitigated: when aggressive behaviors decline prior to school entry, for whatever reason, children are more likely to have positive academic and social outcomes (Campbell et al., 2008).

Children who are neglected early in life are more likely to exhibit higher levels of aggression throughout childhood than children neglected later in life or those who experience other forms of maltreatment (Kotch, Lewis, Hussey, English, Thompson, & Litrownik, 2008). Neglected school-age children also experience more suspensions and disciplinary referrals than abused children (Eckenrode et al., 1993; Kendell-Tackett & Eckenrode, 1996). Not all neglected children will experience these negative outcomes, but as a group young neglected children are at high risk of cognitive and behavioral problems and their consequences.

The highly adverse outcomes associated with maltreatment and developmental problems are detrimental to the individual children and also immensely costly to society. Recently Fang, Brown, Florence and Mercy (2012) estimated that the average lifetime cost per victim of non-fatal child maltreatment is $210,012, or $121.6 billion for children reported for maltreatment in the United States in 2008. Economist James Heckman (2000, 2006) argues that investments made early in life cost considerably less than trying to address problems later in life, particularly in adulthood. Heckman points to evidence that early learning builds the foundation for easier and more efficient learning (Heckman, 2000, 2006). Heckman also notes that, although IQs may not be affected, early interventions have an impact on important outcomes such as motivation to learn and higher achievement test scores, building a skill-base that leads to adult productivity-including higher earnings, more home ownership, less reliance on welfare, and less criminal activity in adult life (Heckman, 2000, 2006). Heckman argues that early intervention programs associated with improved developmental outcomes have higher economic returns than remedial programs for older children and youth, and much higher returns than the adult training programs (Heckman 2000, 2006). Thus, the social and economic impact of early developmental problems is tremendous, but intervening early can help children achieve better developmental and long-term outcomes and at the same time can be less costly and more beneficial to society long term.

Services to Support Development of 2- and 3-year-old Neglected Children

Fortunately, intervening with children at risk early in life can set children on a positive course of development and improve long-term outcomes (Engle & Black, 2008; Shonkoff & Phillips, 2000). Several federally funded programs provide services for children at risk of developmental problems, including the Individuals with Disabilities Education Act (IDEA) Part C (early intervention) and Part B (special education for children age 3 and older). Unfortunately, very few young children involved with child welfare services receive early intervention or special education services (Barth et al., 2008; Casanueva, Cross, & Ringeisen, 2008; NSCAW, 2005; Stahmer, et al, 2005). According to the NSCAW (2005) report from Wave 1 of the study, approximately 3% of 0-2 year olds and 8% of 3-5 year olds investigated by child welfare services received early intervention services. Children with unsubstantiated cases were less likely to receive services to address developmental delays than those with substantiated cases, despite the prevalence of low scores among children in both substantiated and unsubstantiated cases (Casanueva, Cross, & Ringeisen, 2008). Several years after the baseline data were collected, in 2003 the Child Abuse Prevention and Treatment Act (CAPTA) law was amended to require referral of children with substantiated cases to early intervention services, so this number has likely increased; even so, the law does not account for the many children with unsubstantiated cases, despite the similar level of developmental risk among substantiated and unsubstantiated cases (Barth et al., 2008; Casanueva, Cross, & Ringeisen, 2008), so limited receipt of early intervention services remains a concern.

Mental health services may also promote positive development and avert negative outcomes, but only a small proportion of the young children investigated for child maltreatment receive mental health services (Burns et al., 2004; NSCAW, 2005). The NSCAW (2005) report estimated that just 1% of 0-2 year olds and 2% of 3-5 year olds received mental health care. Another NSCAW study estimated that only 6.6% of children age 2 to 5 received mental health services despite one-third of the children scoring in the clinical range of behavioral problems (>=64 on the Child Behavior Checklist [CBCL]; Burns et al., 2004). The rate of service use for behavioral problems is significantly lower for children remaining at home than those living in out-of-home care (Burns et al., 2004; Stahmer et al., 2005). With relatively few young child welfare involved children receiving mental health and early intervention services to avert negative outcomes, it is important to consider the interventions the children do receive and the impact of these services on child development.

Child welfare professionals routinely refer parents who come to their attention to parenting or other services – provided directly by the child welfare agency or by private agencies – with the intention of strengthening parenting skills and the family environment to improve child safety, permanency, and well-being. Less than one-third (27%) of families whose children remain home after investigation receive some form of child welfare services (NSCAW, 2005, calculations by K. Woodruff). About half of the families who do receive services receive parent training (Hurlburt et al., 2007). Specifically, 39% of these parents receive parent training in the first 12 months, and another 11% by 36 months (Hurlburt et al., 2007). The parent training may be mandated or voluntary (Barth et al., 2005), and often includes a component on child development

(Barth et al., 2008). From a transactional theory perspective, parenting services have the potential to help parents alter their parenting practices to better support the healthy growth and development of their children, thereby promoting positive developmental outcomes. Some parent training programs have been associated with improved parenting knowledge and practices and better child development outcomes (Kaminski, Valle, Filene, & Boyle, 2008). Although promising, few child welfare involved families have received evidence-based parent training (Barth et al., 2005). In the child welfare field, where young children face tremendous developmental risk, little is known about the impact of child welfare services, and parenting services in particular, in supporting positive child development (Barth et al., 2005).

Relevance for Social Work and Child Welfare

Child welfare professionals are in a position to promote nurturing, stable relationships in addition to protecting children from harm. Identifying the parents and children most in need of intervention and providing early intervention services at one of the most critical stages of child development has the potential to impact positive development while averting negative short and long-term outcomes. As a field, if we seize the opportunity to help parents provide more nurturing and responsive care and prevent child maltreatment, we have the potential to influence early development and set young children on a positive, healthy developmental trajectory. In order to help influence positive development, we must understand whether or not child welfare services have an impact on child development.

Child welfare practitioners working with young children investigated by child welfare services also need to know what factors predict poor developmental outcomes to help identify key needs and services to incorporate into the child welfare case plan and, when applicable, to advocate for the receipt of early intervention (i.e., Individualized Family Service Plan; IFSP) or special education (i.e., Individualized Education Plan; IEP) services, to avert negative outcomes and promote positive ones. Understanding the early risk factors and finding ways to identify them and offer adequate treatment has the potential to alter developmental trajectories to improve outcomes for children.

Policy makers and program planners need more information about the prevalence of problematic developmental trajectories and the factors associated with problematic and positive trajectories as they allot funds for high risk groups of children and their parents in need of services. In order to plan for the most efficacious services, policy makers and practitioners alike need to understand the impact of child welfare services on the development of children who come to the attention of child welfare agencies. With more than 78,000 2- and 3-year-old children identified as victims of child neglect in just one year (US DHHS, 2010), it is critical to identify the children at greatest risk of developmental problems and take action to encourage optimal development and avert the long-term consequences associated with early risk and delays.

Aims and Objectives of the Dissertation

The purpose of this study is to explore the developmental pathways (trajectories) of young children age 2 and 3 years old investigated for neglect who remain home after investigation by child welfare services, to identify predictors of normal and problematic developmental trajectories, and to assess the relation between child welfare services and development for this group of children. The transactional model of development – adapted from Sameroff and Fiese (2000), incorporating prior research – is presented in the next chapter to provide a theoretical framework for exploration of the research questions. Longitudinal data were collected through the federally funded NSCAW, including developmental and services data, and used in secondary data analysis in the current study. Latent class growth analysis (LCGA) was used to explore the distinct developmental pathways of these high risk children without imposing classification of the children into pre-defined groups prior to the analysis (see Method in Chapter 3 for more information). Once the distinct pathways were identified, the predictors of problematic and normal trajectories were modeled, and the association between child welfare services and development was tested on an exploratory basis. The specific aims of the dissertation are outlined below.

Aim 1: Identify the number, shape, and size of subgroups of children following distinct behavioral trajectories. The first aim of the study was to identify the number and shape of distinct behavioral trajectories that subgroups of young children, age 2 and 3 years old, follow over a period of five or six years after investigation for child neglect, and to estimate the proportion of children in each subgroup. Two developmental indicators – internalizing behaviors and externalizing behaviors – were examined independently, followed by exploration of co-occurring normal and problematic developmental paths for these indicators.

Aim 2: Describe the characteristics of children in distinct trajectory groups, and understand which factors in the caregiving environment predict membership in the behavior trajectory groups. Once the trajectory groups were identified for each developmental outcome, the characteristics of children in each group were described, including significant differences across the trajectory groups. In addition, theoretically relevant variables were tested to identify which factors in the caregiving environment predict membership in the developmental trajectory groups in a multivariate model (one for each developmental outcome). Next, cumulative risk in the caregiving environment was tested as a predictor to understand whether the accumulation of risk factors predicts membership in the developmental trajectory groups.

Aim 3: Explore the association between child welfare services and behavior development, after controlling for other factors in the caregiving environment. For each developmental indicator, a multivariate model was used to test whether or not receipt of child welfare services predicts membership in the trajectory groups after controlling for factors in the caregiving environment. Predictors for co-occurring problematic trajectories were also modeled on an exploratory basis.

Chapter 2: Theoretical Background and Literature Review: Development of Young Children Investigated for Neglect

This chapter provides an overview of the transactional model of child development and the literature regarding relations between characteristics of the child and caregiving environment and the development of neglected children. Next, a conceptual model for the dissertation is presented applying the transactional model of child development to young children age 2 and 3 years old whose families were investigated for child neglect. Research questions are presented at the end of the chapter, organized by study aims.

The Transactional Model of Child Development

The transactional model of child development explains child development as a continuous process influenced by the combination of individual child level factors, family and broader caregiving environment, and the interaction between them over time (Sameroff & Fiese, 2000; Sameroff, 2009). A child's developmental progress or problems are not explained simply by biology, nor are they explained solely by parenting or other factors in the child's environmental context. Rather, the transactional model emphasizes the "dynamic interaction" between the child and caregiving environment as a child develops over time (Sameroff, 1995, 2009). In order to understand the developmental progress of a child it is critical to examine child level factors such as biology and behaviors, parent characteristics and parenting behaviors, and other factors in the broader caregiving environment; and to assess how each may influence the other's behavior over time. The continuous transactions between the child and caregiving environment occur at many levels of the child rearing regulatory system (i.e., between the child, parent, family, and/or cultural level). The strength of influence across levels is not equal, however. Both parent and child influence the other, but the parent's influence is stronger on the child than the child's is on the parent, especially in the early years of the child's life (Sameroff, 2009). Likewise the effects from the societal level are stronger on the parent than the parent's influence on society (Sameroff, 2009).

Many transactions encourage positive development, whereas other transactions may hinder development. Developmental achievements result from a chain of events over time and rarely one antecedent. Therefore, the initial conditions faced by a child cannot reliably predict the child's positive or negative outcome. Rather, there are many points in time when factors in this child rearing regulatory system may support or hinder the child's developmental progress (Sameroff & Fiese, 2000). Problems in development occur when there is an accumulation of negative transactions and factors in the child rearing regulatory system.

Interventions in a Transactional Model

High quality interventions targeting the child and his or her caregiving environment may be successful at altering the child's developmental pathway at various points in the child's life due to the adaptability of the human brain (Bailey, 2002; Sameroff, 1995; Shonkoff & Phillips, 2000). Developmental interventions have the potential to interrupt the negative transactions in a chain of events leading toward a negative outcome (Sameroff, 1995; Sameroff & Fiese, 2000), potentially altering the child's life course (Shonkoff & Phillips, 2000). According to the transactional model when a child is at risk for poor developmental outcomes, these outcomes may be improved by providing an intervention focusing on the child and caregiving environment, which may involve changing (1) the child's behavior (remediation), (2) the parent's interpretation of the child's behavior (redefinition), and (3) helping parents develop the skills to care for and interact with the child in a way that supports the child's positive behaviors and development (reeducation) (Sameroff, 1995; Sameroff & Fiese, 2000). In other words, the intervention may address the child (remediation) with the expectation of influencing the caregiving environment, or the intervention may address the caregiving environment (redefinition or reeducation) with the expectation that the child's behavior will in turn be affected. The most efficient intervention will identify the strengths and weaknesses of the family system, in its environmental context, and select the most appropriate combination of the three strategies (Sameroff, 1995). Looking beyond the child and parent, the transactional model also considers interventions that may focus on redefinition or reeducation at the family or societal level, when appropriate.

The transactional model supports a comprehensive look at child, parent, family, and societal level factors, and the reciprocal interaction among them, to assess strengths and weaknesses in the child rearing regulatory system for an individual child. With this information, practitioners may provide interventions that target the specific areas of the child's family system that require support, selecting the most appropriate combination of remediation, redefinition, or reeducation, and addressing the level of need (big or small) to alter the child's developmental course. This approach acknowledges that no one factor or ecological level will cause developmental problems. The transactional model offers hope for children at high risk of developmental problems because the model posits they may benefit from intervention at multiple time points and at multiple levels, as needed, to improve their developmental course. Sameroff (1995) argues that this complex view of developmental psychopathology is needed because it "matches the complexity of human behavior" (p. 660).

This appropriately complex model is difficult to test in research. Longitudinal research observing details from the child and caregiving environment and their interactions over time is needed. Ideally, research applying the transactional model observes the interactions between the child and caregiving environment from one moment to the next over an extended period of time (Olson & Lunkenheimer, 2009), but the time and resources necessary to complete such research are considerable. Some strides have been made (see Sameroff, 2009), but much more is to be done. The current study adapts the transactional model to create a simplified, testable model of child development using data from a nationally representative longitudinal study of children involved with child welfare services. The literature to support the conceptual model of child development among young neglected children and the impact of child welfare services is reviewed below, followed by the conceptual model used for this dissertation.

Normative and Atypical Behavioral Paths of Young Children

The author reviewed published scholarship to understand normative developmental paths in early childhood, explore what is known about the developmental paths of young neglected children, and identify predictors of normative and negative developmental outcomes. The review includes articles regarding child neglect and child development, as well as articles or book chapters that describe empirical studies related to cognitive and behavior outcomes. Recent scholarly texts related to child development were also reviewed.

Relevant studies and texts were identified through a search of online databases and a review of prior NSCAW publications. The search included the following online databases: Google Scholar (Beta; www.scholar.google.com), PsycINFO, Social Sciences Citation Index, and Social Work Abstracts. NSCAW publications were obtained partially through this process and partially through a review of the National Data Archive on Child Abuse and Neglect (NDACAN) web site (http://www.ndacan.cornell.edu/), including NDACAN's child abuse and neglect Digital Library (canDL; http://www.ndacan.cornell.edu/Ndacan/Bibliography.html), and Administration of Children, Youth & Families web site (http://www.acf.hhs.gov/programs/opre/abuse_neglect/nscaw/). Search terms included combinations of the following: child neglect, development, cognitive skills, language, behavior, trajectories, consequences, risk factors, parenting, parent-child interaction, transactional, cumulative risk, maternal depression, and parenting services. The literature review focuses on findings for children ages 2 and 3 years old, the population for the current study, and developmental trajectories into elementary school, when available. When literature is not available for this population, studies with older or younger children are reviewed briefly.

Behavior Development in Early Childhood

The moment of conception marks the beginning of a lifelong process of development, in which an individual continually grows and changes biologically, psychologically, and socially. Psychologists have documented child developmental pathways for years, examining the normative and atypical paths of development of cognition and behavior. This dissertation examines behavior patterns over time.

Externalizing behaviors. All children exhibit some externalizing behaviors at some point in time. Externalizing behaviors refer to problems the child has with other people, including aggressive behaviors such as fighting, arguing, stubbornness, and defiance (Achenbach, 1991; Achenbach & Rescorla, 2000). Externalizing behaviors also include attention problems (e.g., can't concentrate or sit still) among young children (Achenbach & Rescorla, 2000) and delinquent behaviors (e.g., lying, stealing) among children age 4 and older (Achenbach, 1991). Children typically begin acting out as early as one year of age to express their dissatisfaction. On average, children have increasing levels of aggression during toddlerhood (between age 1 ½ and almost 3), but their attention capacity improves during this time (van Aken, Junger, Verhoeven, van Aken, & Dekovic, 2008). The child must learn how to regulate his or her responses to stimuli that arouse his or her emotions, and subsequently externalizing behaviors diminish (Carpenter & Stackers, 2009).

Typically, according to a review of the literature, 2- and 3-year-old children tend to exhibit elevated aggressive and non-compliant behaviors (e.g., not following instructions in reasonable time, oppositional), followed by a period of substantially improved behaviors through middle childhood (Lochman, Barry, Powell, Boxmeyer, & Holmes, 2008). A decline in externalizing behaviors from age 4 or 5 through elementary school has been reported by both mothers (Keiley, Bates, Dodge, & Pettit, 2000; Prinzie et al., 2006) and fathers (Prinzie et al., 2006). The general decline in parent-reported child externalizing behaviors continues into adolescence in the general population (Bongers, Koot, van der Ende, & Verhulst, 2003). Although aggressive behaviors continue to decline in adolescence on average, there is a temporary increase in non-compliant behaviors among typically developing children (Lochman et al., 2008). Even in populations in which behavioral problems are higher on average (e.g., children investigated by child welfare services and children born to teenage mothers) a decline in behavioral problems occurs over time (McCrae, 2009; Spieker, Larson, Lewis, Keller, & Gilchrist, 1999). At the same time, among children who exhibit high levels of behavioral problems externalizing behaviors may remain at the clinical level over time (McCrae, 2009) and even worsen during adolescence (Lochman et al., 2008). Among children reported to child welfare services, a significant proportion (34%) have externalizing problems when referred for investigation and many (27%) continue to have clinical level problems 3 years later (McCrae, 2009).

Research regarding externalizing behavior patterns over time has begun to move beyond analysis of behaviors among pre-designated groups of children (i.e., boys vs. girls; maltreated vs. non-maltreated). Some studies now use person-centered trajectory analysis such as LCGA, which first finds patterns of behaviors in the population then seeks to understand the characteristics of these groups. Using this type of analysis in community samples, researchers have identified subgroups of children following different behavior trajectories over time (Campbell et al., 2008; Nagin & Tremblay, 1999). In one study following girls and boys from age 2 through age 9, most children exhibited very low (45%) or low (25%) levels of aggression as they grew from toddlers into elementary school children (Campbell et al., 2008). Some children (12%) had moderate levels of aggression that declined substantially over time (moderate decreasing), others (15%) showed moderate aggression that persisted over time (moderate-stable), and a small group of children (3%) exhibited high levels of aggression that persisted over time (high-stable; Campbell et al., 2008).

Researchers following the behavior of low-income boys from age 2 to age 8 found that the majority of boys had low (14%) to moderate (42%) levels of aggression that declined over time, some had high levels of aggression that declined somewhat (38%), and a small group of boys exhibited chronic aggression (6%) that persisted over time (Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Analysis of behaviors of older boys over time, from age 6 through age 15, found similar trajectories for aggressive behaviors, oppositional behaviors, and hyperactivity (Nagin & Tremblay, 1999). Thus, most children show low to moderate levels of aggressive behaviors early in life, and as they learn to regulate their emotions and control their actions, their behavior improves. Others have moderate levels of behavior problems that persist over time. A small group of children with particularly high levels of aggression early in life exhibit persistent problem behaviors over time.

Internalizing behaviors. Internalizing behaviors occur when children direct their emotions inward, exhibiting withdrawn behaviors, somatic complaints, and anxious or depressed behaviors (Achenbach, 1991, 1992). Withdrawn behaviors include preferring to be alone, shyness, staring, and sadness, among others. Somatic complaints include nausea, tiredness, headaches and other physical problems when there is no known medical cause. Anxious or depressed behaviors include being nervous, fearful, lonely, crying, feeling worthless, worrying, and similar behaviors.

Keiley and colleagues (2000) documented stable internalizing scores among children from kindergarten through 7th grade, according to maternal report. This was unlike externalizing behaviors, which decreased over time on average (Keiley et al., 2000). Person-centered trajectory analysis of behaviors, following boys from age 2 to age 6, indicated that externalizing behaviors decreased over time while internalizing behaviors increased slightly (Gilliom & Shaw, 2004). Like externalizing behaviors, internalizing behaviors among young children, age 2 or 3, predicted a diagnosis of internalizing behaviors at age 10 or 11 (Mesman & Koot, 2001).

Co-occurring internalizing and externalizing behaviors. Internalizing behaviors and externalizing behavior problems often co-occur (Achenbach, 1991). Higher levels of internalizing behaviors are associated with higher levels of externalizing behaviors over time (Gilliom & Shaw, 2004; Keiley et al., 2000). Also, there is evidence that internalizing behavior problems early in life predict externalizing behaviors later in life among girls (Maschi, Morgen, Bradley, & Hatcher, 2008).

Behavior Development of Young Maltreated Children

As established by other investigators previously cited in this dissertation, problems with behavior and cognitive development are prevalent among young neglected and abused children. Less is known about the developmental paths that young maltreated children follow over time. This section of the paper reviews the extant literature related to the behavioral trajectories of maltreated children beginning early in life and following them into the school years.

Maltreated children ages 4 to 5 years old from low income families have significantly more internalizing and externalizing behaviors than children not reported for maltreatment (Black et al., 2002), and neglected children are more likely than abused children to have internalizing problems (Hildyard & Wolfe, 2002; Shackman, Wismer, Fries, & Pollak, 2008). In one study examining externalizing behaviors among children of adolescent mothers, children experiencing both maltreatment and maternal depression had a mean score of 60.9, whereas children experiencing maltreatment alone or maternal depression alone had average scores of 55.4, and children with neither risk factor scored 52.1 on average (Black et al., 2002).

Several studies have explored the behavior trajectories of maltreated children, although there is a dearth of trajectory studies focusing on neglected children. Two related developmental studies, summarized by Erickson and colleagues (1989), did compare the socio-emotional development of neglected children to other maltreated and non-maltreated children, finding that neglected children were more non-compliant and angry at age 24 months and later scored much higher on externalizing and internalizing behaviors at age 6, as reported by their teachers. The studies taken together – and drawing participants from the same high-risk sample – provide early evidence of a possible pattern of socio-emotional problems over time among neglected children.

Other studies explore the actual behavior trajectories of maltreated children – one focusing on abused children, and others examining children at risk for maltreatment or investigated by child welfare services for abuse and neglect. One study compared the behavior trajectories of children abused before age 5 and children abused later in life to children with no history of abuse (Keiley et al., 2001). Based on the mother's report of externalizing behaviors, children abused early in life were more likely to follow an aggressive behavior trajectory from kindergarten through the eighth grade than children who did not experience maltreatment or those who were abused later in life (Keiley et al., 2001). Also, children abused early in life were more likely to exhibit higher levels of internalizing behaviors in kindergarten, and continue to show the same level of internalizing behaviors over the following eight years, according to teacher report (Keiley et al., 2001). Thus, age of onset appears to make a significant difference in the abused child's behavioral development. A study using NSCAW data examined externalizing behaviors among children referred to child welfare services nationwide over a three year period (McCrae, 2009). There was a gradual decline in the proportion of children with behavioral needs, although the proportion remained high compared to the general population (McCrae, 2009).

Two recent studies use person-centered trajectory analysis to identify subgroups of children – at risk of maltreatment or investigated for maltreatment – following distinct externalizing behavior trajectories (Tabone et al., 2011; Woodruff & Lee, 2011). One study (Woodruff & Lee, 2011) uses LCGA to explore trajectories of 4-year-old children in the NSCAW sample – including both abused and neglected children – following them over a six year period. Four patterns of externalizing behaviors emerged from the data, similar to patterns of aggression and oppositional behaviors in community populations (e.g., Nagin & Tremblay, 1999; Shaw et al., 2003). More than half of the maltreated preschool children follow a relatively low/normal behavior trajectory with behaviors improving over time, and about one-quarter exhibit more problematic behaviors than the general population initially, but their behaviors improve over time. About one-tenth (11.6%, weighted) exhibit persistent high levels of problematic behavior, and a smaller group of children (4.4%, weighted) follow a *worsening* behavior trajectory (Woodruff & Lee, 2011). Children investigated for neglect were more likely than those investigated for physical abuse to be in the group with *worsening* behaviors over time, suggesting that neglected children may be at greater risk for *worsening* behavior problems (Woodruff & Lee, 2011). Also, internalizing behavior problems at age 4 predict membership in a persistent externalizing problem behavior trajectory and *worsening* externalizing problem behavior trajectory (compared to normal trajectory) over the following six years (Woodruff & Lee, 2011). Due to methodological limitations – including the limited number of time points, exclusion of intervention variables and variables from the early caregiving environment, and small sample size – these results are only exploratory (Woodruff & Lee, 2011). More definitive research is needed to examine the varying behavior trajectories followed by young children involved with child welfare services.

The second study followed children who were at risk of maltreatment, from the Longitudinal Study of Child Abuse and Neglect (LONGSCAN) study, from age 4 to age 10 (Tabone et al., 2011). This study found five trajectory groups, including most children following low (33%) and low-medium (43%) trajectories. Another 12% followed decreased problem trajectories, and a small group (4%) followed a *high chronic* path of externalizing behaviors. Similar to the Woodruff and Lee (2011) study, this study found a small group of children (8%) following a *worsening* behavior trajectory. Tabone and colleagues found that child developmental disability, caregiver depression, caregiver alcohol problems, and low community quality predicted membership in certain trajectory groups. Further, they found a cumulative effect of these significant predictors. Notably, as the number of these factors increased, the probability of the child being in the lowest group decreased whereas the probability of being in the high-chronic group increased.

The prior two sections reviewed the literature on behavior development and trajectories in normative and maltreated populations. Behavioral outcomes of neglected children vary, but on average neglected children fare worse than children in normative samples. A range of factors in the caregiving environment may impact the developmental paths and outcomes of these young children. The literature regarding the influence of child factors and the caregiving environment on the development of young neglected children is reviewed below.

Factors Affecting Behavior Development of Young Maltreated Children

The development of young neglected and abused children is related to the interplay and accumulation of risk factors over time. Child characteristics, parent and parenting characteristics, and factors in the broader caregiving environment have been associated with problematic behaviors. Children facing an accumulation of risk factors early in life – including child and caregiver characteristics and other factors from the caregiving environment – are at greater risk of developmental delays (Sameroff & Fiese, 2000). A relation between child development and involvement with child welfare services – including receipt of parenting services – has also been explored. The evidence regarding each of the factors in the child and caregiving environment, cumulative risk, and child welfare services is reviewed below.

Child characteristics. Literature regarding the relation between child development and demographic characteristics – including gender and race – and chronic health problems is reviewed below. In some studies these variables have been linked to several developmental outcomes, although findings have been mixed and no such relationship is documented for other developmental outcomes. Literature regarding poverty—a factor that affects African American children disproportionately and may confound findings regarding race and development—is reviewed later in this paper.

Demographics. *Gender* has been linked to differences in several developmental measures. Numerous studies have found that boys tend to exhibit more externalizing behavior problems than girls, including studies of community samples (Bongers et al., 2003, 2004; Lochman et al., 2008; Prinzie et al., 2006; Stormshak et al., 2000), physically abused children (Lansford, Malone, Stevens, Dodge, Bates, & Pettit, 2006), and children born to teenage mothers (Spieker et al., 1999). However, several studies have found no significant differences between boys and girls in externalizing behaviors, including a community sample (e.g., Deater-Deckard, Dodge, Bates, & Pettit, 1998) and several recent NSCAW studies of children referred to child welfare services (McCrae, 2009; Woodruff & Lee, 2011). Boys who were investigated by child welfare services as infants or toddlers were more likely than girls to receive special education services once they were in school (Scarborough & McCrae, 2010).

The findings regarding behavior and race are mixed. Among child welfare involved children there were no significant differences in behavior scores for children of different races over a three-year period (McCrae, 2009), yet when the children were matched based on receipt of mental health services Black and Hispanic children had higher behavior problem scores than White children (McCrae, Barth & Guo, 2010). On the other hand, African American children generally had fewer externalizing problems reported by their mothers over time compared to European-American children in several community samples (Keiley et al., 2000; Stormshak et al., 2000), whereas African American children had higher levels of externalizing problems over time in another (Lansford et al., 2006). With mixed findings regarding the relationship between demographic factors and child development, it is important to control for these child variables in statistical analyses in order to understand the influence of other factors in the caregiving environment on child development.

Chronic health problems and other developmental needs. Children with chronic health disorders tend to exhibit more externalizing behavior problems (Wallander et al., 1988) and internalizing behavior problems (Boekaerts & Roder, 1999; Wallander et al., 1988). Similarly, children with serious physical health problems, reported by the parent, were more likely to have DSM-IV diagnoses for internalizing and externalizing problems (Mesman & Koot, 2001). Although behavior problems are elevated, they remain below the level of children in samples of children referred to mental health clinics (Wallander et al., 1987). Also, children with chronic health problems exhibit ongoing behavior problems as a group, but the experiences of individual children tend to fluctuate (Wallander et al., 1997). In a trajectory study of externalizing problems among children at risk of maltreatment, children with a developmental disability at age 4 were more likely to have increasing and high-chronic externalizing behavior problems than very low (normal) levels of externalizing problems (Tabone et al., 2011). Thus, having chronic health problems is a risk factor for internalizing and externalizing problems.

Parent and parenting characteristics. Strengths in the caregiving environment – such as responsive, nurturing parenting – have been associated with positive developmental outcomes (Shonkoff & Phillips, 2000). Children are more likely to experience poor developmental outcomes when they live in caregiving environments characterized by young maternal age (Shaw et al., 2005), maternal depression (Sohr-Preston, 2006), and harsh or neglectful parenting (Hildyard & Wolfe, 2002; Shonkoff &

Phillips, 2000). The literature on the relationship between these parenting factors and child development is reviewed below.

Maternal age. Compared to national estimates, a larger portion of children age 3 and younger who are involved with child welfare services have teenage mothers, and these children born to young mothers are at risk of developmental problems (Scarborough & McCrae, 2010). Preschool children of adolescent parents are more likely to have behavior problems than children of older parents, and these problems increase over time (see review, Coley & Chase-Lansdale, 1998). The relation between maternal age and behavior pathways has also been seen in the more recent trajectory literature. Young maternal age (average age of 25 years) predicted membership in a chronic aggressive behavior group compared to a low problem group (average maternal age of almost 30 years) in a study of child behavior trajectories beginning at age 1 ½ years and following the children to age 10 years (Shaw et al., 2005). Similarly, early motherhood was linked to a high aggression trajectory from 17 to 42 months in another study (Tremblay et al., 2004).

Maternal depression. Maternal depression affects a large portion of caregivers involved with child welfare services (Burns et al., 2010) and has been linked to adverse developmental outcomes among young children in numerous studies, as documented in several reviews of the literature (Lochman et al., 2008; Stacks, 2005). In a study of infants and their caregivers in low-income Chicago neighborhoods, the mother's anxious and depressed symptoms during infancy predicted internalizing problems in early childhood (Edwards, January 2012). Likewise, maternal depression predicted internalizing behaviors among 4 and 5 year olds of low-income adolescent mothers in the national LONGSCAN study (Black et al., 2002).

Most literature focuses on externalizing behaviors. In the NSCAW study researchers found that children of depressed caregivers were more likely than children of non-depressed caregivers to exhibit clinical-level externalizing problems (Burns et al., 2010). Although this study included a wide age range of children, the relation between maternal depression and child behavior has also been found elsewhere in samples with young children. Maternal depression has been associated with child externalizing behavior problems in studies of low-income (Hoffman, Crnic, & Baker, 2006) and adolescent (Spieker et al., 1999) mothers and their 3 year old children, as well as 4 and 5 year old children of low income adolescent mothers (Black et al., 2002). In another nationally representative community-based study of children researchers found no relation between a mother's depressive symptoms and later externalizing behaviors at age 7 or 8, although the researchers found that parental emotional support (measured by the HOME-SF) at age 5 to 6 was associated with fewer behavior problems later, and suggested this emotional support may have served as a protective factor (McCarty, Zimmerman, DiGiuseppe, & Christakis, 2005).

A study using person-centered trajectory analysis to estimate behavior paths for children from age 1 ½ to 10 years found that maternal depression predicted membership in a chronic aggressive behavior group (Shaw et al., 2005). More recently researchers tested a transactional model and found evidence that maternal depression and child behaviors influence one another over time (Shaw, Gross, & Moilanen, 2009). Specifically, the mothers' depressive symptoms were strongly associated with subsequent child externalizing behaviors, particularly among toddlers and continuing into middle childhood; at the same time, the young child's externalizing problems (at ages 3.5 and 5 years) were associated with increased depressive symptoms for the mother at the following time period (ages 5 and 6 years, respectively) (Shaw et al., 2009). Thus, maternal depression has been associated with problem behaviors, including chronic aggressive behaviors, and the two have been demonstrated to influence one another over time.

Maternal depression is somewhat prevalent among mothers with young children referred to child welfare services – exceeding estimates in the general population – and the depression tends to be persistent over time (Casanueva, Cross, Ringeisen, & Christ, 2010). In the national NSCAW study about a quarter of the mothers of young children (under 5 years) who were referred to child welfare services reported depressive symptoms that indicated major depression at baseline, and almost half (46%) of mothers had scores indicating major depression at some point during the following five or six years (Casanueva et al., 2010). The link between maternal depression and child behavior, coupled with the high rate seen in the population of mothers involved with child welfare services, makes depression a critical risk factor to examine in studying developmental trajectories of neglected children.

Harsh, abusive and neglectful parenting behaviors. Parenting behaviors that are coercive, negative or otherwise harsh, abusive or neglectful are linked to more internalizing and externalizing behavior problems among children. Punitive discipline (including yelling, insulting, throwing, refusing to talk, and threatening with punishment, among other behaviors) predicted internalizing problems in a sample of behaviorally disruptive kindergarten children, although spanking did not (Stormshak et al., 2000). Toddlers or preschool children who experience negative parent-child interactions (Smeekens et al., 2007; Stacks, 2005), negative control (Spieker et al., 1999), or harsh discipline or physically aggressive behaviors from their parents (Deater-Deckard et al., 1998; Johnson et al., 2002; Lochman et al., 2008; Shackman, Wismer Fries, & Pollak, 2008) are also more likely to become aggressive or exhibit other externalizing behaviors later in childhood. Physical aggression toward the child and spanking were linked with more aggression in kindergartners (Stormshak et al., 2000). Coercive parenting is associated with higher levels of aggression early in life and slower declines in aggressive behavior over time (Prinzie et al., 2006). The person-centered trajectory literature provides further evidence that coercive parenting affects behavioral paths, as coercive parenting at age 5 months was linked to a high aggression trajectory from 17 to 42 months of age (Tremblay et al., 2004). Children reported for neglect, on the other hand, were more likely than those reported for physical abuse to begin with moderate behavior problems and follow a *worsening* behavior trajectory (compared to a normal trajectory) from age 4 to around age 10 in the NSCAW sample (Woodruff & Lee, 2011).

From a transactional perspective, coercive parenting behaviors early in life and children's early oppositional behavior reinforce one another and lead to persistent aggressive behaviors over time (Sameroff, 2009). This interaction among caregiver and child behaviors was demonstrated when adults with low levels of perceived power were paired with difficult children, and their communication and behaviors toward the child were more negative (Bugental, 2009). It stands to reason that a parent may respond more negatively or harshly to a difficult child than to his or her less challenging sibling.

Responsive and stimulating parenting. Responsive, stimulating, and nurturing parenting has a positive effect on the growth and development of young children (Jaffee, 2007; Shonkoff & Phillips, 2000). Parental responsiveness has been associated with cognitive and behavioral resilience in high risk infants (Jaffee, 2007), and receptive communication, early social competence, and school readiness among young children (Bradley, Corwyn, Burchinal, McAdoo, & Garcia, 2001; Connell & Prinz, 2002). Parental emotional support is also related to behavior scores, and the relationship appears to persist into middle childhood (McCarty et al., 2005). However, in another national study the relation between responsiveness and behavior was only significant for African American children, and more so for those who were poor (Bradley et al., 2001).

Stimulation in the caregiving environment is also linked to positive cognitive and behavior outcomes. Learning stimulation in the home environment was associated with language competence, achievement test scores, early social competence, behavior, and motor development among kindergartners in a national study of U.S. children (Bradley et al., 2001). Children involved with child welfare services as infants who experience cognitive stimulation in the home environment are more likely to have higher language scores in preschool (Harden et al., 2009). The long-term influence of the early home environment – including maternal responsiveness, learning stimulation, and other aspects of the environment measured by the HOME measure– has also been seen among low-income urban children. For example, in one study higher quality of the home environment in infancy was significantly related to higher cognitive scores of the children at age 8, including intelligence, reading, and math scores (Black, Dubowitz, Krishnakumar, & Starr, 2007).

In summary, parent and parenting characteristics affect child cognitive and behavioral development. Young maternal age has long been identified a risk factor for children. There is substantial evidence that maternal depression impacts child development, although treatment can promote normal development among children of depressed mothers. In addition, responsive and stimulating parenting promotes positive cognitive and behavioral growth. In contrast, harsh, abusive, negative, or neglectful parenting hinders the normal development of young children. Additional factors in the caregiving environment also affect development, as documented in the next section.

Broader caregiving environment characteristics. Just as parenting is associated with child development, factors in the broader caregiving environment also have been linked to child development. Specifically, domestic violence, the number of children in the home, and family poverty have each been linked to poor developmental outcomes, as documented below.

Domestic violence. Domestic violence, also termed intimate partner violence and interparental violence, has been linked to internalizing and externalizing behaviors. According to a meta-analysis, children who witness interparental violence were more likely than non-witnesses to have externalizing and internalizing problems (Kitzman, Gaylord, Holt, & Kenny, 2003; Wolfe et al., 2003), however effect sizes for internalizing and externalizing problems were small overall (Wolfe et al., 2003). The combination of witnessing violence and being physically abused was linked with higher levels of internalizing and externalizing behavior problems than witnessing violence without physical abuse (Wolfe et al., 2003).

Number of children in the home. The number of children in the home has been linked to behavior problems in several studies. One study found more internalizing problems when there were more children present (Harper, 2010), whereas another linked internalizing problems to having no older siblings (Bayer, Hiscock, Ukomunne, Price & Wake, 2008). Children with more siblings are more likely to have more externalizing problems (e.g., Anselmi, Piccinini, Barros & Lopes, 2004). Similarly, large family size has been associated with hyperactive behaviors (Larsson, Dilshad, Lichtenstein, & Barker, 2011). Also, relevant to this population, having more children in the home predicts child maltreatment (Lynch & Cicchetti, 1998).

Poverty. When children live in impoverished or low-income families they are at risk of experiencing developmental problems, particularly in the absence of protective factors that help some low-income children thrive (Engle & Black, 2008). Behavior problems may emerge very early in life for children living in poverty, affecting long-term well-being (Engle & Black, 2008). Children in families with low incomes have more behavior problems than their higher income counterparts (Berger, Paxson, & Waldfogel, 2009). Preschool children whose families live in poverty are more likely to have externalizing problems in elementary school (Lochman, 2008), suggesting an effect that lasts over several years. However, the home environment–particularly differences in maternal responsiveness–explains most of the differences among lower and higher income children's language and behavior development (Berger et al., 2009). The person-centered trajectory literature provides further evidence that low income is a risk factor, as children in low income families were most likely to exhibit high levels of aggression between 17 and 42 months (Tremblay et al., 2004). About half of children age 0 to 3 years in the NSCAW sample were living at or below poverty level when referred to child welfare services (Casanueva, Cross, & Ringeisen, 2008), so a substantial portion of young child welfare involved children face this risk factor for cognitive and behavior issues.

Cumulative risk. Children facing numerous risk factors are more likely to experience poor cognitive and behavioral outcomes than those experiencing a few risk factors (Appleyard, Egeland, van Dulmen, & Sroufe, 2005; Barth et al., 2008; Sameroff & Fiese, 2000; Sameroff, Seifer, Baldwin, & Baldwin, 1993). This relation between cumulative risk and development is also seen among children investigated by child welfare services, as seen in the NSCAW study. Risk factors in the caregiving environment in the NSCAW study included caregiver mental health problems, substance abuse, domestic violence, low caregiver education, being a single caregiver, having four or more children in the home, poverty status, minority status, and others. As the number of risk factors experienced by a young child in the NSCAW sample increases, the likelihood that they show developmental delays increases substantially (Barth et al., 2008). Young children with six risk factors had a 90% chance of having developmental delays on assessments, and the percentage increased to 99% with seven risk factors (Barth et al., 2008).

Summary. The research shows that some child characteristics, parent and parenting characteristics, and factors in the broader caregiving environment are related to child internalizing and externalizing behaviors. At the child level, there are mixed findings related to the relation between the child's demographic factors (race and gender) and behavior development, so these factors should be included as control variables.

Chronic health problems predict some developmental challenges. Key factors in the caregiving environment that affect behavior development include maternal depression; young maternal age; parental responsiveness and learning stimulation; parenting behaviors that are harsh, abusive, and neglectful; poverty; and domestic violence. Cumulative risk in the environment, including substance abuse and many of these individual predictors aforementioned, has also predicted developmental delay. The emerging literature examining person-centered behavior trajectories among young children provides further evidence that several of these factors predict persistent high levels of behavior problems, including young maternal age (Shaw et al., 2005; Tremblay et al., 2004), maternal depression (Shaw et al., 2005), and coercive parenting (Tremblay et al., 2004). Thus, a series of challenges or strengths in the caregiving environment may impact behavior development. Given that young neglected and abused children are at high risk for behavior problems, and they often face the above-mentioned risk factors in their environment, it is critical to understand the impact of child welfare services on this population of children. Evidence regarding the relation between child development and involvement with child welfare services, including parenting services, is reviewed in the next section.

Involvement with Child Welfare Services

Ideally involvement with child welfare services will trigger the appropriate services to protect the safety and well-being of the child, including his or her development. In this study, the outcome of the investigation or assessment at baseline (substantiation status) and the receipt of parenting services were each examined to identify any relations with behavior and cognitive development trajectories.

Outcome of the investigation or assessment. The relation between child development and the outcome of the investigation or assessment at baseline–the substantiation status–has been previously examined using the NSCAW and LONGSCAN longitudinal data sets. Findings indicate that children reported to child welfare services are at risk of poor developmental outcomes regardless of substantiation status (Barth et al., 2008; Hussey, Chang, & Kotch, 2006). Very young children, below age 3, in the NSCAW study showed high risk of developmental delays whether or not their cases had been substantiated, with no significant differences between them on language development, adaptive behavior, and cognitive development (Barth et al., 2008). Among children ages 4 to 8 years old in the LONGSCAN study of high risk children there were no significant differences between children with substantiated and unsubstantiated reports in behavioral scores (internalizing, externalizing, or total) or other developmental measures (social, daily living skills, mental health) after controlling for confounding variables (Hussey, Chang, & Kotch, 2006). The literature has not yet explored distinct patterns of behavior trajectories over time, thus the relation between trajectories and substantiation is unknown. However, it is known that children are more likely to receive services–including child welfare services (Casanueva, Cross, & Ringeisen, 2008), early intervention services (Casanueva, Cross, & Ringeisen, 2008), and mental health services (McCrae, Chapman, & Christ , 2006)–when the case is substantiated. Thus, it is necessary to control for substantiation status when testing the association between child welfare services and child development.

Receipt of child welfare services. When children are referred to child protective services, a small proportion will receive ongoing child welfare services after investigation. Child welfare agencies routinely provide, or refer families to, mandated or voluntary parent training and other family support services (Barth et al., 2005). The services may be provided in the community, often in a classroom setting, or in the home (Barth et al., 2005). Approximately half of the parents who receive child welfare services receive parent training services (Hurlburt et al., 2007).

Parenting services have the potential not only to improve parenting, but also to impact child development as the parent and child interact over time (Sameroff, 2009). Unfortunately there is little evidence that these parenting services help parents involved with child welfare services gain competence in parenting skills (Barth et al., 2005). Also, although the parenting services often include a component on child development (Barth et al., 2008) the impact of these services on child development is largely unknown.

Several recent analyses of the NSCAW sample begin to explore these issues. First, researchers examined developmental outcomes for infants and toddlers whose families were investigated by child protective services, comparing outcomes by receipt of child welfare services; 65% of children who remained home without child welfare services received low scores in one or more developmental domains, whereas 51% of the children whose families received services had low scores (Barth et al., 2008). The domains and measures included communication (Pre-School Language Scales – 3rd Edition; PLS-3), adaptive functioning (Vineland Adaptive Behavior Screener), and cognitive functioning (Batelle Developmental Inventory, BDI for younger children; or K-BIT for children 4 and older; Barth et al., 2008). The study design does not allow these differences to be attributed to the receipt of child welfare services, but this is a plausible hypothesis.

In another NSCAW analysis researchers examined the relation between parenting services and parenting skills. The researchers found that parental responsiveness improved among parents of 3 to 5 year olds who were receiving parenting services, whereas parents with similar needs who did not receive the services had *worsening* responsiveness scores (Casanueva, Martin, Runyan, Barth, & Bradley, 2008). However, in the same study no significant difference in responsiveness was found once service receipt was tested in a multivariate model, and there was also no difference in learning stimulation in these families (Casanueva, Martin et al., 2008). Although these results do not support a relation between parenting services and skills, further study is warranted because it is theoretically possible that the services are impacting the parent in some other way, and in turn impacting the children's development.

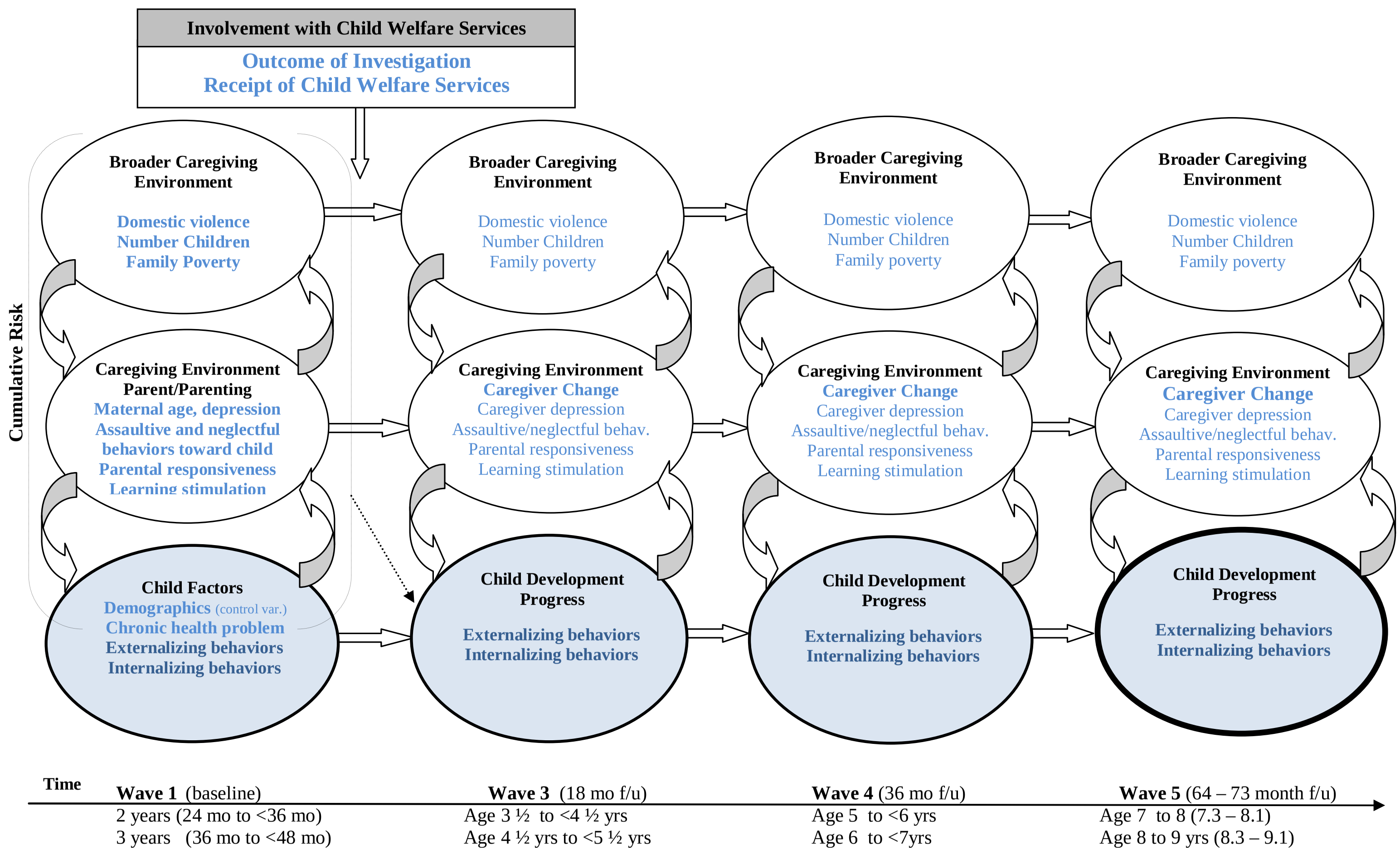
The literature regarding the impact of child welfare services on parenting skills and child development is extremely limited, but there is some evidence supporting the efficacy of parenting services with non-child welfare populations, or populations with very small subsets of child welfare families (Barth et al., 2005). Several parenting interventions that intervene with both the parent and child have been associated with improved child development, including cognitive skills (Cicchetti et al., 2000; Olds et al., 2004) and behavior (Bor, Sanders, & Markie-Dadds, 2002; Hawley & Jensen-Doss, 2008; Leung, Sanders, Leung, Mak, & Lau, 2003; McNeil, Capage, Bahl, & Blanc, 1999; Olds et al., 2004) in randomized trials. In addition to these effects on development, several of the same parenting interventions have been linked with reductions in subsequent child abuse and neglect (Chaffin et al., 2004; Chaffin & Schmidt, 2006; Kitzman, et al., 1997; Olds et al., 1997), which suggests a better environment for the child's development. The trajectory literature also provides some promising evidence that parent training and social skills training together during early elementary school (between age 7 and 9) may interrupt physically aggressive and other anti-social long-term trajectories among low-income boys (Lacourse, Cote, Nagin, Vitero, Brendgen, & Tremblay, 2002).

In summary, from a transactional perspective parenting services should impact the child's development through the parent, and there is some evidence to support this among high-risk populations. Yet, it remains unclear what impact parenting services and other child welfare services have on the children's developmental pathways among children involved in child welfare services due to neglect. This dissertation begins to explore this question, assessing the relation between receipt of child welfare services and behavior development after controlling for factors in the child and caregiving environment.

Conceptual Model to Guide the Dissertation

Figure 2.1 presents a conceptual model for the dissertation – based on the transactional model of child development (Sameroff & Fiese, 2000) and the child development and child welfare literature – to explore the developmental paths of 2- and 3-year-old children whose caregivers were investigated for alleged neglect and to assess the association between child welfare services and their developmental progress. The conceptual model reflects how, according to the transactional model, child development is influenced by the combination of the individual child characteristics, the caregiving environment, and the interaction between them over time (Sameroff & Fiese, 2000). As

Figure 2.1. Transactional model* of child development among 2 and 3 year olds investigated for neglect



***Transactional model adapted from Sameroff & Fiese (2000)**

illustrated in the shaded area of the model, a child's early development influences his or her development over the following years. The 2- and 3-year-old children investigated for neglect have already experienced different levels of deficiencies and strengths in the caregiving environment since infancy, thus some children may be developing normally whereas others are exhibiting developmental problems. The child's level of behavior problems at age 2 or 3 – the baseline in the current study – influence behavior during the preschool years, which in turn influences development as the child enters school age, which then influences behavior as the child progresses through elementary school. Children may follow either normative or persistently problematic developmental trajectories from age 2 or 3 through age 7 to 9, or there may be improvements or declines in developmental scores during this time period (e.g., Woodruff & Lee, 2011). Also at the child level, the model reflects evidence that child internalizing behaviors prior to school entry predict problematic externalizing behavior trajectories (Woodruff & Lee, 2011).

The model further illustrates how the caregiving environment and the transactions between child and caregiving environment influence the child's development continually over time. The conceptual model presented here posits that when children are interacting with caregivers providing responsive and nurturing parenting, they are more likely to follow normative developmental paths (Hirsh-Pasek & Burchinal, 2006; Shonkoff & Phillips, 2000) from age 2 or 3 on into middle childhood, around ages 7 to 9. Likewise, when young children are interacting with caregivers who are very young (Coley & Chase-Lansdale, 1998), depressed (e.g., Lochman et al., 2008), providing less responsive and stimulating parenting (Hirsh-Pasek & Burchinal, 2006; Jaffee, 2007), and are abusive or neglectful (Hildyard & Wolfe, 2002; Shonkoff & Phillips, 2000), the children are more likely to experience more developmental delays. Further, children affected by the interaction between child factors and the caregiving environment characterized by poverty (e.g., Berger et al., 2009) and cumulative risk (Sameroff & Fiese, 2000) early in life (i.e., at age 2 or 3) are more likely to follow problematic developmental trajectories over time.

Further, the conceptual model suggests that caregiver interaction with child welfare services will influence the parent, and in turn impact the child's developmental trajectory. Two variables are incorporated into the model to represent the family's interaction with child welfare services. The outcome of the investigation, or substantiation status, is included as a control variable, and receipt of child welfare services is included because it is the main service variable of interest. Substantiation status must be a control variable because of its relation with receipt of services (i.e., substantiated cases are more likely to receive services; Casanueva, Cross, & Ringeisen, 2008). The conceptual model suggests that child welfare services –the main service variable of interest – should positively influence parenting behaviors and in turn lead to more normative child development pathways. Some delays in development may have already begun when the child's family was investigated for neglect, but there is still much potential to alter the developmental course of a 2- or 3-year-old child because there are many points in time in which changes in the caregiving environment may support or hinder the child's developmental progress (Bailey, 2002; Sameroff, 1995; Shonkoff & Phillips, 2000). When children remain home following investigation by the child protection agency, a common intervention is the provision of parenting services provided directly by child welfare services or through referral to other agencies. Generally speaking, parenting services are designed to help parents develop positive parenting skills and understand child development, which in theory would support the child's positive behavior and development. This approach would fall within Sameroff's (1995; Sameroff & Fiese, 2000) "reeducation" approach to intervention.

From a transactional perspective, the expectation is that intervening with the caregiving environment – the parent in particular – will help alter the child's behavior and developmental course because of the dynamic interaction between parent and child. Although the transactional approach would ideally entail assessment of each individual child's caregiving system and determination of the best point(s) of intervention, reeducation of parents is a viable point of intervention because parents have a greater influence on the child than the child on the parent (Sameroff, 2009). A large proportion of families receiving child welfare services participate in parent training and other parenting services (Hurlburt, Barth, Leslie, Landsverk, & McCrae, 2007). As noted in the literature review, there is some evidence in the child development literature that parenting interventions do impact behavior and development, although few studies have explored this topic in the child welfare literature.

Gaps in the Literature

To date there have been no national studies examining the behavioral trajectories of children age 2 and 3 years old whose families have been investigated for neglect, the primary form of maltreatment faced by young children (US DHHS, 2010). It is clear that young children investigated for maltreatment are at high risk of behavioral problems (e.g., Barth et al., 2008), which may persist over time (McCrae, 2009; Scarborough & McCrae, 2010), and that neglected children constitute the majority of young maltreated children. However the distinct developmental paths of young children investigated for neglect have not been examined. Understanding the actual paths that children follow – such as persistent, *worsening*, improving, or consistently low levels of internalizing or externalizing behaviors – and predictors of distinct paths can help practitioners identify, advocate for, and ensure augmented services for those children most at risk of persistent problems, averting ongoing behavioral problems.

Using a person-centered analytic technique, latent class growth analysis (LCGA), provides a way to follow individual children's paths and find patterns of behavior over time. Rather than modeling the general trend of the ability to self-regulate behaviors among children in predetermined groups (i.e., girls vs. boys), LCGA can provide insight regarding the multiple skill levels (i.e., intercepts) and growth patterns (e.g., shape and direction of growth) among neglected children. Already this technique has revealed multiple behavior paths among children investigated by child welfare services at age 4, with the majority following a relatively normal behavior trajectory or improving behavior path through elementary school and small groups following persistent or *worsening* behavior trajectories (Woodruff & Lee, 2011). Additional use of this technique can help move us beyond simply knowing the average scores of maltreated children, the proportion of children in clinical range at each time point, or average scores for pre-determined groups of cases. LCGA can help uncover patterns of behavior and, coupled with multivariate analyses, identify predictors of distinct behavioral paths, so that we can better identify children in need of augmented services.

Finally, in this high risk population of children investigated for neglect it is important to evaluate whether or not the provision of child welfare services, and parenting services in particular, may alter the course of the children's development. Child welfare agencies routinely provide parenting services to many of the families who come to their attention with the intention of improving child safety, permanency, and well-being. These parenting services have the potential to help parents alter their parenting practices to better support child development, yet these programs are rarely evaluated to determine their impact (Hurlburt, Barth, Leslie, Landsverk, & McCrae, 2007). We do not have information to support the efficacy of parenting and other child welfare services for improving parenting and child development in this high risk population. As noted, moderate, significant differences in parental responsiveness were observed in child welfare-involved parents of preschoolers (ages 3-5) who did and did not receive parenting services, but the parenting services were not significantly related to parental responsiveness when tested in a multivariate model (Casanueva, Martin et al., 2008). Studies have not examined the impact of child welfare services on families of children investigated for neglect, specifically, nor have they looked at the impact of child welfare services on the children themselves, who are intended beneficiaries of the services. What is needed at this juncture is knowledge about the impact of parenting services on the developmental pathways of 2- and 3-year-old children whose families were investigated for neglect and who remain at home.

In summary, the growing knowledge base about the development of young children involved with child welfare services lacks research focusing on neglected children nationally, has not yet examined varying patterns of normal and problematic development and characteristics associated with each, and has not examined the impact of parenting services on child developmental paths. As the push for evidence-based practice grows, so does the need for a more advanced understanding of (1) the patterns of behavior development among 2- and 3-year-old children investigated for neglect who remain home, (2) the characteristics of children in normal and problematic trajectory groups, and (3) the impact of child welfare services – particularly commonly delivered parenting services – on developmental outcomes. With this knowledge, child welfare practitioners will be better able to identify children at greatest risk for developmental problems and support the healthy development of young neglected children by providing appropriate services to help children develop to their full potential. This study seeks to expand the knowledge base toward this end.

Research Questions

The research questions for the study are outlined below, organized by the aims of the dissertation. For each aim, a general hypothesis is provided. A transactional model (Figure 2.1) adapted from Sameroff and Fiese (2000) and incorporating prior research provides a theoretical framework for exploration of these research questions. Each question pertains to children whose families were referred to child welfare services for neglect when the children were age 2 or 3 years old and who remained home after investigation.

Aim 1: Identify the number, shape, and size of subgroups of children following distinct behavioral trajectories.

1) How many distinct trajectories of externalizing behavior development do subgroups of young children follow? What shape are these trajectories? What proportions of children fol*normal* and problematic trajectories?

2) How many distinct trajectories of internalizing behavior development do subgroups of young children follow? What shape are these trajectories? What proportions of children fol*normal* and problematic trajectories?

3) Is there a relation between membership in problematic internalizing and externalizing trajectory groups?

In general, it was hypothesized that many children follow a relatively normal behavioral path, while a small group exhibit a high level of behavior problems, and still others follow improving or *worsening* problematic paths. In addition, it was hypothesized that children who are members of a problematic externalizing behavior group are likely to also be in an internalizing behavior problem group, as internalizing and externalizing behaviors often co-occur.

Aim 2: Describe the characteristics of children in distinct behavior trajectory groups.

1) What child characteristics, parenting behaviors, and characteristics in the broader caregiving environment describe each externalizing behavior trajectory group? Are there significant differences in characteristics across externalizing behavior trajectory groups?

2) What child characteristics, parenting behaviors, and characteristics in the broader caregiving environment describe each internalizing behavior trajectory group? Are there significant differences in characteristics across internalizing behavior trajectory groups?

Children with a chronic health condition, parent and parenting risk factors (young maternal age, low education, single, depressive symptoms, less responsive parenting, less learning stimulation, harsh parenting, neglectful parenting), and risk factors in the broader caregiving environment (domestic violence, low income, more children) at baseline were hypothesized to be more likely to be members of problematic behavior groups than normal behavior group. Further, it was hypothesized that having more risks (cumulative risk) in the caregiving environment is associated with more internalizing and externalizing behavior problems.

Aim 3: Explore the association between child welfare services and other predictors and membership in behavior trajectory groups.

1) Does receipt of child welfare services predict membership in normal and problematic externalizing behavior trajectory groups, after controlling for other factors in the caregiving environment? What other factors in the caregiving environment predict membership in each behavior trajectory group in multivariate analysis?

2) Does receipt of child welfare services predict membership in normal and problematic internalizing behavior trajectory groups, after controlling for other factors in the caregiving environment? What other factors in the caregiving environment predict membership in each behavior trajectory group in multivariate analysis?

3) What factors predict membership in co-occurring problem groups (i.e., being on a problematic path for both internalizing and externalizing behaviors) compared to following normal behavior trajectories?

Based on the transactional model–which posits that intervening with the parents impacts the child through their interactions over time– the receipt of child welfare services was hypothesized to predict membership in normative versus problematic trajectory groups.

The next chapter describes the method used explore these questions.

Chapter 3: Study Method

This chapter describes the study method for the dissertation, including an overview of the statistical technique (latent class growth analysis) that maximizes the utility of the longitudinal data used herein. The study examines developmental pathways of young children (2 and 3 years old) over the course of five to six years, the predictors of normal and problematic pathways, and the association between child welfare services and developmental trajectories using data from the nationally representative National Survey of Child and Adolescent Well-Being (NSCAW).

Sample

Sample selection. All children who were either 2 or 3 years old (24 to 47.9 months), referred to child welfare services due to alleged child neglect, and who remained home following investigation by child protective services at NSCAW Wave 1 (*n*=236) were selected for inclusion in the current study. Child age was measured by the *child age in years* variable derived by the NSCAW team. Children investigated for neglect were identified as children for whom the child welfare worker indicated that the primary alleged maltreatment type was one of two forms of neglect identified in NSCAW: failure to supervise or failure to provide (physical neglect). Primary maltreatment type is a derived variable developed by the NSCAW (2007) team based on a series of questions related to the allegation(s) from the report and investigation, as reported by the caseworker. Children were included in the sample whether or not the maltreatment reports were substantiated because children reported to child welfare services are at risk of poor developmental outcomes regardless of substantiation status (Barth et al., 2008; Hussey, Chang, & Kotch, 2006). Children were also included whether or not they received ongoing services from the child welfare agency. Finally, the children were identified as having remained home following investigation at Wave 1 of the study using the variable *child setting / services*, selecting children with the responses *in home, no services* or *in home, services*.

Descriptive data. Table 3.1 presents descriptive statistics for the sample and weighted population estimates for children represented in this study. Because these data are from a nationally representative sample of children referred to child protective services, population estimates (rather than sample descriptives) are reported in the text. The 236 children in the current sample are estimated to represent 125,606 children in the national population of children involved with child welfare services at baseline of the study.

Children in the current study were age 2 to 3 years old (*M*=2.55, *SE*=0.05, *CI*=2.45-2.65) when they were referred to child protective services for neglect (Wave 1), and they were ages 7 to 9 during the final wave of the study (Wave 5). Just over half of the children were boys (55.1%). Close to half of the children identified as White (44.9%), over a third (35.6%) African American or Black, 12.9% Hispanic or Latino, and 6.6% of another race or ethnicity. More than one quarter (27.9%) of the children were identified as having a chronic health problem.

Caregivers ranged in age from 15 to 55 years (*M*=26.78, *SE*=0.58, *CI*=25.62-27.94), with 9.0% younger than 21 years old at the time of referral. Half of the caregivers (54.7%) were never married and one quarter were currently married (24.3%). Half (50.0%) of the caregivers had a high school degree, another 18.4% had high school plus additional education, and 31% had less than a high school degree. Most families (61.5%)

had one or two children in the home, 15.9% had 3 children, and the rest (22.6%) had 4, 5, or more children in the home. Sixty percent (60.0%) of the families were living in poverty.

Table 3.1. Characteristics of young children and their families referred to CPS and investigated for child neglect who remained home at Wave 1 of the NSCAW study

	Actual sample (unweighted data) n=236		Population Estimates (weighted data) n=125,606 (SE=14,609.38)	
Characteristics	n	%	%	95% Confidence Interval
Child Demographics				
Child Age	236			
2 years	128	54.24	44.79	35.24-54.75
3 years	108	45.76	55.21	45.25-64.76
Gender	236			
Male	122	51.69	55.14	43.72-66.05
Female	114	48.31	44.86	33.95-56.28
Race/Ethnicity	236			
White, Non-Hispanic	122	51.69	44.92	33.51-56.89
Black, Non-Hispanic	70	29.66	35.57	25.49-47.13
Hispanic or Latino	27	11.44	12.86	6.02-25.38
Other race or ethnicity	17	7.20	6.64	3.11-13.61
Chronic health problem	236			
Yes	58	24.58	27.92	18.13-40.38
No	178	75.42	72.08	59.62-81.87
Caregiver Demographics				
Caregiver age	236			
<21 years	24	10.2	9.02	5.03-15.65
21 or more years	212	89.8	90.98	84.35-94.97
Race/Ethnicity	236			
White, Non-Hispanic	135	57.20	48.84	36.27-61.56
Black, Non-Hispanic	59	25.00	32.29	20.09-47.50
Hispanic or Latino	18	7.63	8.42	3.29-19.88
Other race or ethnicity	24	10.17	10.45	5.13-20.11

Table 3.1. Characteristics of young children and their families referred to CPS and investigated for child neglect who remained home at Wave 1 of the NSCAW study, Continued

	Actual sample (unweighted data) n=236		Population Estimates (weighted data) n=125,606 (SE=14,609.38)	
Characteristics	n	%	%	95% Confidence Interval
Marital status	236			
Married	64	27.12	24.25	16.40-34.33
Separated	29	12.29	11.32	6.41-19.23
Divorced	29	12.29	8.72	5.04-14.68
Widowed	2	0.85	0.96	0.22-4.01
Never married	112	47.46	54.74	42.31-66.61
Caregiver Degree	235			
Less than high school	70	29.8	31.67	22.05-43.17
High school	119	50.6	49.95	40.00-59.90
High school plus	46	19.6	18.38	10.95-29.19
(Refused=1)				
Household				
Number of children in HH	236			
1 child	65	27.54	29.67	20.25-41.20
2 children	83	35.17	31.87	23.51-41.58
3 children	43	18.22	15.90	10.91-22.60
4 children	21	8.90	13.90	6.29-27.97
5 or more children	24	10.17	8.67	3.52-19.79
Poverty status	215			
<= 1999 US Pov. Line	121	56.3	59.95	47.36-71.35
Above poverty line	94	43.7	40.05	28.65-52.64
Type of Alleged Neglect	**236**			
Physical neglect	83	35.17	33.53	25.92-42.10
Lack of supervision	153	64.83	66.47	57.90-74.08
Outcome of investigation or assessment	**235**			
Substantiated	88	37.4	22.56	16.10-30.65
Indicated	39	16.6	10.85	6.89-16.67
Neither substantiated nor indicated	80	34.0	57.85	44.58-70.07
High risk	10	2.6	0.21	0.12-1.13
Medium risk	12	5.1	1.62	0.94-8.60
Low risk	6	4.3	2.25	2.38-12.13

Table 3.1. Characteristics of young children and their families referred to CPS and investigated for child neglect who remained home at Wave 1 of the NSCAW study, Continued

	Actual sample (unweighted data) n=236		Population Estimates (weighted data) n=125,606 (SE=14,609.38)	
Characteristics	n	%	%	95% Confidence Interval
Substantiated or Indicated	127	53.8	33.39	24.68-43.41
Other (Neither S/I, Risk)	108	46.2	66.61	56.59-75.32
Receipt of ongoing child welfare services (in home)	236			
No services	104	44.07	68.97	58.72-77.64
Services	132	55.93	31.03	22.36-41.28

Approximately one-third (33.4%) of the cases were either substantiated or indicated. Most of the remaining cases (57.9%) were neither substantiated nor indicated, and a small proportion (4.1%) of cases was assessed by level of risk (low, medium, high) rather than being investigated. Less than one-third (31.0%) of families received child welfare services when they were reported for neglect and the children remained in the home after investigation.

Data Source

This dissertation is a secondary data analysis of survey data collected as part of the federally funded National Survey of Child and Adolescent Well-being (NSCAW, 2007), a nationally representative longitudinal study of children and families involved with child welfare services. Data from the NSCAW child protective services (CPS) sample were used, which consists of children and families investigated or assessed for allegations of child maltreatment between October 1999 and December 2000 (Wave 1, n=5,501; NSCAW, 2007) and follows them through five waves of data collection over approximately 5 or 6 years (64 to 73 months) thereafter. Data from the NSCAW study were collected through in-person interviews with parents, caregivers, and caseworkers, plus individual assessments with children.

The NSCAW sample is a two-stage stratified sample of children investigated or assessed in child welfare agencies in the United States, excluding a limited number of jurisdictions (NSCAW, 2007; NSCAW Research Group, 2002). Stratification was based on geography and case characteristics (NSCAW, 2007). First, nine geographic strata were identified including the eight states with the largest child populations and one stratum containing the remaining states and the District of Columbia. A systematic random sample of primary sampling units (PSUs) – mostly county child welfare agencies – within each stratum was then taken, giving PSU's serving larger numbers of children a higher chance for selection (probability proportionate to size). A total of 92 PSU's were included in the study, after a handful refused and were replaced or were ineligible.

After selecting the primary sampling units, lists of children referred for investigation and assessment for whom the investigation had been closed were obtained for each jurisdiction and stratified. Children from birth to age 14 were included in the sample, whether or not they received ongoing services and regardless of substantiation status. The lists of children were stratified into eight domains covering a combination of age (< 1 year vs. 1 – 14 years old), service receipt (receiving services vs. not receiving services), whether or not they remained home (in-home vs. out-of-home care, for those receiving services), and maltreatment type (sexual abuse vs. other types of maltreatment for the 1 – 14 age group) (see NSCAW Research Group, 2002 for more information on sampling).

Finally, the children were randomly selected from these stratified lists, oversampling infants, children receiving ongoing child welfare services, and children who were investigated for alleged sexual abuse in order to ensure adequate representation. Children were excluded from the sample if another child was the alleged perpetrator, a sibling was already participating in the study, or the referral was screened out (i.e., the *allegation* did not meet criteria for abuse or neglect according to state laws and policies). After selection, the families were invited to participate in the NSCAW study, following IRB approved procedures, and those who agreed were followed over five waves of data collection spanning approximately six years.

After completion of the study, weights were calculated for each case that, when applied in analyses, make it possible to generate national estimates to generalize results to the national population. It is important to note that the sample does not draw from the entire population of children involved with child welfare services nationally. However, the potential for noncoverage bias is relatively small because just a small proportion of the population was not covered, lending confidence to the national estimates; details about the sampling technique and limitations are available elsewhere (NSCAW, 2007; NSCAW Research Group, 2002).

IRB Protocol and License to Use the NSCAW Data

In order to use the NSCAW data set, the National Data Archive for Child Abuse and Neglect (NDACAN) requires that researchers apply for a data user license and take a series of steps to protect the data. Details about access to the data set are available on the NDACAN web site at

http://www.ndacan.cornell.edu/NDACAN/Datasets/Order_Forms/NSCAW_Acquiring_D ata.html. Briefly, the researchers must submit an application, license agreement, data protection plan, and an IRB protocol approved by the researcher's research institution (i.e., University of Maryland, Maryland [UMB] Institutional Review Board [IRB]. The IRB protocol for the current study, with co-chair Dr. Donna Harrington as Principal Investigator, was approved by the University of Maryland IRB July 8, 2011. The IRB protocol was filed under an existing NSCAW User License for University of Maryland researchers, maintained by Dr. Bethany Lee.

NSCAW Data Collection

Data pertaining to young children were collected through interviews with parents or other caregivers and caseworkers, the direct administration of assessments with the children, and observation in the home environment (NSCAW, 2007). Once the children reached school age, data from teachers were also collected. The initial face-to-face interviews (Wave 1) occurred 2 to 6 months after the investigation was closed. A telephone follow-up with parents or caregivers (Wave 2) occurred 12 months after the initial investigation was closed. Caseworkers were also interviewed in person. Additional face-to-face interviews occurred at 18 months (Wave 3) and 36 months (Wave 4) after the initial investigation was closed. The final follow up (Wave 5) for young children – including the children in the sample for this dissertation– occurred between 64 and 73 months after the initial investigation. Thus, most of the children to be selected into this study were between the ages of 7 and 9 years at Wave 5 of the NSCAW study, depending on the age at selection and the timing of the final interviews.

NSCAW included a combination of existing measures and new questions created for the project. Extensive efforts to ensure data quality were put in place by the NSCAW team, including extensive training of field interviewers, use of computer assisted interviews, field observations of interviews, audio monitoring, phone verification, and monthly review of data frequencies (NSCAW, 2007). Measures from NSCAW that were incorporated into the current study are described below.

Measurement: NSCAW Measures and Construction of Variables

All measures and variables for the current study come from the NSCAW data collected from children, caregivers, and caseworkers. The developmental measures and 14 covariates and predictors[4] used in the study are described below. Appendix A summarizes the variables, measures, and the source of information (e.g., parent or caregiver) for each variable in the study.

Developmental measures (outcome variables). Two indicators of child development were used as outcome variables in the current dissertation: child externalizing behaviors and child internalizing behaviors. All developmental indicators were measured using scales available in the NSCAW. The scale scores for the developmental indicators were calculated by the NSCAW team (NSCAW, 2007). The indicators were analyzed individually in order to account for the fact that children may have strengths in some areas and challenges in others. In addition, a chi-square analysis of the emerging developmental trajectories was conducted to understand whether or not the trajectory groups for the developmental measures are related (i.e., whether children who are following problematic externalizing behavior trajectories are also following problematic internalizing trajectories).

[4] 15 variables were initially planned but one variable, parental responsiveness, was omitted due to missing data.

Externalizing behaviors. The Child Behavior Checklist (CBCL) for children age 2-3 (CBCL; Achenbach, 1992) and age 4-16 (Achenbach, 1991) was used to measure child behaviors. The CBCL Externalizing Behaviors scale was used to measure externalizing behaviors – problems the child has regulating his or her behaviors towards others, such as aggression and delinquent behaviors – as reported by the caregiver at baseline (Wave 1) and waves 3, 4, and 5. The externalizing scale consists of 24 items (out of 100) for children ages 2 and 3, and 33 items (out of 118) for children age 4 to 18 years. For each item, caregivers report whether or not their child engaged in the identified behavior (e.g., "argues a lot" or "temper") during the last six months on a scale of 0 to 2 (0=*not true as far as you know*, 1=*somewhat or sometimes true*, and 2=*very true or often true*). The raw scale score for each child at each time point was calculated by the NSCAW team by summing the values of individual CBCL items, with scores ranging from 0 to 66 (NSCAW, 2007).

The NSCAW team also converted raw scores to T-scores (standardized scores with *M*=50 and *SD*=10), which frame the scores in the context of other children of the same gender and age group. T-scores were used in the current analyses. For the externalizing behavior subscale, T-scores below 60 indicate normal range behaviors, scores from 60 to 63 indicate borderline clinical behaviors, and scores above 63 indicated clinical level problems. Although prior studies plotting longitudinal behavior data use raw scores (e.g., Keiley et al., 2000; Woodruff & Lee, 2011; Tabone et al., 2011), T-scores were used in this dissertation in order to combine data from the two age-appropriate versions of the CBCL (CBCL/2-3, and CBCL/4-18) over time. Raw scores and T-scores from the CBCL tend to provide similar results in research analyses (Achenbach & Rescorla, 2001).

The CBCL is a reliable and valid measure (Achenbach, 1991), and has been used widely with good reliability in numerous studies, including NSCAW (McCrae, 2009; NSCAW, 2007). The CBCL has high inter-rater reliability (.96) and good construct validity. In the NSCAW sample the internal consistency for externalizing behaviors was good for children ages 2 and 3 years (.91) and for children ages 4 to 15 years (.92; NSCAW, 2007). The impact of having different untrained raters over time is not possible to assess although this impact should be minimized because most children were at-home at most time points.

Internalizing behaviors. Internalizing behaviors were measured using the Internalizing Behaviors subscale of the Child Behavior Checklist /2-3 (Achenbach, 1992) and /4-18 (Achenbach, 1991). Internalizing behaviors include withdrawn behaviors, somatic complaints, and anxious/depressed behaviors. As explained above, T-scores were used to address the use of two different age-appropriate versions of the CBCL over the six years. Internal consistency for internalizing behaviors is good in the NSCAW sample (.80 for age 2 and 3 years, and .90 for age 4 and older; NSCAW, 2007). As noted above, the CBCL also has high inter-rater reliability and good construct validity.

Child characteristics. Child level variables from Wave 1 of the NSCAW study were used to describe the characteristics of the emerging trajectory subgroups and tested as predictor variables in the current study. Gender and race or ethnicity were included as control variables in the analysis. *Gender* was coded as male and female (reference group). *Race or ethnicity* categories include White/non-Hispanic, Black/non-Hispanic,

Hispanic, and other ethnicity. For bivariate and multinomial analyses race or ethnicity were recoded into minority status, where minority includes Black, Hispanic, and other ethnicity children and non-minority (reference group) includes White/non-Hispanic children. *Chronic health problem* was included as a predictor, as children with chronic health problems are more likely to experience developmental challenges. The NSCAW variable asks caregivers to indicate whether or not the child has any health problems that last a long time or come back again and again; responses of "yes" were used as an indicator of a chronic health problem. Health problems include asthma, birth defects, brain tumor, cerebral palsy, chronic heart condition, diabetes, epilepsy, HIV/AIDS, physical deformities, respiratory problems, spina bifida, and other health problems.

Caregiving environment: Parent[5] and parenting characteristics. Parent level predictors at Wave 1 include the primary caregiver's age, education, marital status (single caregiver), and depressive symptoms. Parenting factors include learning stimulation in the home environment, harsh/assaultive parenting, and neglectful parenting. Change in caregiver – which represents a considerable change in the caregiving environment and thus has potential to change the developmental path – was also included as a time-varying covariate in the longitudinal analyses.

The caregiver's *age*, an indicator of early childbearing, was measured in years and entered as a continuous variable.

Caregiver depression was measured using items from the World Health Organization's Composite International Diagnostic Interview Short-Form (CIDI-SF; Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998). The CIDI-SF allows for

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[5] The term "parent" is used to include all primary caregivers, as the majority of caregivers at baseline were parents.

identification of major depression, with high classification accuracy (93%; Kessler et al., 1998). Parents were identified as depressed during the prior 12 months when they reported experiencing two or more consecutive weeks feeling sad, blue, or depressed, or having lost interest in most things for this time period, and that they felt this way every day or most days for all or most of the day, and report at least three symptoms of depression (e.g., loss of interest in usual activities, tiredness, weight gain or loss, trouble sleeping or excessive sleeping, difficulty concentrating, feelings of low self-worth, thoughts about death). Parents were also identified as depressed if they reported being on medication to treat depression. Caregiver depression was entered as a dichotomous variable (having or not having depressive symptoms).

Parenting behaviors included learning stimulation, harsh/assaultive parenting, and neglectful parenting. *Learning stimulation* was assessed with items from the Home Observation for Measurement of the Environment Short Form (HOME-SF; Caldwell & Bradley 1984). The HOME-SF entails a home visit in which the presence or absence of parenting behaviors toward the child and the physical environment are assessed through a combination of parent self-report and observations made by the interviewer. Higher scores (i.e., more items present) indicate a more positive home environment. Following procedures described in Casanueva, Martin, and colleagues (2008), scores were converted to represent the proportion of positive responses. For example, when 3 of the 5 items indicating learning stimulation were present, then the score is .60. These proportion scores range from 0 to 1, with higher scores indicating greater learning stimulation in the home environment. The learning stimulation scale was found to be reliable in a recent study using NSCAW data (Cronbach's alpha around .90; Casanueva, Martin et al., 2008).

Harsh/assaultive and *neglectful parenting* was operationalized as parent-reported assaultive and neglectful behaviors toward the child, based on parent and caregiver responses to a subset of items on the Conflict Tactics Scale – Parent Child form (CTS-PC; Straus, Hamby, Finkelhor, Moore, & Runyon, 1998). Frequency scores from the total Physical Assault subscale (including minor, severe, and very severe assault) and the Neglect scale were included in the analysis, entered as two separate variables. For each item respondents indicated the frequency of specific aggressive or neglectful behaviors toward the child during the past 12 months on an 8-point Likert style scale; responses were recoded to the midpoint of a range or to the corresponding number (i.e., once=1, twice=2, 3 to 5 times=4, 6 to 10 times=8, 11 to 20 times=15, more than 20 times=25, not in the past 12 months or never=0). The scores for each subscale, calculated by the NSCAW team (2007), were entered into the analysis, with higher scores indicating higher levels of assaultive or neglectful behaviors. In the NSCAW sample there was good internal consistency for the caregiver data overall (total score $\alpha=.92$) and marginal to high internal consistency on subscales (ranging from $\alpha=.66$ for psychological aggression to $\alpha=.95$ for very severe physical assault).

Change in caregiver provides a change in caregiving environment that has the potential to affect child well-being. Change in caregiver was measured using dichotomous variables from the cross-wave data set in NSCAW, calculated by the NSCAW team. Children who remained home after investigation but subsequently experienced a change in caregiver were entered as "1", whereas children were entered as

“0” when they did not experience a change in caregiver or, for a small number of children, this information was ambiguous. Change in caregiver between Wave 1 and Wave 3, between Wave 3 and 4, and between Wave 4 and 5 (3 variables) were entered into the latent class growth analysis models as a time-varying covariate. The percent of children experiencing a change in caregiver was 14.8% by Wave 3, 12.7% by Wave 4, and 17.8% by Wave 5. Change in caregiver includes moves to kinship care, foster care, and other settings.

Broader caregiving environment characteristics. The broader caregiving environment variables include domestic violence, the number of children in the home, and family income at baseline. *Domestic violence* was measured using data collected with the Conflict Tactics Scale (Straus, Hamby, Finkelhor, Moore, & Runyon, 1998). Caregivers were identified as experiencing domestic violence if they reported that their partner did any of the following: threw something at the caregiver; pushed, grabbed or shoved the caregiver; slapped, kicked, bit or hit the caregiver with their fist; hit or tried to hit the caregiver with something; beat up or choked the caregiver; threatened the caregiver with a knife or gun; or actually used a knife or gun on the caregiver. The *number of children in the home* was entered as a continuous variable. *Family income* was reported in $5,000 increments, from <$5,000 per year to $50,000 or more per year (11 categories). Income was entered as a continuous variable.

Cumulative risk. In addition to examining individual predictors, additional analyses explored whether or not cumulative risk predicted the children’s developmental paths. *Cumulative risk* in the caregiving environment was calculated as the number of risk factors the family experienced at baseline, of the following:

1. Having a child maltreatment report (100%)
2. Child's chronic health problem
3. Minority status
4. Caregiver depression
5. Caregiver substance dependency
6. Teen-aged caregiver (<21 at referral, so teen parent when toddler was born)
7. Single caregiver
8. Low caregiver education (less than high school)
9. Domestic violence in last year
10. 4 or more children in the home
11. Living in poverty

These are the same concepts used by Barth and colleagues (2008), however the current dissertation did not use the NSCAW Risk Assessment tool for the variables. For this dissertation, cumulative risk variables were based on parent report (e.g., caregiver depressive symptoms reported in response to scale items), rather than case worker assessment. Each continuous variable used as a predictor was dichotomized in order to count the number of risk factors for the cumulative risk analyses. *Poverty status* was dichotomized as living in poverty (100% of the poverty line or lower) or above the poverty line, based on the number of people in the household and income, based on the 1999 poverty definition. *Caregiver substance dependency* was calculated from two NSCAW created variables indicating alcohol dependency and drug dependency, and based on caregiver responses to a series of questions about their alcohol use and drug use during the past 12 months[6]. Only 5% (n=12) of caregivers in this sample were identified as being alcohol or drug dependent based on self-report. Cumulative risk scores range

[6] Substance use data were available based on caseworker report, but the caregiver reported data was selected to be consistent with other risk factor data, which was based on self-report. Caseworkers reported that at the time of the investigation there was "active alcohol abuse" or "active drug abuse" by the primary caregiver in almost 20% (n=46, 19.74%) of families, whereas parents reported information about substance use yielded just 5% (n=12 of 234) of parents with either drug or alcohol dependency.

from 1 to 11 because all cases have at least one risk factor (having a child maltreatment report); higher scores indicate the presence of more risk factors.

Involvement with child welfare services. Two variables were entered in the analyses to reflect child welfare involvement, including outcome of the initial investigation or assessment and the main variable of interest, receipt of parenting services. *Outcome of the initial investigation or assessment* was coded as a dichotomous variable indicating that the case of alleged maltreatment was (1) substantiated or indicated or (2) other outcome. For the purpose of this study – and consistent with prior studies (e.g., Casanueva, Cross, & Ringeisen, 2008) – unsubstantiated included "neither substantiated nor indicated" and three levels of risk (low, medium, and high risk), the designation given in those cases in which risk was assessed rather than substantiation.

Receipt of child welfare services was measured using the child setting/services variable in NSCAW. Each child in the current study was identified as either "in home, no services" or "in home, services" (reference group) at baseline. The nature, intensity, and duration of services vary from family to family, county to county, and state to state. Some families received parenting skills training and other supportive parenting services, family counseling, mental health treatment, substance abuse treatment, and/or other services. Considerable discrepancies exist between parent report and caseworker report of services received (Casanueva, Martin et al., 2008). Due to the wide variation in services provided and discrepancies in which services were received and for how long, the more detailed services data were not selected for use in this study. Instead, as noted, the broad designation of receiving or not receiving services was selected for this study.

Data Analysis Plan

The current study was conducted in three phases. The first phase used a group-based trajectory modeling approach called latent class growth analysis (LCGA) to identify distinct developmental trajectories in this population of young children whose families were investigated for child neglect and who remained home. Although this is a high-risk population more likely to follow problematic trajectories than normative populations, children investigated by child welfare services are a diverse group that includes children with normal growth and development. With this diversity, it is important to identify which children are following positive developmental trajectories and which are not. LCGA uses longitudinal data to identify distinct groups of children following different developmental trajectories and describe the size and shape of each trajectory, meeting the first aim of the study. Next, bivariate and multivariate analyses were conducted to describe the characteristics of each trajectory group and identify the factors in the caregiving environment that predict membership in each trajectory group, meeting the second aim of the study. The multivariate analyses were conducted using multinomial logistic regression, first modeling the independent effects of factors in the caregiving environment on membership in developmental trajectory group, then the effect of cumulative risk in the caregiving environment. Finally, multinomial logistic regression was conducted to test whether or not receipt of child welfare services predicts trajectory group membership after controlling for factors in the caregiving environment and outcome of the investigation or assessment. This last step meets the third aim of the study. Each type of analysis is described in the following sections.

Latent class growth analysis. Latent class growth analysis (LCGA; Nagin, 2005) was used to examine the developmental progress of young children investigated for neglect who remain at home after the investigation. Specifically, LCGA was used to identify subgroups of children following distinct developmental pathways over the course of five to six years, using data from four time points. LCGA is a statistical method of identifying latent subgroups within a heterogeneous population that follow distinct trajectories over time for a given outcome that is measured repeatedly (Nagin, 2005). Rather than relying on pre-determined groups (e.g., gender or race/ethnicity), LCGA is a person-centered statistical approach (Jung & Wickrama, 2007) that assumes there are homogenous subgroups of individuals following distinct trajectories (Nagin, 2005). For example, when observing the behavioral patterns of children over multiple time points, some children may exhibit consistently low behavioral problems, others may exhibit persistently high behavioral problems, and others may show declining or increasing levels of behavioral problems. A person-oriented level of analysis allows researchers to understand diverse processes and outcomes in human development (Cicchetti & Rogosch, 1996).

LCGA estimates the optimal number of classes (i.e., subgroups) of individuals within the population who follow similar trajectories over time, the intercepts (initial value) and slopes (change over time) for these subgroups, as well as the proportion of individuals belonging to each group. In LCGA trajectories can be modeled to follow linear, quadratic, or cubic trajectories. A series of models are tested, including a range of class numbers and forms (i.e., linear, quadratic, cubic), to determine the best fit for the data set. Based on the assumption that the subgroups are homogenous, LCGA does not estimate the variability around each subgroup's trajectory (Jung & Wickrama, 2007; Nagin, 2005). Instead, LCGA holds the variance of the intercepts and slopes at zero for simplicity in modeling (Nagin, 2005).

Specifying the LCGA model. In the current study the statistical software package M*plus* Version 6.11 (Muthén & Muthén, 1998-2010) was used to model distinct developmental trajectories of young children investigated by child protective services for alleged neglect. Separate sets of LCGA models were estimated for each developmental outcome. Developmental scores were charted at four time points beginning shortly after investigation at age 2 or 3 and following the children through preschool age and into elementary school, ending at age 7 to 9. Data for these four time points were collected at Waves 1 (baseline), 3 (18 months post-baseline), 4 (36 months post-baseline), and 5 (approximately 5 or 6 years post-baseline) of the NSCAW study.

After preparing and importing the outcome data (developmental scores) for the four time points into M*plus*, a series of LCGA models were run for each developmental outcome to estimate the optimal number of classes and form of the trajectories (Table 3.2). A mixture model was specified using Muthén and Muthén's (1998-2010) syntax for LCGA. The time points in the model were plotted at 0, 1, 2, and 4; by skipping 3 on the plot, the researcher was able to model a longer distance between Waves 4 and 5 to account for a longer passing of time between these two waves (28 to 37 months) compared to earlier waves (18 months between waves). After estimating a linear model, the models were re-run specifying the quadratic term, based on evidence that externalizing behaviors may be curvilinear (Bongers et al., 2003; Prinzie et al., 2006).

Table 3.2. Number of LCGA models run for externalizing behaviors and internalizing behaviors, using CBCL t-scores

LCGA models (2, 3, 4, & 5 classes)	Externalizing Behaviors	Internalizing Behaviors
Linear	4	4
Linear with TVC	4	4
Quadratic	4	4
Quadratic with TVC	4	4
Total Number of LCGA Models	**16**	**16**

TVC=Time varying covariate. The time-varying covariate was caregiver change at Waves 3, 4 and 5.

The number of classes (i.e., subgroups) for each developmental measure was estimated by modeling a range of class numbers and determining the best fit for the data set (Table 3.2). First, four linear LCGA models were specified (2, 3, 4, and 5-class models) for externalizing behaviors and four for internalizing behaviors. Theoretically, at least two subsets of children were expected to emerge, following normal and problematic trajectories, and thus a 2-class model was the first tested. A 5-class model was the upward limit to ensure adequate group sizes (due to the limited sample size) and prior research (Woodruff & Lee, 2011) revealing a 4-class model for behavior trajectories amongst 4 year old children from the NSCAW study.

Next, a time varying covariate, caregiver change, was added to each of these models, for another 4 linear models with TVC's for each behavioral outcome. For the TVC, a value of 1 indicated that there had been a change in caregiver since the prior wave (including placement in out-of-home care or with a relative), while a value of 0 indicated there had been no change or that information about caregiver change was ambiguous. Finally, a quadratic term was added to the 8 models (with and without TVC's) for each behavioral outcome. Thus, 16 models were specified for externalizing behaviors and 16 for internalizing behaviors. The researcher then examined the model fit statistics and graphs to determine which model fit the data best.

Selecting the optimal LCGA model. The output for each of the linear and quadratic models (with and without TVC's) were examined and compared for each developmental measure. The covariance coverage in the data set ranged from 0.746 to 1.000, with half at .85 or above; this is well above the minimum (.10) coverage required for model estimation (Muthén & Muthén, 2007). A series of fit indexes were examined to identify the optimal model. Average posterior probability and entropy were also examined. The graphic output illustrating the actual sample means and estimated means was also examined to observe whether or not the resulting classes were distinct and meaningful, and whether the shape of the estimated line fit the actual sample means well. The individual trajectories for the children assigned to each class were also examined to observe how well they fit the estimated trajectory group line

Two types of fit indexes –information criteria (IC) and likelihood-based tests – were examined from the output for all models in order to identify the model that best fits the data. Information criteria tests are used to compare a range of possible numbers of classes (e.g., 2, 3, 4, or 5 classes) to determine which number of classes is the best fit. The Bayesian Information Criterion (BIC) is recommended to identify the optimal number of classes, based on findings from several simulation studies (Nagin, 2005; Nylund, Asparouhov, & Muthén, 2007). According to Nagin (2005), the model with the BIC statistic closest to zero is the one that is most likely to be correctly specified, and should be selected as the best fitting model. Muthén and Muthén use a different formula to calculate the BIC in M*plus* (Nagin's BIC=log(L)-.0.5*k* log (N), whereas M*plus* BIC = -

2logL + r log n). Muthén (2008) notes that when using M*plus* the *lowest* BIC should be selected. Two other types of information criteria (IC's) available in the M*plus* output were also examined in this study: the sample adjusted BIC and Akaike's Information Criteria, AIC. Similarly, smaller numbers indicate the best fitting model.

The purpose of likelihood-based tests is to determine which of two neighboring class models fits best (e.g., 3 or 4-class, 4 or 5-class, etc.). The p-values from these tests are examined, and if significant, indicate that the lower number of groups (k-1; e.g., 3) should be rejected in favor of the higher number of groups (k; e.g., 4) (Nylund et al., 2007). The bootstrap likelihood ratio test (BLRT) performed best in a simulation study (Nylund et al., 2007) and thus was used to guide the decision of the best fitting model. The Lo-Mendall Rubin (LMR) likelihood ratio test was also examined.

Based on recommendations in the literature the Bayesian Information Criterion (BIC; Nagin, 2005; Nylund et al., 2007) and bootstrap likelihood ratio test (BLRT; Nylund et al., 2007) were given the most credence when selecting the best model fit. Another indicator of model fit, entropy, was also examined as suggested by Jung and Wickrama (2007). Entropy is an indicator of the quality of classification of the individuals into the groups. It is a numeric representation of how distinct the trajectory groups are, calculated based on the average posterior probability of group membership. Values closest to 1.0 suggest high entropy. A model with high entropy has groups that are highly distinct from one another.

Graphic output was also examined to help select the best fitting model. The visual examination of the data, through graphic output, allows assessment of whether or not the resulting classes are distinct and meaningful, and whether or not the form of the estimated trajectories (i.e., linear, quadratic) and estimated means are well aligned with the actual sample means. In addition to comparing the estimated and actual sample means for each trajectory, individual trajectories for children assigned to each subgroup were examined to observe how well they fit the estimated trajectory group line.

Once a model was selected based on the criteria described above, an additional statistical test (chi-square) was conducted to verify that the optimal model was *significantly* better than the second most optimal model. For example, for one of the developmental measures a chi-square test was used to rule out the possibility that no significant difference exists between the quadratic and linear LCGA models (null hypothesis). To test the difference in nested models such as these[7], chi square is calculated as 2*the difference in log-likelihood values, and degrees of freedom are calculated as the difference in parameters in the two models (see M*plus* web site [http://www.statmodel.com/discussion/messages] postings by Bengt Muthén , June 23, 2001, and Linda Muthén, August 26, 2011). The resulting chi square value must be greater than the critical value in the chi square probabilities table (available online at http://people.richland.edu/james/lecture/m170/tbl-chi.html) to reject the null hypothesis that there is no difference between the models.

Once the final (optimal) model was selected, the posterior probabilities in that model, the average posterior probability, and the related group assignments were examined. The average posterior probability of group membership is another statistic used to assess the adequacy of the model and, specifically, to assess the degree of classification error (Nagin, 2005). Posterior probabilities represent the likelihood that an

[7] The quadratic model adds the quadratic term, and is considered the full model. The linear model is the same equation but without the quadratic term. It is nested within the quadratic model.

individual child would belong in each of the classes; the individual child is assigned to the group for which he or she has the highest probability of membership. For example, in a three group model, if the child's probability of being assigned to group 1 is .03, group 2 is .83, and group 3 is .14, then the child would be assigned to group 2. These class assignments – called the most likely group membership – were made and used in the bivariate and multivariate analyses exploring the characteristics of each group and predicting trajectory group membership. Finally, the growth parameters in the optimal model were examined and presented in graphic form. Once the best-fitting model was identified, model output including most likely group membership and growth parameters were imported into SAS 9.2 with SAS-callable SUDAAN 10.0.1.

Bivariate analyses. Using SUDAAN 10.0.1, bivariate analyses were conducted with weighted data to describe the characteristics of children in each trajectory group that emerged from the data through LCGA. Both child (i.e., age, race, baseline scores on developmental measures) and caregiver (i.e., parental responsiveness, learning stimulation, self-report abuse of child, and self-report neglect of child) factors were examined. In addition, bivariate analyses (chi square) were used to explore whether or not there is a relation between membership in internalizing and externalizing behavior trajectory groups.

Multinomial logistic regression. Using SUDAAN 10.0.1, multinomial logistic regression analyses were conducted with weighted data to identify significant predictors of trajectory group membership. In SUDAAN dichotomous values are coded as 1 or 2, with 2 being the reference group (e.g., 1=chronic health problem, 2=no chronic health problem, reference group). When calculating the Beta Coefficient and related statistics for dichotomous independent variables, SUDAAN assigns the reference group the value of 0. When calculating odds ratios for the dichotomous variables, SUDAAN assigns the reference group the value of 1.

The multinomial models for aim 2 and aim 3 of the study are summarized in Table 3.3. For aim 2, examining the caregiving environment, the child level variables were entered first, then parent and parenting characteristics, followed by factors in the broader caregiving environment. A second model for aim 2 was examined in which cumulative risk (the count of risks at all 3 levels) was tested as a predictor of trajectory group membership. For aim 3 – exploring the association between receipt of child welfare services and developmental paths while controlling for caregiving environment – the same variables were entered followed by the two child welfare service variables, outcome of the investigation or assessment and receipt of child welfare services. The adjusted Wald F (more conservative than Wald) and associated *p*-value are reported from the regression, and the odds ratios and 95% confidence intervals for each significant variable are reported.

Applying weights to data analyses. Studies based upon NSCAW data, a national probability sample, use the NSCAW sampling weights to adjust results to be representative of the population of families entering child welfare services. In the current study weights were applied in univariate, bivariate, and multivariate analyses conducted in SUDAAN 10.0.1. This allowed generalization of findings from the young children for whom we have data to young children (age 2 and 3 years old) who became involved in American child welfare services due to neglect during the study period.

Table 3.3 Summary of Multinomial Models Predicting Membership in Trajectory Groups[8]

Research question	Number of Independent Variables	Independent Variables
Do factors in the caregiving environment predict membership in trajectory groups? (Aim 2)	12	*Child factors* 1. minority 2. chronic health problems *Parent and parenting factors* 3. caregiver age 4. education 5. single caregiver 6. depression 7. learning stimulation 8. assaultive behavior toward child 9. neglectful behavior toward child *Broader caregiving environment* 10. domestic violence 11. number of children 12. income
Does receipt of services predict membership in trajectory group, after controlling for caregiving environment? (Aim 3)	14	12 factors listed above, plus: *Child Welfare Services* 13. Outcome of investigation or assessment[9] 14. Receipt of child welfare services at baseline[10]
Does cumulative risk predict membership in trajectory group?	1	1. Cumulative Risk
Does receipt of services predict membership in the trajectory groups after controlling for cumulative risk in the caregiving environment?	3	1. Cumulative Risk 2. Outcome of investigation or assessment 3. Receipt of child welfare services at baseline

[8] Three sets of models were conducted: Externalizing Behavior Trajectories (3 groups), Internalizing Behaviors (2 groups), and Co-occurring Internalizing/Externalizing behavior groups (2 groups, exploratory).
[9] Outcome of investigation or assessment includes: Substantiated or indicated vs. other outcomes, including neither substantiated nor indicated, low risk, medium risk and high risk.
[10] Not received vs. received (reference group)

Handling of missing data. Like any national longitudinal dataset, NSCAW has missing data for portions of some cases (e.g., may have caregiver data but not caseworker data, or certain items have no response) and for entire cases at some waves of data collection. The amount of missing data in the NSCAW data set is relatively low, in part because the NSCAW team imputed data for some variables – including primary maltreatment type – when the data were missing (NSCAW, 2007). In the LCGA models missing data were handled using maximum likelihood estimation, which assumes data are missing at random (Schafer & Graham, 2002). This allowed inclusion of the entire sample (all 236 of the children age 2 and 3 years old) in the LCGA analysis. In the remaining analyses, though, cases were excluded due to missing data. For multivariate analyses, cases were excluded when missing data for any independent variable. The subsample of 2- and 3-year-old children with data for all predictor variables was compared to the children excluded due to missing data, and tested for differences in demographic characteristics (results are presented in the next chapter).

Chapter 4: Results

Results from analyses addressing the three aims of the current study are presented in this chapter. First, to address the first aim of the study, results from the LCGA analyses identify the number and shape of subgroups of children following distinct developmental trajectories. Results are presented for externalizing behaviors, then internalizing behaviors, including the CBCL scores, model selection, and trajectories identified. The relation between membership in internalizing and externalizing trajectory groups is also explored.

Next, Aim 2 results are presented in three sections. The characteristics of the subgroups of children following different trajectories are described and relations examined using bivariate analyses, first for externalizing behaviors then for internalizing behaviors. The effects of factors in the caregiving environment on trajectory group membership are examined through multinomial logistic regression. Results regarding externalizing behaviors are presented, followed by internalizing behaviors, and then an exploratory model of co-occurring membership in internalizing and externalizing problem trajectory groups. Next, the cumulative effects of factors in the caregiving environment are examined.

For Aim 3 of the study, two child welfare service variables are added to the multinomial models to explore the association between child welfare services and trajectory group membership. Results regarding externalizing behaviors, internalizing behaviors, and co-occurring membership in externalizing and internalizing problem groups (exploratory) are presented. Finally, the association between receipt of child welfare services and development is explored after controlling for cumulative risk in the caregiving environment.

AIM 1: IDENTIFYING SUBGROUPS OF CHILDREN FOLLOWING DISTINCT BEHAVIORAL TRAJECTORIES

Latent class growth analysis (LCGA) was used to identify the number of subgroups of young children reported for neglect and remain home who followed distinct developmental trajectories over time. First, the outcome variables (externalizing behaviors and internalizing behaviors) were examined through univariate analysis for each wave of data. Means from the study were compared to benchmarks from normative samples (Achenbach, 1992) and the LONGSCAN sample of maltreated children (Hunter et al., 2003). Next, standard scores for each outcome measure were entered into a series of LCGA models using M*plus* 6.11 to identify the optimal number of classes and shape of the developmental trajectories. Results are summarized for externalizing and internalizing behavior trajectories in the following sections, including children's scores, model selection, and a description of the developmental trajectories that emerged.

Externalizing Behaviors

Externalizing behavior scores. CBCL externalizing behavior scores for the children at each wave of data collection are presented in Table 4.1. Raw score means ranged from 15.69 at Wave 1 to 12.26 at Wave 5. Corresponding mean T-scores were in the normal range (M=53.57 at Wave 1 and M=53.82 at Wave 5), with the highest score at Wave 4 (M=56.15). Externalizing scores from single points in time were compared to normative referred and non-referred populations as well as children at risk of maltreatment. As seen in Table 4.1, the children's T-scores at the age of 2 or 3 were significantly higher (Mean difference=3.572; t=5.381, df=235, p<.0005) than the normative sample of non-referred children (*M*=50.0), but well below (Mean difference=-9.028; *t*=-13.601, *df*=235, *p*<.0005) the average for referred children (*M*=62.6; Achenbach, 1991). Scores were similar to a population of children at risk of maltreatment from the LONGSCAN study (Hunter et al., 2003), with no statistically significant differences when comparing the similar age groups.

Table 4.1. Child Behavior Checklist (CBCL) externalizing behavior mean scores for young children who were the subject of child neglect reports and remained home at Wave 1, by wave

			Externalizing Raw Scores		Externalizing T-scores	
N=246	*N*	Missing	*M*	*SD*	*M*	*SD*
Study sample						
Wave 1 (2-3 yrs)	236	0	15.69	8.696	53.57	10.197
Wave 3 (3½ to <5 ½ yrs)	200	36	14.52	8.749	55.16	10.383
Wave 4 (5 to <7 yrs)	205	31	13.54	8.010	56.15	10.016
Wave 5 (7 to 9 yrs)	197	39	12.26	9.374	53.82	11.680
Normative populations						
*CBCL normative data^*						
Non-referred /Age 2-3	321		12.8	8.3	50.0*	10.0
Referred / Age 2-3	321		23.8	10.6	62.6*	12.0
*Children at risk of maltreatment/ LONGSCAN ^^*						
Age 4	1121				55.53	10.79
Age 6	1217				55.33	10.88
Age 8	1090				54.34	11.44

^ Achenbach,1992
^^Hunter et al., 2003
*Significant difference (*p*<.0005) between normative population and NSCAW data.

LCGA model selection. Model fit statistics for the linear and quadratic LCGA models for the CBCL Externalizing Behaviors subscale are presented in Table 4.2. In each of the four sets (linear, linear with time-varying covariate (TVC), quadratic, and quadratic with TVC) of 2, 3, 4, and 5-class models the Bayesian Information Criterion (BIC) and bootstrap likelihood ratio test (BLRT) statistics indicate that the 4-class model fits the data best. The 4-class quadratic model had the lowest BIC score (6157.458),

Table 4.2. Latent class growth analysis model fit statistics for externalizing behavior (T-scores) trajectories (N=236)

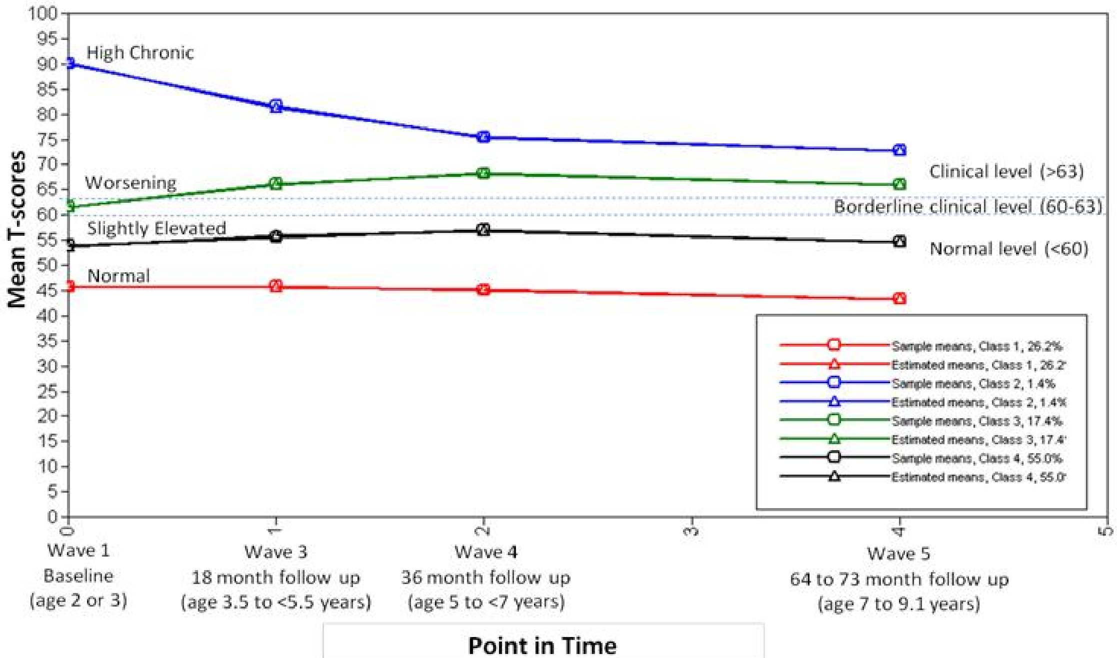
Number of classes	Log-likelihood	Lo Mendall Rubin	BLRT	AIC	BIC	Sample Size adj BIC	Entropy
Linear Models							
2	-3088.074	142.982 *p*=.2504	151.704 *p*<.0005	6194.149	6225.323	6196.797	.630
3	-3051.833	68.315 *p*=.1021	72.483 *p*<.0005	6127.666	6169.232	6131.196	.733
4	-3038.391	25.338 *p*=.0322	26.844 *p*<.0005	6106.782	6158.739	6111.195	.745
5	-3035.805	4.875 *p*=.0871	5.172 *p*=.3750	6107.609	6169.958	6112.905	.775
Quadratic Models							
2	-3081.358	149.911 *p*=.2114	156.770 *p*<.0005	6184.715	6222.817	6187.951	.634
3	-3043.253	72.874 *p*=.1673	76.209 *p*<.0005	6116.506	6168.464	6120.920	.733
4	**-3026.823**	**31.423 *p*=.0008**	**32.861 *p*<.0005**	**6091.645**	**6157.458**	**6097.235**	**.768**
5	-3022.111	9.012 *p*=.3123	9.424 *p*=.250	6090.221 6169.889	6169.889	6096.988	.763
4-class Models with TVCs							
Linear with TVC	-3036.138	26.140 *p*=.0586	27.735 *p*<.0005	6108.276	6170.625	6113.572	.746
Quadratic with TVC	-3026.274	30.879 *p*=.0015	32.292 *p*<.0005	6096.547	6172.751	6103.020	.769

TVC=time varying covariate, caregiver change. The TVC was non-significant at all time points in all models including TVC (2, 3, 4, and 5-class models). Only 4-class models are presented here.
Bold with gray shading highlights the model that fits the data best (the 4-class quadratic model), as indicated by both the BIC and BLRT tests. The 4-class model fit the data best in all four sets of models (linear, linear with TVC, quadratic with TVC), with the quadratic 4-class model fitting significantly better than the other 4-class models.

suggesting the best model fit (Muthén, 2008). In the two sets of models in which caregiver change was entered as a time-varying covariate (TVC), the TVC was not significant and thus did not improve the models. To further test this, a chi-square test was used to compare the 4-class linear model to the 4-class linear model with the TVC, and this test indicated no significant differences. Likewise, the chi-square test comparing the 4-class quadratic model to the 4-class quadratic model with the TVC indicated no significant difference. Thus, the chi-square tests confirmed that adding the time-varying covariate did not significantly improve the models. Entropy was higher for the 4-class quadratic LCGA model (.768) than the 4-class linear model (.745), indicating a better fit. The curvilinear shape of the trajectories in the quadratic model appeared to be well-estimated, with estimated means closely aligning (i.e., overlapping) with actual sample means (Figure 4.1).

The 4-class quadratic LCGA model for externalizing behavior appeared to fit the data better than the remaining models, but an additional statistical test was conducted to verify that this model was significantly better than the linear model, which had the next lowest BIC score. A chi-square test was used to rule out the possibility that no significant difference exists between the quadratic and linear LCGA models (null hypothesis). In this case, the chi square value (23.136) was well above the critical value (14.86) for 4 degrees of freedom at p=0.005. We can reject the null hypothesis that there is no difference. Adding the quadratic term improved the model significantly. Thus, the 4-class quadratic LCGA model was selected as the best fitting model, and was significantly better than the linear model.

Figure 4.1. Externalizing behavior trajectories: 4-class quadratic LCGA model of externalizing behaviors (T-scores) among children reported for neglect at age 2 or 3



Note: Class counts based on the estimated model and class counts based on posterior probabilities were extremely close, but not exact (e.g., for the *worsening* group, green, 41.12971 vs. 41.12966 children). Likewise, the means generated for these groups, presented in the figure above, were extremely close but not exact.

Externalizing behavior trajectories of young children reported for neglect. The 4-class quadratic LCGA model estimates that young children referred for neglect are likely to follow one of four different behavioral trajectories (Figure 4.1). Table 4.3 provides estimates for the intercepts, slopes, and quadratic terms for each of the four trajectories. First, one very small group of children (n = 3)[11] scored high in the clinical

[11] The 3 cases in the *high chronic* group may be considered outliers and in some analyses the 3 cases may be dropped from the analyses, combined with another group, or Winsorized. This study retains the group because the model statistics clearly indicated this was the best model fit, and because this group represents the reality that a very small group of children do have extreme and persistent behavioral problems. The characteristics of the *high chronic* group are presented descriptively. Due to the small group size, though, the *high chronic* group was combined with the *worsening* group into one *persistent problem* group for further statistical analyses.

Table 4.3. Externalizing behaviors: 4-class quadratic LCGA model estimates for intercepts, slopes, and quadratic terms (n=236)

Latent Class	Intercept				Slope				Quadratic Term			
	Estim.	***SE***	**Est/SE**	***p***	**Estim.**	***SE***	**Est/SE**	***p***	**Estim.**	***SE***	**Est/SE**	***p***
High chronic (blue)	90.113	4.139	21.773	<0.0005	-10.292	1.811	-5.682	<0.0005	1.483	0.377	3.931	<0.0005
Worsening (green)	61.584	1.489	41.352	<0.0005	5.581	1.593	3.503	<0.0005	-1.126	0.372	-3.027	0.002
Slightly elevated (black)	53.707	0.923	58.161	<0.0005	2.891	0.894	3.234	0.001	-0.668	0.214	-3.123	0.002
Normal (red)	45.775	1.204	38.010	<0.0005	0.026	1.286	0.020	0.984	-0.168	0.275	-0.609	0.542

range at age 2 or 3 (Wave 1) and declined over time following a curvilinear path. This group remained in the clinical range throughout the four time points, suggesting that problem behaviors persisted, and thus will be referred to as the *high chronic* behavior problem group. Second, a *worsening* behavior problem group (n=40) scored in the *borderline clinical* range at age 2 or 3 and had scores increase along a curvilinear path into the clinical range for the remaining waves, decreasing slightly at wave 5. A third group (n=134), the *slightly elevated* behavior problem group, had mean scores in the normal range at age 2 or 3 – with scores several points above the mean score for the normative population of non-referred children (Achenbach, 1992) – and followed a slightly increasing curvilinear path over time. Mean scores for this group remained in normal range over the five or six years of the study, although some children had scores in borderline or clinical range at some time points. Finally, a *normal* externalizing behavior group consistently scored in normal range. Mean scores for the *normal* externalizing behavior group were below the average score for normative populations, indicating very unproblematic behavior in this group overall.

Posterior probabilities of group membership were calculated for each child, indicating how likely each child is to belong to each of the four groups and to which group the child is most likely to be a member. Based on the average posterior probabilities for the most likely latent class membership, this model continues to show evidence of a good fit. The *slightly elevated* (AvePP=0.87), *normal* (AvePP=0.88), and *worsening* (AvePP=0.84) groups appear to be well identified, with individual children highly likely to be in their assigned group. The average posterior probability for the *high chronic* group is excellent (AvePP=0.996), but only 3 children were most likely to be in this group.

The majority of children in this sample (81.8% unweighted, 84.8% weighted) were most likely to belong in the *slightly elevated* (n=134, 56.8%, 54.8% weighted) or *normal* (n=59, 25.0% unweighted, 30.0% weighted) group. Approximately one-seventh of children were most likely to be members of the *worsening* group (n=40, 16.9% unweighted, 14.7% weighted). The *high chronic* group consisted of a very small group, with just 3 children (1.3% unweighted, 0.5% weighted). These proportions, based on most likely group membership, were similar to the proportions estimated in the model (55.0%, 26.2%, 17.4%, and 1.4%, respectively).

Internalizing Behaviors

Internalizing behavior scores. CBCL internalizing behavior scores for the children at each wave of data collection are presented in Table 4.4. Raw scores averaged 10.7 at Wave 1 (age 2 or 3) and by Wave 5 (age 7 to 9) averaged 7.7. Corresponding mean T-scores were in the normal range (*M*=54.53 at Wave 1 and *M*=52.52 at Wave 5), with the highest score at Wave 1. Although the children's T-scores at the age of 2 or 3 were in normal range, they were significantly higher (Mean difference=4.825; t=7.263, df=235, p<.0005) than the normative sample of non-referred children (M=49.7; Achenbach, 1991). At the same time, the children's scores were significantly lower (Mean difference=-7.475; t=-11.250, df=235, p<.0005) than the average for referred children (M=62.0; Achenbach, 1991). Compared to a sample of children at risk of maltreatment from the LONGSCAN study at Age 4 (Hunter et al., 2003), scores for the current study sample at Wave 3 were significantly higher (Mean difference=3.730; t=5.122, df=199, p<.0005). However there was no significant difference between the current study sample at Wave 4 and the LONGSCAN Age 6 interviews or the current study sample at Wave 5 and the LONGSCAN Age 8 interviews.

Table 4.4. Child Behavior Checklist (CBCL) internalizing behavior scores for young children who were the subject of child neglect reports and remained home at Wave 1: Mean scores for Waves 1, 3, 4 and 5

			Internalizing Raw Scores		Internalizing T-scores	
N=236	N	Missing	*M*	*SD*	*M*	*SD*
Study sample						
Wave 1 (2-3 yrs)	236	0	10.70	6.128	54.53	10.207
Wave 3 (3½ to <5 ½ yrs)	200	36	8.40	6.376	52.96	10.299
Wave 4 (5 to <7 yrs)	205	31	6.37	5.340	51.09	9.605
Wave 5 (7 to 9 yrs)	197	39	7.70	7.393	52.52	11.686
Normative populations						
*CBCL normative data^*						
Non-referred /Age 2-3	321		8.0	5.2	49.7*	9.7
Referred / Age 2-3	321		15.6	7.8	62.0*	11.4
*Children at risk of maltreatment/LONGSCAN ^^*						
Age 4	1121				49.23*	9.53
Age 6	1217				50.95	9.87
Age 8	1090				51.69	10.71

^ Achenbach,1992 (Age 2-3)
^^Hunter et al., 2003
*Significant difference (p<.0005) between normative population and NSCAW data. No significant difference between LONGSCAN Age 6 and W4 or LONGSCAN Age 8 and W5.

LCGA Model Selection. Model fit statistics for the linear and quadratic LCGA models for the CBCL Internalizing Behaviors subscale are presented in Table 4.5. In each of the four sets (linear, linear with TVC, quadratic, and quadratic with TVC) of 2, 3, 4, and 5-class models, the BIC and BLRT statistics indicate that the 2-class model fits the data best. In many of the models, including the 2-class model, warnings were issued

Table 4.5. Latent class growth analysis model fit statistics for internalizing behavior (T-scores) trajectories (N=236)

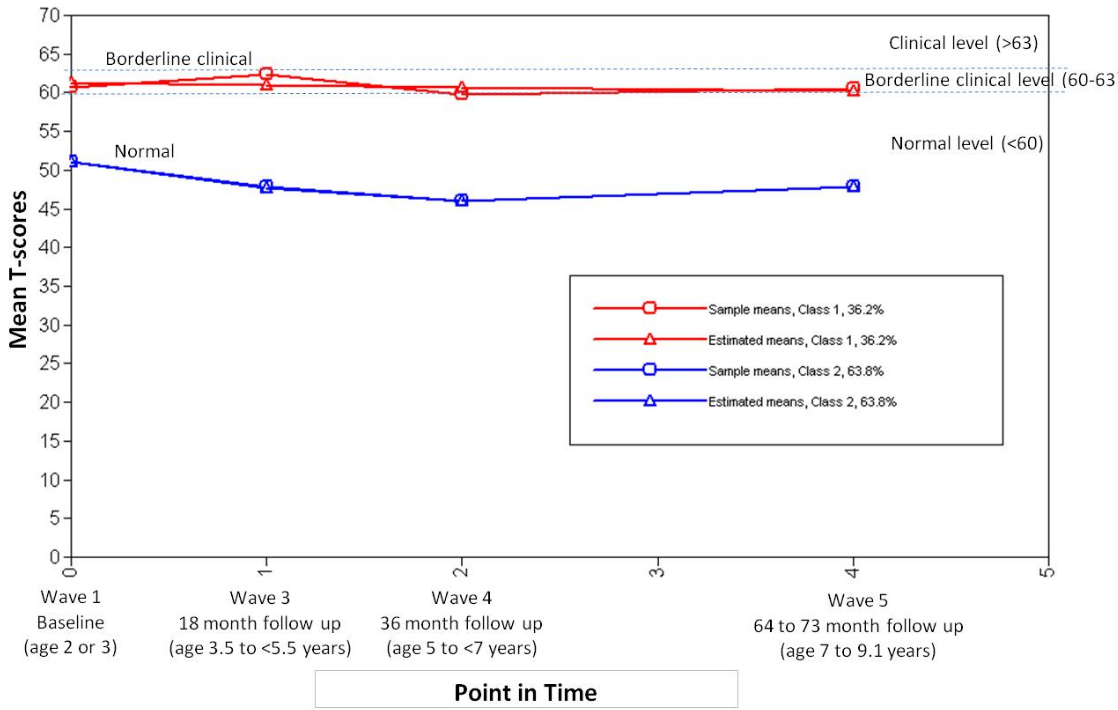
Number of classes	Log-likelihood	Lo Mendall Rubin	BLRT	AIC	BIC	Sample Size adj BIC	Entropy
Linear Models							
2	-3082.640	134.218 $p<.0005$	142.406 $p<.0005$	6183.279	6214.454	6185.927	0.714
3	-3078.348	8.089 $p=0.3280$	8.583 $p=0.0857$	6180.697	6222.263	6184.227	0.523
4	-3073.798	8.578 $p=0.1227$	9.101 $p=0.0857$	6177.596	6229.553	6182.009	0.586
5	-3073.139	1.242 $p=0.7143$	1.318 $p=0.6667$	6182.278	6244.627	6187.574	0.631
Quadratic Models							
2	**-3074.368**	**144.893** ***p* <.0005**	**151.522** ***P*<.0005***	**6170.737**	**6208.839**	**6173.973**	**0.727**
3	-3068.930	10.401 $p= 0.2640$	10.877 $p=.6000$	6167.860	6219.817	6172.273	0.551
4	-3061.301	14.590 $p= 0.1496$	15.258 $P= 0.0706$	6160.602	6226.415	6166.192	0.627
5	-3056.961	8.301 $p= 0.3423$	8.680 $P= 0.2083$	6159.921	6239.589	6166.688	0.663
2-class Models with TVCs							
Linear with TVC	-3080.251	136.452 $p<.0005$	144.777 $p<.0005$	6184.502	6226.068	6188.032	0.721
Quadratic with TVC	-3073.494	145.712 $p<.0005$	152.379 $p<.0005$	6174.989	6223.483	6179.108	0.732

TVC=time varying covariate, caregiver change. In the models with the TVC, the TVC was non-significant at all time points in all models. Models with 2, 3, 4 and 5-classes were tested, but only the 2-class models with TVC's are presented here.
Bold highlights the quadratic LCGA model that fits the data best (the 2-class quadratic model), as indicated by both the BIC and BLRT tests. The 2-class model also fit the data best among the linear models and the quadratic model with a TVC, but the quadratic 2-class model was significantly better than the other 2-class models.

regarding problems with convergence and possible local maxima, with the recommendation to increase the number of random starts; the number was increased to 50 or 100 random starts and the models then converged properly . The 2-class quadratic model had the lowest BIC score (6208.839), suggesting the best model fit. In the two models with time varying covariates (TVC's), caregiver change (the TVC) was not significant and did not improve the model. To further test this, a chi-square test was used to compare the 2-class linear model to the 2-class linear model with the TVC, and this test indicated no significant differences. Likewise, the chi-square test comparing the 2-class quadratic model to the 2-class quadratic model with the TVC indicated no significant difference. Thus, the chi-square tests confirmed that adding the time-varying covariate did not significantly improve the models. Entropy was highest for the 2-class quadratic LCGA model (.727), providing another indicator of a good fit. The curvilinear shape of the trajectories in the quadratic model appeared to be well-estimated, with estimated means aligning very well with actual sample means for one group and relatively well for the other group (Figure 4.2).

An additional statistical test was conducted to verify that the 2-class quadratic LCGA model was significantly better than the linear model, which had the next lowest BIC score. As described earlier, a chi-square test was used to rule out the possibility that no significant difference exists between the quadratic and linear LCGA models (null hypothesis). When comparing these two models, the chi square value (16.544) was above the critical value (10.597) for 2 degrees of freedom at p=0.005. We can reject the null hypothesis that there is no difference. Adding the quadratic term improved the

Figure 4.2. Internalizing behavior trajectories: 2-class quadratic LCGA model of internalizing behaviors (T-scores) among young children reported for neglect



model significantly. Thus, the 2-class quadratic LCGA model was the best fit, and fit the data significantly better than the 2-class linear model for internalizing behaviors.

Internalizing behavior trajectories of young children reported for neglect. The 2-class quadratic LCGA model estimates that young children referred for neglect are likely to follow one of two different internalizing behavior trajectories (Figure 4.2). Table 4.6 provides estimates for the intercepts, slopes, and quadratic terms for the two trajectories. One group scored in the *borderline clinical* range at age 2 or 3 (Wave 1) and continued to score in this range over time. Both the slope and quadratic term were non-significant, indicating that on average scores were stable in this group over time. The other group of children scored in the *normal* range at age 2 or 3 and followed a

Table 4.6. Internalizing behaviors: 2-class quadratic LCGA model estimates for intercepts, slopes, and quadratic terms (n=236)

Latent Class	**Intercept**				**Slope**				**Quadratic Term**			
	Estim.	***SE***	**Est/SE**	***p***	**Estim.**	**SE**	**Est/SE**	***p***	**Estim.**	***SE***	**Est/SE**	***p***
Borderline Clinical	61.254	1.176	52.066	<.0005	-0.297	1.158	-0.256	0.798	0.006	0.286	0.020	0.984
Normal	51.091	0.772	66.214	<.0005	-4.216	0.843	-5.003	<.0005	0.853	0.186	4.577	<.0005

curvilinear path that decreased an estimated 4 points then increased slightly, and always remained well within normal range throughout the five or six years.

Posterior probabilities of group membership were calculated for each child, indicating how likely each child is to belong to each group and to which group the child is most likely to be a member. Based on the posterior probabilities from the 2-class quadratic LCGA model for internalizing behaviors, individual children were assigned to the class in which they were most likely to be a member. The average posterior probabilities for the most likely latent class membership provide further support that this model is a good fit. Both the *borderline clinical* (AvePP=.89) and *normal* (AvePP=.94) groups appear to be well identified, with individual children highly likely to be in their assigned group.

Two-thirds of children in this sample were most likely to belong in the *normal* group (n=151, 64.0% unweighted, 66.1% weighted), and the remaining children (n=85, 36.0% unweighted, 33.9% weighted) were most likely to be members of the *borderline clinical* group. These proportions based on most likely group membership were similar to the proportions estimated in the model (63.8% and 36.2%, respectively).

Relations between Internalizing and Externalizing Behavior Trajectory Groups

Membership in the externalizing trajectory groups was compared to membership in the internalizing trajectory groups, basing group membership on the individual children's most likely class membership. There were 34 children (14.4% unweighted, 12.9% weighted) who were members of both the *borderline clinical* internalizing group and the *persistent externalizing problem* groups, including all three children from the *high chronic* externalizing group. Most of the children (n=142, 60.2% unweighted, 63.9% weighted) were members of *normal* internalizing and externalizing groups. The remaining children were members of a single problem group, either the *borderline clinical* internalizing (n=51, 21.6% unweighted, 20.95% weighted) or *persistent externalizing problem* (n=9, 3.8% unweighted, 2.3% weighted) trajectory groups. Thus, a large portion (n=202, 85.6% unweighted, 87.1% weighted) did not have co-occurring membership in internalizing problem and externalizing problem groups.

Bivariate analysis (chi square) was conducted using weighted data to explore whether or not there is a statistically significant relation between membership in the internalizing and externalizing behavior groups in this group of high-risk children. There was a significant relation between internalizing and externalizing group membership (Adjusted Wald F=9.951, $p<.0005$). Children in the *persistent externalizing problem* group were more likely to be in the *borderline clinical internalizing* group (85.2%) than the *normal internalizing* group (14.8%).

Summary

Children reported for neglect at age 2 or 3 are likely to follow one of four externalizing behavior paths and one of two internalizing behavior paths. Most children

(84.8%) are likely to be members of a *slightly elevated* or *normal* externalizing behavior trajectory group. However, there are some children (15.2%) who are likely to be members of *persistent externalizing problem* trajectory groups (*high chronic* and *worsening*). Likewise, two-thirds of these young children are likely to be members of a *normal* internalizing trajectory group, whereas about one-third (33.9%) are likely to be members of a *borderline clinical* internalizing behavior group. In sum, the majority of children reported for neglect at age 2 or 3 are likely to follow relatively normal behavioral paths over the following 5 or 6 years; a smaller proportion exhibit persistent internalizing and behavior problems in the borderline and clinical range.

AIM 2: RELATIONS BETWEEN CAREGIVING ENVIRONMENT AND BEHAVIOR TRAJECTORY GROUP MEMBERSHIP

As discussed above, the majority of the young children reported for neglect who remain home follow *slightly elevated* (54.8%) or *normal* (30.0%) externalizing behavior trajectories over the following five or six years, and two-thirds (66.1%) follow *normal* internalizing behavior trajectories, based on most likely group membership (Table 4.7, weighted data). However, some of these young children have externalizing and internalizing behavior problems. Approximately 15% of the children follow *worsening* externalizing paths and a small group of children (0.51%) have very *high chronic* behavior problems that persist over time. Also one-third (33.86%) of the young children have persistent borderline internalizing problems over time. Moreover, 14.4% of the children (1 in 7) were members of both the *borderline clinical* internalizing trajectory group and one of the *persistent externalizing problem* groups. It is important to understand what factors in the caregiving environment predict membership in the externalizing and internalizing problem groups.

Table 4.7. Most Likely Group Membership: Number of Children in Each Externalizing and Internalizing Trajectory Group

	Actual sample (unweighted data) n=236		Population Estimates (weighted data) n=125,606 (*SE*=14,609.38)	
Characteristics	n	%	%	95% CI
Externalizing behaviors	236			
Externalizing Behavior Problems				
High chronic	3	1.27	0.51	0.16-1.65
Worsening	40	16.95	14.65	8.97-23.03
Slightly elevated	134	56.78	54.82	45.68-63.65
Normal	59	25.00	30.02	20.33-41.90
Internalizing behaviors	236			
Borderline Clinical	85	36.02	33.86	25.70-43.11
Normal	151	63.98	66.14	56.89-74.30

CI=Confidence Interval

Following the transactional model, this study examined possible predictors of membership in the externalizing and internalizing behavior trajectory groups at three levels: child characteristics, parent and parenting characteristics, and the broader caregiving environment, using data collected at Wave 1 of the study. First, bivariate analyses were used to describe the characteristics of children and their families in each trajectory group. Next, multinomial analyses were conducted to identify factors in the caregiving environment that predict membership in the trajectory groups in multivariate models. Due to the very small size of the *high chronic* externalizing problem group, the *high chronic* and *worsening* problem trajectory groups were combined into one group (*persistent externalizing problems*) for bivariate and multinomial analyses. Thus, three externalizing behavior groups and two internalizing behavior groups were examined. In addition, children who were members of both the *borderline clinical* internalizing problem group and the *persistent externalizing problem* group were identified in order to explore predictors of co-occurring membership in internalizing and externalizing problem trajectory groups.

The internalizing and co-occurring models had two categories for the outcome variable, and thus could have used the binary logistic regression procedures (LOGISTIC), but the MULTILOG procedure was used instead to provide consistency across all three sets of models (externalizing with 3 groups, and internalizing and co-occurring with 2 groups each). Multinomial logistic regression is a generalization of binary logistic regression, and therefore the MULTILOG procedure was deemed appropriate for analyses of the internalizing and co-occurring groups[12]. A summary of the variables entered in each of the multinomial models is provided in Chapter 3, Table 3.3. Results of all analyses are weighted and significant relationships are highlighted with asterisks.

Characteristics of Children and Families in Each Trajectory Group

Results of bivariate analyses of baseline characteristics are provided in the tables below for externalizing (Tables 4.8a and 4.8b) and internalizing (Tables 4.9a and 4.9b) trajectory groups. The characteristics of each of these groups of children are summarized in the following two sections.

Externalizing behavior trajectory group. The characteristics of children in each of the four externalizing behavior trajectory groups were identified using weighted population estimates for categorical (Table 4.8a) and continuous (Table 4.8b) independent variables. Although descriptive data are provided for children in the *high*

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[12] According to the online SUDAAN manual, the MULTILOG procedure, used in the current study, "Fits logistic and multinomial logistic regression models to ordinal and nominal categorical data and computes hypothesis tests for model parameters; estimates odds ratios and their confidence intervals for each model parameter; uses GEE to efficiently estimate regression parameters, with robust and model-based variance estimation" (Research Triangle Institute, 2001, p.34).

Table 4.8a. Characteristics of children in externalizing behavior trajectory groups and bivariate analyses[13] using weighted data: Categorical variables (unweighted n=236, weighted=125,606)

		Persistent Externalizing Problems		Normal Range		Chi-square	
Variable	Total N	*High chronic* %	*Worsening* %	*Slightly elevated* %	*Normal* %	Adj. Wald F	*p-value*
% based on most likely group membership	236	3	40	134	59		
Unweighted %		1.3%	17.0%	56.8%	25.0%		
Weighted %		0.5%	14.7%	54.8%	30.0%		
Child Characteristics							
Gender	236					0.895	0.414
Male	122	30.0%	47.7%	59.6%	51.0%		
Female	114	70.0%	52.3%	40.4%	49.0%		
Racial or Ethnic Minority	236					2.363	0.102
Yes	114	0.0%	28.8%	57.3%	64.8%		
No	122	100.0%	71.2%	42.7%	35.3%		
Race/Ethnicity	236					1.073	0.389
White, Non-Hispanic	122	100.0%	71.2%	42.7%	35.3%		
Black, Non-Hispanic	70	0.0%	25.8%	36.4%	39.4%		
Hispanic or Latino	27	0.0%	1.1%	13.4%	17.8%		
Other race or ethnicity	17	0.0%	1.9%	7.4%	7.6%		
Chronic health problem	236					1.784	0.176
Yes	58	73.2%	52.4%	26.9%	17.2%		
No	178	26.9%	47.7%	73.1%	82.9%		
Parent and Parenting Characteristics							
Caregiver age <21	236					0.022	0.979
Yes	24	0.0%	8.3%	9.5%	8.6%		
No	212	100.0%	91.7%	90.5%	91.4%		
Race/Ethnicity	236					1.268	0.286
White, Non-Hispanic	135	100.0%	63.5%	47.2%	43.8%		
Black, Non-Hispanic	59	0.0%	19.6%	29.5%	44.1%		
Hispanic or Latino	18	0.0%	0.2%	11.3%	7.2%		
Other race or ethnicity	24	0.0%	16.7%	11.9%	4.9%		

[13] Due to the small size of the *high chronic* group (n=3), the *high chronic* and *worsening* groups were combined into one persistent externalizing problem group (n=43) for statistical comparison with the *slightly elevated* and *normal* groups. Adjusted Wald F and *p-value*s are based on comparison of three groups.

Table 4.8a. Characteristics of children in externalizing behavior trajectory groups and bivariate analyses[14] using weighted data: Categorical variables (unweighted n=236, weighted=125,606), Continued

		Persistent Externalizing Problems		Normal Range		Chi-square	
Variable	Total N	*High chronic* %	*Worsening* %	*Slightly elevated* %	*Normal* %	Adj. Wald F	*p-value*
Marital status	236					0.737	0.658
Married	64	0.0%	27.8%	24.8%	22.0%		
Separated	29	0.0%	18.2%	13.5%	4.3%		
Divorced	29	43.1%	9.6%	8.1%	8.9%		
Widowed	2	0.0%	0.0%	1.8%	0.0%		
Never married	112	56.9%	44.4%	52.0%	64.8%		
Single caregiver	236					0.088	0.916
Yes	172	100.0%	72.2%	75.2%	78.0%		
No	64	0.0%	27.8%	24.8%	22.0%		
Low caregiver education (<HS)	235					3.363	0.041*
Yes	70	100.0%	52.4%	35.9%	13.4%		
No	165	0.0%	47.6%	64.1%	86.6%		
Caregiver Degree	235					2.289	0.070^
Less than high school	70	0.0%	52.4%	35.9%	13.4%		
High school	119	70.0%	44.9%	50.2%	51.7%		
High school plus	46	30.0%	2.7%	13.9%	34.9%		
Caregiver depression	221					4.286	0.018*
Yes	52	70.0%	42.9%	19.5%	7.2%		
No	169	30.0%	57.1%	80.5%	92.8%		
Substance Dependency	234					0.971	0.384
Yes	12	0.0%	7.1%	2.7%	10.2%		
No	222	100.0%	92.9%	97.3%	89.8%		
Broader Caregiving Environment							
Have 4 or more children	236					0.5061	0.605
Yes	45	0.0%	33.2%	18.4%	25.4%		
No	191	100.0%	66.8%	81.6%	74.6%		
Number of children in HH	236					0.685	0.703
1 child	65	43.1%	34.8%	24.7%	36.0%		
2 children	83	26.9%	20.9%	35.5%	30.8%		
3 children	43	30.0%	11.1%	21.5%	7.9%		
4 children	21	0.0%	12.3%	10.2%	21.7%		
5 or more children	24	0.0%	20.9%	8.2%	3.7%		

[14] Due to the small size of the *high chronic* group (n=3), the *high chronic* and *worsening* groups were combined into one persistent externalizing problem group (n=43) for statistical comparison with the *slightly elevated* and *normal* groups. Adjusted Wald F and *p-value*s are based on comparison of three groups.

Table 4.8a. Characteristics of children in externalizing behavior trajectory groups and bivariate analyses[15] using weighted data: Categorical variables (unweighted n=236, weighted=125,606), Continued

		Persistent Externalizing Problems		Normal Range		Chi-square	
Variable	Total N	*High chronic* %	*Worsening* %	*Slightly elevated* %	*Normal* %	Adj. Wald F	*p-value*
Domestic violence	206					0.784	0.461
Yes	55	73.2%	27.5%	17.4%	16.2%		
No	151	26.9%	72.5%	82.6%	83.8%		
Poverty	215					0.122	0.885
<= 1999 US Pov. Line	121	100.0%	60.9%	57.7%	63.3%		
Above poverty line	94	0.0%	39.1%	42.3%	36.7%		
Child Welfare Services							
Type of Alleged Neglect	236					0.101	0.904
Physical neglect	83	73.2%	35.0%	31.3%	36.2%		
Lack of supervision	153	26.9%	65.0%	68.7%	63.8%		
Outcome of investigation or assessment	235					0.296	0.746
Substantiated or Indicated	127	30.0%	42.6%	32.1%	31.3%		
Other (Neither S/I, Risk)	109	70.0%	57.4%	67.9%	68.7%		
Receipt of ongoing child welfare services (in home)	236					0.607	0.548
No services	104	0.0%	75.0%	64.2%	76.0%		
Services	132	100.0%	25.0%	35.9%	24.0%		

*p<.05 **p<.005 ***p<.0005; ^p<.10 (trend)

[15] Due to the small size of the *high chronic* group (n=3), the *high chronic* and *worsening* groups were combined into one persistent externalizing problem group (n=43) for statistical comparison with the *slightly elevated* and *normal* groups. Adjusted Wald F and *p-value*s are based on comparison of three groups.

Table 4.8b. Characteristics of children in externalizing behavior trajectory groups and bivariate analyses using weighted data: Continuous variables (unweighted n=236, weighted=125,606)

		Persistent Externalizing Problems		Normal Range			
Variable	N	*High chronic* *M (SE)*	*Worsening* *M (SE)*	*Slightly elevated* *M (SE)*	*Normal* *M (SE)*	Adj. Wald F	*p-value*
Parent and Parenting Characteristics							
Caregiver Age	236	25.0 (1.32)	26.5 (1.76)	26.4 (0.86)	27.7 (1.14)	0.36	0.697
HOME scores							
Parental responsiveness	215	1.0 (0.00)	0.90 (0.06)	0.86 (0.04)	0.89 (0.05)	0.24	0.790
Learning Stimulation	234	0.61 (0.21)	0.71 (0.06)	0.79 (0.04)	0.81 (0.03)	1.19	0.310
Parent self-report of assault-ive/neglectful behavior (CTS-PC)							
Assaultive behavior[16]	234	47.7 (10.63)	21.8 (5.52)	11.7 (2.01)	12.8 (5.63)	1.57	0.216
Neglectful behavior	233	6.7 (6.12)	1.2 (0.57)	2.0 (0.80)	1.4 (0.86)	0.18	0.836
Broader Caregiving Environment							
Number of children in HH: Mean (std. err.)	236	1.9 (0.51)	2.6 (0.49)	2.4 (0.19)	2.3 (0.30)	0.19	0.830
Family income category: Mean (std. err.)	236	2.5 (0.49)	3.9 (0.48)	4.1 (0.47)	4.0 (0.55)	.07	0.935
Cumulative Risk							
Total number of risks	179	5.16 (0.49)	4.90 (0.29)	4.41 (0.34)	4.21 (0.24)	1.69	0.193

M=Mean; *SE*=Standard Error ; HOME=Home Observation Measure of the Environment; CTS-PC=Conflict Tactic Scale–Parent Child.
**p*<.05 ***p*<.005 ****p*<.0005; ^*p*<.10 (trend)

[16] All children with data were included in calculation of mean scores (weighted data). Physical assault mean scores were re-run in a subgroup of parents, including only those parents with scores >0 (n=177), in order to compare scores to findings from Straus et al. (2003). The average mean score from Straus and colleagues was 13.4. Mean scores were higher in all trajectory groups in the current study, ranging from *M*=15.94 (*SE*=2.42) in the moderate low group to *M*= 29.0 (*SE*=5.16) in the persistent externalizing was 19.21 (*SE*=3.71).

chronic group, this group was combined with the *worsening* problem group for statistical analyses, together designated the *persistent externalizing problem* group.

In bivariate analysis only two variables were statistically significantly related to externalizing behavior trajectory group membership. Caregiver education (less than high school) was significantly related to externalizing behavior trajectory group membership (p=0.041). Within the group of parents with less than a high school education, just 12.3% were in the *normal* group, 24.6% in the *persistent externalizing problem* group, and 63.1% in the *slightly elevated* group[17]. Within the group of parents with a high school education or higher, a higher proportion (36.6%) of children was in the *normal* group, and a smaller proportion (11.1%) was in the *persistent problem* group, with 52.2% in the *slightly elevated* group. Thus, when parents of children reported for neglect have low education (less than high school), their children are less likely to be in the *normal* group, and conversely more likely to be in the *persistent problem* group. Conversely, children with more educated parents (high school or above) are less likely to be in the *persistent problem* group and more likely to be in the *normal* group.

In addition to education, caregiver depressive symptoms were significantly related to externalizing behavior trajectory group membership (p=.018). Within the group of parents with depressive symptoms, 10.1% were in the *normal* group, 35.9% in the *persistent problem* group, and 54.1% in the *slightly elevated* group. Within the group of parents without depressive symptoms, 55.8% were in the *slightly elevated* group, which is similar to the percent found for parents with depressive symptoms; however a larger proportion were in the *normal* group (32.7%) and a smaller proportion were in the

[17] The percentages reported in the text do not match those in the table because the table shows % within the trajectory groups, whereas the % in the text are within the levels of the IV as needed for interpretation of a significant chi square test.

persistent problem group (11.5%) compared to children of parents with depressive symptoms. Thus, when parents reported depressive symptoms children were more likely to be in the *persistent problem* group, whereas parents not reporting depressive symptoms were more likely to have children in the *normal* trajectory group.

Internalizing Behavior Trajectory Groups. The characteristics of children in each of the two internalizing behavior trajectory groups were identified using weighted population estimates for categorical (Table 4.9a) and continuous (Table 4.9b) variables. In bivariate analyses, gender (p=0.026) and caregiver degree (p =0.042) were the only two variables significantly related to internalizing behavior trajectory group membership. A larger proportion of boys (43.3%) than girls (22.2%) were most likely to be members of the *borderline clinical* internalizing trajectory group rather than the *normal* internalizing group. Parent's with less education (35.5% less than high school, 43.0% high school) were more likely to have children in the *borderline clinical* group than parents with more than a high school education (8.86%). There was also a trend toward a relation between parent self-report of physically assaultive behavior toward the child and internalizing behavior trajectory group (p=0.053), with parents in the *borderline clinical* group reporting more assaultive behaviors toward the child. There were no other statistically significant relations or trends in the bivariate analyses.

Table 4.9a. Characteristics of children in two classes of internalizing behavior trajectories and bivariate analyses using weighted data: Categorical variables (unweighted n=236, weighted=125,606)

Variable	Un-weighted N	Weighted Data Borderline Clinical %	Normal %	Adjusted Wald F	*p-value*
% based on most likely group membership	236	85	151		
Unweighted%		36.0%	64.0%		
Weighted %		33.9%	66.1%		
Child Characteristics					
Gender	236			5.223	0.026*
Male	122	70.6%	47.3%		
Female	114	29.4%	52.7%		
Racial or Ethnic Minority	236			1.470	0.230
Yes (Black, Hispanic, Other)	114	47.0%	59.2%		
No (White, Non-Hispanic)	122	53.0%	40.8%		
Race/Ethnicity	236			0.570	0.637
White, Non-Hispanic	122	53.0%	40.8%		
Black, Non-Hispanic	70	32.5%	37.2%		
Hispanic or Latino	27	10.3%	14.2%		
Other race or ethnicity	17	4.2%	7.9%		
Chronic health problem	236			0.012	0.914
Yes	58	28.6%	27.6%		
No	178	71.4%	72.4%		
Parent and Parenting Characteristics					
Caregiver Age is <21	236			1.414	0.239
Yes	24	15.5%	5.7%		
No	212	84.6%	94.3%		
Race/Ethnicity	236			0.281	0.839
White, Non-Hispanic	135	51.6%	47.4%		
Black, Non-Hispanic	59	26.8%	35.1%		
Hispanic or Latino	18	9.6%	7.8%		
Other race or ethnicity	24	12.0%	9.7%		
Single caregiver	236			0.480	0.491
Yes	172	80.5%	73.3%		
No (married)	64	19.5%	26.7%		
Marital status	236			1.173	0.331
Married	64	19.5%	26.7%		
Separated	29	18.2%	7.8%		
Divorced	29	12.0%	7.1%		
Widowed	2	0.0%	1.5%		
Never married	112	50.3%	57.0%		

Table 4.9a. Characteristics of children in two classes of internalizing behavior trajectories and bivariate analyses using weighted data: Categorical variables (unweighted n=236, weighted=125,606), Continued

Variable	Un-weighted N	Weighted Data Borderline Clinical %	Normal %	Adjusted Wald F	*p-value*
Low caregiver education (<HS)	235			0.020	0.887
Yes	70	32.7%	31.1%		
No	165	67.3%	68.9%		
Caregiver Degree	235			3.324	0.042*
Less than high school	70	32.7%	31.1%		
High school	119	62.5%	43.4%		
High school plus	46	4.7%	25.5%		
Caregiver depression	221			1.646	0.204
Yes	52	27.6%	15.8%		
No	169	72.4%	84.2%		
Substance Dependency	234			0.134	0.715
Yes	12	6.5%	4.9%		
No	222	93.5%	95.1%		
Broader Caregiving Environment					
Number of children in HH	236			0.992	0.419
1 child	65	37.2%	25.8%		
2 children	83	30.3%	32.7%		
3 children	43	17.6%	15.0%		
4 children	21	4.2%	18.8%		
5 or more children	24	10.7%	7.6%		
4 or more children in HH	236			1.609	0.209
Yes, 4 + children	45	15.0%	26.4%		
No, 3 or fewer children	191	85.0%	73.6%		
Domestic violence last year	206			1.463	0.231
Yes	55	25.1%	15.6%		
No	151	74.9%	84.4%		
Poverty	215			0.064	0.801
<= 1999 US Pov. Line	121	61.7%	59.1%		
Above poverty line	94	38.4%	40.9%		
Child Welfare Services					
Type of Alleged Neglect	236			2.050	0.157
Physical neglect	83	23.1%	38.9%		
Lack of supervision	153	76.9%	61.1%		
Outcome of investigation or assessment	235			0.004	0.950
Substantiated or Indicated	127	33.8%	33.2%		
Other (Neither S/I, or Risk)	108	66.2%	66.8%		

Table 4.9a. Characteristics of children in two classes of internalizing behavior trajectories and bivariate analyses using weighted data: Categorical variables (unweighted n=236, weighted=125,606), Continued

Variable	Un-weighted N	Weighted Data Borderline Clinical %	Normal %	Adjusted Wald F	*p-value*
Receipt of ongoing child welfare services (in home)	236			0.008	0.930
No services	104	68.4%	69.3%		
Services	132	31.6%	30.8%		

**p*<.05 ***p*<.005 ****p*<.0005; ^*p*<.10 (trend)

Table 4.9b. Characteristics of children in two classes of internalizing behavior trajectories and bivariate analyses using weighted data: Continuous variables (unweighted n=236, weighted=125,606)

Variable	Un-weighted	Weighted Data: Borderline Clinical		Normal		Adjusted Wald F	*p-value*
	N	*M*	*SE*	*M*	*SE*		
Parent and Parenting Characteristics							
Caregiver age	236	25.7	1.33	27.3	0.59	1.18	0.281
HOME environment scores							
Parental responsiveness	215	0.82	0.06	0.90	0.02	1.53	0.221
Learning Stimulation	234	0.77	0.04	0.79	0.03	0.08	0.772
Parent self-report of physically assaultive or neglectful behavior (CTS-PC):							
Assaultive behavior[18]	234	18.6	3.99	11.1	2.67	3.87	0.053^
Neglectful behavior	233	2.4	0.77	1.4	0.72	0.81	0.370
Broader Caregiving Environment							
Mean number of children (std. err.)	236	2.2	0.24	2.5	0.17	1.52	0.223
Family income category	215	3.6	0.36	4.3	0.42	1.38	0.244
Cumulative risk in the caregiving environment							
Total number of risks:	236	4.5	0.21	4.5	0.28	0.0	1.000

M=Mean; *SE*=Standard Error ; HOME=Home Observation Measure of the Environment; CTS-PC=Conflict Tactic Scale–Parent Child.
**p*<.05 ***p*<.005 ****p*<.0005; ^*p*<.10 (trend)

[18] All children with data were included in calculation of mean scores (weighted data). Physical assault mean scores were re-run in a subgroup of parents, including only those parents with scores >0 (n=177), in order to compare scores to findings from Straus et al. (2003). The average mean score from Straus and colleagues was 13.4. Mean scores were higher in the current study, ranging from *M*=16.17 (*SE*=4.24) in the normal group to *M*= 24.36 (*SE*=3.96) in the borderline clinical internalizing group. For all children, *M*=19.21 (*SE*=3.71).

Factors in the Caregiving Environment Predicting Behavior Trajectories

The relations between factors in the caregiving environment and behavior trajectory group membership were tested by entering 12 independent variables into several multinomial logistic regression models (see Chapter 3, Table 3.3 for a summary of the variables entered in each of the multinomial models). The first two models test the the association between caregiving environment and internalizing and externalizing behaviors. The third model explores the relation between caregiving environment and co-occurring membership in internalizing and externalizing behavior problem groups. Consistent with transactional theory, independent variables were grouped according to the following levels: child factors, parent and parenting characteristics, and the broader caregiving environment.

A total of 178 children (unweighted), representing an estimated 92,404 children (weighted), were included in the analysis, after cases with missing data for independent variables were excluded. The subsample (n=178) included in the models was similar to the complete sample (n=236 unweighted, n=125,606 weighted) in the proportion of children represented in each trajectory group for both internalizing and externalizing behaviors. There were no statistically significant differences between the subsample and excluded cases for the child and caregiving environment characteristics, with the exception of income (Appendix B). Families with lower income were significantly more likely to be excluded due to missing data on background characteristics (Adj Wald F=5.42, p=0.023). However, the effect was small, accounting for only 3.9% of the variance (Multiple R^2=0.039). Results from the three multinomial logistic regression models testing the relations between caregiving environment on externalizing behaviors, internalizing behaviors, and co-occurring internalizing and externalizing behaviors are presented below.

Predicting externalizing behavior trajectories. In the model testing the association between factors in the caregiving environment and membership in externalizing trajectory groups, three variables from baseline are statistically significant (p<.05) predictors of membership in the externalizing behavior trajectory groups (Table 4.10). Minority status, the parent's report of physically assaultive behavior toward the child, and household income predicted externalizing group membership. There were also trends toward significance for low caregiver education and number of children in the household (Table 4.10). Results from the post hoc analysis (Table 4.11) identify which trajectory groups (*persistent problem* and *normal*) were different from the *slightly elevated* group for the significant predictors, and the odds of being in these groups compared to the *slightly elevated* group. The *slightly elevated* group was selected as the reference group because the average scores for this group are closest to average scores in a non-clinical normative population and more than half the children were most likely to be members of this group.

Children with persistent externalizing problems. Compared to the *slightly elevated* externalizing behavior group, children in the *persistent externalizing problem* group were more likely to be non-minority (White), lower income, and parents were more likely to report physically assaultive behaviors toward the child (Table 4.11). The odds ratio for being in the *persistent problem* group compared to the *slightly elevated* group is 78% less for minority children than White children. For each increase in

Table 4.10. Multinomial logistic regression identifying factors in the caregiving environment that predict membership in externalizing behavior trajectory groups (weighted data; unweighted n=178, weighted n=92,404)

	df	Adjusted Wald F	*p-value*
Child characteristics			
Minority status	2	3.29	0.044*
Chronic health problems	2	1.16	0.321
Parent and Parenting Characteristics			
Caregiver age	2	1.58	0.215
Education level less than high school	2	2.59	0.083^
Single caregiver	2	1.26	0.291
Depressive symptoms	2	0.97	0.385
Learning stimulation (HOME)	2	2.22	0.117
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	2	7.71	0.001**
Neglectful behaviors (CTS-PC)	2	2.35	0.103
Broader Caregiving Environment			
Domestic violence toward caregiver	2	0.99	0.378
Number of children in the home	2	2.67	0.077^
Household income	2	3.85	0.026*

HOME=Home Observation Measure of the Environment; CTS-PC=Conflict-Tactic Scale–Parent Child.
*$p<.05$ **$p<.005$ ***$p<.0005$; ^$p<.10$ (trend)

income category[19], the odds ratio for being in the *persistent problem* group (compared to the *slightly elevated* group) decreased by 23%. In other words, children with higher household incomes are *less likely* to be members of the *persistent problem* group. For each 1 point increase in parent-reported assaultive behaviors toward the child[20], the odds ratio of being in the *persistent problem* group compared to the *slightly elevated* group increases by 9%.

[19] 11 categories, ranging from less than $5,000 to more than $50,000
[20] Ranging from 0 to 98

Table 4.11. Odds ratios for statistically significant predictors of externalizing behavior trajectory groups, comparing membership in *persistent problem* group and *normal* group to *slightly elevated* externalizing behavior group (reference group) (weighted data)

Variable	Group	B	SE of B	t-test	*p-value*	Odds ratio	95% CI for Odds Ratio
Minority	Persistent Problem	-1.52	0.76	-2.00	0.0497*	0.22	0.05-1.00[a]
	Normal	0.94	0.66	1.41	0.164	2.55	0.68-9.60
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	Persistent Problem	0.09	0.03	3.19	0.002**	1.09	1.03-1.16
	Normal	-0.06	0.03	-1.86	0.068^	0.94	0.89-1.06
Household income	Persistent Problem	-0.26	0.11	-2.39	0.020*	0.77	0.62-0.96
	Normal	0.12	0.13	0.92	0.361	1.13	0.86-1.48

CI=Confidence Interval; CTS-PC=Conflict-Tactic Scale–Parent Child.
**p*<.05 ***p*<.005; ^*p*<.10 (trend)
[a] The upper confidence interval is not actually 1.00, but was rounded up to 1.00 at two decimal places.

Children with normal externalizing behaviors. There were no statistically significant differences between children with *normal* externalizing behaviors and children with *slightly elevated* externalizing behaviors. There was a trend toward parents reporting fewer physically assaultive behaviors toward the child in the *normal* group compared to the *slightly elevated* group. Both groups of children had scores that, on average, remained in the normal range during the course of the study.

Predicting internalizing behavior trajectories. Two variables from baseline are statistically significant (p<.05) predictors of membership in the internalizing behavior trajectory groups (Table 4.12). Minority status and the parent's report of physically assaultive behavior toward the child predicted internalizing group membership. The odds of being in the *borderline clinical* internalizing group compared to the *normal* internalizing behavior group for these variables are presented in Table 4.13.

Compared to the *normal* internalizing behavior group, children in the *borderline clinical* internalizing problem group were more likely to be non-minority (White) and have parents who were more likely to report physically assaultive behaviors toward the child. The odds ratio for being in the *borderline clinical* group compared to the *normal* group is 68% less for minority children than White children. For each 1 point increase in parent-reported assaultive behaviors toward the child, the odds ratio of being in the *borderline clinical* group compared to the *normal* group increases by 5%.

Table 4.12. Multinomial logistic regression identifying factors in the caregiving environment that predict membership in internalizing behavior trajectory groups (weighted data; unweighted n=178, weighted n=92,404)

	df	Adjusted Wald F	*p-value*
Child characteristics			
Minority status	1	4.50	0.038*
Chronic health problems	1	1.29	0.261
Parent and Parenting Characteristics			
Caregiver age	1	0.54	0.465
Education level less than high school	1	0.42	0.517
Single caregiver	1	0.02	0.879
Depressive symptoms	1	1.12	0.293
Learning stimulation (HOME)	1	0.45	0.504
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	1	4.71	0.034*
Neglectful behaviors (CTS-PC)	1	0.50	0.480
General Caregiving Environment			
Domestic violence toward caregiver	1	0.00	0.974
Number of children in the home	1	0.28	0.597
Household Income	1	2.28	0.136

HOME=Home Observation Measure of the Environment; CTS-PC=Conflict Tactic Scale–Parent Child.
*p<.05 **p<.005 ***p<.0005

Table 4.13. Odds ratios for statistically significant predictors of internalizing behaviors, comparing membership in *borderline clinical* internalizing behavior trajectory group to *normal* internalizing behavior group (reference group) (weighted data)

Variable	B	SE of B	t-test	*p-value*	Odds ratio	95% CI for Odds Ratio
Minority	-1.13	0.53	-2.12	0.038*	0.32	0.11-0.94
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	0.05	0.02	2.17	0.034*	1.05	1.00[a]-1.11

CI=confidence interval; CTS-PC=Conflict Tactic Scale–Parent Child
*p<.05
[a] The lower confidence interval is not actually 1.00, but was rounded down to 1.00 at two decimal places.

Predicting co-occurring membership in internalizing and externalizing behavior problem trajectories. In order to begin to examine predictors of co-occurring internalizing and externalizing problems that persist over time, an exploratory multinomial analysis was conducted. First, children who were members of both the *borderline clinical* internalizing behavior problem trajectory group and the *persistent externalizing problem* group were identified. They were compared to all other children who were not members of both groups in a multinomial model. The non-co-occurring group consisted of children who were either members of only one problem group (*borderline clinical* internalizing or a *persistent externalizing problem* group) or who were members of the *normal* behavior groups for both internalizing and externalizing behaviors.

Three variables from baseline are statistically significant (p<.05) predictors of co-occurring internalizing and externalizing behavior problems over time (Table 4.14). Minority status, the caregiver’s report of physically assaultive behavior toward the child, and the number of children in the home predicted co-occurring membership in internalizing and externalizing problem groups. There was also a trend toward significance for household income (Table 4.14).

The odds of having co-occurring problems compared to being a member of a single problem or *normal* groups for each significant predictor are presented in Table 4.15. Compared to children who were members of one of the problem groups or both *normal* behavior groups, children with co-occurring membership in internalizing and externalizing problem groups were more likely to be non-minority (White) and have parents who were more likely to report physically assaultive behaviors toward the child.

Table 4.14. Multinomial logistic regression identifying factors in the caregiving environment that predict membership in co-occurring internalizing/externalizing behavior trajectory groups (weighted data; unweighted n=178, weighted n=92,404)

	df	Adjusted Wald F	*p-value*
Child characteristics			
Minority status	1	5.90	0.018*
Chronic health problems	1	1.81	0.183
Parent and Parenting Characteristics			
Caregiver age	1	1.23	0.271
Education level less than high school	1	0.73	0.397
Single caregiver	1	1.21	0.276
Depressive symptoms	1	0.25	0.620
Learning stimulation (HOME)	1	3.21	0.078^
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	1	14.45	<0.0005***
Neglectful behaviors (CTS-PC)	1	2.27	0.136
General Caregiving Environment			
Domestic violence toward caregiver	1	0.06	0.808
Number of children in the home	1	5.87	0.018*
Household Income	1	3.98	0.050^

HOME=Home Observation Measure of the Environment; CTS-PC=Conflict-Tactic Scale–Parent Child.
*p<.05 **p<.005 ***p<.0005; ^p<.10 (trend)

Table 4.15. Odds ratios of statistically significant predictors by trajectory group, comparing co-occurring membership in internalizing and externalizing behavior trajectory groups to non-co-occurring problem behavior group (reference group) (weighted data)

Variable	B	SE of B	t-test	*p-value*	Odds ratio	95% CI for Odds Ratio
Minority (ref=non-minority)	-2.34	0.96	-2.43	0.018*	0.10	0.01-0.66
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	0.11	0.03	3.80	0.000***	1.12	1.06-1.19
Number of children in the home	0.78	0.32	2.42	0.018*	2.19	1.15-4.18

CI=confidence interval; CTS-PC=Conflict Tactic Scale-Parent Child
*p<.05. ***p<.0005

The odds ratio for being in the *co-occurring problem* groups compared to the other children is 90% less for minority children than White children. For each 1 point increase in parent-reported assaultive behaviors toward the child, the odds ratio of having co-occurring problems increased by 12%. Also, for each additional child in the household, the odds ratio of having co-occurring internalizing and externalizing problems to not having co-occurring problems increased by 219%.

Cumulative Risk in the Caregiving Environment

Cumulative risk in the caregiving environment has been associated with increased rates of developmental problems (Appleyard, Egeland, van Dulmen, & Sroufe, 2005; Barth et al., 2008; Sameroff & Fiese, 2000), and thus was examined as a predictor of developmental trajectories in the borderline or clinical range. Eleven risk factors were included in the calculation of cumulative risk, including the following: child maltreatment report (a risk factor for all children in the sample), child's chronic health problem, minority status, caregiver depression during past year, caregiver alcohol or drug dependency during the past year, young caregiver (<21 years), single caregiver, low caregiver education (less than high school), domestic violence, having 4 or more children in the home, and living in poverty (see Table 4.16 for the percent of each risk experienced by families reported for child neglect when child is age 2 or 3 years old). Risks were those experienced during the past year (e.g., domestic violence during the last 12 months). The number of risks experienced by each family was calculated for families with data available for all 11 of these risk factors (Table 4.17). There was a high level of

Table 4.16. Cumulative Risk: Percent of each risk experienced by families reported for child neglect when child is age 2 or 3 years old (unweighted n=236, weighted=125,606)

Risk factor	N	# with risk	% with risk Unweighted	Weighted	95% CI
1. Child maltreatment report	236	236	100.0%		
2. Single caregiver	236	172	72.9%	75.8%	65.67-83.60%
3. Living in poverty	215	121	56.3%	59.95%	47.36-71.35
4. Minority status	236	114	48.3%	55.1%	43.11-66.49%
5. Low caregiver education	235	70	29.8%	31.7%	22.05-43.17%
6. Domestic violence	206	55	26.7%	18.97%	13.17-26.54%
7. Child's chronic health problem	236	58	24.6%	27.9%	18.13-40.38%
8. Caregiver depression	221	52	23.5%	20.0%	13.18-29.23%
9. Having 4 or more children in home	236	45	19.1%	22.6%	13.24-35.75%
10. Young caregiver	236	24	10.2%	9.0%	5.03-15.65%
11. Caregiver substance dependency	234	12	5.1%	5.5%	2.61-11.0%

CI=Confidence Interval

Table 4.17. Cumulative Risk: The number of risks experienced by families reported for child neglect when child is age 2 or 3 years old (n=179, unweighted n= 94,047)

Number of Risks	Number of families	% of families Unweighted	Weighted	95% Confidence Interval
1	3	1.7%	2.3%	0.48-10.68%
2	19	10.6%	9.1%	4.41-17.96%
3	37	20.7%	14.4%	8.68-22.94%
4	37	20.7%	23.7%	13.81-37.61%
5	46	25.7%	28.9%	18.21-42.7%
6	21	11.7%	8.9%	4.88-15.53%
7	15	8.4%	12.0%	4.88-26.47%
8	1	0.6%	0.7%	0.09-4.81%

risk in the families in this sample, with two-thirds (67%, n=120 of 179) of the families having experienced 4 or more of these risk factors. Almost half (46.4%) reported experiencing 5 or more risks.

Multinomial logistic regression was conducted to examine whether or not the number of risks experienced by the family predicted the child's developmental trajectories. Three multinomial models were run to predict membership in externalizing behavior trajectory groups, internalizing behavior trajectory groups, and, on an exploratory basis, co-occurring internalizing and externalizing behavior problems. Results were non-significant in all three models (Table 4.18). Cumulative risk in the caregiving environment did not predict membership in externalizing or internalizing behavior trajectory groups, nor did it predict co-occurring internalizing and externalizing behavior problems.

Table 4.18. Multinomial logistic regression testing cumulative risk in the caregiving environment as a predictor of membership in externalizing, internalizing, and co-occurring problem trajectory groups (3 models; weighted data; unweighted n=179, weighted n=94,047)

	df	Adjusted Wald F	*p-value*
Externalizing Behavior Trajectory Groups	2	1.72	0.188
Internalizing Behavior Trajectory Groups	1	0.00	1.000
Co-Occurring Internalizing and Externalizing Behavior Problems	1	1.06	0.307

Summary

There are several factors in the caregiving environment that predict membership in internalizing and externalizing behavior trajectory groups. Parent self-report of physically assaultive behaviors toward the child, being non-minority (White), and lower household income predicted membership in persistent externalizing problem groups.

Parent self-reported physically assaultive behaviors toward the child and being non-minority (White) also predicted membership in the *borderline clinical* internalizing problem group. An exploratory analysis also shows an association between the parent's assaultive behaviors and co-occurring membership in internalizing and externalizing problem groups; the odds ratio for assaultive behaviors were larger for co-occurring membership than for separate analyses of internalizing or externalizing problems. Cumulative risk in the environment did not predict membership in the behavior trajectory groups.

AIM 3 RESULTS: EXPLORING THE ASSOCIATION BETWEEN RECEIPT OF CHILD WELFARE SERVICES AND TRAJECTORY GROUP MEMBERSHIP

Child welfare practitioners seek to promote the safety, permanency, and well-being of children who become involved in child welfare services. Results from the first part of this study (Aim 1) provide evidence that many of the young children who become involved with child welfare services due to neglect at age 2 or 3 follow relatively normal behavior trajectories as they grow, at least until the middle of elementary school. At the same time some children persistently exhibit internalizing and externalizing behavior problems over time, including *worsening* externalizing problems. Aim 2 of the study identified factors in the child's caregiving environment that predict membership in problematic trajectories. Aim 3 begins to explore whether or not receipt of child welfare services is associated with the externalizing and internalizing behavior trajectories followed by young children reported for neglect.

Three multinomial logistic regression analyses were conducted to model the association between child welfare services and membership in externalizing behavior groups, internalizing behavior groups, and co-occurring internalizing and externalizing problems, after controlling for factors in the caregiving environment. Results from these models are presented below. Cases with data for all predictors were retained in the analysis. There were no statistically significant differences between cases included in the analysis and those excluded due to missing data, except for household income (see Appendix B).

Child Welfare Services and Externalizing Behaviors

Receipt of services at baseline did not predict membership in externalizing behavior trajectory groups, nor did outcome of the investigation (Table 4.19). Consistent with the models examining the caregiving environment alone, three variables from the caregiving environment at baseline were statistically significant ($p<.05$) predictors of trajectory group membership. Minority status, the caregiver's report of physically assaultive behavior toward the child, and household income predicted externalizing group membership. There were also trends toward significance for low caregiver education, learning stimulation, and number of children in the household (Table 4.19). Results from the post hoc analysis (Table 4.20) identify which trajectory groups (*persistent problem* and *normal*) were different from the *slightly elevated* group for the significant predictors, and the odds of being in these groups compared to the *slightly elevated* group.

Table 4.19. Multinomial logistic regression testing association between receipt of child welfare services and **externalizing** behavior trajectory group membership, after controlling for caregiving environment (weighted data; unweighted n=177, weighted n= 92,325)

	df	Adjusted Wald F	*p-value*
Child characteristics			
Minority status	2	3.32	0.043*
Chronic health problems	2	1.25	0.294
Parent and Parenting Characteristics			
Caregiver age	2	1.61	0.209
Education level less than high school	2	2.58	0.084^
Single caregiver	2	1.14	0.328
Depressive symptoms	2	0.90	0.413
Learning stimulation (HOME)	2	2.62	0.081^
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	2	8.85	0.0004***
Neglectful behaviors (CTS-PC)	2	2.10	0.130
General Caregiving Environment			
Domestic violence toward caregiver	2	1.10	0.338
Number of children in the home	2	2.74	0.072^
Household Income	2	4.43	0.016*
Child Welfare Service Factors			
Outcome of investigation/assessment	2	0.15	0.865
Receipt of services (ref=received)	2	1.61	0.208

HOME=Home Observation Measure of the Environment; CTS-PC=Conflict-Tactic Scale–Parent Child.
**p*<.05 ***p*<.005 ****p*<.0005; ^*p*<.10 (trend)

Table 4.20. Odds ratios for statistically significant predictors of externalizing behavior trajectory group membership, comparing membership in *persistent problem* group and *normal* group to *slightly elevated* externalizing behavior group (reference group); model testing receipt of child welfare services after controlling for caregiving environment (weighted data)

Variable	**Group**	**B**	**SE of B**	**t-test**	***p-value***	**Odds ratio**	**95% CI for Odds Ratio**
Minority	Persistent Problems	-1.64	0.81	-2.01	0.048*	0.19	0.04-0.99
	Normal	0.85	0.67	1.27	0.210	2.35	0.61-9.02
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	Persistent Problems	0.09	0.03	3.36	0.001**	1.10	1.04-1.16
	Normal	-0.06	0.03	-1.87	0.066^	0.94	0.88-1.00[a]
Household income	Persistent Problems	-0.30	0.11	-2.67	0.010*	0.74	0.59-0.93
	Normal	0.12	0.13	0.94	0.353	1.13	0.87-1.46

CI=Confidence Interval; HOME=Home Observation Measure of the Environment; CTS-PC=Conflict-Tactic Scale–Parent Child.
**p*<.05 ***p*<.005; ^*p*<.10 (trend)
[a] The upper confidence interval is not actually 1.00, but was rounded up to 1.00 at two decimal places.

Children with persistent externalizing problems. Compared to the *slightly elevated* externalizing behavior group, children in the persistent externalizing problem group were more likely to be non-minority (White), lived in lower income households, and parents were more likely to report physically assaultive behaviors toward the child. The odds ratio for being in the *persistent problem* group compared to the *slightly elevated* group is 81% less for minority children than White children. For each increase in income category, the odds ratio for being in the persistent problem group (compared to the *slightly elevated* group) decreased by 26%. For each 1 point increase in parent-reported assaultive behaviors toward the child, the odds ratio of being in the *persistent externalizing problem* group compared to the *slightly elevated* group increases by 10%.

Children with normal externalizing behaviors. There were no statistically significant differences between children with *normal* externalizing behaviors and children with *slightly elevated* externalizing behaviors. There was, however, a trend toward parents reporting fewer physically assaultive behaviors toward the child in the *normal* group compared to the *slightly elevated* group. Both groups remained in the normal range on average over time.

Child Welfare Services and Internalizing Behaviors

Receipt of services at baseline did not predict membership in internalizing behavior trajectory groups after controlling for caregiving environment, nor did outcome of the investigation (Table 4.21). Consistent with the models examining the caregiving environment alone, two variables from baseline are statistically significant (p<.05) predictors of membership in the internalizing behavior trajectory groups (Table 4.21). Minority status (non-minority) and the parent's report of physically assaultive behavior toward the child predicted internalizing group membership.

Table 4.21. Multinomial logistic regression testing association between receipt of child welfare services and **internalizing** behavior trajectory group membership, after controlling for caregiving environment (weighted data; unweighted n=177, weighted n=92,325)

	df	Adjusted Wald F	*p-value*
Child characteristics			
Minority status	1	5.32	0.024*
Chronic health problems	1	1.54	0.219
Parent and Parenting Characteristics			
Caregiver age	1	0.61	0.436
Education level less than high school	1	0.62	0.432
Single caregiver	1	0.00	0.964
Depressive symptoms	1	1.27	0.264
Learning stimulation (HOME)	1	0.22	0.644
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	1	4.64	0.035*
Neglectful behaviors (CTS-PC)	1	0.52	0.473
General Caregiving Environment			
Domestic violence toward caregiver	1	0.00	0.944
Number of children in the home	1	0.31	0.582
Household Income	1	2.22	0.141
Child Welfare Service Factors			
Outcome of investigation/assessment	1	0.00	0.946
Receipt of services (ref=received)	1	1.40	0.241

HOME=Home Observation Measure of the Environment; CTS-PC=Conflict-Tactic Scale–Parent Child.
*p<.05

Table 4.22 presents the odds of being in the *borderline clinical* internalizing group compared to the normal internalizing behavior group for these variables. Compared to the normal internalizing behavior group, children in the *borderline clinical* internalizing problem group were more likely to be non-minority (White) and have parents who were more likely to report more physically assaultive behaviors toward the child. The odds ratio for being in the *borderline clinical* group compared to the *normal*

Table 4.22. Odds ratios of statistically significant predictors of internalizing behaviors, comparing membership in *borderline clinical* internalizing behavior trajectory group to *normal* internalizing behavior group (reference group); model testing receipt of child welfare services after controlling for caregiving environment (weighted data)

Variable	**B**	**SE of B**	**t-test**	***p-value***	**Odds ratio**	**95% CI for Odds Ratio**
Minority (ref=non-minority)	-1.27	0.55	-2.31	0.024*	0.28	0.09-0.84
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	0.05	0.02	2.15	0.035*	1.05	1.00[a]-1.11

CI=confidence interval
*p<.05
[a] The lower confidence interval is not actually 1.00, but was rounded down to 1.00 at two decimal places.

group is 72% less for minority children than White children. For each 1 point increase in parent-reported assaultive behaviors toward the child, the odds ratio of being in the *borderline clinical* group compared to the normal group increases by 5%.

Child Welfare Services and Co-occurring Membership in Internalizing and Externalizing Behavior Problem Trajectories

In this exploratory analysis, there was a trend toward a significant relationship (p=0.074) between not receiving child welfare services at baseline and co-occurring membership in internalizing and externalizing behavior trajectory groups (Table 4.23). Outcome of the investigation was not related to co-occurring membership. Five variables from the caregiving environment are statistically significant (p<.05) predictors of co-occurring membership in internalizing and externalizing behavior problem trajectories when child welfare services are included in the model (Table 4.23). Minority status, learning stimulation in the home environment, the caregiver's report of physically assaultive behavior toward the child, the number of children in the home, and household income predicted whether or not children were members of both internalizing and externalizing problem trajectories.

Table 4.23. Multinomial logistic regression testing association between receipt of child welfare services and co-occurring membership in internalizing and externalizing behavior trajectory group, after controlling for caregiving environment (weighted data; unweighted n=177, weighted n=92,325)

	df	Adjusted Wald F	*p-value*
Child characteristics			
Minority status	1	9.42	0.003**
Chronic health problems	1	1.20	0.277
Parent and Parenting Characteristics			
Caregiver age	1	1.49	0.227
Education level less than high school	1	0.95	0.334
Single caregiver	1	0.79	0.377
Depressive symptoms	1	0.12	0.727
Learning stimulation (HOME)	1	4.61	0.035*
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	1	16.35	<0.0005***
Neglectful behaviors (CTS-PC)	1	2.41	0.126
General Caregiving Environment			
Domestic violence toward caregiver	1	0.17	0.679
Number of children in the home	1	5.39	0.023*
Household Income	1	5.35	0.024*
Child Welfare Service Factors			
Outcome of investigation/assessment	1	0.01	0.931
Receipt of services (ref=received)	1	3.30	0.074^

HOME=Home Observation Measure of the Environment; CTS-PC=Conflict-Tactic Scale–Parent Child.
*p<.05 **p<.005 ***p<.0005; ^p<.10 (trend)

Table 4.24 presents the odds of co-occurring membership of problem groups compared to not having co-occurring problems (i.e., being a member of a single problem group or both normal groups). Compared to children without co-occurring membership in problem groups, children with co-occurring membership in internalizing and externalizing problem trajectories were more likely to have the following characteristics:

1. Non-minority (White)
2. Less learning stimulation in the home environment
3. Parents reported more physically assaultive behaviors toward the child.
4. More children in the home
5. Lower household income

This was the first model in this dissertation in which learning stimulation was a significant predictor of behavior trajectory membership, whereas the other predictors were significant in prior models.

Table 4.24. Odds ratios of statistically significant predictors of co-occurring membership, comparing co-occurring membership in internalizing and externalizing behavior trajectory group to non-co-occurring problem behavior group environment (reference group); model testing receipt of child welfare services after controlling for caregiving (weighted data)

Variable	**B**	**SE of B**	**t-test**	***p-value***	**Odds ratio**	**95% CI for Odds Ratio**
Minority (ref=non-minority)	-2.52	0.83	-3.03	0.004**	0.08	0.01-0.41
Learning stimulation (HOME)	-2.12	1.04	-2.03	0.046*	0.10	0.01-0.85
Parent self-report of physically assaultive behaviors toward the child (CTS-PC)	0.11	0.03	4.00	<0.0005***	1.12	1.06-1.19
Number of children	0.79	0.34	2.30	0.024*	2.23	1.12-4.44
Household income	-0.27	0.12	-2.25	0.028*	0.76	0.59-0.96

CI=confidence interval; CTS-PC=Conflict Tactic Scale-Parent Child; HOME=Home Observation Measure of the Environment
**p*<.05 ***p*<.005 ****p*<.0005

The odds ratio for being in the *co-occurring problem* groups compared to the other children is 92% less for minority children than White children. For each 1 point increase in the learning stimulation proportion score the odds ratio for co-occurring problem group membership decreases by 90%. For each 1 point increase in parent-reported assaultive behaviors toward the child, the odds ratio of having co-occurring problems increased by 12%. Also, for each additional child in the household, the odds ratio of having co-occurring internalizing and externalizing problems to not having co-occurring problems increased by 223%. Finally, for each increase in income category, the odds ratio for co-occurring internalizing and externalizing problems decreases by 24%.

Relation Between Child Welfare Services and Trajectory Group After Controlling for Cumulative Risk

Multinomial logistic regression was conducted to examine whether or not child welfare services predicted developmental trajectory group membership after controlling for the number of risks experienced by the family. Three multinomial models were run to predict membership in externalizing behavior trajectory groups, internalizing behavior trajectory groups, and, on an exploratory basis, co-occurring membership in internalizing and externalizing behavior problem trajectory groups. Results were non-significant in all three models (Table 4.25). Neither child welfare services nor cumulative risk in the caregiving environment predicted membership in externalizing, internalizing, or co-occurring trajectory groups.

Table 4.25. Multinomial logistic regression testing the association between receipt of child welfare services and development after controlling for cumulative risk in the caregiving environment (3 models; weighted data; unweighted n=179, weighted n=94,047)

	df	Adjusted Wald F	*p-value*
Externalizing Behavior Trajectory Groups			
Cumulative Risk	2	2.07	0.134
Child Welfare Service Factors			
Outcome of Investigation or Assessment	2	0.91	0.408
Receipt of services	2	0.92	0.405
Internalizing Behavior Trajectory Groups			
Cumulative Risk	1	0.00	0.964
Child Welfare Service Factors			
Outcome of Investigation or Assessment	1	0.04	0.850
Receipt of services	1	0.95	0.334
Co-Occurring Internalizing and Externalizing Behavior Problems			
Cumulative Risk	1	2.06	0.156
Child Welfare Service Factors			
Outcome of Investigation or Assessment	1	0.67	0.418
Receipt of services	1	2.19	0.144

Summary

Young children (age 2 and 3 years old) reported for neglect who remain at home after investigation were found to follow one of four externalizing behavior paths (*high chronic* problem, *worsening* problem, *slightly elevated*, and *normal* externalizing behaviors) and two internalizing behavior paths (*borderline clinical* and normal) over the following five or six years. Parent self-report of physically assaultive behaviors toward the child, being non-minority (White), and lower household income predicted membership in persistent externalizing problem groups (including both *high chronic* and *worsening* problem group). Parent self-reported physically assaultive behaviors toward the child and being non-minority (White) also predicted membership in the *borderline* *clinical* internalizing problem group. In addition, an exploratory analysis shows an association between the parent's assaultive behaviors and membership in both internalizing and externalizing problem groups. When child welfare services are added to the models, these factors in the caregiving environment continue to be significant predictors, although there is no association between receipt of services and behavior trajectory membership. One variable, learning stimulation, was a significant predictor in this model but none of the other models. Cumulative risk in the environment did not predict membership in the behavior trajectory groups in any of the models. The implications of these results are discussed in the next chapter.

Chapter 5. Discussion

The current study identified four externalizing behavior paths and two internalizing behavior paths among young children referred to child protective services for neglect. Parent-reported assaultive behaviors toward the child predicted membership in *persistent externalizing problem* and *borderline clinical internalizing problem* trajectories, compared to normal range trajectories. These findings are discussed below in relation to transactional theory and prior research, followed by implications for policy and practice, limitations, strengths, and a conclusion

Identifying Distinct Behavior Trajectories of Young Children Reported for Neglect

Results from the current study highlight the heterogeneity of internalizing and externalizing behavioral trajectories among young children who have been referred to child protective services for neglect. As hypothesized, the majority of the children exhibited behaviors that were within normal range for children of the same age from the age of 2 or 3 over the following five or six years, while fewer children exhibited borderline or clinical level behavior problems during that time period. This result is consistent with two recent studies that identified distinct externalizing behavior trajectories of preschool age children involved with child welfare services (Woodruff & Lee, 2011 using NSCAW data) and at high risk for maltreatment (Tabone et al., 2011 using LONGSCAN data). No studies exploring internalizing behavior trajectories of maltreated children were found in the literature.

Contrary to the hypothesis, there was no improving or worsening internalizing group, as scores were relatively stable over time. The stability seen over time in these groups, and in the normal and slightly elevated externalizing groups, must be interpreted cautiously. Each line represents average scores for a subgroup of children and individual scores do vary to some extent over time. There was a worsening externalizing group, but the only improving group consisted of just a few children with extremely high scores which may have declined due to regression toward the mean.

Externalizing behavior trajectories. In the current study of very young children, age 2 or 3, four distinct externalizing behavior paths over the following five or six years were identified: *high chronic, worsening, slightly elevated,* and *normal*. Based on the final model selected, a very small group of children (0.5%, weighted) exhibited very high clinical level problems at age 2 or 3 (Wave 1), with clinical level problems persisting over the following five or six years. This *high chronic* group was the only one of the four trajectory groups to show a significant decrease in externalizing scores over time. However, given the very high starting scores in this small group of cases, this decrease may be due to regression toward the mean and may not indicate actual improvement. Whether or not the children's behaviors truly improved to some degree, the children in the *high chronic* group continued to score in the clinical range on the behavior problems scale at ages 7 to 9 (Wave 5), suggesting a need for early intervention to help this subset of young children develop self-regulatory skills.

Children in another group, approximately one in seven (14.7%) of those referred for neglect, were most likely to exhibit borderline clinical behaviors at age 2 or 3 and follow a *worsening* curvilinear path into the clinical range of externalizing behavior problems. This group showed slight improvement in the final wave, but scores remained above the Wave 1 scores, in clinical range. Unlike this group of children, typically externalizing behaviors decline as children grow, from the slightly elevated externalizing behaviors of toddlerhood to the substantial improvements seen as children move into middle childhood (Keiley et al., 2000; Lochman et al., 2008; Prinzie et al, 2006).

Children with persistent externalizing behavior problems, like those in the *high chronic* and *worsening* trajectory groups, are at risk of facing a host of long-term problems. As noted earlier, children with elevated aggressive and rule-breaking behaviors often exhibit poor academic performance and social skills (Campbell, Spieker, Burchinal, & NICHD ECCRN, 2008), are at greater risk of dropping out of school (Lochman et al., 2008), and long-term may exhibit delinquency in adolescence (Green, Gesten, Greenwald & Salcedo, 2008; Lochman et al., 2008; Schaeffer, Petras, Ialongo, Poduska, & Kellam, 2003), as well as criminal behaviors (Schaeffer et al., 2003). Early intervention is needed to help this group of young children improve self-regulatory skills and avoid *worsening* behaviors over time. If aggressive behaviors – such as those present among children in the persistent problem groups –decline prior to school entry there is evidence that the children may have more positive social and academic outcomes (Campbell et al., 2008).

A heartening 84.8% of young children referred for neglect were most likely to follow *normal* range externalizing behavior trajectories from age 2 or 3 through the age of 7 to 9, following either a *slightly elevated* (54.8 %) or *normal* (30.0%) externalizing behavior path. The *slightly elevated* group had scores that were, on average, several points higher than a non-clinical normative population, but still within the normal range. Also, some of the children in the *slightly elevated* group scored in the borderline clinical range at one point during the four years, but the rest of their scores were in the normal range, demonstrating a pattern of relatively normal behaviors over time. Like the *worsening* group (14.7%), the *slightly elevated* group followed a behavior path that slightly increased then slightly decreased again, but never improved beyond the original score on average. The *normal* group – representing close to one-third of the children – scored several points below the non-clinical normative population, with caregivers reporting very few if any problem behaviors. Their scores remained stable over time.

The finding that most young children referred for neglect appear to follow somewhat normal behavioral paths speaks to the resiliency of children and suggests the presence of positive factors in the caregiving environment that may help the children develop self-regulatory skills. It is possible that some children are benefitting from unmeasured interventions as well as strengths in the caregiving environment. Nonetheless, the majority of children present with somewhat elevated scores, albeit in normal range, and some children have scores in borderline clinical range at one point in time. These families may benefit from interventions that build on their strengths in parenting and provide additional information and supports to help parents guide their children to improve their behaviors and development.

Findings from this study are similar to the studies of externalizing behavior paths among maltreated preschool children, which identified a small group of children following *high chronic* problem paths and the majority of children following normal range behavior trajectories (Tabone et al., 2011; Woodruff & Lee, 2011). Similarly, a longitudinal study of girls and boys recruited from hospitals shortly after birth showed a small group (3%) had very high stable aggression from age 2 through age 9, while the majority followed either very low or low aggression trajectories (Campbell et al., 2008).

This study is also similar to the preschool studies in that they each had small groups of children following *worsening* behavior paths. However the *worsening* group in the current study consisted of 14.7% of the children, whereas 8% were in the *worsening* group in the preschool studies, following almost identical paths (Tabone et al., 2011; Woodruff & Lee, 2011). Interestingly, the average score at Wave 5 (age 7 to 9) in the current study was similar to the average score of the other two cohorts of children at a similar age (e.g., age 7 or 8, the third data point). Unlike the current study, the other three trajectory studies also identified a group with improving behavior paths.

It is unclear whether the differences between the current study and the two preschool studies – which have similar populations – are due to differences in age at first measurement (2 or 3 versus 4 years old), age at last measurement (7 to 9 versus 10 years), alleged maltreatment type (neglect versus any child abuse or neglect), or some other variable. It is plausible that the 2 and 3 year olds following the *worsening* path in the current study could continue to improve along a curvilinear path. Alternately, some of the children with similar behaviors at baseline may worsen as they get older (beyond the current study) while others improve over time; this would be consistent with divergent paths of children with moderate aggressive behaviors in the community sample of two-year-olds (Campbell et al., 2008). Additional research is needed to examine the behavior trajectories of these young children further into the future, and to compare outcomes for multiple maltreatment types over this longer period of time. Nonetheless, it is clear that the children referred for neglect are a heterogeneous group, with most following relatively normal behavioral paths, while others follow persistent problem trajectories over time.

Internalizing behavior trajectories. This study moves the field forward by exploring the distinct internalizing behavior trajectories of young children referred for neglect. Two trajectory groups were identified. Almost two-thirds of the children followed a relatively *normal* internalizing behavior path, while just over one-third of the children have *borderline clinical* internalizing behaviors throughout the five or six years of the study. Internalizing scores remained relatively stable over time, consistent with prior research showing stable scores (Keiley et al., 2000) or only slightly increasing scores over time (Gilliom & Shaw, 2004).

Relations between membership in internalizing and externalizing behavior trajectory groups. As hypothesized, children who were members of the *persistent externalizing problem groups* (*high chronic* and *worsening*) were more likely to be in the *borderline clinical internalizing* group (85.2%) than the *normal internalizing* group (14.8%). The significant relation between membership in internalizing and externalizing problem trajectory groups found in this dissertation is consistent with prior studies indicating a relation between internalizing and externalizing behaviors (Achenbach, 1991; Gilliom & Shaw, 2004; Keiley et al., 2000).

Notably, though, most children (n=142, 63.9% weighted) were members of normal-range trajectory groups for both internalizing and externalizing behaviors (i.e., the *normal* internalizing group and either the *slightly elevated* or *normal* externalizing groups). One in five (n=51; 21.0% weighted) were members of the borderline clinical internalizing group but followed normal range externalizing paths.

Characteristics Predicting Trajectory Group Membership

This study examined a series of factors in the caregiving environment that predict the different paths of externalizing and internalizing behavior development. The parent's self-report of assaultive behavior toward the child appears to be a salient factor predicting membership in *persistent externalizing problem* groups and the *borderline clinical internalizing problem* group compared to normal level groups among young children reported for neglect. The more assaultive behaviors reported, the more likely the child was to be in the externalizing and internalizing problem groups. The link with externalizing behavior problems found in this study is consistent with research linking harsh, aggressive, or coercive parenting with aggressive behaviors in children (Kaplan, Pelcovitz, & Labruna, 1999; Knutson, DeGarmo, Koeppl, & Reid, 2005; Manly, Kim, Rogosch, & Cicchetti, 2001; Prinzie et al., 2006; Stormshak et al., 2000; Tremblay et al., 2004). The link with internalizing behaviors conflicts with a prior research finding that physical aggression was not associated with internalizing behaviors, whereas punitive discipline was (Stormshak et al., 2000). However, that study focused on a different population, consisting of slightly older (kindergarten) children with disruptive behaviors from a community sample.

The current study focused on children reported for neglect, not physical abuse, but there was a presence of assaultive behaviors, from mild to very severe, in many of the homes. These assaultive behaviors were related to the developmental outcomes of the children. From a transactional theory perspective it makes sense that harsh or assaultive parenting leads to aggressive behaviors from the child, and in turn the aggressive and rule-breaking behaviors may lead to more harsh or assaultive parenting. It seems many of the children are also responding with internalizing behaviors – withdrawn, anxious, or depressed behaviors. In the recent study of 4-year-old children reported for abuse and neglect, assaultive behaviors closely approached the threshold for significance in predicting the high behavior problem trajectory (Woodruff & Lee, 2011). Perhaps harsh or physically assaultive parenting behaviors have a greater influence on behavior development among maltreated children when it begins earlier in life. Further research is needed to better understand this relationship within maltreated populations. Also, further analyses with the NSCAW data and research with a larger sample of young maltreated children will help clarify whether or not allegations of multiple maltreatment types (i.e., both neglect and physical abuse) predict behavior paths, just as the self-reported assaultive behaviors did in this sample. Also, further research should explore whether severity of maltreatment or experiencing chronic (versus transient) neglect predicts behavior development.

White children were more likely to belong to the *borderline clinical* internalizing and *persistent externalizing problem* groups than minority children. This finding is consistent with several community-based studies in which European-American children exhibited more internalizing and externalizing problems on average than African American children, based on maternal report of behaviors (Keiley et al., 2000; Stormshak et al., 2000). Lower household income also predicted membership in the *persistent externalizing problem* group. This result should be interpreted with caution, given that income was the one variable in which there was a significant difference between families included in the study and those excluded due to missing data. However, the finding is consistent with prior research in which socio-economic status is inversely related to externalizing behaviors (Keiley et al., 2000).

Although a higher proportion of children of parents with depressive symptoms were in the persistent behavior problem groups in bivariate analysis, no relation was found between caregiver depressive symptoms and trajectory group membership in multivariate analyses. This is contrary to prior studies linking caregiver depressive symptoms with CBCL scores among children age 2 to 18 referred to child welfare services (Burns et al., 2010) or preschool children at high risk of maltreatment (Tabone et al., 2011). On the other hand, the finding is consistent with the trajectory study of 4-year-olds from the NSCAW sample (Woodruff & Lee, 2011). Further research is needed to understand the circumstances in which caregiver depressive symptoms impact development, such as the subgroups of children (e.g., neglected vs. abused; young children vs. older children) or the duration and timing of depressive symptoms. Also, future research could introduce caregiver depressive symptoms as a time-varying covariate, given recent evidence that maternal depression and child behaviors influence one another over time (Shaw, Gross, & Miolanen, 2009). No relation was found between the child's chronic health problem and development, but this may be because elevated internalizing and externalizing behaviors in children with chronic health problems are not as high as clinical populations (Wallander et al., 1988) and may come and go rather than following a consistent path over time (Wallander et al., 1998). Thus, contrary to the hypothesis, many of the individual factors did not predict behavior group membership, nor did cumulative risk.

Co-occurring membership. On an exploratory basis, children with co-occurring membership in internalizing and externalizing problem trajectories were compared to other children – who were members of normal internalizing and externalizing trajectory groups, or who were members of just one of the two. The parent's self-reported assaultive behaviors predicted being a member of both internalizing and externalizing problem trajectory groups. Having more children in the household also predicted co-occurring membership. These variables should be further explored with a larger sample in which there are four outcomes, instead of two: co-occurring membership, externalizing problem only, internalizing problem only, or membership in normal internalizing and externalizing groups. A larger sample would likely provide a larger group in the externalizing only category.

Receipt of Child Welfare Services and Behavior Development

The current study explored the association between receipt of child welfare services and membership in developmental trajectory groups. Based on the transactional model – which posits intervening with the parent can impact the child – it was hypothesized that receipt of child welfare services would predict membership in normative rather than problematic behavior trajectories. Neither the outcome of the investigation (i.e., whether or not the case was substantiated or indicated versus other findings) nor the receipt of services after investigation predicted trajectory group membership. The lack of significance for outcome of the investigation is consistent with prior studies finding a similar level of developmental risk among substantiated and unsubstantiated cases (Barth et al., 2008; Casanueva, Cross, & Ringeisen, 2008). Yet young children with substantiated cases are more likely than those with unsubstantiated cases to receive developmental services through Part C of IDEA (IFSP) and special education services (IEP) (Casanueva, Cross, & Ringeisen, 2008).

Receipt of child welfare services was not related to membership in the externalizing or internalizing problem trajectory groups in the current study. This result is not surprising given that a wide range of child welfare services are provided, and services are generally geared toward safety and permanency, with less emphasis on child development and well-being. From a transactional theory perspective, intervening with the parents has great potential to impact the child's development as parent and child interact with one another over time (Sameroff, 2009), but the impact of child welfare services on the developmental pathways of young neglected children is difficult to assess. Even if a relation had been found, no causal inference could have been made, as child welfare services cannot be assigned randomly and those who receive services may differ from those who do not receive services on various factors.

One option to help assess causality is to conduct a study with a larger sample size and use propensity score matching to help create "equal" groups of children who do and do not receive services, then test whether or not receipt of child welfare services is related to developmental paths. Without propensity score matching, analyses produce biased results (Barth, Guo, & McCrae, 2008). This approach still does not address the vast number of different interventions being used nationally. Another approach is to conduct more randomized controlled trials with children involved with child welfare services, comparing services as usual to evidenced based parenting interventions linked with positive parenting and child behavior outcomes.

Significant variables in the child welfare service models. When the child welfare services variables were introduced into the models, the same variables from the caregiving environment – including assaultive behaviors, being White, and (for externalizing behaviors) household income – were significant. However several additional variables became significant, including the number of children in the home and learning stimulation. Although it is unclear what accounts for this change, it is possible that families selected to receive services tend to have more children and environments with less learning stimulation, confounding these results. Further research is needed to compare similar families receiving and not receiving services to understand the impact of receipt of child welfare services and other factors in the caregiving environment.

Cumulative Risk

Sameroff and colleagues (1987) suggest that cumulative risk be used to identify children and families to receive interventions to improve developmental outcomes. Barth and colleagues (2008) found that the number of risks was related to developmental outcomes among children reported to child welfare services for alleged abuse or neglect. Similarly, McCrae and Barth (2008) found an association between the number of risks and an indicator of clinical symptoms, which included behavior, trauma, and depressive symptoms. Cumulative risk also predicted membership in externalizing behavior trajectory groups among children at high risk of maltreatment (Tabone et al., 2011). Surprisingly, cumulative risk did not predict membership in behavior trajectory groups in the current study of young children reported for neglect. There are several key differences between the cumulative risk variable in this dissertation and the other child welfare-related studies which could account for the different findings. First, even though the same 11 factors from the Barth et al. (2008) study were used, this dissertation calculated cumulative risk based on parent-reported data rather than using caseworker-reported data from the NSCAW-developed risk assessment; also, the sample was somewhat different (i.e., age 2 and 3 versus 0 to 3 years; neglect only versus abuse and neglect). Second, this dissertation predicted behavior trajectories rather than scores at a single point in time, and focused on internalizing and externalizing behaviors rather than a broader indicator of developmental delay (Barth et al., 2008) or mental health symptoms (McCrae & Barth, 2008). Third, the number of risk factors considered in the calculation of cumulative risk was different than two of the studies. Tabone and colleagues (2011) limited their count of risk factors to four variables found to be significant in a multivariate model. Perhaps certain risk factors are far more salient than others and the list of counted risks should be limited to these. On the other hand, McCrae and Barth (2008) used a set of 21 risk factors. Only the total model – which included maltreatment characteristics in addition to child, caregiver and family characteristics – predicted clinical level problems in younger children age 2 to 6, whereas models focusing on specific domains (e.g. child and caregiver characteristics) did not.

Cumulative risk should be studied further in young children reported for neglect, in light of findings from prior studies with maltreated populations that there is a relation. Further analyses with the current sample could explore whether or not the number of caseworker-reported risks predicts behavior trajectory, and the cumulative risk variable could contain the 21 risk factors from the McCrae and Barth (2008) study, including maltreatment characteristics. Alternatively, further analyses could create a cumulative risk variable using a smaller set of risk factors that were individually associated with trajectories (as in Tabone et al., 2011). Further research should also assess cumulative risk with a larger sample of young children reported for neglect.

Implications for Practice

Identification of children at risk of internalizing and externalizing behavior problems. Early identification of children at risk of following problematic developmental trajectories will allow targeted interventions to improve outcomes. Based on results from this study, it is clear that not every child is in need of referral for early intervention services due to behavioral issues. In fact, some children exhibit very few internalizing or externalizing problems. However, one in seven children do exhibit externalizing behaviors and one-third exhibit internalizing behaviors that persist over time. These children should be identified, assessed, and treated to avoid the persistence of these problems that is evident in the current study. Although the current policy is to refer all young children involved in substantiated cases to early intervention for assessment, substantiation status did not predict behavior patterns in this dissertation, nor in prior studies (e.g. Barth et al., 2008; Rosenberg & Smith, 2008), so this method may not be effective. Also, when caseworker's were asked individually whether or not children had mental health issues, only 48% of the children with clinical level symptoms were identified (McCrae & Barth, 2008).

A simple, affordable method is needed to more effectively use limited resources to identify children with behavioral and other developmental issues who need a thorough screening, assessment and/or treatment for behavioral concerns without overburdening the early intervention, mental health, or child welfare systems. There have been a number of efforts to survey and summarize the screening and assessment tools available for mental health (Ringwalt, 2008; Williams, 2008) and developmental concerns (Glascoe, 2005), including behavioral issues. The cost of most screening tools, the training required to learn how to administer many, and the time necessary to complete these instruments could be overwhelming to a child welfare agency, particularly given the volume of children served each year (McCrae & Barth, 2008).

Several very brief and affordable screening options are available to identify children in need of thorough screening and assessment, although more research is needed regarding the validity of each. First, the Mental Health Screening Tool 0-5 (MHST 0-5) is a brief screen designed for workers without expertise in child development and mental health (California Institute for Mental Health [CIMH], no date). The MHST 0-5 consists of four questions, and a response of "yes" to one or more items indicates an immediate need for more thorough screening or assessment (CIMH, no date; Williams, 2008). Once a child is identified, another screening tool and/or assessment could be conducted (Williams, 2008). When feasible additional screening could be done by the child welfare agency, or the child could be referred to early intervention services for assessment. The MHST fact sheet (http://www.cimh.org/downloads/ScreeningTool0-5.pdf) includes a list of decisions that child welfare agencies should make in order to implement the MHST as a brief screening tool. The MHST is available for free online, making this another viable option for implementation with a large number of children. The MHST is also available for children age 5 and older (http://www.cimh.org/downloads/ScreeningTool5-adult.pdf), so child welfare agencies could consider this option for older children as well. Although designed for children being considered for out-of-home placement, this tool can be used for any child involved with child welfare to help identify children in need of mental health assessment.

Second, McCrae and Barth (2008) suggest that information collected routinely by caseworkers during an investigation could be used to screen children for referral for mental health assessment. In fact, they found that, using this information, 75% of children ages 2 to 6 were correctly identified as having clinical symptoms. This information could then be used to indicate additional screening and/or assessment with a standardized measure. The cost of screening all children involved with child welfare services is tremendous (McCrae & Barth, 2008). This approach is more cost-efficient, since it could identify high risk children to screen using standardized measures. At the same time, this approach over identifies children with possible mental health problems, increasing the cost beyond the actual need (McCrae & Barth, 2008). Also, the same analysis has not yet occurred with the subpopulation of young children referred for neglect, so it is unclear whether or not the method will be as effective at identifying young children investigated for neglect at high risk for behavioral issues.

Results of the current study also suggest that, among young children investigated for neglect, assaultive or harsh parenting behaviors are associated with more internalizing and externalizing problems. It is important to note that this does not mean that all parents reporting externalizing behaviors are likely to be assaultive. However, identifying assaultive parents could help identify children at risk for behavioral problems who have not yet exhibited these behaviors, as well as ensuring safety of the child. Parents may not be as open to reporting their assaultive behaviors to a child welfare worker during an investigation as they were to researchers in the NSCAW study. However, it is possible that additional information about maltreatment type (i.e., cases with both neglect and abuse) could similarly predict problem trajectories. This subsample consisted of children for whom the caseworker identified neglect as the most serious maltreatment type, and for some children abuse was also identified. Further analyses are needed to determine whether or not multiple maltreatment types (i.e., neglect and abuse) are similarly an indicator of problem behavior trajectories. If true, maltreatment characteristics (e.g., multiple maltreatment types, severity) could be used to identify children at risk for behavioral problems even if they have not started to exhibit problem behaviors.

Interventions for children referred for neglect who are at risk of problem behavior trajectories. Once children referred for neglect have been identified as being at risk of long-term behavior problems, practitioners can incorporate services into the case plan to address these developmental needs. Interventions are needed to help improve parenting skills in managing these behaviors and help children develop better self-regulatory skills and behaviors. The transactional model suggests that interventions may need to work to change the behaviors of the child, reframe the parent’s interpretation of behaviors, improve parenting skills, or a combination of these (Sameroff, 1995; Sameroff & Fiese, 2000). Consistent with this, early intervention, special education, and evidence based parenting interventions are each services that may be appropriate for children at risk of long-term behavior problems, and a combination of these services may be warranted.

Early intervention and special education services are funded through Part C and Part B of the federal Individuals with Disabilities Education Act (IDEA; http://idea.ed.gov). As a provision of receiving funding, states are required to serve children with disabilities and have the option to serve children with developmental delays. Children who may be eligible can receive a comprehensive assessment at no cost, to determine if early intervention or special education services are needed. Child welfare practitioners can refer children younger than 3 to the local agency providing early intervention services for a comprehensive assessment. Children age 3 and older can be referred to the public school system, usually through the special education department (Glascoe, 2005). After making a referral, practitioners can also advocate for these children referred during the assessment process to increase the likelihood that the children receive early intervention (i.e., Individualized Family Service Plan; IFSP) or special education (i.e., Individualized Education Plan; IEP) services, and help engage families in these services, to avert negative outcomes and promote positive ones.

Evidence-based parenting interventions that have been linked to improved parenting skills and positive behavioral outcomes should be priority in some cases. Specifically, when parenting classes are incorporated into a case plan and the child is also presenting with behavioral problems, child welfare practitioners could refer families to community or clinic based parenting interventions using evidenced-based models, or institute evidence-based models within the child welfare agencies, designed to address both parenting and child behaviors. The Incredible Years, Parent-Child Interaction Therapy, and Triple P Positive Parenting Program are three evidence-based models serving children as young as 2 or 3 that have been linked with positive parenting and behavioral outcomes.

The Incredible Years training for parents is designed for families with children as young as two years old who present with aggression and other behavioral problems

(Webster-Stratton, Mihalic, Fagan, Arnold, Taylor, & Tingley, 2001), so this intervention could be well-suited for families referred for neglect with children at risk of internalizing or externalizing behavior problems. Participation in the Incredible Years intervention is associated with reductions in harsh parenting and increased supportive parenting (Baydar, Reid, & Webster-Stratton, 2003) as well as reduced conduct problems in the children (Reid, Webster-Stratton, & Baydar, 2004). Notably, families with low income and maternal mental health risk were responsive to this community based intervention through the Head Start program (Baydar et al., 2003). This is unlike many parent training programs, in which low income families may be less responsive to the training (Reyno & McGrath, 2006, meta-analysis). Offering parent training in a more universal approach – such as the Incredible Years offered through the Head Start program – may be a way to avoid the stigma of screening and serve to prevent maltreatment while encouraging nurturing, effective parenting and positive child behavior development.

Parent-Child Interaction Therapy (PCIT) is another parent training model linked with positive parenting and child behavior outcomes, and is designed for children age 3 to 6 and their parents. PCIT involves working with parent-child dyads, teaching and coaching child-directed and parent-directed interactions (Eyberg et al., 2001). PCIT has been linked with reductions in behavior problems and parenting stress, and these gains were maintained over several years (Eyberg et al., 2001). Among families with multiple prior reports of abuse and severe parent-to-child violence, the PCIT intervention was more effective than a standard community parenting class in reducing negative parenting behaviors and re-reports of physical child abuse (Chaffin et al., 2004). The training and resources required for this intervention are higher than for a group-based intervention.

Although not designed for group-based intervention, PCIT has been tested in a small group model in an effort to find a more cost-effective method of delivery (Niec, Hemme, Yopp, & Brestan, 2005).

The Triple P Positive Parenting program provides multiple levels of intervention depending on the family's needs, so the format, number, length, and duration of sessions vary (Sanders et al., 2003). The Triple P intervention may include brief phone consultation, parenting seminars, individual parenting skills training, group-based parenting training, and media and informational strategies to reach entire communities (Prinz et al., 2009). Tripe P is designed to serve families with children from birth to age 18. Studies of the Triple P program show positive parenting and child behavior outcomes, including fewer child behavior problems and emotional symptoms, greater parental sense of competence, and less self-reported parental dysfunction in intervention groups (Bor et al., 2002; Leung et al., 2003; Roberts et al., 2006). Positive outcomes were retained 6 months (Roberts et al., 2006) or a year (Bor et al., 2002) after intervention. Reductions in physical abuse were also found in a population trial of the Triple P program (Prinz et al., 2009).

Each of the three programs described above have been designated as well supported by the California Evidence-Based Clearinghouse for Child Welfare (http://www.cebc4cw.org), with medium relevance for child welfare. Researchers have begun to test these programs with child welfare populations (e.g., Chaffin et al., 2004, 2010), and some trials are currently being conducted. More effectiveness trials for parenting interventions are needed for families involved with child welfare services.

Nonetheless, these models seem quite relevant for the subset of child welfare involved families with children at high risk of behavioral problems.

Implications for Policy

Preventive interventions have the potential to save money while improving outcomes for children at risk of developmental problems (Heckman 2000, 2006). Early intervention and special education services funded through IDEA and special programs such as Early Head Start and Head Start are available for eligible children to help address developmental problems faced by children with developmental needs. However, many children and families are not being served by these programs, in part because they have not interfaced with the systems and in part because funding does not necessarily match the need for services.

In 2003, the CAPTA law was amended to require referral of children with substantiated cases to early intervention services, so the number of children involved with child welfare services who have been referred for early intervention has likely increased. Even so, the law does not account for the many children with unsubstantiated cases, despite the similar level of developmental risk among substantiated and unsubstantiated cases seen in the current study and others (Barth et al., 2008; Casanueva, Cross, & Ringeisen, 2008). Given that children with unsubstantiated cases appear just as likely as children with substantiated cases to exhibit persistent externalizing and internalizing problems, in the borderline and clinical range, it seems appropriate to extend the CAPTA mandate to apply to children with unsubstantiated cases as well. The goal would be to increase the number of young children referred for neglect to receive services.

At the same time, due to the large number of children referred to child welfare services each year, referring every child who has been referred for neglect could overwhelm the agencies providing early intervention and special education services. Moreover, some young children referred for neglect are not at high risk for behavioral or other developmental problems. Because substantiation status does not predict behavioral or developmental problems, an alternative is needed to identify families and children in need of early intervention and special education services. Child welfare practitioners could screen every young child referred for neglect, and refer those with risk of behavior problems to early intervention or special education services. With a simple, brief method of screening, this may be a more cost-effective way to identify children in need of comprehensive evaluation, which then would be completed by early intervention or special education programs. Child welfare services and early intervention services should partner to ensure that young children involved with child welfare services have access to early intervention services without unnecessarily overwhelming programs funded by IDEA.

In addition, expanding funding for IDEA Part C services, special education services, Early Head Start, and Head Start would help meet the increase in service demand that is likely when more children involved with child welfare services are referred to these programs. Some of these funds could be allocated to offer evidence-based parenting programs with these services (e.g., providing Incredible Years through the Head Start program), as a more universal approach may be more successful engaging families to strengthen their parenting skills to nurture better behavioral and developmental outcomes. Policy makers should also consider expanding and reallocating child welfare funding to support increased use of evidence based and evidence informed parenting programs that support positive parenting and reduce behavior problems. Augmented funding may be particularly important in supporting the transition to these programs, as implementing and testing evidence based and evidence informed programs with this population may be costly.

Limitations

This study has several limitations that must be acknowledged. First, the transactional model being applied in the study cannot be fully implemented to optimally understand the impact of the caregiving environment on child development trajectories. The transactional approach emphasizes the dynamic interaction between child and caregiving environment, but it is not possible to observe these transactions in the NSCAW data set. The transactional model is being applied more generally here, using NSCAW data in order to examine children's pathways over time and the impact of factors in the caregiving environment at baseline. Change in primary caregiver at each time point was examined as a time-varying covariate, in the spirit of the transactional model. Caregiver change included a variety of circumstances, including children moving to kinship care, foster care and other settings, and should be explored in more detail with a larger sample.

Second, exploration of an association between receipt of child welfare services and child development trajectories must be considered exploratory for several reasons, including the heterogeneity of services provided and the selection bias inherent in the receipt of child welfare services. Child welfare services is a broad term encompassing a wide range of parenting services, family preservation, counseling, and other services provided by many state and local child welfare agencies and community programs across the nation. Parenting services vary substantially in quantity, quality, and approach, delivered by staff from child welfare, mental health, and community agencies in classroom settings or incorporated into in-home family preservation services (Hurlburt, Barth, Leslie, Landsverk, & McCrae, 2007). This study cannot tease out specific models of intervention, fidelity of implementation, or intensity of services, and dosage information is limited. This heterogeneity limits the ability to understand the impact of services on child developmental outcomes; even if some child welfare services do impact child development, the presence of others that may not have an impact weakens the ability to detect an impact. Further, even if child welfare services had been a significant predictor in the current study, the actual services that impact child development outcomes would remain unknown.

Third, selection bias may influence who did and did not receive child welfare services, which in turn may bias the results pertaining to the association between receipt of child welfare services and development. To help address this issue the regression analyses controlled for factors in the caregiving environment that may influence the development of these young children. Propensity score matching was considered as a technique to minimize selection bias (Guo & Frazer, 2010). However, the small sample size in the current study (*n*=236) –and the much smaller subsample that would emerge of similar families who did and did not receive services–would be inadequate for further data analyses (for example, see Casanueva et al., 2008, in which the matched subsample was 43.9% of the original sample, or 588 of 1,340). Also, some critics have found that bias continues to be a problem even when propensity scores are used (Agodini & Dynarski, 2004, and Michalopoulos et al., 2004, as cited in Guo & Frazer, 2010, p. 327).

Measurement is another challenge in the study. The Child Behavior Checklist used to measure internalizing and externalizing behaviors, the learning stimulation subscale of the HOME, and the CTS-PC used to measure parent's assaultive and neglectful behaviors toward the child are each based on parent self-report. Responses are driven by the parents' perceptions and willingness to share information, and in some cases could yield underreporting of problem behavior or the parent's maltreatment of the child. Nonetheless, many parents did report assaultive behaviors toward the child, and even with the assumed under-reporting there was a statistically significant relation between assaultive behaviors and the children's internalizing and externalizing problem trajectories. Also, the CBCL required repeated measurement over four time points, and the raters were caregivers who were not trained to complete these measures consistently. The impact of having different untrained raters over time is not possible to assess in the current dissertation, but this problem should be minimized because most children were at home at most time points, so the same caregivers often rated the same child.

Another limitation was the inability to include an important variable, the presence of recurrent or chronic neglect in the caregiving environment. There is evidence that children experiencing chronic and more severe neglect are more likely to experience more internalizing (Lynch & Cicchetti, 1998) and emotional problems (Ethier, Lemelin, & Lacharite, 2004), and tend to be more aggressive and withdrawn (Ethier, Lemelin, & Lacharite, 2004) . Multiple maltreatment reports have been associated with more child behavior problems among children referred to child welfare services (Kohl & Barth, 2007), although the direction of the relationship is unclear. Repeated reports may indicate that the caregiving environment continues to be compromised, and was considered as a variable in this dissertation. However, the variable was excluded from the dissertation because the NSCAW study only captured recurrent reports for the cases that remained open at later waves of the study, so there is an undercount of re-reports and re-substantiations in the NSCAW data set (National Data Archive on Child Abuse and Neglect, 2007).

Finally, the sample size in this dissertation was relatively small (n=236), but was sufficient to identify meaningful groups in the current study. In addition, each of the models yielded statistically significant results, indicating sufficient power to detect some significant relations. However, even though the data are from a nationally representative sample, generalizations from such a small group to all young children investigated for neglect in the nation must be made with caution. Despite its limitations, this exploratory study has tremendous strengths, summarized next.

Strengths

The study moves the field forward by identifying subgroups of very young children involved with child welfare services who follow distinct developmental trajectories. The use of the LCGA technique allowed examination of longitudinal data and inclusion of cases with missing developmental data at some time points, maximizing the final sample size. The study provides new evidence that there are subgroups of young children referred for neglect who face high developmental risk, while others follow relatively normal internalizing and externalizing behavior paths over time. The finding that behavioral problems often persist underscores the importance of providing early intervention services to avert ongoing problems. As noted, a brief method of screening for children showing signs of behavioral issues, or at risk of behavioral issues, could be used to identify many of the children in need of further screening and assessment. The study also finds a relation between parent-reported assaultive behaviors toward the child and problem behavior trajectories. Further analyses will help determine whether there is a relation between multiple maltreatment types (i.e. abuse and neglect) and behavior trajectories; if this is true, children investigated for both neglect and abuse could be referred for screening and assessment by early intervention or special education services.

Second, the study explores the association between receipt of child welfare services and the developmental paths of young children investigated for neglect. Although no significant effect was found, it raises the question of the nature of services provided to help children with high developmental risk in this already high risk population. With an emerging literature on parenting interventions, it is time to try targeting interventions based on the developmental needs of the children and specific skill needs of the parents, and testing the efficacy of interventions in that context. Further, the interventions should be tested with children who come to the attention of child welfare services due to neglect, regardless of substantiation status.

Finally, this study uses data from a nationally representative sample of children involved with child welfare services. By applying the NSCAW weights the findings can be generalized to the population of 2 and 3 year old children whose families are investigated for neglect and who remain home after investigation. The study moves the field forward by examining behavioral pathways over time in a nationally representative sample of young children involved with child welfare services.

With the knowledge generated from this study, practitioners and policy makers can begin to develop a clearer understanding of the developmental needs of young children referred for neglect and the factors that influence their well-being over time. The results help set the stage for intervention studies to assess the impact of specific parenting interventions and dosages that are maximally efficient in addressing the diverse needs of this high risk group of young children whose families come to the attention of child welfare services for neglect but who remain home after investigation.

Conclusion

Children referred to child welfare services for neglect are a heterogeneous group with different levels of behavioral and developmental needs. Although the majority of these children follow relatively normal behavior paths, one in seven follow *worsening* externalizing behavior paths, and a very small group of children exhibit *high chronic* externalizing behaviors over time; at the same time, about one-third exhibit *borderline clinical* internalizing behaviors consistently from age 2 or 3 into middle childhood. Child welfare agencies can play a role in improving developmental outcomes for children referred for neglect by identifying children at risk of developmental problems, referring them to the age-appropriate programs, and advocating for children to ensure they receive the services. Although the policy to refer all children in substantiated cases to early intervention services is well meaning, using brief screening tools during investigation may better identify the children most at risk – whether or not their cases have been substantiated – and avoid overwhelming early intervention services. In addition, child welfare services can intervene at the family level, using evidence based programs to help parents improve parenting skills to optimize child development as they interact with their children every day. Child welfare practitioners and early educators can work together to advocate for more funding to support early intervention, special education, and evidence-based and evidence informed parent training programs to adequately serve children involved with child welfare services at high risk of developmental problems.

With so many children referred to child welfare services due to neglect each year, and neglect often persisting over time, it is imperative that child welfare practitioners identify the children most at risk of behavioral challenges and link them and their families with early intervention, special education, and/or parenting services to help the child build their self-regulatory skills and strengthen parenting skills. Identifying young children at risk and providing early interventions has the potential to set more young neglected children on a positive course of behavioral development.

Appendix A. Study Variables and Measures

Table A.1. Variables and measurement summary

Concept / Variable	Measurement	Source of Information
Sample Selection (Wave 1)		
Child age 2 or 3	Child age reported at baseline	NSCAW derived, caregiver and caseworker report
Child remained home after investigation	Child Setting/Services, selecting all children with one of the following two values: 1=In home, no services 2=In home, services	NSCAW derived, caregiver and caseworker report
Child alleged to have experienced neglect	Primary type of alleged maltreatment, selecting only two values: 4 = "Physical Neglect didn't provide" 5 = "Neglect - no supervision"	NSCAW derived, caseworker report
Outcome Variables: Trajectories (Wave 1, 3, 4 and 5)		
Child Externalizing Behaviors	Child Behavior Checklist (CBCL; Achenbach, 1991), two versions, for age 2-3; and 4-18 Externalizing scale, Continuous variable. Both raw scores and standard scores examined for descriptive analyses. Standard scores used for outcomes in LCGA.	Parent or caregiver
Child Internalizing Behaviors	Child Behavior Checklist (CBCL; Achenbach, 1991), two versions, for age 2-3; and 4-18 Internalizing scale, Continuous variable. Both raw scores and standard scores examined for descriptive analyses. Standard scores used for outcomes in LCGA.	Parent or caregiver
Time Varying Covariate Used in Trajectory Analysis		
Change in caregiver	1=Caregiver change occurred; 0=No change, or ambiguous. Dichotomous variable indicating whether or not there was a change in caregiver between Wave 1 and Wave 3, Wave 3 and Wave 4, or Wave 4 and Wave 5.	NSCAW derived

Table A.1. Variables and measurement summary , Continued

Concept / Variable	Measurement	Source of Information
Independent Variables for the Multinomial Regression Analyses, Descriptive Data, and/or Cumulative Risk (Wave 1)		
Child characteristics		
Gender	1=Male 2=Female	Parent or caregiver
Racial or ethnic minority	1=Minority (Black, Hispanic, Other) 2=White, Non-Hispanic	Parent or caregiver
Chronic health problem	1=Yes 2=No	Parent or caregiver
Parent and Parenting Characteristics		
Caregiver age	Age in years (at baseline) Continuous variable	Parent or caregiver
Depressive symptoms	World Health Organization Composite International Diagnostic Interview Short-Form-CIDI-SF (Kessler, Andrews, Mroczek, Ustun & Wittchen, 1998); Dichotomous variable, 1=Having depressive symptoms 2=Not having depressive symptoms.	Parent or caregiver
Caregiver substance abuse	Alcohol dependency or drug dependency 1=Alcohol OR drug dependency indicated 2=Neither alcohol nor drug dependency Dichotomous variable. Using these two NSCAW calculated dependency variables (alcohol dependency, drug dependency), researcher coded all caregivers reporting either alcohol or drug dependency as 1.	Parent or caregiver self-report
Parental responsiveness to child	Home Observation for Measurement of the Environment Short Form (HOME-SF; Caldwell & Bradley 1984), converted to proportion of items with positive responses Continuous variable (range 0 – 1)	Observations by NSCAW research assistant
Learning stimulation	HOME-SF (Caldwell & Bradley, 1984) converted to proportion of items with positive responses. Continuous variable (range 0 – 1)	Parent or caregiver self-report
Physically assaultive behaviors toward the child	Conflict Tactics Scale – Parent-Child (CTS-PC; Straus, Hamby, Finkelhor, Moore, & Runyon, 1998), Total physical assault scale, Continuous variable.	Parent or caregiver
Neglectful behaviors toward the child	CTS-PC (Straus, Hamby, Finkelhor, Moore, & Runyon, 1998), Neglect scale, Continuous variable	Parent or caregiver

Table A.1. Variables and measurement summary , Continued

Concept / Variable	Measurement	Source of Information
Broader Caregiving Environment		
Domestic violence	Conflict Tactics Scale (Straus, 1979). Partner threw something at the caregiver; pushed, grabbed or shoved the caregiver; slapped, kicked, bit or hit the caregiver with their fist; hit or tried to hit the caregiver with something, beat up or choked the caregiver, threatened the caregiver with a knife or gun or actually used a knife or gun on the caregiver.	Parent or caregiver
Low Income	Household income at Wave 1, categorical treated as continuous, with 11 categories: 1: <5k 2: 5,000 to <10,000 3: 10,000 to <15,000 4: 15,000 to <20,000 5: 20,000 to <25,000 6: 25,000 to <30,000 7: 30,000 to <35,000 8: 35,000 to <40,000 9: 40,000 to <45,000 10: 45,000 to <50,000 11: >=50,000	Parent or caregiver
Involvement with child welfare services		
Outcome of initial investigation or assessment	1=Yes, Substantiated or indicated 2=No, neither substantiated nor indicated, or Other, including low, medium, or high risk (reference group)	Caseworker
Receipt of child welfare services	Child setting/services 1=In home, no services 2=In home, services	Caseworker and parent, NSCAW team
Cumulative Risk		
Number of risks in the caregiver environment	Number of risk factors, of the following: 1. Child maltreatment 2. Child has chronic health problem (Biomedical risk condition) 3. Minority status 4. Caregiver substance abuse 5. Caregiver depression (mental health problem) 6. Young Caregiver 7. Single Caregiver 8. Low Caregiver Education 9. Domestic violence in the past year 10. 4 or more children in the home 11. Living in poverty Categorical and continuous variables were dichotomized prior to counting the number of risks.	Variable calculated for current study, based on responses from caseworker and caregiver.

Table A.1. Variables and measurement summary , Continued

Concept / Variable	Measurement	Source of Information
Additional Variables		
NSCAW Identifier	Unique number assigned to each case in data set	
Weighting variables	National Weights calculated for NSCAW sample	
Geographic variables	- Sample Stratum - NSCAW primary sampling unit identifier	

Table A.2 Variables and measures: Detailed list

Concept / Variable	Measurement	Source of Information	NSCAW Variable Name
Sample Selection (Wave 1)			
Child age 2 or 3	Child age reported at baseline	NSCAW derived variable, based on reported DOBs from primary caregivers and caseworkers (discrepancies resolved by NSCAW team)	chdAgeY
Child remained home after investigation	Child Setting/Services, selecting all children with one of the following two values: 1=In home, no services 2=In home, services (excludes foster home, kin care setting, etc.)	NSCAW derived variable, based on caregiver and caseworker report (discrepancies resolved by NSCAW team)	chdSet
Child alleged to have experienced neglect	Primary type of alleged maltreatment, selecting only two values: 4 = "Physical Neglect didn't provide" 5 = "Neglect - no supervision"	NSCAW derived variable, based on caseworker report	chrabuse
Outcome Variables: Trajectories (Wave 1, 3, 4 and 5)			
Child Externalizing Behaviors	Child Behavior Checklist (CBCL; Achenbach, 1991), two versions, for age 2-3; and 4-18 Externalizing scale, Continuous variable Both raw scores and standard scores examined for descriptive analyses. Standard scores used for outcomes in LCGA.	Parent or caregiver	Age 2-3 Raw: PTC_EXT TC3_EXT TC4_EXT TC5_EXT Standard: PTC_EPT TC3_EPT TC4_EPT TC5_EPT

Table A.2 Variables and measures: Detailed list, Continued

Concept / Variable	Measurement	Source of Information	NSCAW Variable Name
			Age 4 and up Raw: PBC_EXT BC3_EXT BC4_EXT BC5_EXT Standard: PBC_EPT BC3_EPT BC4_EPT BC5_EPT
Child Internalizing Behaviors	Child Behavior Checklist (CBCL; Achenbach, 1991), two versions, for age 2-3; and 4-18 Internalizing scale, Continuous variable Both raw scores and standard scores examined for descriptive analyses. Standard scores used for outcomes in LCGA.	Parent or caregiver	Age 2-3 PTC_INT TC3_INT TC4_INT TC5_INT Standard: PTC_IPT TC3_IPT TC4_IPT TC5_IPT Age 4 and up Raw: PBC_INT BC3_INT BC4_INT BC5_INT Standard: PBC_IPT BC3_IPT BC4_IPT BC5_IPT
Time Varying Co-variate for the Latent Class Growth Analysis (Waves 3, 4 and 5)			
Change in caregiver	1=Caregiver change occurred (includes move to kinship care, foster care, other settings); 0=No change, or ambiguous. Dichotomous variable, indicating whether or not there was a change in caregiver between Wave 1 and Wave 3, Wave 3 and Wave 4, or Wave 4 and Wave 5.		CgChW13 CgChW34 CgChW45

Table A.2 Variables and measures: Detailed list, Continued

Concept / Variable	Measurement	Source of Information	NSCAW Variable Name
Independent Variables for the Multinomial Regression Analyses, Descriptive Data, and/or Cumulative Risk (Wave 1)			
Child characteristics			
Gender	1=Male 2=Female Dichotomous variable	Parent or caregiver	chdGENDR
Racial or ethnic minority	1=Minority (Black, Hispanic, Other) 2=White, Non-Hispanic Recoded the NSCAW race or ethnicity variable (chdRACEH), which included: 1=White, Non-Hispanic 2=Black, Non-Hispanic, 3=Hispanic, 4=Other	Parent or caregiver	chdRACEH
Chronic health problem	1=Yes 2=No Dichotomous variable	Parent or caregiver	chdCHRON
Parent and Parenting Characteristics			
Caregiver age	Age in years (at baseline) Continuous variable	Parent or caregiver	PCGVRAGE
Depressive symptoms	World Health Organization Composite International Diagnostic Interview Short-Form-CIDI-SF (Kessler, Andrews, Mroczek, Ustun & Wittchen, 1998); Dichotomous variable, 1=Having depressive symptoms 2=Not having depressive symptoms. See text for complete definition.	Parent or caregiver	PDP1A PDP1AA PDP1BA PDP1CA PDP1DA PDP2A PDP2AA PDP2AB PDP2AC PDP2AD PDP3A PDP3AA PDP4A PDP5A PDP6A PDP8A PDP8AM PDP8AY PDP8BA PDP8CA PDP8DA PDP8EA PDP9A PDP9AA PDP9BA PDP9CA PDP10A PDP10AA

Table A.2 Variables and measures: Detailed list, Continued

Concept / Variable	Measurement	Source of Information	NSCAW Variable Name
			PDP10AB PDP10AC PDP10AD PDP11A PDP11AA PDP12A PDP13A PDP14A PDP16A PDP16AM PDP16AY PDP16BA PDP16CA PDP16DA PDP16EA
Caregiver substance abuse	Alcohol dependency or drug dependency 1=Alcohol OR drug dependency indicated 2=Neither alcohol nor drug dependency Dichotomous variable NSCAW created two variables, one indicating alcohol dependency and one indicating drug dependency, based on a series of questions about drug and alcohol use and frequency in the last 12 months. Using these two NSCAW variables, researcher coded all caregivers reporting either alcohol or drug dependency as 1.	Parent or caregiver self-report	PAD_ALDP PDD_DRDP
Parental responsiveness to child	Home Observation for Measurement of the Environment Short Form (HOME-SF; Caldwell & Bradley 1984), converted to proportion of items with positive responses Continuous variable (range 0 – 1)	Parent or caregiver self-report and observations by NSCAW research assistant	Age 0-2 PIO1C PIO1E PIO1G PIO2F PIO2G Age 3-5 PIO4B PIO4C PIO4D PIO4E
Learning stimulation	HOME-SF (Caldwell & Bradley, 1984) converted to proportion of items with positive responses Continuous variable (range 0 – 1)	Parent or caregiver self-report and observations by NSCAW research assistant	Age 0-2 PHO2A PHO3A PHO5A PHO6A

Table A.2 Variables and measures: Detailed list, Continued

Concept / Variable	Measurement	Source of Information	NSCAW Variable Name
			Age 3-5 PHO16A PHO17A PHO19A PHO26A PHO27A
Physically assaultive behaviors toward the child	Conflict Tactics Scale – Parent-Child (CTS-PC; Straus, Hamby, Finkelhor, Moore, & Runyon, 1998), Total physical assault scale, Continuous variable	Parent or caregiver	PDS_ATPR
Neglectful behaviors toward the child	CTS-PC (Straus, Hamby, Finkelhor, Moore, & Runyon, 1998), Neglect scale, Continuous variable	Parent or caregiver	PDS_NGPR
Broader Caregiving Environment			
Domestic violence	Domestic violence was measured using data collected with the Conflict Tactics Scale (Straus, 1979). Caregivers were identified as experiencing domestic violence if they reported that their partner did any of the following: threw something at the caregiver; pushed, grabbed or shoved the caregiver; slapped, kicked, bit or hit the caregiver with their fist; hit or tried to hit the caregiver with something, beat up or choked the caregiver, threatened the caregiver with a knife or gun or actually used a knife or gun on the caregiver.	Parent or caregiver	PDV1A PDV2A PDV3A PDV4A PDV5A PDV6A PDV7A PDV8A PDV9A
Low Income	Household income at Wave 1, categorical treated as continuous, where 1: <5k 2: 5,000 to <10,000 3: 10,000 to <15,000 4: 15,000 to <20,000 5: 20,000 to <25,000 6: 25,000 to <30,000 7: 30,000 to <35,000 8: 35,000 to <40,000 9: 40,000 to <45,000 10: 45,000 to <50,000 11: >=50,000	Parent or caregiver	pin2a
Involvement with child welfare services			
Outcome of initial investigation or assessment	1=Yes, Substantiated or indicated (reference group) 2=No, neither substantiated nor indicated, or Other, including low, medium, or high risk	Caseworker	CCI10A

Table A.2 Variables and measures: Detailed list, Continued

Concept / Variable	Measurement	Source of Information	NSCAW Variable Name
	Recoded from original variable, which included 1=Substantiated 2=Indicated 3=High risk 4=Medium risk 5=Low risk		
Receipt of child welfare services	Child setting/services 1=In home, no services 2=In home, services Dichotomous variable	Caseworker and parent, resolved by NSCAW team	chdSet
Cumulative Risk			
Number of risks in the caregiver environment	Number of risk factors, of the following: 12. Child maltreatment 13. Child has chronic health problem (Biomedical risk condition) 14. Minority status 15. Caregiver substance abuse 16. Caregiver depression (mental health problem) 17. Young Caregiver 18. Single Caregiver 19. Low Caregiver Education 20. Domestic violence in the past year 21. 4 or more children in the home 22. Living in poverty Categorical and continuous variables were dichotomized prior to counting the number of risks.	Calculated variable, based on responses from caseworker and caregiver.	
Additional Variables			
Unique number assigned to each case	NSCAW Identifier		NSCAWID
Weighting variables	National Weights - Wave 1 - Waves 3,4,5 - Wave 5		NANALWT NANLW345 NANALWT5
	Geographic variables - Sample Stratum (9 stratum, including 8 large states and a 9th stratum that includes cases from remaining states) - NSCAW primary sampling unit identifier (92 PSU's; but definition of values not listed)		STRATUM NSCAWPSU

Appendix B. Missing Data Analyses

Table B.1. Missing data analyses: Comparison of cases included in the analyses versus cases excluded from the analyses due to missing data

	Caregiving Environment Model		Child Welfare Services Model		Cumulative Risk Model		Child Welfare Services controlling for Cumulative Risk	
N Included	178		177		179		178	
N Excluded	58		59		57		58	
Variable	Adj. Wald F	*p-value*	Adj. Wald F	*p-value*	Adj. Wald F	*p-value*	Adj. Wald F	*p-value*
Child Characteristics								
Gender	0.766	0.385	0.778	0.381	0.351	0.556	0.197	0.659
Racial or Ethnic Minority	0.242	0.624	0.257	0.614	0.034	0.855	0.013	0.908
Chronic health problem	2.627	0.110	2.639	0.109	2.138	0.148	1.942	0.169
Parent and Parenting Characteristics								
Caregiver Age	0.14	0.712	0.13	0.722	0.24	0.629	0.67	0.418
Single caregiver	0.498	0.483	0.487	0.488	0.728	0.397	0.372	0.544
Low caregiver education	2.553	0.115	2.579	0.113	1.899	0.173	1.462	0.232
Broader Caregiving Environment								
Number of children in HH	0.29	0.591	0.31	0.581	0.06	0.815	0.93	0.339
Income	5.42	0.023*	5.46	0.023*	5.81	0.019*	2.18	0.146
Child Welfare Services								
Outcome of investigation or assessment	1.022	0.316	1.022	0.316	2.491	0.119	0.552	0.460
Receipt of ongoing child welfare services (in home)	0.029	0.866	0.037	0.848	0.094	0.760	0.153	0.697

*p<.05;   Multiple R-square for income was 0.039 (caregiving environment and child welfare services models) and 0.043 (cumulative risk model)

Appendix C. Cognitive Development

Cognitive development was one of the outcomes the researcher planned to examine as part of the dissertation. The latent class growth analyses were conducted, but the cognitive results are presented in the Appendix due to serious concerns with measurement. Due to the measurement concerns and their effect on LCGA results, no further analyses were conducted with cognitive data. This Appendix provides the literature review for cognitive development, a summary of the cognitive measures used and the results from the LCGA analyses.

Prevalence of Cognitive and Language Delays among Young Neglected Children

Children who experience neglect in their early years are at high risk for poor developmental outcomes, exhibiting more cognitive delays (Hildyard & Wolfe, 2002; Shonkoff & Phillips, 2000), problems with language development (Hildyard & Wolfe, 2002; Katz, 1992), aggression (Hoffman-Plotkin & Twentyman, 1984), and poor academic performance (Eckenrode, Laird, & Doris, 1993; Kendell-Tackett & Eckenrode, 1996) compared to their peers who were not maltreated. Although the rate of cognitive delay specific to neglected children age 2 and 3 years old has yet to be published, cognitive and language delays are known to be prevalent among young children who have been investigated by child welfare services nationally – the majority of whom have been identified as neglected (NSCAW, 2005). Almost one-third (30.4%) of the youngest maltreated children, age 36 months and younger, have extremely low cognitive scores (2 standard deviations below the mean) as measured by the Batelle Developmental Inventory (BDI), and 13.8% of the children have extremely low scores on language skills as measured by the Preschool Language Scale (PLS-3) (Casanueva, Cross, & Ringeisen, 2008). An NSCAW study focusing on children age 2 to 5 documents delays in cognitive skills (10 to 33%) and language development (10 to 17%) among children remaining home after investigation, depending on age (age 2 and younger vs. ages 3 to 5) and case status (active child welfare case or not) (Stahmer et al., 2005). Compared to the general population, these young children involved with child welfare services exhibit higher rates of cognitive and language problems (Stahmer et al., 2005) and behavior problems (Burns et al., 2004; Stahmer et al., 2005) than children in the general population. These developmental problems appear to persist over time (Barth et al., 2008; McCrae, 2009). Infants and toddlers investigated for neglect, compared to physical or sexual abuse, may be particularly vulnerable to persistent problems, as evidenced by the greater likelihood of receiving special education services once they reach school-age (Scarborough & McCrae, 2010).

Impact of Early Developmental Problems

When the caregiving environment does not nurture the growth and development of young children they are likely to fall behind developmentally, which may set the course for an array of long-term consequences (Shonkoff & Phillips, 2000). Researchers in the field of neuroscience suggest that early adversity – including abuse and neglect – may affect the development of neural processes such as attention- and emotion-regulatory abilities, which in turn may affect behavior and cognitive developmental trajectories (Shackman et al., 2008). The early development of children's cognitive, language, and socio-emotional skills influences their school readiness and early academic achievement (Snow, 2006). Children experiencing maltreatment very early in life exhibit lower cognitive functioning at age 6 compared to those maltreated more recently as well as children who have not been maltreated (Erickson, Egeland, & Pianta, 1989). When children fall behind early in life, this sets the course for long term academic struggles and poor long-term educational outcomes (Shonkoff & Phillips, 2000).

Consistent with the developmental literature, young maltreated children with many risk factors are likely to face early developmental delays and be unprepared for school when they enter kindergarten (Barth et al., 2008). Once neglected children are in school, they are more likely to earn lower grades (Eckenrode et al., 1993; Kendell-Tackett & Eckenrode, 1996) and score lower on standardized academic tests (Hildyard & Wolfe, 2002) compared to non-maltreated children. Not all neglected children will experience these negative outcomes, but as a group young neglected children are at high risk of cognitive and behavioral problems and their consequences.

Services to Support Development of 2- and 3-year-old Neglected Children

Fortunately, intervening with children at risk early in life can set children on a positive course of development and improve long-term outcomes (Engle & Black, 2008; Shonkoff & Phillips, 2000). Several federally funded programs provide services for children at risk of developmental problems, including the Individuals with Disabilities Education Act Part C (early intervention) and Part B (special education for children age 3 and older). Early education programs such as Head Start have demonstrated reductions in the need for special education and grade repetition (Anderson et al., 2003), and other high quality early childhood education programs such as the Abecedarian Project have demonstrated both short-term and long-term impact on cognitive and academic abilities among low-income families (Campbell & Ramey, 1994; Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001). Unfortunately, very few young children involved with child welfare services receive early intervention or special education services (Barth et al., 2008; Casanueva, Cross, & Ringeisen, 2008; NSCAW, 2005; Stahmer, et al, 2005).

Literature

Normative and Atypical Cognitive Development of Young Children

Cognitive development is a process beginning in infancy involving a person's ability to acquire and use knowledge. It "refers to the manner in which people learn to think, reason, and use language. Cognition involves a person's intelligence, perceptual ability, and ability to process information" (Berman, Kozier, Erb, & Snyder, 2008, p. 356). The environment that a child interacts with is key to unlocking the growth of a child's mind (Bruner, 1964). Infants have an innate information processing system which, with exposure to the physical and social environment around them, develops gradually and continually (Cohen & Cashon, 2006). There is an incredible growth in cognitive skills between birth and elementary school involving a progression of skills that build upon each other. Individual development varies tremendously, with children having strengths in different areas and following diverse developmental pathways (Vallotton & Fischer, 2008).

Early language and intelligence are key aspects of cognition referenced repeatedly in the literature, each interrelated with other aspects of cognition (i.e., perception, memory, reasoning, etc.). Language refers to symbolic human communication (i.e., speech, writing, signs) and serves as a key conduit to convey thoughts (expressive language) and receive information (receptive language; Ellis, 2008; Feldman & Messick, 2008). Language development requires coordination of several aspects of cognition including attention, visual and auditory processing, and memory (Ellis, 2008). At the same time language contributes to other areas of cognitive development, providing the building blocks for complex cognition (Ellis, 2008). As children acquire language they gain ways to organize their experiences, progressing from the ability to create simple representations of their environment based on concrete objects (i.e., “I like blocks”) to complex representations inclusive of abstract thinking (Bruner, 1964; Feldman & Messick, 2008). Early language skills are predictive of later language skills (Feldman & Messick, 2008; Rescorla, 2002), suggesting some constancy in language development over time. Early language skills are also predictive of scores on cognitive tests (Carson et al., 1998), as well as reading skills (Hayiou-Thomas, Harlaar, Dale, & Plomin, 2010; Poe, Burchinal, & Roberts, 2004; Rescorla, 2002) and academic performance (Kastner, May, & Hildman, 2001) in middle elementary school. Among child welfare involved children, low language scores early in life are associated with special education placement once children are in school– an indicator of developmental need (Scarborough & McCrae, 2010). Despite these relations, it is important to note that each child develops differently. Many children who face early delays catch up on language development over time, and early language delay does not necessarily indicate other cognitive delays (Carson, Klee, Perry, Muskina, & Donaghy, 1998).

Intelligence – another key aspect of cognition – has been conceptualized in many ways, with many different operational and “real” definitions (Sternberg, Kaufman, & Grigorenko, 2008). Taking these many definitions into account, intelligence generally refers to what you know, how you think, and your ability to learn from experience and adapt to your environment (Sternberg et al., 2008). Intelligence tests are widely used to compare the cognitive abilities of same-age children. Intelligence scores are variable in the preschool years, but during the school years individual children's scores tend to be stable compared to their same-age peers when measured repeatedly over time (Moffitt, Caspi, Harkness, & Silva, 1993). For a small subset of children, though, profound life changes may impact intelligence test scores, albeit usually in modest amounts (Moffitt et al., 1993). Whether or not change occurs, and how much, varies from one child to the next (Moffit et al., 1993). In summary, cognitive skills – including language and intelligence – are developed continually over time, influenced by the child's interaction with the caregiving environment, and early development sets the course for development throughout childhood.

Cognitive Trajectories of Maltreated Children

Researchers suggest that early development sets the stage for lifelong development, and neglected children are at risk of poor outcomes (Shonkoff & Phillips, 2000). Developmental studies of neglected and other maltreated children show lower levels of functioning compared to non-maltreated high-risk children beginning around 12 months, followed by a decline in intellectual functioning compared to their peers through the toddler and preschool years (Erickson et al., 1989). At age 6, neglected children performed poorly on cognitive tests assessing comprehension, vocabulary and other cognitive skills, earning lower scores than children who were not maltreated, those who were sexually abused, and those whose parents were psychologically unavailable (Erickson et al., 1989). More recent evidence from the child welfare literature provides evidence that abused and neglected children are at high risk of facing cognitive delays, language delays, and academic problems at various stages of childhood, suggesting possible problematic trajectories over time. On average cognitive functioning is lower than the normative population in maltreated children age 36 months and younger (Casanueva, Cross, & Ringeisen, 2008), among preschool children (Stahmer et al., 2005), and among maltreated school-age children (Crozier & Barth, 2005). Neglected children in particular score lower on academic tests (Hildyard & Wolfe, 2002) and earn lower grades (Eckenrode et al., 1993; Kendell-Tackett & Eckenrode, 1996) compared to non-maltreated children. Taken together, it seems likely that children neglected early in life may be at risk of early cognitive challenges that persist over time. Yet the developmental paths of individual children vary considerably (Vallotton & Fischer, 2008), and not all maltreated children have low scores. There are likely subgroups of neglected children following distinct developmental paths, some normative and some problematic. The actual, varying cognitive trajectories of neglected children – and the proportion of children following problematic and normative trajectories – have not yet been explored in the literature.

Factors Affecting Cognitive Development of Young Maltreated Children

Child characteristics. Language development differs slightly for boys and girls, although receptive skills are similar; on average boys develop expressive language skills (i.e., speech) somewhat more slowly than girls (Reynolds & Goldson, 2009). On the other hand, intelligence scores – as measured by the Kaufman Brief Intelligence Test (K-BIT) – are similar for males and females (Kaufman & Wang, 1992). No significant gender differences in cognitive or academic measures – including K-BIT, Mini Battery of Achievement (MBA) math, and MBA reading – were observed among boys and girls in the national NSCAW study (Crozier & Barth, 2005).

There have been mixed findings regarding a relationship between *race* and child development as measured by standardized tests. In some studies African American children score lower on average on language development than white children, but these differences are small and are likely to be explained by greater prevalence of low socio-economic status, a factor consistently associated with lower language scores (Tomblin, Records, Buckwalter, Xuyang, Smith, & O'Brien, 1997). Similarly, race has been linked to lower scores on the K-BIT, but the difference was only about half of a standard deviation for the youngest children, age 4 to 7 (Kaufman & Wang, 1992). In the national NSCAW sample of families referred to child welfare services – the data source for the current study – African American school-age children were more likely to score lower on the K-BIT than their white counterparts, but the children had similar reading and math scores in the MBA (Crozier & Barth, 2005).

Parent and parenting characteristics. Preschool children of adolescent parents are more likely to have cognitive delays than children of older parents, and these problems increase over time (see review, Coley & Chase-Lansdale, 1998). In addition to maternal age, maternal depression is related to cognitive development.

Maternal depression has been linked to adverse developmental outcomes among young children in numerous studies, as documented in several reviews of the literature (Lochman et al., 2008; Sohr-Preston & Scaramella, 2006; Stacks, 2005). Before age 2 children of depressed and non-depressed mothers may have similar cognitive scores, but by age 3 children of untreated depressed mothers score lower on cognitive scores than their peers (Cichetti, Rogosch, & Toth, 2000). In a nationally representative sample, young children age 28 to 50 months (approximately age 2 through 4 years) had lower cognitive scores when their mothers reported either moderate or severe depressive symptoms, compared to children with non-depressed mothers (Petterson & Albers, 2001). Similarly, maternal mental health, including depression, was linked to lower math scores among child welfare involved school-age children, although there was no relation with intelligence (K-BIT) scores (Crozier & Barth, 2005). Very early in life maternal depression may impact cognitive development as depressed mothers tend to be less responsive in their parenting, use less infant-directed speech, provide less frequent and positive physical touch (affecting neural development), and provide less attention to reinforce exploration and manipulation of objects and early attempts at speaking (Sohrs-Preston & Scaramella, 2006). During toddlerhood depressed parents are less likely to join their children in symbolic play and less likely to read to the children (or read for shorter periods and engage less in conversation), and thus may not support and stretch their children's cognitive and language development as much as non-depressed mothers (Sohrs-Preston & Scaramella, 2006). Treatment of depressed mothers and their toddlers– helping to improve communication and interaction – may promote typical cognitive development and prevent decreases in age-expected cognitive scores associated with maternal depression (Cichetti et al., 2000).

Parenting behaviors that are coercive, negative or otherwise harsh, abusive or neglectful are linked to slower cognitive and language development in children. Young children, ages 3 to 6, scored lower on cognitive (Stanford-Binet Intelligence Scale and Merrill-Palmer Scale of Mental Tests) and language (Peabody Picture Vocabulary Test) tests when they were the subject of confirmed reports of abusive or neglectful parenting, compared to non-maltreated children of similar income (Hoffman-Plotkin & Twentyman, 1984). The link between maltreatment and cognitive and language scores persists beyond the effect of poverty as demonstrated in multiple studies (Cicchetti, 2004; Erickson et al., 1989). However, in at least one study neglect did not predict cognitive delays after controlling for several risk factors, including SES and maternal depression, in a high-risk group of urban preschoolers (Dubowitz et al., 2002).

Broader caregiving environment. Cognitive-language problems may emerge very early in life for children living in poverty, affecting long-term well-being (Engle & Black, 2008). Poverty has been linked to lower cognitive scores among young children between 28 and 50 months in a nationally representative sample of women pregnant in 1988 (Petterson & Albers, 2001). Persistent poverty (poverty at baseline and follow up) had a large effect on cognitive skills for girls, and was also related to lower cognitive scores for boys (Petterson & Albers, 2001). The relation between poverty and cognitive skills has also been documented in a national sample of child welfare involved children. Specifically, children referred to child welfare services who were living in poverty scored lower on tests of intelligence (K-BIT), math, and reading compared to child welfare involved children not living in poverty (Crozier & Barth, 2005). Poverty also effects language ability. Three-year-old children in families with low incomes have lower levels of language ability than higher income children (Berger, Paxson & Waldfogel, 2009), and young low-income children are more likely to have a slower rate of language development and more language delays (Feldman & Messick, 2008).

Cumulative environmental risk during the first year of life has been associated with lower IQ scores in 4-year-old children (Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987). An accumulation of risk factors has also been linked with lower levels of language ability (measured by PLS-3) among low-income 3-year-old children (Stanton-Chapman, Chapman, Kaiser, & Hancock, 2004). Among school-aged maltreated children, performance on cognitive measures (i.e., Mini Battery of Achievement (MBA) reading and math) worsened significantly as the number of risk factors increased (Crozier & Barth, 2005).

Research Questions

This portion of the study aims to identify the number, shape, and size of subgroups of children following distinct developmental trajectories for cognitive functioning. The research questions, listed below, pertains to children whose families were referred to child welfare services for neglect when the children were age 2 or 3 years old and who remained home after investigation.

3) How many distinct trajectories (paths) of cognitive development–receptive and expressive language before age 4, and verbal and non-verbal intelligence thereon–do subgroups of these young children follow?

4) What shape are these trajectories (i.e., linear, cubic, quadratic)?

5) What proportions of children follow normal and problematic trajectories?

6) Is there a relation between membership in problematic cognitive and problematic behavioral trajectory groups?

In general, it is hypothesized that some of these young children may be developing cognitive/language skills at a normal rate, whereas others may score considerably lower and progress at a slower rate of cognitive and language development. In addition, it is hypothesized that children in a highly problematic behavior group may also be in the lowest scoring cognitive subgroup.

Methods

Cognitive Measures

Cognitive skills will be measured by combining two measures, the Preschool Language Scale-3 (PLS-3; Zimmerman, Steiner, & Pond, 1992) for ages 2 and 3years and the Kaufman Brief Intelligence Test (K-BIT; Kaufman & Kaufman, 1990) for children 4 and older in following waves. Multiple measures are needed because the study follows children from a very young age – when language skills are a key indicator of cognitive ability – to school age when broader measures may be used (i.e., the K-BIT beginning at age 4). Both early language skills (Hayiou-Thomas et al., 2010; Kastner et al., 2001; Poe et al., 2004) and intelligence test scores (as measured by the K-BIT; Kaufman & Kaufman, 1990) represent aspects of cognitive skills, and both are correlated with academic achievement; thus they provide a reasonable estimate of cognitive skills for the purpose of this study. Both scales include a measure of expressive language (expressive communication on the PLS-3 and expressive vocabulary on the K-BIT), further linking the measures. Standardized scores will be used in order to provide an estimate of cognitive ability compared to other children in the same age range, and to help account for the use of two different measures.

Rather than assuming the PLS-3 and K-BIT measures complement each other in assessing cognitive ability at various ages, preliminary analyses were conducted to assess the degree to which the measures correlate in this sample when both measures are available. The scores were examined to determine whether or not there are any consistent patterns across scales that may affect results (e.g., if PLS-3 scores are lower than K-BIT, then changes over time may be due to the measure rather than actual developmental change). Three sets of analyses were conducted (see Data Analysis Plan, LCGA, Specifying cognitive LCGA models) and results compared to determine whether or not similar patterns emerged. The correlations among the two measures and the comparisons of LCGA models using different combinations of the measures are described in the Results section.

The PLS-3 measures early expressive communication and auditory comprehension skills in children ages 5 and younger and has been standardized for boys and girls using a representative sample stratified by parent education level, geographic region, and race (Zimmerman, Steiner, & Pond, 1992). The PLS-3 has been shown to have acceptable internal consistency (α =.87 on the total score), high test-re-test reliability (.91 to .94 for the total score), and good inter-rater reliability (.98 correlation for 89% of raters; Zimmerman, Steiner, & Pond, 1992). The PLS-3 is an observational measure with two subscales, Auditory Comprehension and Expressive Communication. Raw scores, standard scores, and percentiles are available in the dataset for each subscale and the total scale, calculated by the NSCAW Research Team. The total language standard score will be used in the current study. The normative mean for the PLS-3 is *M*=100 (*SD*=15). It is important to note that a study assessing the performance of low-income African American children on the PLS-3 found that this group scored significantly lower (*M*=86.09, *SD*=12.79) than the norm, as did a smaller comparison group of low-income white children (M=88.20, SD=13.24) (Qi, Kaiser, Milan, Yzquierdo, & Hancock, 2003). The PLS-3 is still considered a reliable and valid measure of language development for low-income African American children, but results should be interpreted with caution (Qi et al., 2003). A conservative cutoff of 2 *SD* below the mean will be interpreted as a significant delay (Qi et al., 2003) for the primarily low-income NSCAW population. This conservative cutoff also helps address concerns with data collection which necessitated estimation of scores for children for whom the skip pattern was incorrectly administered for this measure (Richard Barth, personal communication, November 2010).

The K-BIT measures verbal and non-verbal intelligence of children age 4 and older (Kaufman & Kaufman, 1990). The K-BIT is administered directly with the child in two sections: the verbal section assesses the child's knowledge of words and the matrices (non-verbal) measure the child's ability to perceive relationships and complete analogies. The K-BIT has been normed using a nationally representative sample stratified by gender, socio-economic status, race/ethnicity, and geographic region (Kaufman & Kaufman, 1990). The K-BIT is not a comprehensive measure, but this brief measure of cognitive functioning is reliable and valid, including validity for screening young children (Lichtenberger, Broadbooks, & Kaufman, 2000). The K-BIT is significantly correlated with achievement tests (Lassiter & Bardos, 1995; Prewett & McCaffery, 1993). The composite and subscales have good internal consistency and test-retest reliability (Kaufman & Kaufman, 1990; Lichtenberger et al., 2000). In the NSCAW sample the composite score yielded good internal consistency ($\alpha = .84$), with adequate internal consistency on the verbal (.76) and non-verbal (.79) subscales (NSCAW, 2007). Raw scores were computed and converted to standard scores by the NSCAW team. The standardized scale has a mean of 100 and a standard deviation of 15. Children scoring 85 or above are within normal range of intelligence, while children scoring below 85 should receive more comprehensive assessment. For the purpose of this study, and consistent with the planned interpretation for the PLS-3, a more conservative cut-off of 2 SD below the mean (scoring 70 or below) will be interpreted as a significant cognitive delay. The composite score from the K-BIT will be used to assess cognitive skills for children age 4 and older during Waves 3, 4 and 5 in the current study.

LCGA Analyses for Cognitive Trajectories: Specifying the Models

Due to the use of two distinct measures of cognition over the five to six years, three sets of cognitive models were run on an exploratory basis: K-bit scores only during Waves 3, 4 and 5; PLS-3 scores at Wave 1 combined with K-BIT scores for Waves 3, 4 and 5; and PLS-3 scores at Waves 1 and 3 combined with K-BIT at Waves 4 and 5 (Table C.1). First, four linear LCGA models (2-class, 3-class, 4-class, and 5-class) were specified for each set of cognitive scores. Next, a time varying covariate, caregiver change, was added to each of these models. Finally, a quadratic term was added to the 24 models (with and without TVC's) to test the possibility of a curvilinear shape of the trajectories. Thus, a total of 48 LCGA models for cognition were estimated. Results for each set (KBIT only; PLS-3 W1/KBIT W3, 4, 5; and PLS-3 W1-3/KBIT W4-5) were compared to see if similar results emerged.

Table C.1. Number of LCGA Models Run for Each Developmental Trajectory

	Cognitive Skills^		
LCGA models (2, 3, 4, & 5 classes)	**KBIT W3-5**	**PLS-3 W1; KBIT W3-5**	**PLS-3 W1&3; KBIT W4&5**
Linear	4	4	4
Linear with TVC	4	4	4
Quadratic	4	4	4
Quadratic with TVC	4	4	4
Total Number of LCGA Models	**16**	**16**	**16**

TVC=Time varying covariate. The time-varying covariate was caregiver change at Waves 3, 4 and 5.
^Cognitive skills data were run 3 different ways, due to a change in measures over time. See text for explanation.

Results

Identifying Subgroups of Children Following Distinct Cognitive Development Trajectories: LCGA Results

Cognitive scores. Cognitive trajectories were modeled for this dissertation, but several challenges arose due to age-appropriate instrumentation changes and a limited number of data points available for each instrument. Cognitive data for these measures are presented in the tables below and discussed in this section.

In the NSCAW study different cognitive measures were completed at different age ranges, and at certain ages more than one age-appropriate measure was administered. Table C.2 provides the number and percent of children in the current study cohort (n=236) completing the Preschool Language Scale (PLS-3), the Kaufman Brief Intelligence Test (K-BIT), and both instruments. The majority of children in the current sample (n=236) completed the PLS-3 at Wave 1 (89.0%) and Wave 3 (78.8%), but more children completed the K-BIT at Wave 4 (83.5%) and Wave 5(79.7%). None of the children in this cohort were administered the PLS-3 at Wave 5 due to their age.

Table C.2. Number of children completing the PLS-3 and K-BIT assessments at each wave of the NSCAW study (N=236)

	Wave 1		Wave 3		Wave 4		Wave 5	
	N	%	N	%	N	%	N	%
PLS-3	210	89.0	186	78.8	144	61.0		
K-bit	1	0.4	109	46.2	197	83.5	188	79.7
Both PLS-3 and K-BIT	1	0.4	107	45.3	143	60.6	0	0.0

Table C.3 provides average scores for the young children who completed the PLS-3 and K-BIT at each wave. Scores for the PLS-3 at Waves 1, 3 and 4 fell below the normative mean (M=100, SD=15), and the difference was significant at each wave (p<.0005). The mean difference ranged from -18.19 at Wave 1 to -8.87 at Wave 4. Compared to findings from a study of low-income African American children (M=86.09, SD=12.79; Qi et al., 2003), the mean PLS-3 scores for the current sample were significantly higher (p=.001, p=.013, p=.002 at Waves 1, 3 and 4, respectively). PLS-3 scores for the current sample were also significantly higher than those of low-income white children in the same study (M=88.20, SD=13.24; Qi et al., 2003) at Wave 1 (p<.0005), but the difference was not significant at Wave 3 (p=.345) and there was a trend toward significance at Wave 4 (p=.066). Mean scores for the K-BIT in this sample fell below the normative mean (M=100, SD=15), with mean differences ranging from -6.94 points at Wave 3 to -4.2 points at Wave 5. The difference was significant at each wave (p<.0005) but within 1 standard deviation of the normative mean.

Table C.3. Mean standardized scores for children completing PLS-3 and K-BIT

	Wave 1			Wave 3			Wave 4			Wave 5		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD
PLS-3	210	81.81	19.10	186	89.48	18.49	144	91.13	18.96	--	--	--
K-BIT Vocabulary	1	99.00	--	109	91.05	12.53	197	92.50	13.56	188	93.02	13.79
K-BIT Composite	1	107.00	--	109	93.06	14.50	197	93.59	13.67	188	95.80	13.29

In order to follow the cognitive development of children over the five or six years of the study, the scores from the two measures were used together. As seen in Table C.3, the average standard scores for the PLS-3 and K-BIT were within a few points of each other at Wave 3 and again at Wave 4. Table C.4 presents the correlations between the two measures at Waves 3 and 4. The PLS-3 and K-BIT measures have a relatively strong correlation (above .5) in this sample of young children at both waves, and these correlations are statistically significant (p<.0005). However, the correlations were well below the .80 benchmark used to test convergent or concurrent validity. Also, the correlation accounts for only a small percent of the variance (e.g., 25.5% for PLS-3 Total Language and K-BIT Composite scores). Despite this considerable limitation, LCGA analyses were run on an exploratory basis.

Table C.4. Correlations between PLS-3 and K-BIT scores, Waves 3 and 4

	Wave 3			Wave 4		
	PLS-3 Total	K-BIT Vocab.	K-Bit Compos.	PLS-3 Total	K-BIT Vocab.	K-Bit Compos.
PLS-3 Total Language	1	.601**	.505**	1	.496**	.538**
K-BIT Vocabulary	.601**	1	.715**	.496**	1	.806**
K-BIT Composite	.505**	.715**	1	.538**	.806**	1

**p<.0005

LCGA model selection. Three sets of LCGA models were run, including one with K-BIT scores only over three waves (Waves 3, 4, and 5), one with PLS-3 scores at Wave 1 and K-BIT scores at waves 3, 4, and 5, and one with PLS-3 scores at waves 1 and 3 and K-BIT scores at Waves 4 and 5. For each of these, linear, quadratic, linear with TVC, and quadratic with TVC models were run. In each set of 2, 3, 4, and 5-class models, the BIC and BLRT statistics indicate that the 3-class model fits the data best. In many of the models, the number of random starts was increased to 100 in order to address convergence issues, and sometimes warnings about convergence problems continued to be issued.

Results from the three sets of models were similar, indicating that 3-classes emerged. Two of the three[21] sets of results are presented below. First, the model with K-

[21] The model using each measure for two waves is not reported here for two reasons: 1) the model with the PLS-3 for Wave 1 and The K-BIT for the three remaining waves provides as much consistency across waves as possible, and 2) because the BIC score was lowest for this model.

BIT scores only is presented as it is important to examine a model with consistency of instrumentation across the waves of data, albeit only 3 waves. Second, because having four data points was optimal, a model combining the PLS-3 for Wave 1 and K-BIT for the three remaining waves is also presented.

K-BIT only model. Model fit statistics for the linear and quadratic LCGA models for cognitive functioning using K-BIT scores only (at Waves 3, 4 and 5) are presented in Table C.5. The 3-class linear model had the lowest BIC score (3937.110), suggesting the best model fit. The linear shape of the trajectories in the linear model were well-aligned with actual sample means (Figure C.1). In the models with time varying covariates (TVC's), the TVC was not significant and thus did not improve the model. However, entropy was higher for the 3-class quadratic LCGA model (0.735) and quadratic model with TVC (0.745) than the 3-class linear model (0.715).

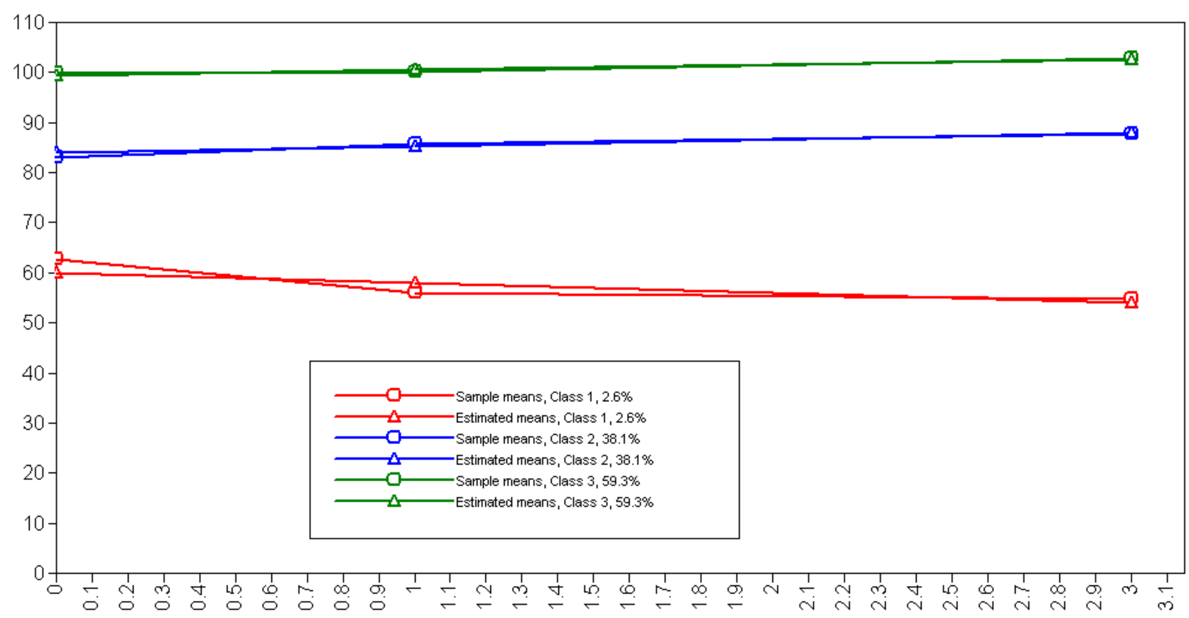
The chi-square test was conducted to test whether or not the 3-class quadratic LCGA model for K-BIT scores was significantly better than the 3-class linear model. When comparing these two models, the chi square value (1.82) was well below the critical value for 3 degrees of freedom at $p=0.005$ (12.838) and even at $p=.10$ (6.251). Thus, we cannot reject the null hypothesis. Therefore, it is evident that the quadratic term did not improve the model, supporting our selection of the 3-class linear model. Thus, when using the K-BIT scores only (Waves 3, 4 and 5), the 3-class linear model fit the data best.

Table C.5. Latent class growth analysis model fit statistics for cognitive trajectories, using K-BIT scores for Waves 3, 4, and 5 (N=220)

Number of classes	Log-likelihood	Lo Mendall Rubin	BLRT	AIC	BIC	Sample Size adj BIC	Entropy
Linear Models							
2	-1957.621	65.646 P=0.0361	69.70 p<0.0005	3931.242	3958.391	3933.039	0.661
3	**-1938.890**	**35.281 P=0.0046**	**37.461 P<0.0005**	**3899.780**	**3937.110**	**3902.251**	**0.715**
4	-1935.466	6.449 P= 0.6780	6.848 P=0.1538	3898.933	3946.443	3902.077	0.606
5^	-1928.312	13.476 0.1230	14.309 P= 0.0128	3890.623	3948.315	3894.442	0.675
Quadratic Models							
2	-1956.766	-1992.433 P= 0.0260	71.334 P<.0005	3933.532	3967.468	3935.778	0.665
3	-1937.980	35.907 P=0.0457	37.571 P<.0005	3903.960	3951.471	3907.105	0.735
4	-1930.033	15.190 P= 0.3456	15.894 P<.0005	3896.066	3957.152	3900.109	0.716
5							
3-class Models with TVCs^^							
Linear with TVC	-1937.889	33.610 P= 0.0101	35.687 P<.0005	3903.779	3951.290	3906.924	0.720
Quadratic with TVC^	-1936.783	34.012 P=0.0279	35.589 P<.0005	3907.567	3965.258	3911.385	0.746

^In the 5-class linear and quadratic models and the 3-class quadratic model with TVC the best loglikelihood value was not replicated even after increasing the number of random starts to 100.
^^In the models with time-varying covariates (caregiver change) the TVC's were non-significant.

Figure C.1: Cognitive trajectories, K-BIT ONLY: 3-class linear LCGA model of K-BIT scores at Waves 3, 4 and 5 among young children reported for neglect



Model with PLS-3 scores at Wave 1 and K-BIT scores at Waves 3, 4 and 5. Model fit statistics for the linear and quadratic LCGA models for cognitive functioning using PLS-3 scores at Wave 1 and K-BIT scores at Waves 3, 4 and 5 are presented in Table C.6. The 3-class quadratic model had the lowest BIC score (5785.806), suggesting the best model fit. In the quadratic model with time varying covariates (TVC's), the TVC was not significant and thus did not improve the model. Entropy was higher for the 3-class quadratic LCGA model (.698) than the 3-class linear model (.696). The curvilinear shape of the trajectories in the quadratic model appeared to be fairly well-aligned with actual sample means (Figure C.2).

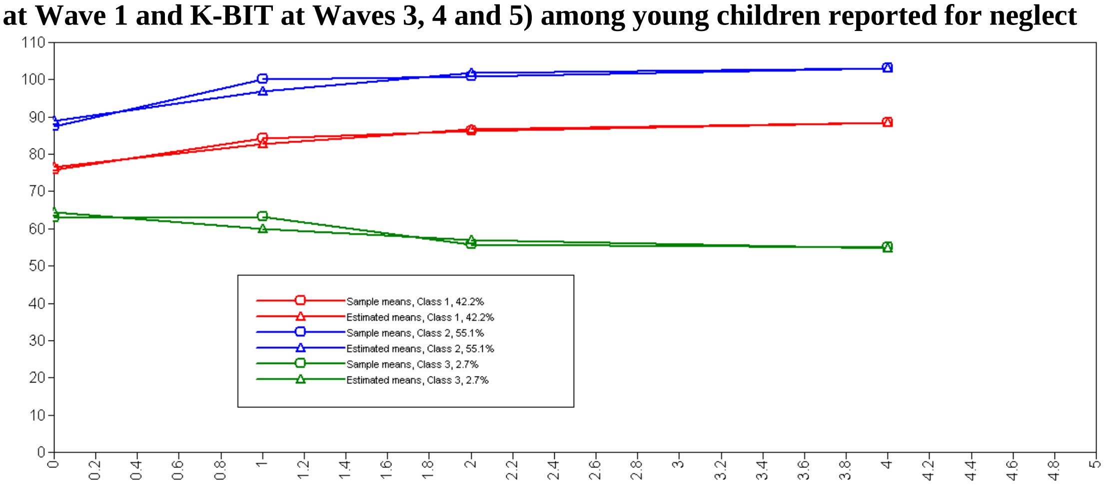
The chi-square test was conducted to verify that the 3-class quadratic LCGA model was significantly better than the 3-class linear model, which had the next lowest BIC score. When comparing these two models, the chi square value (24.626) was well above the critical value (12.838) for 3 degrees of freedom at p=0.005. We can reject the null hypothesis that no significant difference exists between the quadratic and linear LCGA models. Adding the quadratic term improved the model significantly. Thus, the 3-class quadratic LCGA model fit the data significantly better than the 3-class linear model for cognitive scores when combining PLS-3 and K-BIT scores over time. Thus, when using the PLS-3 at Wave 1 and the K-BIT at Waves 3, 4 and 5, the 3-class quadratic model fit the data best. However, it is important to note that in examining the graphic output in Figure C.2 it appears that the change in instrumentation between Waves 1 and 3 likely accounts for the quadratic nature of the model.

Table C.6. Latent class growth analysis model fit statistics for cognitive trajectories, using PLS-3 scores for Wave 1 and K-BIT scores for Waves 3, 4, and 5 (N=231)

Number of classes	Log-likelihood	Lo Mendall Rubin	BLRT	AIC	BIC	Sample Size adj BIC	Entropy
Linear Models							
2	-2884.538	70.469 P=0.0311	74.785 P<.0005	5787.075	5818.057	5789.532	0.630
3	-2864.398	37.954 P= 0.0028	40.279 P<.0005	5752.796	5794.105	5756.072	0.696
4^	-2859.871	8.531 P=0.4448	9.053 P=0.0526	5749.743	5801.379	5753.838	0.665
5	-2859.183	1.298 P=0.5195	1.377 P=0.6667	5754.366	5816.329	5759.279	0.552
Quadratic Models							
2	-2873.744	74.092 P=0.0479	77.495 P<.0005	5769.489	5807.355	5772.492	0.625
3	**-2852.085**	**41.416 P= 0.0006**	**43.319 P<.0005**	**5734.170**	**5785.806**	**5738.265**	**0.698**
4	-2846.850	10.010 P=0.6233	10.470 P=0.0968	5731.700	5797.106	5736.886	0.680
5	-2841.864	9.534 P=0.3776	9.972 P=0.3333	5729.727	5808.903	5736.006	0.711
3-class Models with TVCs^^							
Linear with TVC^^	-2861.062	36.391 P=0.0039	38.620 P<.0005	5752.124	5803.760	5756.219	0.695
Quadratic with TVC	-2850.463	39.112 P=0.0021	40.909 P<.0005	5736.925	5798.889	5741.839	0.699

^The 4-class linear model produced a warning that 1 out of 100 bootstrap draws did not converge; this warning persisted after increasing the number of random starts to 100. Thus, the 5-class model was not run.
^^ In the 3-class linear model with TVC, the TVC was significant at Wave 4 (p<.0005), and non-significant at Wave 3 (p=.112) and Wave 5 (p=.933). However, the TVC was not significant at any wave (p=.175, p=.346, and p=.526 at W3, 4 and 5) in the quadratic model, which fit the data best. Also, a chi-square test indicated no significant difference between the linear model with and without the TVC.

Figure C.2: Cognitive trajectories: 3-class quadratic LCGA model of cognitive scores (PLS-3 at Wave 1 and K-BIT at Waves 3, 4 and 5) among young children reported for neglect



Cognitive behavior trajectories of young children reported for neglect. Both sets of analyses estimate that young children referred for neglect are likely to follow one of three different cognitive trajectories (Figures C.1 and C.2). Estimates for the intercepts, slopes, and quadratic terms (where applicable) for the three trajectories in the K-BIT only linear model (Table C.7) and the PLS-3/K-BIT quadratic model (Table C.8) are presented below. Three groups of children emerged in both sets of analyses (K-BIT only and PLS-3/K-BIT), including more than half the children estimated to belong in a group scoring in normal range (60.9% and 56.3%, respectively), some (38% and 42%) having moderate low scores, around 1 SD below the mean, and a small number (n=6 in both models) with significant delays, based on most likely group membership.

K-BIT 3-class linear model. As seen in Table C.7, one group scored very close to the normative mean (100) on the K-BIT during Waves 3, 4 and 5, with a slight but statistically significant increase over time (p=.028). This group will be designated the Average Cognition group. The second group scored close to one standard deviation below the mean over the 3 waves, and will be called the Moderate Low group. A conservative cutoff of 2 *SD* below the mean will be interpreted as a significant delay (Qi et al., 2003) given the lower normative means among low-income children. The third group, the Significant Delay group, scored more than 2 SD below the mean at Wave 1 and their scores worsened somewhat over time (p=.028).

Table C.7. Cognitive functioning: 3-class quadratic LCGA model estimates for intercepts, slopes, and quadratic terms (K-BIT ONLY at W3-5; n=231)

Latent Class	**Intercept**				**Slope**			
	Estim.	**SE**	**Est/SE**	**p**	**Estim.**	**SE**	**Est/SE**	**p**
1	59.968	3.158	18.989	0.000	-1.993	2.187	-0.911	0.362
2	83.868	2.215	37.859	0.000	1.364	0.894	1.525	0.127
3	99.441	1.798	55.301	0.000	1.067	0.486	2.197	0.028

The slope was non-significant for all three groups, indicating cognitive function was stable from toddlerhood through middle elementary school. In other words, children in the Moderate Low scoring and Significant Delay groups continued to have low scores over the five or six years of the study, while children in the Average Cognition group continued to perform in average range.

The average posterior probabilities for the most likely latent class membership for the Average Cognition Group (AvePP=0.87), moderate low (AvePP=0.83), and Significant Delay (AvePP=0.95) were all good, so the groups appear to be well identified, with individual children highly likely to be in their assigned group.

The majority of children in this sample were most likely to belong in the Average Cognition group (n=134, 60.9% unweighted[22]), most others were most likely to belong in the Moderate Low group (n=80, 36.4%, unweighted) and a very small number (n=6, 2.7% unweighted) were most likely to be members of the Significant Delay group. These proportions based on most likely group membership were similar to the proportions estimated in the model (59.3%, 38.1%, and 2.6%, respectively).

PLS-3/K-BIT 3-class quadratic model. As seen in Table C.8 one group averaged a standard score of 90 on the PLS-3 at age 2 or 3 (Wave 1) and scored very close to the normative mean (100) on the K-BIT during Waves 3, 4 and 5. This group will be designated the Average Cognition group, as their average was consistent with normative population at three waves, and scores at the first wave (still within one SD of the mean) may have been low due to an error in a skip pattern when data were collected. The second group, the Moderate Low group, scored more than one standard deviation below

[22] Due to measurement issues, and the decision not to conduct further analyses, posterior probabilities from the LCGA analyses were not explorted from Mplus into SUDAAN. Therefore, unweighted percentages are provided rather than the preferred weighted percentages.

the mean at Wave 1, then scored somewhat higher at subsequent waves, with scores around one standard deviation below the mean for Waves 4 and 5. As noted, a conservative cutoff of 2 *SD* below the mean will be interpreted as a significant delay (Qi et al., 2003) given the lower normative means among low-income children and an error in data collection in NSCAW Wave 1. The third group, designated the Significant Delay group, scored more than 2 SD below the mean at Wave 1 and their scores worsened somewhat over time, although the slope was not statistically significant. Each group followed a curvilinear path, although this result must be interpreted extremely cautiously due to the change in instrumentation between Waves 1 and 3 and the error in data collection at Wave 1. Nonetheless, three groups emerged, with scores in average range, low scores, and significantly delayed scores.

Table C.8. Cognitive functioning: 3-class quadratic LCGA model estimates for intercepts, slopes, and quadratic terms (PLS-3 at W1 and K-BIT at W3-5; n=231)

Latent Class	**Intercept**				**Slope**				**Quadratic Term**			
	Estim.	**SE**	**Est/SE**	**p**	**Estim.**	**SE**	**Est/SE**	**p**	**Estim.**	**SE**	**Est/SE**	**p**
1	76.500	2.389	32.016	0.000	7.190	2.381	3.020	0.003	-1.047	0.530	-1.975	0.048
2	89.029	2.135	41.694	0.000	9.325	1.744	5.349	0.000	-1.458	0.357	-4.086	0.000
3	64.414	3.131	20.571	0.000	-5.132	3.465	-1.481	0.139	0.681	1.006	0.677	0.498

The slope and quadratic terms were significant for the Average Cognition and Moderate Low group, indicating that scores followed an increasing curvilinear path. In examining the graphic output, the curve primarily occurs at the time of change in instrumentation for these two groups. The slope and quadratic term were non-significant for the Significant Delay group.

The average posterior probabilities for the most likely latent class membership for the Average Cognition Group (AvePP=0.86), moderate low (AvePP=0.83), and Significant Delay (AvePP=0.95) were all good, so the groups appear to be well identified, with individual children highly likely to be in their assigned group. The probabilities were very similar to the other model.

The majority of children in this sample were most likely to belong in the Average Cognition group (n=130, 56.3% unweighted[23]), most others were most likely to belong in the Moderate Low group (n=95, 41.1% unweighted) and a very small number (n=6, 2.6% unweighted) were most likely to be members of the Significant Delay group. These proportions based on most likely group membership were similar to the proportions estimated in the model (55.1%, 44.2%, and 2.7%, respectively).

The results of the LCGA analyses for cognitive development must be viewed cautiously due to the change in instrumentation and, related to this, the difficultly in interpreting the slope and quadratic terms. Entropy for the selected model was below .70, adding to concern about interpretation. Although there seems to be some credence to the three groups that emerged (Average, Moderate Low, and Significant Delay) on an exploratory basis, the researcher decided not to proceed with describing the characteristics of the group or predicting membership due to concerns with the group assignment from these LCGA analyses.

Limitations

Measurement is a major challenge in the study. The NSCAW technical team dedicated resources to training individuals to administer the instruments, yet the quality of the developmental data are not as strong as would be if collected by professionals trained specifically to administer developmental tests. Moreover, there is not a single measure that can span the cognitive development from age 2 or 3 to ages 7 to 9, so

[23] Due to measurement issues, and the decision not to conduct further analyses, posterior probabilities from the LCGA analyses were not explorted from Mplus into SUDAAN. Therefore, unweighted percentages are provided rather than the preferred weighted percentages.

changes in instrumentation may affect results. The data must be examined with the knowledge that instrumentation likely affects the shape of the trajectories, and results should be interpreted cautiously.

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