

PROFILES OF FUNCTIONING:
DESCRIBING PART C EARLY INTERVENTION RECIPIENTS
IN KINDERGARTEN

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ABSTRACT

ANDREA MICHELLE LEE: Profiles of Functioning:
Describing Part C Early Intervention Recipients in Kindergarten
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For the past two decades, infants and toddlers with disabilities have received early intervention services in the United States under successive federal legislative acts. A significant limitation in prior research has been the lack of information describing these children's characteristics beyond exit from early intervention services. Information regarding this population's abilities when they enter kindergarten has not been available. The purpose of this study was to explore patterns of functioning in kindergarten for children who received early intervention services through Part C of the Individuals with Disabilities Education Act (P.L. 108-446, 118 Stat. 2647). The study drew on data from the National Early Intervention Longitudinal Study (NEILS). Data for this study included ratings of skills and abilities for 1,521 children, on 56 items from teacher surveys and family interviews. The data was nationally representative of all children entering Part C in the years 1997 to 1998. Using a functional approach based on the conceptual model and classification system of the International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY), three factors of functioning were identified. These factors described children's functioning in mobility and self-care; behavioral and social functioning; and learning and applying knowledge. Cluster analysis was used to identify clusters of children with similar profiles of functioning on the three factors. Results indicated five distinct clusters of children with varying functioning in skills and abilities. Children in clusters were described in terms of children's socio-demographic characteristics, description of disability at entry to Part C, and Individualized Education

Program (IEP) status in kindergarten. The study provides evidence of the variability in Part C recipients' functioning in kindergarten. The profiles raise questions about the experiences and characteristics of children in differentiated clusters, with implications for functioning and IEP status in kindergarten. The study also reinforces the utility of the ICF-CY as a universal taxonomy to describe dimensions of functioning, health, and disability. The study further suggests the importance of capturing precise estimates of functioning in universally defined domains, and communicating findings using a common language which is meaningful to professionals across disciplines.

TABLE OF CONTENTS

| | |
|---|------|
| LIST OF TABLES..... | vi |
| LIST OF FIGURES..... | vii |
| LIST OF ABBREVIATIONS AND SYMBOLS..... | viii |
| Chapter | |
| I. INTRODUCTION AND REVIEW OF LITERATURE..... | 1 |
| Review of Literature..... | 2 |
| Section 1: Part C Early Intervention..... | 2 |
| Section 2: Beyond Exit from Part C..... | 5 |
| Section 3: Advancing Understanding of Part C Recipients in Kindergarten..... | 11 |
| Rationale and Research Questions..... | 18 |
| II. METHOD..... | 20 |
| Participants..... | 22 |
| Information Sources..... | 23 |
| Procedure..... | 24 |
| Phase I: Selection of Items..... | 25 |
| Phase II: Mapping Items to the ICF-CY..... | 25 |
| Phase III: Data Preparation..... | 26 |
| Phase IV: Factor Analysis..... | 30 |
| Phase V: Cluster Analysis..... | 41 |

| | |
|---|----|
| Phase VI: Describing the Clusters..... | 43 |
| III. RESULTS..... | 47 |
| Identification of Clusters..... | 47 |
| Description of Cluster Members..... | 57 |
| IV. DISCUSSION AND IMPLICATIONS..... | 67 |
| Different Profiles of Functioning and IEP Status in Kindergarten..... | 68 |
| Variations in Clusters by Part C Entry Variables..... | 73 |
| Socio-demographic Differences Within and Across Clusters..... | 77 |
| Limitations..... | 84 |
| Contributions of Study..... | 85 |
| Suggestions for Future Research and Practice..... | 86 |
| REFERENCES..... | 89 |

LIST OF TABLES

Table

| | |
|--|----|
| 1. Metric for Scaling Interview and Survey Items..... | 28 |
| 2. Factor Loadings for Confirmatory Factor Model for Three-Factor Oblique Solution, Using Retained Items Mapped to ICF-CY..... | 36 |
| 3. Variance Explained By One- to Eight-Cluster Solutions..... | 50 |
| 4. Five Cluster Solution Using Three Factors of Functioning..... | 53 |
| 5. Child, Family, and Part C Characteristics of Clusters..... | 60 |
| 6. Analysis of Variance for Communication Items..... | 62 |
| 7. Summary of Cluster Descriptions..... | 63 |

LIST OF FIGURES

Figures

1. Pictorial representation of analytic procedure for study.....21
2. Factor centroids according to cluster.....54
3. Cluster centroids, depicted as SDs from factor means.....55
4. Distribution of children within clusters by profiles of disability at entry to Part C.....61

LIST OF ABBREVIATIONS AND SYMBOLS

| | |
|----------|--|
| ANOVA | Analysis of Variance |
| EI | Early Intervention |
| ESS | Explained Sums of Squares |
| ICF-CY | International Classification of Functioning, Disability, and Health for Children and Youth |
| IDEA | Individuals with Disabilities Education Act |
| IEP | Individualized Education Program |
| IFSP | Individualized Family Service Plan |
| KFI | Kindergarten Family Interview |
| KTS | Kindergarten Teacher Survey |
| M | Mean |
| N | Population Size |
| NEILS | National Early Intervention Longitudinal Study |
| p | P-value |
| SD | Standard Deviation |
| SE | Standard Error |
| % | Percent |
| η^2 | Eta squared |
| χ^2 | Chi-square |

CHAPTER 1

Introduction and Review of Literature

Early Intervention (EI) is a global initiative geared towards remediation and/or prevention of developmental problems observed in infancy, toddlerhood, and early childhood (Odom & Kaul, 2003). In the United States, infants and toddlers with disabilities may receive EI services under Part C of the Individuals with Disabilities Education Act (IDEA; P.L. 108-446, 2004, 18 Stat. 2647). One of the goals of Part C is to provide sufficient early intervention so as to limit children's needs for special education services when they are school age (P.L. 99-457, 1986, 100 Stat. 1145, 20 U.S.C. §1471). Despite this stated goal, there is a dearth of research on Part C children's functioning when they enter kindergarten.

This study seeks to describe the functional characteristics of Part C recipients in kindergarten. The paper begins with a description of current understanding of Part C EI recipients in kindergarten, and then presents an analytic examination of this issue. The Literature Review section provides an overview of relevant literature for this endeavor. The section concludes with the research questions for this study. The paper continues with a presentation of the Method, including a thorough overview of the analytic plan and methodology to address the research questions. Analytic findings are presented in the Results section. A summary of these findings and their implications are described in the Discussion section.

Review of Literature

This literature review is divided into three major sections. The first section discusses Part C of IDEA, including an overview of the rationale, purposes, and goals of EI as defined in Part C. The second section describes factors that could be associated with variability in Part C recipients' functioning in kindergarten. The section provides a discussion of existing research on Part C recipients after they exit Part C services. It recognizes the need for further studies and includes a discussion of methods for advancing understanding of Part C recipients in kindergarten. The third section describes the importance of a functional perspective, providing a presentation of the International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY; WHO, 2007) used in this study. The Review of Literature concludes recognizing the potential for using profiles of functioning in a person-oriented analytic approach as a mechanism for understanding Part C recipients' functioning in kindergarten.

Section 1: Part C Early Intervention

In the United States, the Department of Education recognizes the need and right of children and youth with disabilities to receive services and resources to support their educational attainment. In 1975, Congress passed into law the Education for All Handicapped Children Act (P.L. 94-147) to provide states monies to support children who qualify under a category of educational disability. Initially developed for school-age children, this public law changed over time to also support the development of young children and infants. In recognizing and responding to “an urgent and substantial need” to provide services to infants and toddlers with disabilities (P.L. 99-457, 100 Stat. 1145, 20

U.S.C. §1471), Congress added Part H: Handicapped Infants and Toddlers in 1986.

Today, the Program for Infants and Toddlers with Disabilities is located in Part C of the Individuals with Disabilities Education Act (IDEA) of 2004 (the most recent revision of P.L. 99-457; P.L. 108-446, 118 Stat. 2647).

As a federal law, IDEA provides a basic framework for identifying which infants and toddlers are in need of Part C services, with states generating the actual definitions and criteria for eligibility. As described in the 2004 amendments of IDEA, infants and toddlers can qualify for services under Part C when they are experiencing developmental delays in one or more major areas (cognitive development, physical development, communication development, social or emotional development, or adaptive development); or, have a diagnosed “physical or medical condition” that has a high probability of negatively impacting the child’s development (20 U.S.C. §1432, as amended by IDEA, 2004). IDEA 2004 also permits provision of services for children deemed “at risk” for developmental delay. The “at risk” eligibility category may be an option for a child experiencing a biomedical and/or environmental condition that is known to place a child at risk for substantial delay, if services are not provided. Few states utilize this option (Danaher, Goode, & Lazara, 2007), and for those children entering under the “at risk” option, most do so because of biomedical risk (Scarborough, Hebbeler, & Spiker, 2006). After determination of eligibility for Part C, the services and resources that will be provided to a young child and his or her family are outlined by the family and early childhood professionals in an Individualized Family Service Plan (IFSP).

Part C of IDEA provides a number of stipulations for states. Part C can be described as a federal grant program that assists states in developing, operating, and

funding early intervention programs for infants and toddlers (birth until age 3). In order to receive federal monies under Part C of IDEA, states must ensure that every eligible child and his or her family have the opportunity to utilize EI services. To do so, the law mandates that states receiving funds under Part C of IDEA must conduct child finds, which include public awareness and comprehensive systems to find children that should be identified for early intervention services. States also must provide a Central Directory of Resources and incorporate an Interagency Coordinating Council (including professionals as well as parents of young children with disabilities) to assist the lead agency (appointed by the governor) in receiving grant monies and running the administration needs of the state's EI programs. Part C funding to states is determined by the number of total infants and toddlers in a state according to state census data (P.L. 108-446, 2004, 118 Stat. 2647).

The goals of Part C are based on the concept that “early intervention in the lives of children with disabilities and their families provides greater opportunities for improving developmental outcomes” (U.S. Department of Education, 2005, p3; underlining added for emphasis). As described in its conception in 1986, the specific goals of Part H Handicapped Infant and Toddlers (now Part C) are to “enhance the development of handicapped infants and toddlers;” “to reduce educational costs...by minimizing the need for special education and related services after handicapped infants and toddlers reach school age;” “to minimize the likelihood of institutionalization...and to maximize independent living;” and, “to enhance the capacity of families to meet the special needs of their infants and toddlers with handicaps” (P.L. 99-457, 1986, 100 Stat. 1145, 20 U.S.C. §1471). Thus, the original goals of Part C reflect a desire to minimize

costs and burden to the educational system later in these children's lives as well as a goal to enhance the development of these infants and toddlers.

Section 2: Beyond Exit from Part C

The goals of Part C clearly speak to enhancing children's development as infants and toddlers with an anticipated impact on their future functioning as they enter public schools. While it would seem both important and prudent to consider how these children continue to develop and function when they reach school age, there is little research describing Part C recipients beyond their exit from Part C. This section reviews existing research on children who receive EI services, describing findings from studies on Part C recipients in kindergarten. It concludes by considering an alternative approach for understanding Part C recipients at kindergarten age.

Factors Associated with Variability in EI Children's Functioning. Research on variability in outcomes for children who receive EI tends to focus on global issues in variability in children's development. The research most often describes immediate developmental outcomes (Park & Peterson, 2003), as opposed to factors which could impact Part C recipients in particular or EI recipients over time. Nonetheless, this literature can provide an overview of factors which could potentially contribute to variations in Part C recipients' later functioning. It is also important to consider research describing factors influencing general development (not necessarily specific to children in EI), largely because recipients of EI are more vulnerable to experiencing a variable rate in development as a result of both risk and protective factors (Fraser et al., 2004). For this study, there is interest in socio-demographic factors associated with variability in Part C EI recipients' functioning at kindergarten age, including: socioeconomic status or

family income, child ethnicity (due to its high correlation with other factors; Fraser, Kirby, & Smokowski, 2004), age of entry into EI, gender, and maternal education level.

Research demonstrates that maternal education is a strong predictor of outcomes and variability in development (Chapman, Scott, & Mason, 2002). Lower maternal education is associated with fewer opportunities for education, which is highly correlated with poverty (Fraser et al.); in addition, poverty is highly correlated with minority status and poorer developmental outcomes across childhood (Fraser et al.). In the face of stressors, boys generally tend to show more severe and prolonged disturbances in their development than girls (Wangby, Bergman, & Magnusson, 1999). Thus, lower income, low maternal education, and being male are associated with poorer outcomes for many developmental considerations across childhood.

This pattern has also been found to impact child functioning in kindergarten. Child Trends created a profile of children who were lower functioning in kindergarten on cognitive development, social and emotional development, and health. Those children were more likely to be boys from families with income levels at or just above the poverty line. These children tended to have parents with low levels of education, and African-American children were overrepresented in the population (Wertheimer, Croan, Moore, & Hair, 2003).

Research on Part C recipients showed they also were more likely to be boys, ethnic minorities, and from low-income families as compared to the distribution of the general population (Scarborough et al., 2004). Additionally, age at entry into EI has been shown as statistically significantly related to eligibility category for Part C (Scarborough et al., 2006). Children who enter Part C because of developmental delay enter as toddlers,

whereas those who enter because of environmental risk or diagnosed conditions typically enter in the first year of life (Scarborough et al., 2004; Scarborough et al., 2006).

Other factors related to eligibility category included gender, maternal education level, and family income. Boys were more likely to enter Part C for reasons associated with developmental delay (Scarborough et al., 2006). Eligibility category was significantly related to mother's level of education, but not in a predictable fashion, such that both lower and higher educated mothers were more likely to have children enter Part C because of developmental delays (Scarborough et al.). There were disproportionately more children from low-income families in Part C, however children from families with higher household incomes were more likely to be eligible because of developmental delay than children from lower-income families (Scarborough et al.).

It should be clear that many factors associated with variation in child development are correlated. Even when factors are known to be associated with variability in child development, interpreting their influence on child outcomes is difficult and likely nonlinear (Olds, 2003). That is, these factors do not impact EI child recipients in predictable ways. They can be interrelated, and can all also be related to severity of disability or biomedical risk at time of entry into Part C. For example, intensity of EI services, or higher participation in provided EI services, may correspond with better functioning- or skill-based outcomes later in EI recipients' lives. However, there appears to be a dynamic interaction between intensity of services and severity of disability or biomedical risk factor, such as low-birth-weight (Hill, Brooks-Gunn, & Waldfogel, 2003). Longer or more intensive services are not always related to severity or disability or risk factor (Nelson, Westhues, & MacLeod, 2003), however, making it difficult to identify the

interaction or role of disability severity in service provision or receipt. Few children in Part C receive services for the entire 36 months covered by Part C. Children entered Part C at varying ages, with age of entry confounded with severity and type of disability and/or reason for entry into Part C. Children also exited Part C because they were no longer eligible or because their families made the choice to withdraw. These factors mean length of Part C services varies significantly across children and families, with many factors impacting the reason for the length of services (Hebbeler et al., 2007).

In summary, research suggests family income, ethnicity, age of entry into EI, gender, and maternal education level may be associated with variability in child outcomes and experiences during EI and later in childhood. Consideration of these factors are important in describing children entering Part C, and would be an important contribution to understanding how socio-demographic characteristics are related to patterns of functioning later in Part C recipients' lives. Unfortunately, relatively little is known about Part C recipients after they leave Part C.

Existing Research on Part C Recipients in Kindergarten. The National Early Intervention Longitudinal Study (NEILS) is the only study using a nationally representative sample of children and families who received Part C services. Using a longitudinal design, NEILS followed children from the time they entered Part C in 1997 and 1998, through their kindergarten school year. Disability status under Part B of IDEA played a prominent role in how outcomes for Part C recipients at kindergarten were considered. Child outcomes were also examined in terms of sensory and motor functioning, communication skills, academic skills, and social skills and behavior. Because NEILS is a national probability sample of infants and toddlers entering Part C

the analyses provided a nationally representative picture of the functioning and skills of children who received Part C services.

When considering Part C recipients in kindergarten in terms of disability status and special education placement, 55% of the children received special education services; 11% of the children had a disability but did not receive special education services; and 32% of the children did not have an Individualized Education Program (IEP). This distribution was similar across children who entered EI services in the first, second, or third year of life. The primary IDEA category for those children receiving special education services was speech and language impairment (22%), followed by developmental delay (14%), mental retardation (13%), autism (8%), and multiple disabilities (8%; Hebbeler et al., 2007).

A child who entered EI services due to a diagnosed medical condition was significantly more likely to continue to qualify for special education services than a child who entered EI services because he or she was considered “at risk” for developmental delay. Children who entered EI because of developmental delay were more likely than children from the “at risk” group to receive special education services at kindergarten, but less likely than children who entered Part C with a diagnosed condition. Boys were more likely than girls to receive special education services at kindergarten, following the trend from Part C (Hebbeler et al., 2007).

In the NEILS final report, child outcomes were considered in terms of sensory and motor functioning, communication skills, academic skills, and social skills and behavior. According to teacher ratings, most children’s hearing (90%) and vision (76%) were normal for age. In addition, motor functioning was typically normal for age,

including use of hands (64%), use of arms (76%), and use of legs (73%). However, 10% of children had some or suspected difficulty with hearing, 24% had some or suspected difficulty with vision, and 36%, 24%, and 27% of children had some or suspected difficulty with use of hands, use of arms, and use of legs respectively (Hebbeler et al., 2007). Teacher and parent ratings also showed children who received Part C services had significant challenges in communication during the kindergarten school year. As reported by teachers and parents, 60% of former Part C recipients understood others as well as same-age peers, and only 50% had skills to communicate with others at a level similar to same-age peers. Children who qualified for special education services in kindergarten were especially likely to struggle with communication skills, with 29% suspected to have or with a mild difficulty, 13% with moderate difficulty, and 18% with severe or extreme difficulty (Hebbeler et al., 2007).

For academic skills as compared to same-age peers, teacher ratings suggested most children (52%) had thinking and reasoning skills typical or normal for their age, 25% had mild difficulty, 10% had moderate difficulty, and 14% had extreme or severe difficulty. The subgroup with the most reported difficulty in thinking and reasoning was children with an IEP at kindergarten. Only 32% of these children were rated as comparable to peers in this area, with most having mild difficulties (31%), moderate difficulties (15%), and severe or extreme difficulties (22%). Looking at more specific academic skills in literacy and mathematics, children with an IEP were more likely to struggle with a myriad of skills in literacy and mathematics (Hebbeler et al., 2007).

Data on social skills and behavior at home and in the classroom were also collected in parent interviews and teacher surveys. The findings were described in

relation to children's special education status at time of kindergarten. Teachers rated 60% of all Part C recipients to exhibit behavior normal for age. When broken down by disability status, 82% of those children without an IEP were rated as exhibiting typical behavior for their age, compared to 68% of children with a disability but no IEP and 46% of children with an IEP. This distribution was also found for social skills, with 54% of the total sample, 79% of children without an IEP, 73% of children with a disability but no IEP, and 36% of children with an IEP described as demonstrating typical social skills for their age (Hebbeler et al., 2007).

NEILS provided the first and only comprehensive overview of Part C children in kindergarten. The analyses used to examine these aspects of child outcomes were conducted using the entire sample, to provide a nationally representative picture of the functioning and skills of children who entered Part C services for each particular area or domain. While an important contribution to the collective understanding about Part C recipients in kindergarten, the relationship between functioning in one domain and functioning in another area of domain was not considered, nor were patterns of functioning across domains and children considered.

Section 3: Advancing Understanding of Part C Recipients in Kindergarten

There is a dearth of research on Part C recipients' abilities, skills, and needs after they leave Part C. In considering approaches to advancing knowledge about these children in kindergarten, it is important to identify a perspective that respects current focus and need in the field. The author posits that a functional perspective is most appropriate for describing Part C children in kindergarten. This section considers the use of a functional perspective and proposes the use of the International Classification of

Functioning, Disability, and Health for Children and Youth (ICF-CY; WHO, 2007) as an organizing taxonomy for describing the functioning of children in kindergarten.

Disability versus Functioning. In the past disability status has been utilized as a means for categorizing and describing children (Simeonsson, Bailey, Smith, & Buysse, 1995). Florian et al. (2006) discussed the challenges and problems with considering disability as a way of understanding children. They persuasively argued for a change from “discrete categorical classification systems traditionally used in education that (a) do not recognize the complexity of human differences, (b) unnecessarily stigmatize children, and (c) do not always benefit the individuals who are classified” (p. 36). Leonardi, Bickenbach, Ustun, Kostanjsek, and Chatterji (2006) also challenged existing definitions of disability, both advocating for a universal definition of disability as well as a conceptualization of disability that acknowledges that it is not static and more than the idea of impairment. They proposed a definition of disability as “a difficulty in functioning at the body, person, or societal levels, in one or more life domains, as experienced by an individual with a health condition in interactions with contextual factors” (p. 1220). Both procedurally and conceptually, then, the use of disability definitions and status have been considered problematic.

A functional approach has been advanced as a more useful and appropriate means for understanding children. Such an approach allows for an understanding of children’s varying skills and abilities, as well as their needs (Simeonsson et al., 1995). The changing focus to a functional approach is evident in the education sector. Initially, the United States Office of Special Education Programs (OSEP) asked states to report Part C outcomes in terms of identifying who has received Part C funds, and what these funds

provided. Over the years, OSEP Part C data collection history became formalized to include child count (including breakdown by race and ethnicity in 1997), trends in program settings, age of entry into EI, exiting, dispute resolution, early intervention services, and personnel (Westat, 2006). Traditionally, the only outcomes reported from the perspective of the child recipient were related to the total number of children receiving services, descriptions of these children in terms of race and ethnicity, and characteristics of the services these children received. However, states are now required to report on 14 indicators of Part C outcomes that now include one indicator (indicator number 3) of child functioning, including social-emotional skills, acquisition and use of knowledge and skills, and use of appropriate behaviors (OSEP, 2007).

Using the ICF-CY Framework. OSEP's move towards understanding children's functioning as a mechanism for considering outcomes or utility of services mirrors more global discussions about the appropriateness and utility of considering functioning relative to disability and service provision for individuals in need of support (Leonardi et al., 2006; Park & Peterson, 2003). This section describes a new framework for considering functioning and disability, and then describes its possible utility for understanding Part C recipients in kindergarten from a functional perspective.

The International Classification of Functioning, Disability, and Health for Children and Youth. In 2001, the World Health Organization (WHO) introduced its newest addition to the Family of International Classifications (FIC), the International Classification of Functioning, Disability, and Health (ICF). The ICF is descendent of the International Classification of Impairments, Disabilities, and Handicaps (ICIDH; WHO, 1980), originally published by WHO for trial purposes in 1980. The ICF framework

represents a shift from a medical model to a biopsychosocial model of disability, as well as a shift from a classification of the “consequences of disease” to a classification of “components of health” (WHO, 2007, 4). The names of domains and words utilized in the ICF also more closely represent a positive psychology approach to understanding human functioning and disability.

The ICF as a universal taxonomy was revolutionary in that it provided a mechanism for professionals from multiple disciplines to use the same standard language and framework to consider, describe, and classify dimensions of health and health-related states. Being a part of the WHO-FIC, the ICF can be used in combination with the International Classification of Diseases, Tenth Revision (ICD-10; WHO, 1992). Thus, practitioners can diagnose and identify disorders or disease in ICD-10, and then classify and describe associated functioning and health in ICF. Depending on context and training, psychologists may find that a diagnosis in the Diagnostic Statistical Manual for Mental Disorders, Fourth Edition, Text Revised (DSM-IV-TR; American Psychiatric Association, 2000) or an educational disability “diagnosis” under IDEA is relatable to an ICD-10 diagnosis or code.

While appropriate for adults, the ICF was insufficient in classifying functioning, health, and the unique considerations of childhood and child development (Simeonsson, Leonardi, Björck-Åkesson, Hollenweger, & Lollar, 2003). More specifically, development occurs rapidly throughout infancy, childhood, and adolescence, and the ICF was lacking in depth of content and scope to sufficiently document these changes. In subsequent years, a task force worked on developing a version more oriented to the

specific needs, situations, and patterns of development in children and youth. This version for children and youth, the ICF-CY, became available in 2007.

The task force that worked on the ICF-CY modified and expanded descriptions in the ICF, assigned content to previously unused codes in the ICF, altered inclusion and exclusion criteria where appropriate, and expanded the use and role of qualifiers to include the necessary developmental aspect missing in the original ICF (WHO, 2007, xi). Thus, the ICF-CY expands upon the content of the ICF, but it shares the same organizational structure and conceptual framework as the ICF. The team that modified the ICF for children and youth utilized the original framework with heavy consideration of Bronfenbrenner and Ceci's (1994) ecological model that conceptualizes a child's adaptation as a function of ongoing interactions between the child (and his or her characteristics) and the environment over time. Because the ICF-CY is a derivation of the ICF, and because children and youth are the population of interest in this paper, only the ICF-CY will be considered from this point forward.

The organizational structure of the ICF-CY involves an initial division of the taxonomy into four major domains; Body Functions, Body Structures, Activities/Participation, and Environmental Factors. The ICF-CY uses an alphanumeric coding system, with letters representing each of the four domains. Body Functions is represented by "b" and describes the physiological functions of body systems, while Body Structures is represented by "s" and represents anatomical structures or parts of the body. Activities/Participation is represented by "d" and includes functioning at both an individual and societal perspective. In the ICF-CY, activity is defined as "execution of a task by an individual" (WHO, 2007, 9), and participation is defined as "involvement in a

life situation” (WHO, 2007, xvi, 9). Environmental Factors is represented by “e” and defined as “the physical, social and attitudinal environment in which people live and conduct their lives” (WHO, 2007, xvi, 9).

After division into the four domains, the ICF-CY contains chapters (represented by one digit numbers) corresponding to content relevant to the given domain. Information being considered can be mapped onto codes within each chapter that relate to aspects of functioning. The ICF-CY also utilizes a universal qualifier to specify the extent to which a function or activity differs from an expected or typical state” (WHO, 2007, xviii). The qualifier uses values from with values from 0 (no problem) to 4 (complete problem). The use of ICF-CY codes will be described in the Method section.

The ICF-CY as an Organizing Taxonomy. In the introduction to the ICF-CY, it is suggested that the framework and taxonomy can be used in clinical, administrative, surveillance, policy, research, statistical, and educational applications (WHO, 2007, xviii, 5). This study will use the ICF-CY to organize data, by utilizing the standard language and consistent, universal framework for identifying, describing, and understanding domains of functioning. It should be noted the areas of functioning identified in the Activities/Participation chapter of the ICF-CY are not new or different areas of functioning, but rather are an organized taxonomy of skills and abilities already discussed and utilized in research and practice. The link is clear when one considers the major developmental domains incorporated into “developmental delay” include cognitive, physical, communication, social or emotional, and/or adaptive development. These domains have been described as important for consideration of children’s development in most widely used measures capturing young children’s growth and development

(Greenwood, Luze, & Carta, 2002). Importantly, these developmental domains correspond closely with the ICF-CY Activities/Participation chapters, and six in particular: Chapter 1, Learning and Applying Knowledge; Chapter 2, General Tasks and Demands; Chapter 3, Communication; Chapter 4, Mobility; Chapter 5, Self-Care; and Chapter 7, Interpersonal Interactions and Relationships. These same domains of functioning can be found in the majority of U.S. states' department of education learning standards (Fevola, Bagnato, & Kronk, in press). Thus, the ICF-CY will provide a theoretical framework for creating factors of functioning across key domains of child functioning considered as important in child development and education. These factors can be used in analyses designed to understand Part C recipients in kindergarten from a functional perspective.

Understanding Variations in Functioning. The NEILS findings reflect a broad picture of outcomes at kindergarten year, but do not provide an understanding of patterns of kindergarten functioning. To advance understanding of Part C recipients in kindergarten, it would be essential to identify variability in profiles of functional characteristics of children utilizing a clear, consistent framework describing child functioning, such as the ICF-CY. Such an approach is consistent with person-oriented methodologies, which respect the fact an individual is “an integrated, organized totality” (Bergman & Trost, 2006, p. 604), represented by a constellation of variables such as the areas of functioning described in the ICF-CY. Person-oriented analyses allow the researcher to consider the individual “as a functioning whole” (Bergman & Trost, 2006, p. 605). Work by Sameroff and Fiese (2000) additionally suggests profiles more closely approximate the reality of an individual and his or her functioning, as opposed to

considering isolated variables. Cluster analysis is a person-oriented analytic approach that could allow for child functioning profiles to emerge, providing information on how Part C recipients function in kindergarten across salient domains.

Rationale and Research Questions

This study seeks to advance understanding of Part C recipients' functioning in kindergarten by using methodology consistent with a functional perspective. The NEILS data provide the opportunity to examine functioning of Part C recipients during their kindergarten year, and the ICF-CY provides the organizational structure needed to develop factors of functioning from the data collected in NEILS. Cluster analysis provides a person-oriented analytical method that allows for identification of various profiles based on functional characteristics of children in kindergarten. Once profiles of functioning are defined, further analyses can describe child- and family-level socio-demographic characteristics associated with distinct patterns of functioning.

The primary goal of the proposed study is to identify profiles of functioning during the kindergarten school year as a way of describing children who received Part C services as infants and toddlers. This goal will be accomplished by extracting information that describes aspects of child functioning in kindergarten available in NEILS. These items will be analyzed to determine how children can be described in terms of functional profiles groups. The study will answer the following questions: What are the profiles of functioning at time of the kindergarten school year for children who received Part C services as infants and toddlers? A second question is, are there socio-demographic factors or special education placement characteristics associated with these functioning profiles. That is, are there common and different characteristics of the children found

within and between each group of the cluster solutions?

CHAPTER 2

Method

This study involved systematic data reduction, for the purpose of understanding kindergarteners who were enrolled in Part C EI as infants and toddlers. The goal of the analyses was to identify an unknown number of clusters that clearly describe patterns in Part C recipients' functioning in kindergarten. In order to arrive at these clusters, and to describe them once identified, a detailed plan was generated for analyses. The analytic plan involved: identification of items from NEILS kindergarten parent interview and teacher survey; mapping these items to the ICF-CY and conducting a factor analysis to identify functional characteristics; and the cluster analysis and descriptive follow-up analyses. Figure 1 is provided to facilitate understanding of the analytic plan.

The Method chapter is divided into three sections. The first section describes the participants, or the Part C recipients whose functioning was rated by teachers and parents in kindergarten. The second section briefly describes the information source for this study. The third section describes the procedure for the study.

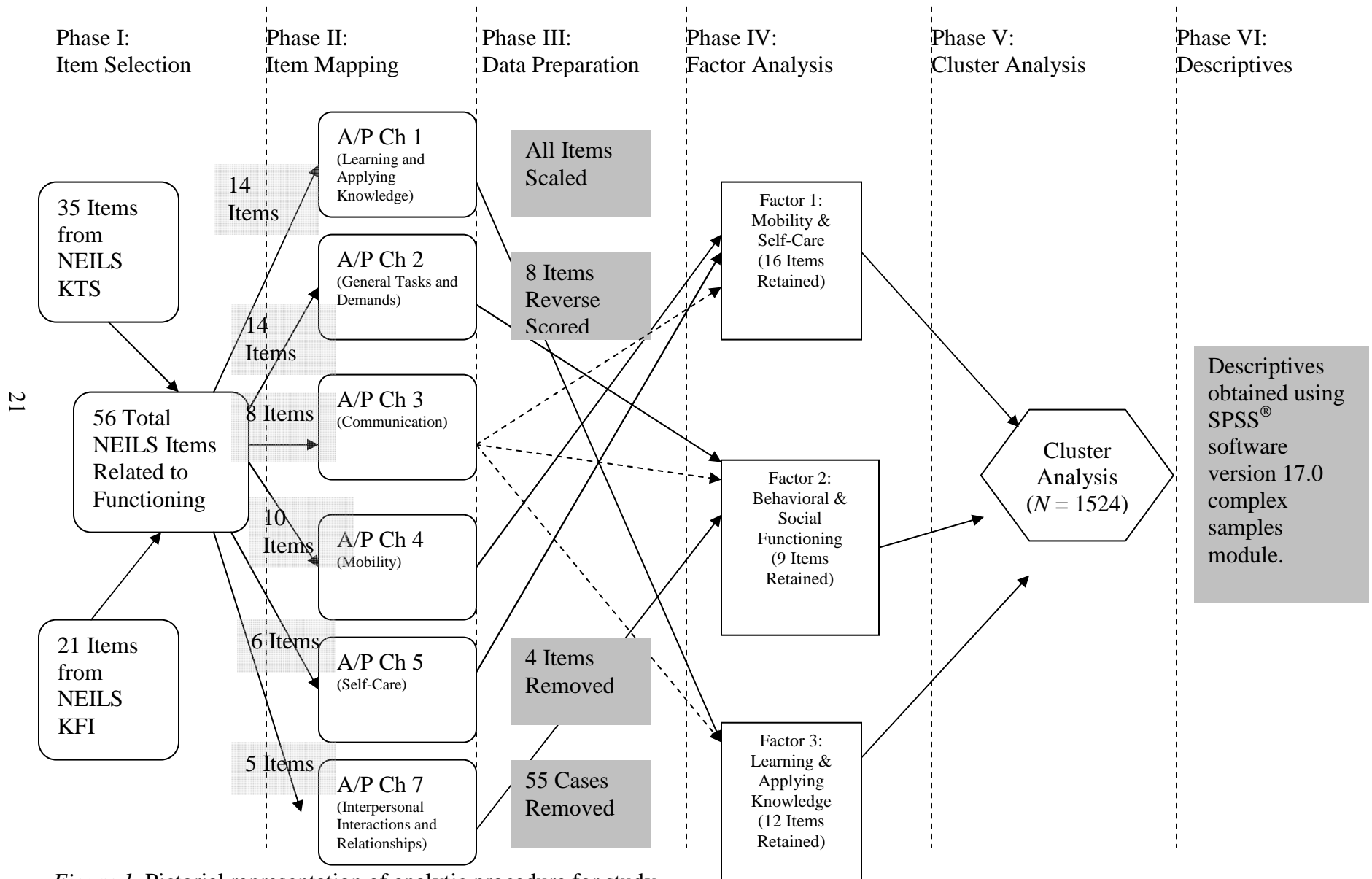


Figure 1. Pictorial representation of analytic procedure for study.

Participants

The NEILS enrollment data include information on 3,338 children and their families. The children who participated in the study entered Part C EI services between September 1997 and November 1998, and came from 93 counties across 20 states. Inclusion/exclusion entrance criteria for participation in the study included that the child be less than 31 months of age and that the adult caretaker speak English or Spanish (Hebbeler & Wagner, 1998). Of those approached and who met inclusion criteria, 71% agreed to participate (Hebbeler et al., 2001). For those children participating, 64% were eligible because of developmental delay, 20% due to a diagnosed condition, and 16% because they were considered “at risk” for developmental delay (Hebbeler et al., 2001). Of those children entering Part C, 61% were boys; with 27% coming from families with an income less than \$15,000 per year (compared to 21% of the general population of 3-year olds for this period of time; Hebbeler et al., 2001). Compared to the national population, more children were likely to be African-American (21% compared to 14% in the general population), and less likely to be Caucasian (53% compared to 61% in the general population; Scarborough et al., 2004).

The data for this study was based on Part C children and families who participated in the kindergarten family interview (KFI), and who had information available from teachers who completed surveys during spring of the kindergarten year [Kindergarten Teacher Survey (KTS)]. For these two data sources considered in this study there were data for a total of 1,581 children with both KFI and KTS data (Hebbeler et al., 2007). The sample of children in this study reflected the larger enrollment sample of 3,338 children,

with no statistically significant differences in terms of gender ($p = .14$), race/ethnicity ($p = .12$), maternal education ($p = .11$), family income level ($p = .09$), or profile of disability at entry to Part C ($p = .15$). The similarities between the two groups is important to note, as the clusters were identified using the sample of 1,581 children and did not incorporate the entire enrollment sample. In addition to the differences between the two groups being negligible from the standpoint of statistical significance, the use of national weights (incorporating information from all children entering Part C in the U.S. between 1997 and 1998) in describing the clusters further minimizes the potential impact of attrition or bias.

Information Sources

In NEILS a telephone interview was conducted with the “person best able to answer questions about the child and the child’s program” from the family when the child entered kindergarten. Due to difficulties in connecting with some families by phone, some respondents answered a reduced number of items via a mail questionnaire (Hebbeler & Wagner, 1998). The KFI asked the responding parent a series of questions about the child and his or her current functioning across a variety of domains. The KFI was completed in the fall of the child’s kindergarten year.

If the parent provided contact information for the child’s kindergarten teacher, then a KTS was distributed and collected by mail in the spring of the child’s kindergarten year. The survey asked kindergarten teachers about the child’s school and learning environment, type of education, and functioning within school. The Academic Rating Scale, which asked teachers to rate children’s progress on specific skills related to literacy and mathematics, was also used in the Early Childhood Longitudinal Study-

Kindergarten Cohort. Teachers also rated children using items adapted from the Social Skills Rating Scale (Hebbeler et al., 2007).

The KFI and KTS were completed at different points in the child's kindergarten year. The family responded in the fall, while the teachers completed the survey in the spring. Families and teachers answered different questions, and were not reporting child functioning based on the same questions or on identical skills. Teachers reported on functioning in the school environment, while families described functioning at home and in the greater community. The potential confounding nature of the difference in timing is minimized by the fact both respondents rated the child's functioning in the same general timeframe (kindergarten year), and the items from the KFI were different from the items in the KTS. Items from both sources were included in the analyses.

Procedure

Cluster analysis was used to answer the first research question regarding identification of patterns of functioning in kindergarten. In order to conduct the analysis, several steps were completed to identify factors of functioning characteristics for use in cluster analysis. The procedure section is divided into six parts, each titled to represent its corresponding phase of the analytic plan, as represented in Figure 1. Phase I describes the process of selecting potential items for analysis, and Phase II describes the procedure for mapping these items to the ICF-CY. Data preparation is described in Phase III. Phase IV presents the factor analysis utilizing the identified items, and the resulting factors used in cluster analysis. Phase V provides an overview of the cluster analysis. Phase V describes the person-oriented analytic approach (cluster analysis) to explore Part C recipients' functioning in kindergarten. Phase VI presents the descriptive follow-up analyses.

Phase I: Selection of Items

The first step was to determine which items related to children's functioning. In reviewing the content of the KTS and KFI, it was noted that many items were conceptually related to functioning as described in a child's activities and participation, and could therefore be mapped onto the ICF-CY. KTS and KFI items were selected as related to child functioning based on their face validity. This process was facilitated by the structure of the interview and survey, which utilized tables with prompts asking the respondent to consider the child's skills and behaviors. An elementary school teacher and a developmental psychologist were asked to review the KTS and KFI and select items they believed related to child functioning. There was 100% agreement among the items selected by all reviewers, resulting in 56 potential items for use in analyses.

Phase II: Mapping Items to the ICF-CY

The 56 items needed to be reduced into meaningful constructs of functioning. The ICF-CY was selected as a theoretical and structural framework for identifying these constructs through the use of a task called mapping. Mapping content to the ICF-CY involves a series of steps that has been described in the ICF-CY and in guidelines developed by Cieza et al. (2005). This process involves identifying meaningful concepts and linking each item to the most descriptive, detailed code of the ICF-CY as possible (with consideration of inclusion and exclusion criteria in the ICF-CY). The mapping process resulted in the 56 items being linked to the Activities/Participation chapters in the ICF-CY.

A second individual trained in the ICF-CY (and practiced in mapping) linked the selected 56 items to the ICF-CY for the purpose of calculating inter-reliability of

mapping. As the *chapter* structure of the Activities/Participation domain in the ICF-CY was utilized as the organizing framework, mapping at the chapter-level was the most important area of reliability. There was 100% agreement at the chapter-level, meaning both individuals mapped each item to the same chapter within the Activities/Participation domain of the ICF-CY.

Items mapped to six of the nine chapters of the Activities/Participation domain. These chapters included: Chapter 1, Learning and Applying Knowledge; Chapter 2, General Tasks and Demands; Chapter 3, Communication; Chapter 4, Mobility; Chapter 5, Self-Care; Chapter 7, Interpersonal Interactions and Relationships. Based on location of the items within the six chapters, the mapping exercise suggested six potential constructs or factors of functioning could be created for the purposes of the cluster analysis. For example, all items mapping onto Chapter 1, Learning and Applying Knowledge, could be grouped to create a factor, while all items mapping onto Chapter 2, General Tasks and Demands, could be grouped to create another factor of functioning. Thus, using the structure of the ICF-CY, there were six potential factors describing functioning.

Phase III: Data Preparation

With potential items for analysis selected and organized according to the structure of the ICF-CY, the next step in analytic preparation was to prepare the actual data. This section describes the tasks of item scaling and imputation of missing data for the study.

Item Scaling. The ICF-CY includes a four-level universal qualifier to “specify the extent to which a function or activity differs from an expected or typical state” (WHO, 2007, xviii). The universal qualifier was not used in scaling the selected items because of methodological challenges. The Likert scales used in the items did not always provide up

to four levels of differentiation and the scaling was not the same for all items. More specifically, question 16 on the family interview used a 3-point scale (1-not at all yet, 2-does it, but not well, 3-does it well), with an additional response for “don’t know.” Question A22 used a frequency-related 3-point scale (1-never, 2-sometimes, 3-very often), with “not applicable” and “don’t know” options. Questions A23 and A24 on the teacher survey used a 5-point scale (1-not yet, 2-beginning, 3-in progress, 4-intermediate, 5-proficient) with a “not applicable” option. Question A25 used a 6-point scale to denote level of difficulty in functioning (1-normal for age, 2-suspected difficulty, 3-mild difficulty, 4-moderate difficulty, 5-severe difficulty, 6-extreme difficulty).

A review of the item scaling revealed that the response scales could be collapsed onto a 3-point metric, with 0.5 point increments. The resulting metric used 3 anchor points, using the descriptions associated with response scaling. As described in Table 1, the metric results in a value of 1.0 representing severe difficulties or absence of a skill; 2.0 representing mild difficulty or an emerging skills; and, 3.0 representing average functioning or above.

Table 1

Metric for Scaling Interview and Survey Items

| Kindergarten | | | | |
|---------------------|---------------------------|---|-----------------------|---------------------------|
| | Family Interview | Kindergarten Teacher Survey | | |
| Metric for Analysis | Question 16 | Question A22 (reverse scale l, n, p, q, t, u, x) | Questions A23 and A24 | Question 25A |
| 0.5 | | | | 6 (extreme difficulty) |
| 1.0 | 1 (not at all yet) | 1 (never) | 1 (Not yet) | 5 (severe difficulty) |
| 1.5 | | | 2 (beginning) | 4 (moderate difficulties) |
| 2.0 | 2 (does it, but not well) | 2 (sometimes) | 3 (in progress) | 3 (mild difficulty) |
| 2.5 | | | 4 (intermediate) | 2 (suspected difficulty) |
| 3.0 | 3 (does it well) | 3 (very often) | 5 (proficient) | 1 (normal functioning) |

Missing Data and Scaling Issues. Data cleaning was necessary to prepare the data for analysis. Of the 1,581 potential cases for analysis, 29 individuals had data on either

the KTS or KFI, but not both. These 29 cases were removed from the dataset (resulting in 1,552 cases). Each selected item had about 30 missing values (that is, 30 cases out of 1,552 participants). A decision rule was made, such that cases with over 50% missing values on all items were removed. This procedure resulted in the removal of 26 cases, representing 64% of the total missing values across the 56 items. The removed cases represented a cross-section of the larger sample, with no significant differences in terms of description of disability at entry to Part C, gender, race/ethnicity, or family income level. The remaining five to eight missing values for each item (across the remaining 1,526 participants) were imputed as the mean value of the individual's scores on the other items mapping to that particular Activities/Participation chapter. This same process was used to impute scores for the "Refused," "Don't Know," and "Not Applicable" options on some items.

Several items (A22 l, n, p, q, t, u, and x) were reverse scaled to account for the negative structure of their content. Four items (A22d, "control his/her temper in conflict situations with others," 11.1%; A22f, "respond appropriately to teasing by other students," 24.5%; A22h, "respond appropriately when pushed or hit by other students," 16.6%; and A22j, "receive criticism well," 14.2%) were not used because they had frequencies of "Not Applicable" for over 10% of the total number of responses for the item.

In summary, a total of 0.5% of all responses were imputed or rescaled. Four items were removed as they met criteria for exclusion (due to a large percentage of values to be imputed). Of the original 1,581 participants, 29 cases were removed because they did not have matching linking IDs in the data, and 26 were removed because they had a large

percentage (over 50%) of missing data. The data used for the analyses contained 1,526 cases with information on 52 items which mapped to six chapters of the Activities/Participation domain of the ICF-CY.

Phase IV: Factor Analysis

The six potential factors of functioning derived from the mapping process had a strong theoretical basis. However, it was unknown if the items mapping to the same Activities/Participation chapter truly related to each other in this population, and the extent to which each item may contribute to variance within its factor based on the identification with a particular Activities/Participation chapter. Determining an appropriate number and nature of factors of functioning was very important, as interpretation of clusters is based on the ability to recognize variability across the items used in the analysis (El-Khoury & Bergman, 2002). Interpretation of cluster solutions also becomes more difficult as the number of factors increases. Therefore, it was important to determine the fewest number of possible factors describing functioning. Factor analysis was utilized to determine how the items related to each other, and how to best reduce the total number of factors describing functioning. The results of the factor analysis are presented as they were utilized for the purpose of identifying clusters of children with similar profiles of functioning.

A factor analysis explored the underlying/latent constructs in the 52 items. SPSS v. 17 (Statistical Package for the Social Sciences, version 17, 2007) was used for the analysis, which incorporated a split-half design. In the following sections, the researcher distinguishes results based on the entire dataset, and each of the two split-half datasets. Description of the factor analysis method and results is divided into sections on data

screening, the factor extraction stage, and the factor rotation stage. A final section for Phase IV describes the factors used for the purpose of cluster analysis.

Data Screening. The factor analysis began with a screening of the data. With a sample size of 1,526 and a ratio of cases to variables of about 27:1, the correlation coefficients estimated from the sample by the factor analysis procedures can be presumed to be reliable, when considering the historically preferable ratio of at least 20:1 (Ware, 2006). While the variables for analysis did not represent perfect normal distributions, screening procedures suggested there were no extreme violations of normality, linearity, multicollinearity, or singularity. Examination of potential outliers using Mahalanobis Distance values for cases suggested all 1,526 cases should be retained for analysis.

An initial Principal Component Analysis was conducted to determine if the correlation matrix was factorable. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .95, which Kaiser considered “marvelous” (Ware, 2006). The result of Bartlett’s test ($\chi^2 [1526] = 21648.919, p < .001$) suggested the correlation matrix was sufficiently different from the identity matrix, indicating the factor model was appropriate.

Factor Extraction. The factor extraction stage is an exploratory factor analysis. Determining the number of factors to rotate is not an exact science, and involves consideration of multiple guidelines and methods. The goal was to balance the findings of these various guidelines to determine a plausible number of latent factors, explaining the greatest amount of variance (Ware, 2006). For this study, exploratory factor analysis incorporated information from eigenvalues from Principal Components Analysis, scree plots, and Horn’s test.

In examining the initial Principal Components Analysis, it appeared there were likely three underlying factors. The Kaiser-Guttman Rule states factors with eigenvalues greater than or equal to 1.0 should be retained. This rule is based on the logic that “true” factors should have greater variance than a standardized variable in the correlation matrix, whose value is 1.0 (Ware, 2006). The Kaiser-Guttman rule, like all guidelines for exploratory factor analysis, is subject to fault and does not always accurately estimate the underlying number of factors. In the exploratory factor analysis for the entire dataset, the Kaiser-Guttman Rule suggested three underlying factors. One of the split-half group analyses also suggested three factors. The other split-half group analysis suggested up to ten underlying factors, as there were ten factors of eigenvalues greater than or equal to 1.0. There was a marked change in the difference between eigenvalues for factors three and four.

The scree plots for the combined factor analysis and the two split-half analyses were examined. The scree plot is a visual plot of the magnitude of the eigenvalues produced in the Principal Components Analysis, and the point at which the “elbow” occurs suggests the number of “true” underlying factors. A visual inspection of the scree plot for the factor analysis for the entire dataset again suggested three factors. Similar to the findings utilizing the Kaiser-Guttman rule, the first split-half factor analysis suggested three factors, while the second split-half factor analysis suggested a greater number of factors. In reviewing the second split-half scree plot, the greatest change in slope occurred between components three and four; however, the line became straightest at a point between components seven and ten.

Horn's test was also utilized to help determine the number of underlying factors in the data. Horn's test is a parallel analysis between the actual eigenvalues derived from the Principal Components Analysis with eigenvalues derived from data randomly generated and incorporating the same number of factors. Horn's test was conducted three times with the whole dataset and each split-half, resulting in nine total comparisons of "real" and "random" eigenvalues. Seven of the nine comparisons suggested three underlying factors. One of the nine suggested four underlying factors, and another suggested five underlying factors. The four and five factor comparisons utilized the second split-half dataset, which had suggested up to ten factors using the Kaiser-Guttman rule.

In utilizing the guidelines of the Kaiser-Guttman rule, the scree plots, and Horn's test, the researcher hypothesized there were likely three latent factors in the dataset. As the findings utilizing the guidelines were not all consistent, the researcher recognized there were possibly up to ten underlying factors in the data. Therefore, the researcher determined it would be prudent to systematically examine three-, four-, five-, six-, seven-, eight-, nine- and ten-factor solutions, using orthogonal and oblique rotations.

Factor Rotation. The confirmatory factor analysis stage utilized Principal-Axis Factoring to determine the best factor solution from the factor structures examined in the exploratory stage. Both oblique and orthogonal rotations were explored for factor solutions ranging from three-factors to ten-factors. Determination of which factor solution to retain incorporated consideration of regression weights on each factor of a solution, with a "good" factor loading represented as regression weights greater than 0.3 on one factor and less than 0.25 on other factors (ideally with a difference of about 0.2 to

0.3 between the highest loading and lowest loadings; Ware, 2006) for each item. As in the exploratory phase, a split-half design was utilized to confirm the factor structure in this phase of analysis.

Findings in the confirmatory stage of factor analysis were consistent for the entire dataset and for each split-half. The oblique rotation best confirmed the factor structure, an expected finding as factors were assumed to be correlated to some degree. Using the same “good” loading criteria, the separate factor analyses of each half of the data demonstrated similar, strong loadings for most items. Those items with the strongest loadings on one factor in the original factor analysis maintained similar factor loadings, typically within 0.05 on each factor. However, items with weaker loadings on each factor showed greater variability across the split-half factor analyses.

In general, items mapping to the same ICF-CY Activities/Participation chapter loaded onto the same factor. All eleven items mapping to Activities/Participation Chapter 4, Mobility, loaded on Factor 1. The five items mapping to Activities/Participation Chapter 5, Self-Care, also loaded to Factor 1. The six items mapping to Activities/Participation Chapter 2, General Tasks and Demands, loaded onto Factor 2. Four of the five items mapping to Activities/Participation Chapter 7, Interpersonal Interactions and Relationships, loaded to Factor 2. The item “cooperate with another child to do something together” from Chapter 7 loaded to Factor 1. Thirteen of the fifteen items that mapped to ICF-CY Activities/Participation Chapter 1, Learning and Applying Knowledge, loaded on Factor 3. The items “thinking and reasoning” and “know right from left” from Activities/Participation Chapter 1 loaded similarly to both Factor 1 and Factor 3.

None of the items mapping to Activities/Participation Chapter 3, Communication, loaded to any one factor. Instead, they tended to load similarly to Factor 1 and Factor 3, with some loading on Factor 2. This suggests the importance of communication skills for children across areas of functioning. Table 2 provides an overview of items loading to the three factors, including where items mapped to the ICF-CY Activities/Participation domain.

The factor analysis procedures were conducted for the purposes of identifying factors of functioning for use in cluster analysis. The items used did not necessarily approximate univariate normality, because the information is based on a nationally representative sample of infants and toddlers with disabilities who received Part C services.

Table 2

Factor Loadings for Confirmatory Factor Model for Three-Factor Oblique Solution, Using Retained Items Mapped to ICF-CY

| NEILS Items Listed Under ICF-CY A/P Chapters | Extracted Factors | | |
|--|-------------------------------------|--|--|
| | Factor 1: Mobility and Self-Care | Factor 2: Behavioral and Social Functioning | Factor 3: Learning and Applying Knowledge |
| CHAPTER 4, MOBILITY | | | |
| A25e – use of legs | .833 | .017 | .170 |
| 16b – walk quickly or run | .826 | .124 | .154 |
| 16a – walk without holding on to anything | .786 | .110 | .164 |
| A25d – use of arms | .776 | .030 | .141 |
| 16d – take the paper off candy to unwrap it | .700 | .022 | .048 |
| A25 c – use of hands | .690 | .082 | .042 |
| 16e – copy a circle | .655 | .012 | .145 |
| 16c – skip with alternating feet | .550 | .005 | .044 |

| | | | |
|---|-------------|------|------|
| 16f – color within the lines of a coloring book | .553 | .055 | .026 |
| 16g – spread food, like butter or jelly, on bread or crackers using a utensil | .553 | .067 | .055 |
| 16w – draw a person with a recognizable head and body, or head, nose, eyes, and mouth | .531 | .003 | .284 |

CHAPTER 5, SELF-CARE

| | | | |
|--|-------------|-------|------|
| 16h – put on a shirt or jacket with help | .803 | .019 | .028 |
| 37 16i – put shoes on correct feet | .649 | .033 | .114 |
| 16k – have bladder control during the day | .636 | .046 | .097 |
| 16l – understand and stay away from common dangers | .545 | -.064 | .162 |
| 16j – tie his or her shoelaces | .300 | -.061 | .109 |

CHAPTER 2, GENERAL TASKS AND DEMANDS

| | | | |
|--|------|-------------|------|
| 16q – follow a two-step verbal direction | .036 | .636 | .017 |
|--|------|-------------|------|

| | | | |
|---|------|-------------|------|
| A22e – easily make transitions from one classroom activity to another | .118 | .576 | .098 |
| A22g – follow directions | .226 | .553 | .107 |
| A22y – follow classroom rules and routines | .247 | .553 | .098 |
| A22p – act impulsively | .101 | .524 | .106 |

CHAPTER 7, INTERPERSONAL

INTERACTIONS AND RELATIONSHIPS

38

| | | | |
|--|------|-------------|------|
| A22k – cooperate with other students without prompting | .218 | .500 | .192 |
| A22l – fight with others | .166 | .449 | .029 |
| A22b – make friends easily | .266 | .444 | .172 |
| A22n – argue with others | .189 | .431 | .161 |

CHAPTER 1, LEARNING AND APPLYING

KNOWLEDGE

| | | | |
|---|------|------|-------------|
| A24d - solves problems involving numbers using concrete objects | .053 | .009 | .732 |
|---|------|------|-------------|

| | | | |
|--|------|------|-------------|
| A24g – uses a variety of strategies to solve math problems | .042 | .028 | .710 |
| A23f – uses different strategies to read unfamiliar words | .075 | .063 | .692 |
| A24c - shows an understanding of the relationships between quantities | .009 | .066 | .679 |
| A23d - produces rhyming words | .000 | .076 | .658 |
| A23e – reads simple books independently | .062 | .034 | .651 |
| A23h – demonstrates an understanding of some of the conventions of print | .010 | .046 | .650 |
| A23g – composes simple stories | .059 | .131 | .636 |
| A24e – demonstrates an understanding of graphing activities | .023 | .071 | .635 |

| | | | |
|--|-------|-------|-------------|
| A24b - orders groups of objects | .022 | .080 | .610 |
| A24a - sorts, classifies, and compares math materials by various rules and attributes | .057 | .075 | .502 |
| A23c- easily and quickly names all upper- and lower-case letters of the alphabet | .102 | .075 | .322 |
| <hr/> | | | |
| Rotation Sum of Square Loadings | 8.773 | 4.760 | 5.501 |

Note: Factors are correlated when using an oblique rotation. Sums of squared loadings cannot be summed to calculate a total variance explained by each factor or the solution.

Creating Factors of Functioning. The goal of the factor analysis was to identify underlying constructs for creating factors of functioning based on both a theoretical (offered by the ICF-CY) and statistical structure. One item from Activities/Participation Chapter 7 and two items from Chapter 1 did not load cleanly to a single factor and were removed from the factor solution. As all items in Chapter 3, Communication, loaded onto more than one factor, they were not used in the factor solution for identifying clusters via cluster analysis. Given their clear importance to children's functioning, items mapping to Chapter 3, Communication, were utilized in follow-up analyses to describe the clusters.

A mean was obtained for each child on each factor. The three factors represented three distinct skill areas, when considering the items loading to each factor. Items loading on Factor 1 were those which mapped primarily to Chapter 4, Mobility, and Chapter 5, Self-Care. Thus, the mean of items loading to Factor 1 was the value for "Mobility and Self-Care." Items loading to Factor 2 were those which mapped primarily to Chapter 2, General Tasks and Demands, and Chapter 7, Interpersonal Interactions and Relationships. The wording of these items related to issues in controlling and managing behavior and engaging in social situations appropriately. The mean of items loading to Factor 2 was the value for "Behavioral and Social Functioning." Finally, items loading to Factor 3 were those which mapped to Chapter 1, Learning and Applying Knowledge. The means of these items was the value for "Learning and Applying Knowledge."

Phase V: Cluster Analysis

The culmination of the data preparation and factor analyses resulted in 1,526 cases with values on three factors of functioning (Mobility and Self-Care; Behavioral and Social Functioning; and, Learning and Applying Knowledge) for identifying clusters.

Cluster analysis can be conducted with a wide variety of variables. The constellation of chosen variables impacts the number of clusters identified, and representation of individuals within each cluster. The purpose of this study was to identify varying profiles related to child functioning as a way to understand children in kindergarten who received Part C services as infants and toddlers. Because child functioning was the primary focus of this study, only variables corresponding to aspects of functioning were utilized in the cluster analysis. Other variables, describing the child (including child- and family-level sociodemographic characteristics, descriptions of disability at entrance to Part C, and disability status in kindergarten) were used in later analyses to describe the clusters of children once identified based on similar patterns of functioning.

The SLEIPNER program (Bergman & El-Khoury, 2002), version 2.1, is comprised of sixteen modules with varying analytical capabilities. It was developed for use with person-oriented analyses, and allows for greater flexibility in performing cluster analysis as compared to other programs, such as SPSS. To identify patterns of Part C recipients' functioning in kindergarten, cluster analysis was performed using Ward's hierarchical method (Ward, 1963). The cluster analysis was first run utilizing all cases. The cluster solution was confirmed using a split-half approach, with analyses using each half of the data compared to the cluster analysis using the full dataset. The Relocate module was implemented to refine the cluster solutions by relocating each individual to increase the variance explained by the total cluster solution. The Simulate module compared the cluster solution to simulated attempts made by the computer program. The purpose was to determine if the observed cluster solution explained more variance than

the simulated solutions; if so, then there would be support the cluster solution is viable (Burk lecture, January 2008; El-Khoury & Bergman, 2002).

Determining which cluster solution to retain for further analysis was based on considerations of within-group homogeneity of variance and between-group homogeneity of variance. For this study, Bergman's (1998) criteria were used to determine the cluster solutions. The criteria included: "a) a manageable number of clusters, b) a minimum level of the percentage of explained sums of squares, preferably over 67%, c) a sharp increase in *ESS* (explained sums of squares), and d) a theoretically meaningful and interpretable solution" (as cited in Almqvist & Granlund, 2006, p. 166). These criteria can be interpreted to mean that groups should have at least 15 people, the cluster solution should explain at least 67% of the variance (*ESS* greater than 67%), and the homogeneity coefficients for each cluster should be less than 1.00. In addition, the groups should be easily interpretable from a theoretical or practical standpoint.

Phase VI: Describing the Clusters

Variable-oriented analyses were used to complement person-oriented analyses by providing further information about the identified clusters. Every case was assigned membership in one of the identified clusters derived in the cluster analysis conducted in SLEIPNER. Descriptive analysis on the clusters was conducted using SPSS[®] software version 17.0 (SPSS, 2007) complex samples module, designed to analyze data from complex sample surveys (including stratified, unequally weighted, and clustered samples). These analyses used probability sampling weights so that the results reflect the population of all infants and toddlers who entered Part C services in the US in 1997 and 1998. These weights were generated based on a methodology that takes county, state,

regional, and national estimates into account while considering the distribution of factors such as age at first IFSP, gender, race, and reason for eligibility. Detail on the weighting process has been reported in Javitz, Spiker, Hebbeler, and Wagner (2002).

Clusters were described using child-level and family-level socio-demographic characteristics, including a) family income at enrollment, b) maternal education, c) child ethnicity, e) child gender, and f) child's age at entry to Part C. Child's age at entry to Part C was categorized in three groups, from birth until one year of age; older than year and up to two years of age; and entrance after two years of age, until up to three years of age. These socio-demographic variables were identified based on their importance and prominence in the research literature.

Clusters were also described using a description of the child's disability at entrance to Part C. Children were assigned to one of four mutually exclusive groups on the basis of agencies' and caregivers' descriptions of why the child was eligible for Part C and caregivers' descriptions of the child's functioning. The four mutually exclusive groups included: (1) children with a diagnosed condition of any kind, who additionally may have delays or experience conditions considered in the category; (2) children receiving services under the at-risk category, and exclusively because of biomedical and/or environmental or social risk factors; (3) children reported as entering because of developmental delay, who may have also experienced conditions considered under the at-risk category; and (4) children entering Part C exclusively for reasons related to speech/language delays, although they may also have experienced conditions considered under the at-risk category and/or been considered to have minor functional limitations (Hebbeler, Levin, Perez, Lam, & Chambers, 2009). Clusters were additionally compared

on the basis of IEP status in kindergarten. Clusters were compared on whether children had a 504 plan only (suggesting needs for services, but not at the level necessary to qualify under IDEA Part B), an IEP (meaning the child qualified for services under IDEA Part B), or did not qualify for services under either 504 or IDEA Part B. In this way, the relative need for IDEA services could be considered across clusters.

All of the variables of interest were nominal in nature, with assigned values differentiating categories or levels. To compare clusters on these variables, omnibus crosstabulations (using Chi-square frequency analysis Tests of Independence) were conducted. Distributions of examined characteristics were compared to the population estimates.

Communication items did not load cleanly to one factor and were not used in the cluster analysis for identifying clusters. Instead, ANOVAs and Tukey post hoc tests were run to compare the clusters on three communication items. The three communication items used for description of communication functioning were “initiates conversation with others,” “understands others,” and “communicates with others.” These items were chosen because they represented three important components of language, namely a socially-oriented communication skill (A22c), receptive language ability (A25h), and expressive language ability (A25i). It is important to note these communication items contain a distinctly social aspect, and are likely differentiated from the speech and language concerns experienced by children who qualify for speech or language impairments. That is, as opposed to the articulation and language use challenges which led some children to receive services for speech or language impairment, these items

correspond to more communication and social-communication oriented skills and abilities.

CHAPTER 3

Results

The Results chapter is divided into two sections. The first section provides an overview of identification of clusters. The second section describes results of follow-up analyses describing the clusters. Overall descriptions of the clusters are provided in this section, whereas implications of these findings are elaborated in the Discussion section.

Identification of Clusters

Overview of Three Factors. Three factors of functioning were identified through the process of: (1) selecting items; (2) mapping them to the Activities/Participation chapter of the ICF-CY; and (3) conducting factor analyses to identify underlying latent constructs among the items. The factors were named according to the location of the items within chapters in the ICF-CY Activities/Participation domain. Scaling for the items comprising each factor of functioning ranged from the lowest possible score of 0.5 and a highest possible score of 3.0, with 0.5 increments. A score of 3.0 reflected approximately “normal” functioning. The scaling was described in further detail in Table 1 on page 27 (Chapter 2, Method).

The Mobility and Self-Care factor had a mean (M) of 2.47, with a standard deviation (SD) of 0.47. Using the terminology associated with the scaling of items, former Part C recipients had a mean ability level at the “intermediate” (2.5) level of skill or functioning on these items. The standard deviation suggests children ranged from demonstrating these skills “sometimes” or they demonstrated these skills “but not well”

(2.0) to demonstrating approximately a “proficient” level of functioning on items in mobility and self-care. A cluster with a mean score below 2.0 on this factor would have considerable difficulty when compared to other former Part C peers.

The mean and standard deviation of the Behavioral and Social Functioning factor had similar values to Mobility and Self-Care ($M = 2.46$, $SD = 0.41$). In consideration of the scaling terminology, Part C recipients’ average functioning level on these items was in the “intermediate” (2.5) range, with most children’s scores falling between “sometimes” demonstrating these skills to experiencing an almost “proficient” level of functioning on these items. Children in a cluster with a mean score below 2.05 would have lower functioning on behavioral and social skills than most other former Part C peers.

The Learning and Applying Knowledge factor had a lower mean than the other two factors of functioning ($M = 1.55$, $SD = 0.36$). Unlike the other two factors, children tended to demonstrate a “beginning” level of skill or to experience “moderate difficulties” in functioning on items related to learning and applying knowledge. The lower mean score may be partly explained by considering the items comprising this factor. These items relate to skills that may only be emerging in kindergarten students, or which may continue to emerge in many students through first grade. For example, skills in “uses a variety of strategies to solve math problems” and “composes simple stories” feasibly could be part of a first grade curriculum, as these skills may not be mastered in the kindergarten year. As with the other two factors, a cluster’s mean score falling at about one standard deviation (in this case, 1.19) or below the mean would suggest

considerable difficulty in this area of functioning when compared to other former Part C peers.

Cluster Analysis. For the purpose of the cluster analysis, there were 1,526 children with mean values on three factors of functioning. The hierarchical cluster analysis yielded several potentially interpretable cluster solutions. Determination of which cluster solution to retain was based on Bergman's (1998) criteria, described in the Method chapter. Several of Bergman's criteria were met by all cluster solutions. These included homogeneity coefficients of less than 1.00 for all clusters within a cluster solution, as well as a minimum of 15 cases per cluster within a solution. These criteria were not as helpful in identifying the "best" cluster solution as they may have been for a dataset with a smaller number of participants.

Utilizing Bergman's other criteria, cluster solutions were reviewed to determine a minimum number of clusters to describe at least 67% of the variance, and which could be interpreted meaningfully. Looking at Table 3, which details the *ESS* for cluster solutions for the whole dataset, it was clear the five-cluster solution explained the minimum threshold of 67% *ESS*, with a noted decrease in *ESS* value between solutions using five and four clusters. However, there was not the "sharp" (as cited in Almqvist & Granlund, 2006, p. 166) change noted in Bergman's criteria. The two split-half cluster analyses provided similar findings, with the five-cluster solution providing the minimum *ESS* each time. One of the solutions suggested a more marked decrease in *ESS* from five to four clusters, and the other resulted in the approximately 6% *ESS* difference as seen for the whole dataset.

Table 3.

Variance Explained by One -to Eight-Cluster Solutions

| Number of Clusters | Explained Sum of Squares (<i>ESS</i>) |
|--------------------|---|
| 8 | 76.4130 |
| 7 | 74.7733 |
| 6 | 71.6838 |
| 5 | 67.8891 |
| 4 | 61.9080 |
| 3 | 54.7875 |
| 2 | 40.6806 |
| 1 | 0.00 |

The five-cluster solution was considered the most likely interpretable solution, but other cluster solutions were also considered. As cluster solutions utilizing less than five clusters did not explain enough variance in analyses for the whole dataset and the two split-half analyses, the six-, seven-, and eight-cluster solutions (which explained at least 67% *ESS*) were considered. As the number of clusters in a solution increased from five, the highest and lowest functioning clusters of the five-cluster solution separated into smaller, less differentiated clusters. For example, the six-cluster solution was differentiated from the five-cluster solution solely on the basis of the highest functioning cluster (of the five-cluster solution) breaking into two smaller clusters with 0.10 *SD*

differences on mean functioning on Mobility and Self-Care and Learning and Applying Knowledge. These differences between the five- and six-cluster solutions were found for the whole dataset, and both split-half dataset analyses.

In the seven-cluster solution, in addition to the separation of the highest functioning cluster into two clusters, the lowest functioning cluster broke into two clusters with 0.10 *SD* differences on abilities and challenges on Learning and Applying Knowledge and 0.15 *SD* differences on Behavioral and Social Functioning. The eight-cluster solution showed an additional separation of cases in the lowest functioning cluster from the seven-cluster solution. These findings were consistent across the analyses for the whole dataset and both split-half analyses.

In scrutinizing the various cluster solutions further, it became clear that the clusters breaking off from clusters in the five-cluster solution approached values closer to the overall mean for each factor of functioning. Thus, the five-cluster solution represented the range of highest and lowest functioning clusters, with greater distinctions between cluster means on each of the three factors. The five-cluster solution was also most feasible to interpret, as there were more pronounced differences between cluster centroids (means), making interpretation clearer. Understanding the differences between clusters was facilitated by their low homogeneity coefficient values from 0.069 to 0.150, which indicated the clusters were “tight” with a high degree of homogeneity between members of each cluster. In consideration of Bergman’s criteria, the five-cluster solution was selected as the best solution for further analysis.

To maximize the variance explained by the five-cluster solution, the Relocate module was run to relocate cases to potentially better-fitting clusters. The Relocate

module resulted in 69.7% of the variance explained, an increase of about 2% *ESS*. Thirty-eight cases were moved between the two highest functioning clusters. This finding suggests cases in the two highest functioning clusters may be more similar than cases in other functioning clusters.

The Simulate module was then implemented to compare the selected cluster solution to simulated random solutions representing “chance.” The simulated solutions of five clusters on three factors, using Ward’s method and “shaken down” ten times, resulted in a maximum explained variance of 62%. Thus, the five-cluster solution derived from cluster analysis with the data for this study resulted in a significantly greater *ESS* than randomly drawn solutions. The findings from the Simulate module suggested the five-cluster solution was viable using internal criteria for validation (Burk lecture, January 2008). The split-half approach to this study, which resulted in similar findings to the analyses run for the whole data-set, also suggested internal validation for the five-cluster solution.

Descriptive analysis on the clusters was conducted using the probability sampling weights described in the Method chapter. The following results utilize statistics incorporating these weights, so that the results reflect the population of infants and toddlers who entered Part C services in the US in 1997 and 1998. A summary of the five clusters is reported in Table 4 and depicted in Figure 2. It is important to bear in mind that means and standard deviations on each factor were all relative to the other children who received Part C services as infants and toddlers. The values do not represent means and standard deviations on standardized tests, nor are they in relation to all kindergarten students.

Table 4
Five-Cluster Solution Using Three Factors of Functioning

| Cluster | Factors of Functioning | | | | | | <i>n (%)</i> | <i>HC</i> |
|------------|---------------------------|-----|---|-----|---------------------------------------|-----|--------------|-----------|
| | Mobility and Self-Care | | Behavioral and Social Functioning | | Learning and Applying Knowledge | | | |
| | M | SD | M | SD | M | SD | | |
| Total | 2.47 | .47 | 2.46 | .41 | 1.55 | .36 | | |
| Population | | | | | | | | |
| 1 | 2.62 | .29 | 2.74 | .20 | 1.62 | .20 | 559 (35) | .112 |
| 2 | 2.69 | .18 | 1.99 | .20 | 1.54 | .26 | 244 (20) | .092 |
| 3 | 2.82 | .17 | 2.73 | .23 | 1.97 | .15 | 303 (18) | .069 |
| 4 | 2.15 | .22 | 2.16 | .36 | 1.22 | .21 | 288 (17) | .150 |
| 5 | 1.36 | .31 | 2.17 | .32 | 1.04 | .10 | 132 (9) | .140 |

Note: *n* = unweighted sample size
 Results are weighted and include complex samples design.
HC = homogeneity coefficient

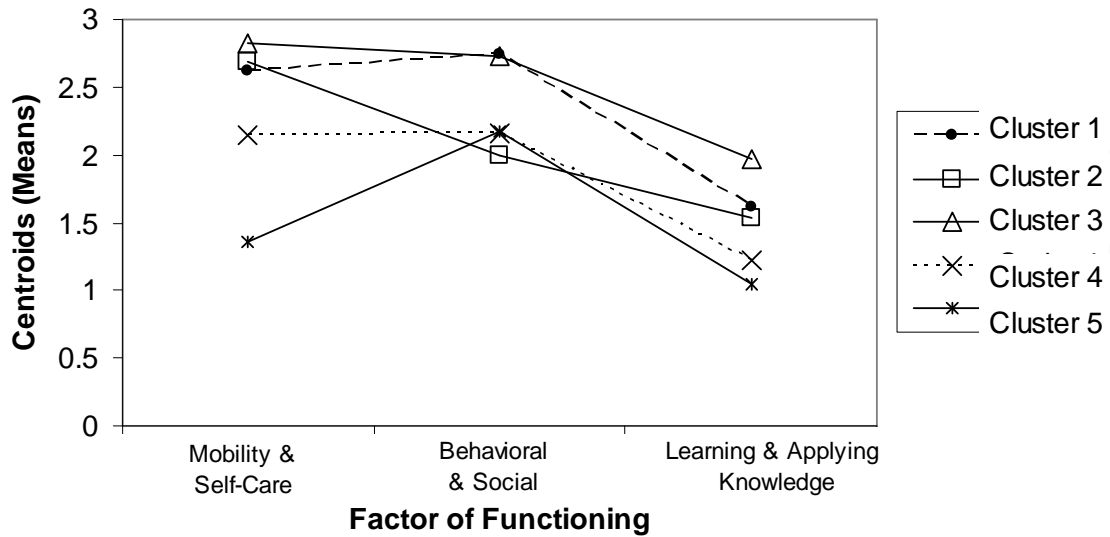


Figure 2. Factor centroids according to cluster.

As can be seen, clusters varied by their mean scores on each of the three factors of functioning. The difference between clusters was more clearly described by the differences in the number of standard deviations from the mean value on each respective factor. A visual representation of differences in clusters according to standard deviations from the mean for each factor is presented in Figure 3.

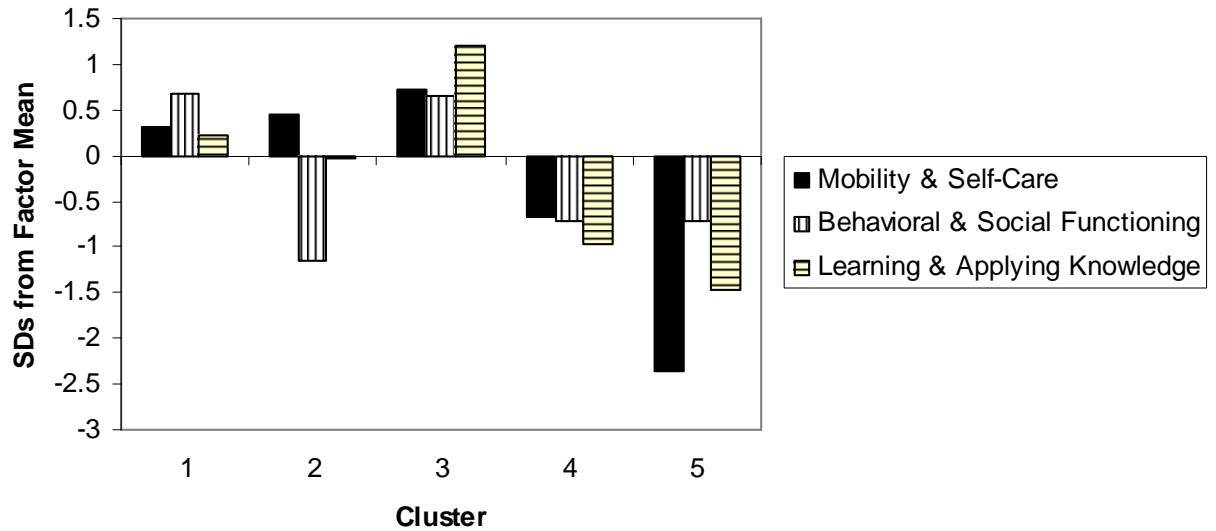


Figure 3. Cluster centroids, depicted as SDs from factor means.

Descriptors were applied to each cluster based on its scores in relation to the mean values of each factor. Terminology related to clusters' functioning is in relation to other clusters, all comprised of former Part C recipients in kindergarten. Cluster 1 and Cluster 3 represented children with mean or above the mean values on each factor of functioning. Using the item scaling terminology, the mean values represented "intermediate" to "proficient" functioning in Mobility and Self-Care and Behavioral and Social Functioning. Learning and Applying Knowledge skills were rated as "in progress" or demonstrated by the child "sometimes." In comparing the two clusters, children in Cluster 3 had higher values than children in Cluster 1 on Learning and Applying Knowledge, with comparable values on Behavioral and Social Functioning and somewhat higher values on Mobility and Self-Care. Cluster 1, representing 35% of Part C

recipients, was labeled “Average Functioning,” and Cluster 3, representing 18% of Part C recipients, was labeled “Above Average Functioning.”

Children in Cluster 2 had a similar mean value on Mobility and Self-Care to children in Cluster 1 and Cluster 3. On Learning and Applying Knowledge, children in Cluster 2 had approximately the mean value for all Part C recipients in kindergarten, described as “beginning” demonstration of skills and abilities using item terminology. Children in Cluster 2 varied from children in Cluster 1 and Cluster 3, and the other clusters, in their lower mean value (described as “beginning” skills or skill “in progress”) on Behavioral and Social Functioning. Cluster 2, representing 20% of Part C recipients in kindergarten, was labeled “Behavioral and Social Functioning Challenges.”

Cluster 4 and Cluster 5 were the two clusters whose members’ functioning on all three factors was consistently rated below the mean, as compared to other Part C recipients in kindergarten. Children in both clusters had less difficulty in functioning on Behavioral and Social Functioning than Cluster 2. The difference between the two clusters was the extent to which the children’s mean functioning was below the overall mean for each factor. Cluster 4 members were rated from 0.68 to 0.96 SD below the mean for each factor of functioning. They were rated as having skills “in progress” in Mobility and Self-Care and Behavioral and Social Functioning, and as “not yet” demonstrating skills or having “severe difficulty” on Learning and Applying Knowledge. Cluster 4, representing 17% of Part C recipients in kindergarten, was labeled “Below Average Functioning.”

Children in Cluster 4 and Cluster 5 had comparable mean values on Behavioral and Social Functioning. Children in Cluster 5 differed from children in Cluster 4 in that

they were rated as having greater difficulty on Mobility and Self-Care and Learning and Applying Knowledge. On both of these factors, Cluster 5 members' scores were the most different from the mean than children in other clusters on any factor. Cluster 5 members were rated as having "severe difficulty" or skills "not yet" demonstrated or "beginning" on items relating to mobility, self-care, and learning and applying knowledge. Cluster 5, representing 9% of Part C recipients in kindergarten, was labeled "Mobility/Self-Care and Learning/Applying Knowledge Functioning Challenges."

Description of Cluster Members

Using chi-square tests of independence, clusters were compared on the variables described in the Method section. Results found significant differences between children in different clusters for most socio-demographic variables, descriptions of the child's disability at entrance to Part C, and the child's IEP status in kindergarten (Table 5). More specifically, there were significant differences on the child- and family-level socio-demographic variables including child's gender $\chi^2(2.92, 55.49, N = 1,526) = 20.90, p = .031$, child's race/ethnicity $\chi^2(6.48, 123.08, N = 1,526) = 58.31, p = .046$, and mother's education level $\chi^2(7.35, 139.62, N = 1,526) = 77.50, p = .029$. Children across clusters were also different for age at IFSP $\chi^2(4.135, 78.56, N = 1,526) = 75.14, p = .001$, and the disability profile to which they belonged when entering Part C $\chi^2(5.84, 110.86, N = 1,526) = 269.34, p = .001$. Crosstabulations were also significant for differences between clusters on the child's IEP status in kindergarten $\chi^2(6.20, 117.70, N = 1,526) = 309.82, p = .001$. The only test which did not result in statistically significant findings was the crosstabulation for family income at enrollment $\chi^2(9, 188) = 91.234, p = .06$.

The reported means and percentages are estimates of those that would be obtained if all children entering Part C in the U.S. had been included in the study and analyses. Because the values are estimates, there is variation in their precision in capturing actual population values. An examination of the precision of the estimate is captured by the standard error (*SE*). The *SE* can be used to construct a 95% confidence interval by multiplying the *SE* by 1.96, providing a range of values which likely contain the true value 95 times out of 100. Thus, the higher the *SE*, the less precise the reported means and percentages. An examination of the *SE*, along with reported percentages, modulates the relative confidence which can be placed in particular findings. For example, the variable race was significant at a *p*-value less than 0.50 at $p = 0.046$, but there were relatively high *SEs* associated with some of the larger, more notable differences in percentages. Therefore, the variations in proportions of racial categories across children in different clusters should be interpreted with more caution than variables with *p*-values more closely approximating zero and lower *SEs*.

Table 5

Child, Family, and Part C Characteristics of Clusters

| | Population Estimates %(SE) | Cluster 1 %(SE) | Cluster 2 %(SE) | Cluster 3 %(SE) | Cluster 4 %(SE) | Cluster 5 %(SE) |
|-----------------------------|----------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Gender* | | | | | | |
| Boys | 61 (1.2) | 57 (3.0) | 69 (3.8) | 57 (3.6) | 70 (3.2) | 56 (4.9) |
| Girls | 39 (1.2) | 43 (3.0) | 31 (3.8) | 43 (3.6) | 30 (3.2) | 44 (4.9) |
| Race* | | | | | | |
| White | 55 (3.3) | 56 (3.5) | 47 (6.3) | 61 (2.0) | 57 (4.6) | 52 (7.5) |
| African-Am. | 20 (1.2) | 17 (3.0) | 31 (4.7) | 14 (2.3) | 24 (3.2) | 17 (4.9) |
| Hispanic | 15 (2.9) | 17 (3.3) | 13 (3.5) | 15 (2.8) | 16 (3.8) | 14 (4.0) |
| Asian/PI | 4 (2.0) | 4 (2.4) | 6 (3.2) | 6 (1.5) | 1 (0.7) | 5 (3.0) |
| All Other | 5 (1.3) | 6 (1.3) | 4 (1.8) | 3 (1.6) | 3 (1.0) | 12 (5.3) |
| Family Income ^{ns} | | | | | | |
| <=15K | 23 (1.7) | 19 (3.1) | 35 (4.2) | 18 (3.7) | 26 (2.8) | 23 (6.4) |
| 15,001-25K | 16 (1.5) | 17 (2.4) | 14 (3.4) | 14 (3.5) | 15 (3.8) | 17 (3.3) |
| 25,001-50K | 28 (1.5) | 28 (2.2) | 21 (3.2) | 26 (9.8) | 29 (3.4) | 39 (7.9) |
| 50,001-75K | 18 (1.2) | 18 (2.6) | 12 (2.3) | 25 (2.8) | 18 (2.4) | 11 (3.2) |
| >75K | 13 (1.5) | 16 (2.1) | 12 (2.3) | 14 (3.3) | 9 (1.5) | 10 (2.6) |
| Mother's Ed.* | | | | | | |
| <HS | 13 (1.0) | 12 (1.7) | 15 (4.3) | 7 (2.1) | 15 (2.9) | 20 (6.5) |
| HS/GED | 31 (1.7) | 29 (2.4) | 40 (4.0) | 26 (2.8) | 33 (2.7) | 29 (5.7) |
| Some college | 27 (1.5) | 26 (2.1) | 27 (3.4) | 27 (3.1) | 28 (4.3) | 32 (5.2) |
| BA/BS + | 29 (1.9) | 33 (2.7) | 18 (1.6) | 41 (4.0) | 24 (3.8) | 20 (5.1) |

| | | | | | | |
|--------------|----------|----------|----------|----------|----------|----------|
| Profile ** | | | | | | |
| S/L only | 18 (2.5) | 22 (3.3) | 15 (4.5) | 34 (3.3) | 5 (1.1) | 1 (0.8) |
| Dx | 38 (2.9) | 29 (2.5) | 33 (4.4) | 19 (3.1) | 61 (4.0) | 81 (4.2) |
| DD | 31 (2.4) | 31 (3.0) | 43 (4.6) | 28 (2.5) | 30 (4.5) | 12 (2.8) |
| Risk only | 14 (2.0) | 19 (3.5) | 10 (2.7) | 19 (4.2) | 5 (1.6) | 6 (3.2) |
| Age IFSP** | | | | | | |
| b-12 | 39 (2.3) | 38 (3.1) | 32 (4.8) | 24 (4.5) | 48 (5.2) | 72 (5.3) |
| 12-24 | 34 (1.8) | 37 (3.1) | 34 (3.3) | 37 (4.6) | 31 (4.2) | 22 (5.3) |
| 24-36 | 27 (1.6) | 25 (2.0) | 34 (3.3) | 38 (3.0) | 21 (4.0) | 7 (3.8) |
| IEP status** | | | | | | |
| No | 40 (1.8) | 44 (2.6) | 45 (3.6) | 74 (2.4) | 8 (1.9) | 1 (0.9) |
| Yes IEP | 54 (1.8) | 49 (2.6) | 50 (4.2) | 21 (2.8) | 85 (2.6) | 97 (1.4) |
| Yes 504 | 2 (0.6) | 2 (0.9) | 2 (1.4) | 1 (0.6) | 2 (1.3) | 2 (1.2) |

Note: * $p \leq .05$, ** $p < .01$. Values in cells represent observed percentages of groups at each level of each variable, with standard error percentages in parentheses. K represents the concept of a thousand dollars. HS = high school; GED = General Equivalency Diploma; $BA/BS+$ = Bachelors of Arts/Bachelors of Science or more education; S/L = Speech/Language Delay; DD = Developmental Delay (not including speech/language delay exclusively); Dx = Diagnosed Condition; $b-12$ = birth up to 12 months of age; $12-24$ = twelve up to twenty-four months of age; $24-36$ = twenty-four up to thirty-six months of age.

There were large differences across clusters in regards to children’s membership in one of the four mutually exclusive profile groups describing children’s disabilities and functioning at entry to Part C. These differences played a prominent role in understanding variability in children’s kindergarten functioning as potentially relating to their functioning as infants and toddlers. The variability across clusters on this variable is particularly evident when viewed as a graph, presented in Figure 4. The greatest amount of variability is found for percentages of children within each cluster belonging to the diagnosed condition profile group at entry to Part C. There are also notable, but less demarcated, differences for the speech/language only and developmental delay profiles, with more minor differences noted for the at-risk only group.

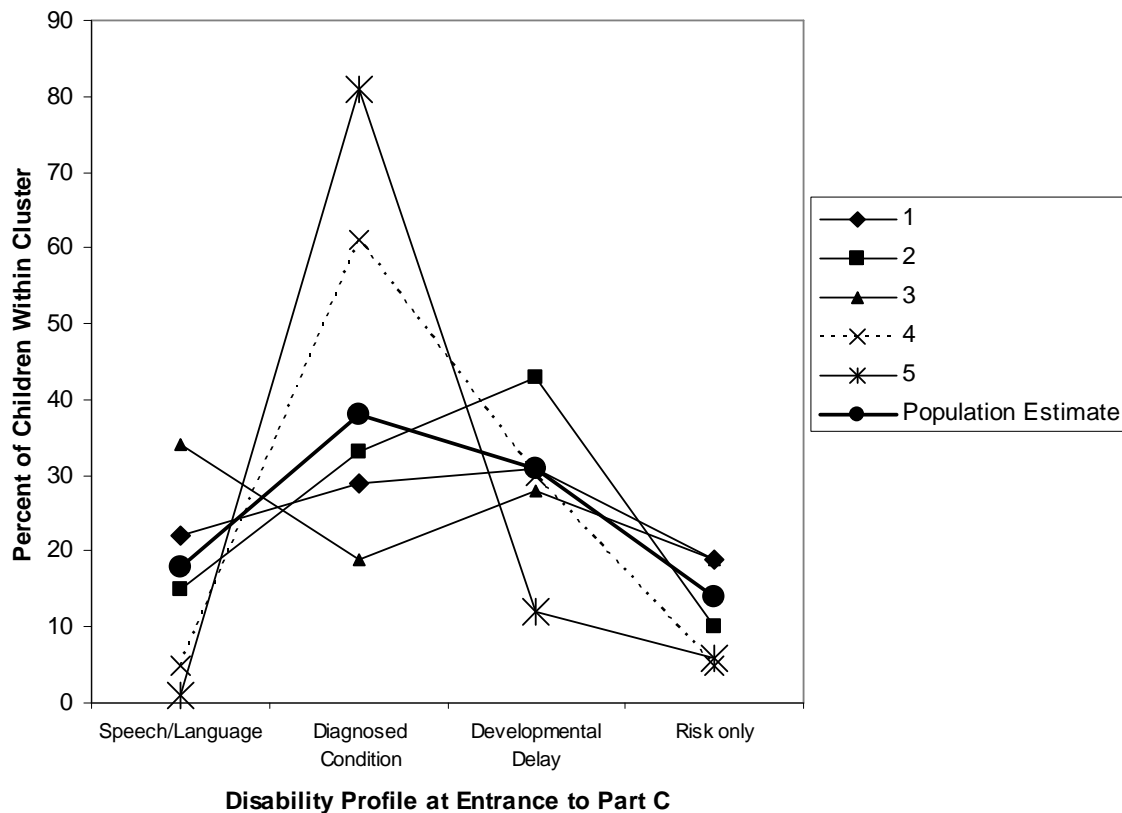


Figure 4. Distribution of children within clusters by profiles of disability at Part C entry.

Communication items were not included in the cluster analysis due to the items loading strongly on more than one factor in the factor analysis. ANOVAs and Tukey post hoc tests were run on three communication items, representing the child’s functioning in “initiates conversation with others” (A22c), “understands others” (A25h), and “communicates with others” (A25i). Findings suggested there were statistically significant differences among children in different clusters on functioning on A22c [$F(4,1518) = 198.373, p < .001, \eta^2 = .343$], A25h [$F(4,1518) = 280.252, p < .001, \eta^2 = .425$], and A25i [$F(4,1518) = 290.286, p < .001, \eta^2 = .433$]. All pairwise comparisons were significant ($p < .001$), with lower mean scores on all three items for children in Cluster 4 and Cluster 5 compared to children in other clusters (Table 6).

Table 6

Analysis of Variance for Communication Items

| | Cluster 1 | Cluster 2 | Cluster 3 | Cluster 4 | Cluster 5 |
|--|----------------|----------------|----------------|----------------|----------------|
| Item | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) |
| A22c – initiates conversation with others | 2.63 (.54) *** | 2.41 (.64) *** | 2.76 (.44) *** | 1.91 (.69) *** | 1.41 (.63) *** |
| A25h – understands others | 2.76 (.49) *** | 2.50 (.62) *** | 2.92 (.27) *** | 1.92 (.77) *** | 1.35 (.76) *** |
| A25i – communicates with others | 2.58 (.63) *** | 2.29 (.75) *** | 2.81 (.43) *** | 1.56 (.81) *** | 1.04 (.61) *** |

*** $p < .001$

Combining the cluster descriptions and ANOVA follow-up analyses, the five clusters were described according to their members’ functioning and characteristics. When chi-square tests of independence were significant, proportions of children within clusters were compared to population estimates to determine variations from expected values. Stated differently, after a chi-square test of independence was noted as statistically significant at a *p*-value of 0.05 or less for a particular variable, population estimates for levels within that variable were compared with proportions across clusters. The largest observed differences were described and utilized to compare children within clusters. A summary of the major findings describing each cluster are presented in Table 7, with a more thorough description provided in the subsequent paragraphs.

Table 7

Summary of Cluster Descriptions

| Cluster | |
|--|--|
| (% Overall Population) | Summary of Key Differences |
| 1: “Average Functioning” (35%) | -Distributed similarly to the overall population of Part C recipients in kindergarten -Fewer entered Part C described as having a diagnosed condition |
| 2: “Behavioral and Social Functioning Challenges” (20%) | -More African-American children -More boys -More likely to belong to the developmental delay profile group at entry to Part C |

| | |
|--|--|
| 3: “Above Average Functioning” (18%) | <ul style="list-style-type: none"> -More White -More likely to belong to the speech/language delays only profile group at entry to Part C -Older at entrance to Part C -Mothers with higher levels of education -Less likely to have an IEP in kindergarten |
| 4: “Below Average Functioning” (17%) | <ul style="list-style-type: none"> -More likely to belong to the diagnosed condition profile group at entry to Part C -More likely to be boys -More likely to have an IEP in kindergarten -Lower mean scores on all three communication items |
| 5: “Mobility/Self-Care and Learning/Applying Knowledge Challenges” (9%) | <ul style="list-style-type: none"> -More likely to belong to the diagnosed condition profile group at entry to Part C -More likely to enter Part C at the youngest ages -Most likely to have an IEP in kindergarten -Mother with lower levels of education -Lowest mean scores on all three communication items |

In considering the characteristics of children in Cluster 1 (“Average Functioning,” 35%), these former Part C recipients were distributed similarly to the overall average of all Part C recipients in kindergarten. Proportions in terms of gender, race/ethnicity, mother’s educational level, age at first IFSP, and IEP status were similar for children in this cluster as compared to the national population of former Part C recipients. A slightly

smaller proportion were described as having a diagnosed condition at entry to Part C (29% in Cluster 1 compared to 38% of the national population of Part C recipients).

Children in Cluster 2 (“Behavioral and Social Functioning Challenges,” 20%) were characterized by noted differences in proportions on race, gender, and profile upon entry to Part C. A larger proportion of children in this cluster were boys (69%, compared to 61% in the Part C population) and African-American (31%, compared to 20% in the Part C population), although the significance level at $p = .05$ and the larger *SEs* associated with levels of race in Cluster 2 warrant some caution in interpreting this finding. Children in Cluster 2 were also more likely to be described as having developmental delay (other than speech/language delay exclusively) at entry to Part C when compared to the population estimate, 43% versus 31% respectively.

A slightly larger proportion of children in Cluster 3 (“Above Average Functioning,” 18%) was White (61%) compared to the population estimate (55%). They were described as entering Part C services exclusively for speech/language delays, 34% compared to 18% of the national Part C population estimate. These children entered Part C at an older age (38% versus 27%, for the ages 24 to 36 months) and had mothers with higher levels of education (41% versus 29% of mothers having a Bachelors degree or higher). Cluster 3 children were less likely to receive special education services in kindergarten, with 74% of children not having an IEP as compared to 40% in the population estimate.

Cluster 4 (“Below Average Functioning,” 17%) children were more likely to enter Part C services because of a diagnosed condition (61% versus 38% of the population). A total of 70% were boys, a larger proportion compared to 61% of the population. A larger

proportion received special education services in kindergarten (85% versus 54%). As described above, children in Cluster 4 also had lower mean scores on all three communication items ($p < .001$) compared to former Part C peers.

Like Cluster 4, Cluster 5 (“Mobility/Self-Care and Learning/Applying Knowledge Functioning Challenges,” 9%) members were more likely to enter Part C with a diagnosed condition (81%) compared to the population (38%). They also entered Part C at younger ages (72% versus 39% entering between birth and 12 months). They almost all (97%) receive special education services in kindergarten (compared to 54% of the Part C population). Like Cluster 4, Cluster 5 members had poorer communication skills on the three communication items ($p < .001$). Unlike Cluster 4, the mothers of children in Cluster 5 also had less education, with more of their mothers (20%) having less than a high school degree compared to the population (13%), and fewer having an advanced degree (20% versus 29% having a Bachelors degree or higher). These findings should be interpreted carefully, as large *SEs* (6.5 and 5.1, respectively) were associated with these percentages. A larger proportion of Cluster 5 members also belonged to the “other” race/ethnicity category than expected (12% versus 5%), which should also be considered cautiously given the *SE* value of 5.3 associated with the percentage.

CHAPTER 4

Discussion and Implications

The primary objective of this study was to identify and describe profiles of functioning for Part C recipients in their kindergarten year. The ICF-CY was used to identify domains of functioning in which clusters of children had varying levels of abilities and challenges. This study demonstrated the utility of using cluster analysis for this purpose. Five distinct profiles were identified, accounting for all children who entered Part C in 1997 and 1998, varying in their skills and abilities on Mobility and Self-Care, Behavioral and Social Functioning, and Learning and Applying Knowledge. These differences were stable across two split-half analyses, suggesting they are representative of true functional differences in the national population of Part C recipients in kindergarten.

In this chapter differences between clusters will be elaborated with a discussion of implications of these findings. Figure 2, Mean scores on factors of functioning according to cluster, on page 53 (Chapter 3, Results) provides a visual summary of differences in functioning for each cluster and Table 7, on pages 62 to 63, provides a verbal summary of key differences. The clusters are first compared based on their members' profiles of functioning and communication abilities, with a discussion regarding the proportion of children with an IEP in kindergarten in each cluster. The clusters are then compared on the basis of a description of the children's disability at entrance to Part C and their age at entry. The potential roles of gender, race/ethnicity, mother's education level, and family

income are reviewed with a presentation of variations across clusters. Limitations of the study are discussed, followed by a review of the contributions of this study to current knowledge, including a discussion on the use and role of the ICF-CY. The chapter concludes with suggestions for future research and practice.

Different Profiles of Functioning and IEP Status in Kindergarten

Understanding differences in the clusters was based primarily on comparisons in their mean functioning on the three factors. The five clusters exhibited marked differences in child functioning with one noted similarity. Using scaling descriptions, children in all clusters had some areas where skills were still emerging in Learning and Applying Knowledge. Former Part C recipients had lower mean scores on this factor compared to the other two factors of functioning. This pattern may be explained by the nature of the items comprising this factor, as children reasonably could be expected to continue developing (as opposed to being “proficient” or mastering) these skills beyond the kindergarten year. While children in all clusters were rated as continuing to develop skills in Learning and Applying Knowledge, they predominantly differed from each other in their patterns of functioning across the three factors and in the proportion with IEP status. Having an IEP in kindergarten would suggest difficulties in functioning, significant to the extent the child is able to qualify for special education services.

Children in Cluster 1 (“Average Functioning,” 35%) and Cluster 3 (“Above Average Functioning,” 18%) were more similar to each other than children in other clusters. They were more likely to be moved between these two clusters in analyses designed to maximize variance accounted for by the cluster solution. As rated by their teachers and parents, these children were generally experiencing relatively mild

difficulties in functioning in kindergarten as compared to the other three clusters. Children in Cluster 3 most closely approximated “normal” functioning on all three factors. Children in Cluster 1 had lower mean scores in Learning and Applying Knowledge and Mobility and Self-Care than children in Cluster 3. Children in both clusters had mean Behavioral and Social Functioning scores close to 3.0. These findings suggest over half of Part C recipients will be viewed as having approximately “normal” skills and abilities in Mobility and Self-Care and Behavioral and Social Functioning in kindergarten.

Children in these clusters may appear to have relatively small differences in functioning, but these differences became more apparent when comparing the children’s IEP status in kindergarten. Of the children in Cluster 1, 49% had an IEP in kindergarten. This proportion is similar to the population of former Part C recipients in kindergarten (54% with an IEP). In contrast only 21% of children in Cluster 3, the highest functioning cluster, had an IEP in their kindergarten year. These differences suggest a possible threshold for eligibility for IEP in kindergarten, as evidenced by differences in rated child functioning. Using the scaling terminology, children in these clusters most differed on their functioning in Learning and Applying Knowledge, with Cluster 1 members having “moderate” difficulties and Cluster 3 members having more “mild” difficulties in functioning. Thus, the threshold for eligibility may be reflected in parents’ and teachers’ perceptions of “moderate” challenges (more likely to qualify for an IEP) versus “mild” challenges (less likely to qualify for an IEP). Concurrently, this finding suggests the relative subjectivity in determining if a child qualifies for special education services in kindergarten. In Cluster 3, 21% of children had an IEP in kindergarten, despite having the same profile in functioning as their peers in the same cluster.

Children in Cluster 2 (“Behavioral and Social Functioning Challenges,” 20%) most differed from children in the other four clusters because of their challenges in Behavioral and Social Functioning. In the cluster analysis and its associated analyses, children in this cluster were not likely to be grouped with children in other clusters, nor were they likely to be relocated to other clusters to maximize variance of the cluster solution. Cluster 2 was continually denoted as different from other clusters.

Children in Cluster 2 were similarly likely as children in Cluster 1 to have an IEP in kindergarten (50% and 49%, respectively). This finding is somewhat difficult to interpret. Children in Cluster 2 and Cluster 1 had similar approximately “normal” skills in Mobility and Self-Care, and similar “moderate” difficulties in Learning and Applying Knowledge. Cluster 2 members however had distinguishable differences in mean functioning in Behavioral and Social Functioning compared to children in other clusters. These difficulties were rated as “mild” according to scaling terminology, and not “moderate” or more severe. Because there were similar proportions of children with an IEP in kindergarten in Cluster 2 and Cluster 1, it lends the question as to whether the “moderate” challenges in Learning and Applying Knowledge drove eligibility for special education services, with the difficulties in Behavioral and Social Functioning distinguishing clusters, but not necessarily contributing to IEP status. Stated differently, this finding may suggest children with behavioral and social challenges are rated or perceived as different by teachers and parents, but these challenges may not result in identification for Part B services at a rate beyond peers with similar functioning in Mobility and Self-Care and Learning and Applying Knowledge, with higher Behavioral and Social Functioning. This finding is consistent with the idea that IEP status may mask

or not account for different patterns of functioning in children (Gibb & Skiba, 2008), even though they may have different profiles of functioning across important domains. Children in Cluster 2 were also rated as approximately “normal” in functioning on communication skills, as were children in the two highest functioning clusters.

Children in Cluster 4 (“Below Average Functioning,” 17%) and Cluster 5 (“Mobility/Self-Care and Learning/Applying Knowledge Functioning Challenges,” 9%) were rated as experiencing the most pervasive challenges across all factors of functioning. They were also rated as having the most significant challenges in communication, in the “mild” to “severe” range. Children in both clusters were rated as having “mild” difficulties in Behavioral and Social Functioning. They differed in that children in Cluster 4 were rated as having “mild” to “moderate” challenges in Mobility and Self-Care and Learning and Applying Knowledge, while children in Cluster 5 had “moderate” to “severe” challenges on these two factors. Compared to their Part C peers, both clusters’ members were more likely to have an IEP in kindergarten (85% of Cluster 4, 97% of Cluster 5). The difference in IEP status proportion denotes the greater severity of challenges for children in Cluster 5 in Learning and Applying Knowledge, but perhaps Mobility and Self-Care in particular. The major difference between children in Cluster 4 and Cluster 5 was the “moderate” to “severe” challenges in Mobility and Self-Care for Cluster 5 members compared to the “mild” difficulties on this factor for children in Cluster 4. Thus, the 8% of children in Cluster 4 without an IEP may have not qualified for services, despite similar challenges in Learning and Applying Knowledge, because of less severe challenges in Mobility and Self-Care. This finding highlights the importance

of Mobility and Self-Care skills in kindergarten, as well as possible subjectivity of determining eligibility for special education.

Implications. Comparing patterns of functioning for children in the five clusters, it becomes clear that children who receive Part C services have different profiles of functioning in kindergarten. They have different needs for special education services, as evidenced by the fact that children in the highest functioning cluster were least likely to have an IEP, while children in the two lowest functioning clusters were proportionately very likely. Children within a cluster, with similar profiles of functioning, do not all share the same IEP status. This is particularly true for clusters whose members were described as having more “mild” (as opposed to “moderate” or “severe”) difficulties in functioning. This variability in IEP status for children within clusters suggests interesting implications, such as the utility and importance of using the ICF-CY framework as a way to describe variations in children’s functioning. Relying on IEP status as a mechanism for comparing children masks differences in functioning, including descriptions of relative strengths and weaknesses in functioning across domains.

Other implications relate to the finding that while almost all children in the lowest functioning clusters had an IEP, children in the other three clusters did not consistently have an IEP. There appears to be a relative threshold in eligibility determination, as children with functioning difficulties rated as “mild” were less likely to have an IEP than those with more severe challenges. Because children with “mild” functioning challenges did not consistently have an IEP, there is also an implication for subjectivity in the process of determining eligibility for special education services. One would assume children with the same profile of functioning should share a similar need (or lack of need)

for special education services. For children with “mild” challenges, special education placement may be influenced by a variety of factors unrelated to child functioning. These may include parent and teacher attitudes and beliefs about acceptability of special education services (Donovan & Cross, 2002); variations in state disability definitions (Hallahan et al., 2007; Hallahan, Keller, & Ball, 1986); policies and standards of school districts and individual schools (Reschly, 2002); and availability of school-based and community-based resources for children and families outside of special education (Hallahan et al., 2007).

Variations in Clusters by Part C Entry Variables

Cluster profiles of functioning differed across the three factors. Children in clusters were also compared based on description of their disability at the time of entry to Part C (Developmental Delay, excluding Speech/Language only delays; Speech/Language Delay, exclusively; Diagnosed Condition; and, At-Risk for delay) and the age at entry to Part C services. The findings speak to the nature of delays and needs based on the child’s disability at entrance to Part C, and how these descriptions may relate to age of entry.

Children in Cluster 3 (“Above Average Functioning”) were the highest functioning and were more likely to be part of the Speech/Language Only group at entry to Part C (34% of Cluster 3, compared to the national estimate of 18% of Part C recipients in kindergarten). They tended to enter Part C at an older age compared to children in other clusters, consistent with other findings noting children with speech and language delays are more likely to enter as toddlers (Scarborough et al., 2004; Scarborough et al., 2006). Children in this cluster were also least likely to have an IEP in

kindergarten. Children in the lowest functioning clusters were much less likely to belong to the Speech/Language Only group at entrance to Part C (5% of Cluster 4 and 1% of Cluster 5).

These findings suggests a difference in relative severity of impairment for children who enter Part C for speech and language delays exclusively, such that these children's delays may be more likely to resolve over time with support and services, as compared to children with other delays or diagnosed conditions. This finding is consistent with research suggesting that some children may be better described as "late talkers" whose delays are described as slower rates of speech and language development, while other children may have "true" speech and language delays requiring services (Rescorla, 2009; Rescorla & Lee, 2000). This premise is consistent with findings of this study that 20% of children in Cluster 3 have an IEP at kindergarten, perhaps reflecting "true" speech and language delays or impairments.

There were notable differences in descriptions of disability at entry to Part C when comparing children in the highest functioning clusters with children in the two lowest functioning clusters. Children in Cluster 4 ("Below Average Functioning") and Cluster 5 ("Mobility/Self-Care and Learning/Applying Knowledge Functioning Challenges") were more likely to be described as having a diagnosed condition at entry to Part C. Children with diagnosed conditions tend to enter Part C earlier in life, during the first year of life (Scarborough et al., 2004; Scarborough et al., 2006). Children in these two clusters were found to enter Part C at younger ages. These children also were much more likely to continue to need services in kindergarten. In contrast, children in Cluster 3,

the highest functioning cluster, were proportionately less likely to be described as having a diagnosed condition at Part C entry and were least likely to have an IEP in kindergarten.

These findings demonstrate the severity of impairment and children's need for services for children who enter Part C because of a diagnosed condition; particularly given they tended to belong to the lowest functioning clusters in kindergarten. Diagnosed conditions include cerebral palsy, blindness, deafness, Down's syndrome, and other genetic anomalies. Research has documented the relatively high risk for delay and impairment in functioning for children diagnosed with these conditions early in life (Fraser et al., 2004; Masten, Best, & Garmezy, 1990; Moffitt & Caspi, 2001). This study confirms that children who enter Part C because of diagnosed conditions are likely to continue to need services in kindergarten.

Proportionate representation of children described as eligible for Part C because of being at risk for delays also differed across children in the highest and lowest clusters. Children in the two highest clusters were proportionately more likely to be described as "at-risk" for delays, while children in the two lowest clusters were proportionately less likely to be included in the Risk Only group. Children described as at-risk, as well as those with diagnosed conditions tend to enter Part C earlier, compared to those whose disability is described as a developmental delay (Scarborough et al., 2004; Scarborough et al., 2006). This prior finding is consistent with findings of this study, as evidenced by the younger entry age of children with the lowest functioning in Cluster 4 and Cluster 5. There is also inconsistency with prior findings as this study suggested children with the highest functioning were both more likely to enter Part C for Risk Only and to enter Part C at older ages than children in other clusters. This finding may reflect the possibility that

children who enter Part C for reasons related to risk for developmental delays may in fact reap the benefits of Part C services, experiencing more “mild” difficulties in functioning and being less likely to have an IEP in kindergarten compared to children who entered Part C for diagnosed conditions.

Children who entered Part C described as having a developmental delay (excluding those with exclusively speech/language delay) have more variability in their functioning profiles in kindergarten, compared to children who entered for other reasons. There were similar proportions of children entering Part C for developmental delay in the highest functioning clusters and in Cluster 4, the second-lowest functioning cluster. However, there was a higher proportion of children described as having a developmental delay in Cluster 2 (“Behavioral and Social Functioning Challenges”) and a much lower proportion in Cluster 5 (the lowest functioning cluster). This finding may suggest a more global, more severe nature of impairments for children with developmental delay as compared to children who entered Part C with speech and language delays only. These children may experience great variability in their functioning in kindergarten, but perhaps not at the most severe levels of challenge. Given the higher than expected proportion of children who entered Part C with a developmental delay in Cluster 2, these children may also exhibit behavioral and social challenges in kindergarten at a higher rate than children belonging to the other disability descriptors. These findings may additionally reflect variability in state definitions for developmental delay (Hebbler, Spiker, Wagner, Cameto, & McKenna, 1999).

Implications. The findings comparing description of disability and age at entry to Part C across children in different clusters have interesting implications regarding the

infant-toddler descriptors of disability. Children entering Part C whose disability is described as speech and language delays or who were considered at risk for delays are rated as higher functioning and are less likely to have an IEP in kindergarten, given the higher proportion of these children in clusters with the highest functioning children. Children with diagnosed conditions are more likely to be rated as experiencing significant challenges in functioning in kindergarten, evidenced by a high proportion of these children in clusters with the lowest functioning children. Children described as having a developmental delay have the greatest variability in their profiles of functioning in kindergarten. Variations in functioning may reflect variations in these children's functioning over time, including at entry to Part C. In summary, children entering Part C exhibit variable profiles of functioning in kindergarten, with unique patterns associated with descriptors of disability at entry to Part C.

Socio-demographic Differences Within and Across Clusters

The clusters have been described in terms of the children's functioning and IEP status in kindergarten, as well as a descriptor of their disability and age at entry to Part C. This section elaborates differences across children in different clusters according to socio-demographic characteristics, including gender, mother's education level, family income, and race/ethnicity characteristics.

Gender. Children's gender appeared to be related to profiles of functioning. There were higher proportions of boys in Cluster 2 ("Behavioral and Social Functioning Challenges") and Cluster 4 ("Below Average Functioning"), but not in Cluster 5, the lowest functioning cluster. These findings suggest boys may exhibit mild to moderate development delays longer than girls, but perhaps at a similar rate when considering

moderate to more severe levels of impairment in functioning. This hypothesis would be consistent with findings from Wangby et al. (1999) that boys tend to demonstrate longer and more significant challenges in development in the face of stressors delaying their development; but the similar proportions of boys and girls in the lowest functioning cluster would not be explained. The higher proportion of boys in Cluster 2 may also be related to the higher proportion of children described as having a developmental delay at entry to Part C, as boys have been found more likely to enter Part C for reasons related to developmental delay (Scarborough et al., 2006).

Because there was a higher proportion of boys in Cluster 2 (“Behavioral and Social Functioning Challenges”), boys appeared to be more likely to be rated as experiencing challenges in behavioral and social skills. This difference in proportions may reflect an underlying difference in boys’ development of behavioral and social skills, as compared to girls. However, the higher proportion of boys in this cluster may be a result of how their behaviors are viewed and interpreted by adults in their lives. Mothers were more likely to rate the children, and the teachers rating the children were more likely to be women. There is a possibility female raters hyper-criticize boys’ behaviors and social skills, although the issue of whether female teachers respond differently to boys and their behaviors is debatable (Beaman, Wheldall, & Kemp, 2006).

Regardless of rater gender, studies have suggested boys’ behaviors are more criticized by teachers of both sexes. Boys are more likely to be viewed as having behavioral problems in early elementary school (Froschl & Sprung, 2005), with teachers describing girls as exhibiting “ideal” student behavior, including a more “complacent” behavioral style (Myhill, 2002). Teachers may not appreciate the differences in boys’

development or demonstration of skills in behavioral and social skill areas, as compared to girls. In a study of gender differences in child-teacher relationships in elementary school, and teachers' perspectives of boys' behaviors, there were significantly more problems in boys' relationships with teachers, characterized by greater social and emotional distance and conflict (Koepke & Harkins, 2008). Thus, the higher proportion of boys in Cluster 2 may be affected by raters' bias.

Mother's Education Level. Research continually demonstrates maternal education as a strong predictor of variability in children's development (Chapman et al., 2002). This study demonstrated that mothers' education level may impact Part C children's profiles of functioning in kindergarten. Children in the highest functioning cluster were more likely to have more highly educated mothers, with children in the lowest functioning cluster more likely to have less educated mothers. In addition, the primary distinction between the lowest two functioning clusters was children in the lowest functioning cluster (Cluster 5, "Mobility/Self-Care and Learning/Applying Knowledge Challenges") had proportionately more mothers with less education than mothers of children in the second lowest functioning cluster (Cluster 4, "Below Average Functioning").

Because lower maternal education has been associated with fewer opportunities for children's education and development (Fraser et al., 2004), it is likely findings of this study relate to the children's experiences and opportunities. Children in the highest functioning cluster may have had greater opportunities for experiences promoting their development, partly as a function of their mother's education level, whereas children in the lowest functioning cluster may have had fewer opportunities promoting their growth

and development, contributing to their lower functioning in kindergarten. More limited opportunities for exploration and learning have been hypothesized as one reason children of mother's with low levels of education were seen as having more problems with motor development (Lee & Kahn, 1998).

Race/Ethnicity. Children's race/ethnicity appeared to relate to different profiles of functioning in kindergarten, but given the large *SEs* associated with these findings, caution is warranted in interpretation. In considering the implications of this finding, it is relevant to recall that children's race and ethnicity are often correlated with other factors describing differences in outcomes for their development and functioning, such as rate of poverty, opportunities for educational experiences, and mother's education level (Fraser et al., 2004). Cluster 2 ("Behavioral and Social Functioning Challenges") included a higher proportion of children who are African-American. This finding may reflect differences in children's experiences for learning to manage behavior and utilize social skills, as a function of opportunities being correlated with race/ethnicity, family income, and mother's education. This hypothesis would be supported by the finding that children in the highest functioning cluster (Cluster 3, "Above Average Functioning"), with approximately "normal" behavioral and social functioning, were proportionately more likely to be White than would be expected.

It is worth mentioning again that caution must be used in hypothesizing about racial or ethnic factors in the findings. However, utilizing existing literature regarding this topic, it is possible to hypothesize whether racial or cultural may have played a role in these findings. Perhaps African-American children were rated as having lower behavioral and social skills as a function of teacher bias. For example, for those African-

American children with teachers of another race or ethnicity, the children's behaviors or social interactions could be misunderstood as inappropriate, when these behaviors were not intended to be so. It has been hypothesized this phenomenon is due both to differences in African-American behavior and expression, as well as teachers' tendencies (particularly those who are not African-American) to seem more biased towards reading these behaviors as inappropriate (Weinstein, Curran, & Tomlinson-Clarke, 2004; Weinstein, Tomlinson-Clarke, & Curran, 2003). As an example, the child may have engaged in overlapping speech viewed as disrespectful by the teacher, but simply done out of habit and due to sociolinguistic style on the part of the child (Monroe, 2005). The identification of a greater number and less well-defined "problem" behaviors and more punitive punishments have also been found in teachers' responses to African-American children (Johnston, 2000; McCadden, 1998). The flip side to this phenomenon is that teachers rate White children as higher functioning in behavioral and social skills, perhaps because their behaviors are better understood or more similar to the teachers' own behaviors (Monroe, 2005). These earlier findings are important considerations for this study, as they suggest children's race or ethnicity may play a role in situations requiring ratings of the children's behavior or social skills by adults, as was the case in collection of data for this study.

Family Income. Unlike other studies examining the potential relationship between income and child developmental trajectory, this study did not find a significant difference between clusters on levels of family income at enrollment to Part C ($p = .06$). One potential reason for this finding may be the multiple levels in the family income variable may have generated too much statistical noise for the role of the lowest levels of income

to be demonstrated. In future analyses, it may be useful to utilize a dichotomized family income variable, with levels representing family income below the poverty line, and family income above the poverty line. In doing so, the analysis may result in a statistically significant finding for family income across clusters. Overall young children with disabilities entering Part C are poorer than the general population, but these findings demonstrate that their school-age functioning is not significantly related to family income at entry. Of note, children in Cluster 2 (“Behavioral and Social Functioning Challenges”) appeared proportionately more likely to come from the lowest family income level of less than \$15,000 per year (at a proportion of 35% compared to the population proportion of 23%). This finding may reflect the correlation between race and income, as children in Cluster 2 were proportionately more likely to be African-American.

Implications. Socio-demographic characteristics of children in the clusters suggest implications at a societal level. The most prominent is the finding suggesting the role of maternal education level in differentiated levels of functioning for Part C children in kindergarten. When comparing maternal education level across clusters, children whose mothers had lower levels of education appeared to be disproportionately represented in lower functioning clusters. One of the greatest distinctions between children in the two lowest functioning clusters was children with the very lowest functioning (Cluster 5) had mothers with lower levels of education than those children with the second-lowest functioning (Cluster 4). Children in both of these clusters were different compared to children with the highest functioning (Cluster 1), whose mothers were proportionately more highly educated.

This finding reinforces the importance of the family and the home environment in children's growth and development. Research has shown the link between parent education and child academic attainment and educational needs (Lynch, 2009). Mothers' literacy level predicts child literacy development (U.S. Department of Education, 1999), children whose parents have less than a high school education have poorer reading outcomes (Kogut, 2004), and children's effective participation in schools relates to parental educational and literacy level (Papen, 2001). The finding from this study suggests the continued need for prevention and intervention efforts focused on enhancing parental education. While it would seem altruistic to assert that all parents should be provided the opportunity to complete a high school education or GED program, a more effective intervention focus may be family literacy programs. These programs have documented that parents can learn new or additional way to interact with their children so as to enhance the children's literacy development and education attainment, with positive outcomes for children from preschool through adolescence (Lynch, 2009). Programs focused on enhancing parental education could help break the cycle of children of poorly educated mothers requiring school-age special education services.

Socio-demographic comparisons raise questions about the potential role of rater bias. As suggested, boys and African-American children appear to be disproportionately rated as lower functioning, or to be rated as having more challenges in behavioral and social skills. These findings could relate to systemic issues in services or opportunities correlated to mother's education, poverty, or opportunity; but, they could also be indicative of variability in how adults view differences in skills, abilities, or behavioral styles as a function of race or gender. Alternatively, boys and African-American Part C

recipients may be more likely to experience lower functioning in kindergarten as the result of other variables impacting development, such as biomedical risk factors more prominent in minority populations and boys (Satcher, 2001). These issues should be explored further, as they would suggest varying methods of prevention and intervention with differently targeted audiences.

Limitations

Working with secondary data presents inherent limitations. Only those variables available in the data source can be utilized. In this study, a significant amount of data reduction was required to identify and develop the three factors of functioning. These factors approximated the constructs they described, but may not have represented these domains of functioning as accurately as if the data were collected exclusively for this purpose. Additionally, some values had to be transformed or imputed in the dataset. There were relatively few missing values and defensible criteria were used for determining when and how to transform or impute values. Nonetheless, any time data must be changed or generated there is an opportunity for error.

The ability to replicate this study may be limited, given a number of critical decisions were made which determined the trajectory for the rest of the study. These decisions included the initial selection of items, the choice to use the ICF-CY to organize the items, the selection and use of the chosen factor solution for creating factors of functioning, and the choice of cluster solution. Best practices in analysis and research were used at each step to help enhance the reliability of the study and findings. The selection of items and use of the ICF-CY were decisions made by the researcher, based in research and theoretical perspectives about the importance of using functional

characteristics based in a universal framework as a way to describe children. The selections of factor and cluster solutions were made utilizing current, defensible criteria and methodology. The split-half approach and evaluation of solutions using multiple criteria were intentionally utilized to help minimize researcher error and bias in the analytic process. There is no guarantee, however, that the selected factor and cluster solutions were “best” or “most accurate.” Because each decision altered the course of the study, it is unknown if the results of this study could be replicated in future research using the same data.

Contributions of Study

This study provided the first integrated portrayal of Part C children’s functioning in kindergarten, using a functional approach with person-oriented methodology which respects the complexity of child development and functioning. This study described five diverse patterns of functioning for kindergarten children who received Part C services. Importantly, these distinct subgroups were identified beyond existing eligibility criteria (disability status), which demonstrated that diversity in functioning is masked by IEP status. These findings suggest that children who enter Part C as infants and toddlers do not continue to need services beyond early childhood in the same way or at the same rate. Instead, there is great variability in their functioning in kindergarten which appears to be related to several factors, including descriptions of their disabilities at entry to Part C.

While describing Part C children according to their functioning in kindergarten was the primary purpose of this study, the use of the ICF-CY as the guiding framework for conceptualizing functioning was an additional important contribution. This study reinforces the need for and use of the standard language and framework of the ICF-CY as

a way to organize and understand data for the purposes of describing child functioning. Without the structure of the ICF-CY, developing factors of functioning and understanding those areas of functioning described by each factor would have relied predominantly on the researcher's belief and evaluation. The ICF-CY provided the necessary theoretical and organizational structure to organize the data in a meaningful way to develop factors which could be easily interpreted for understanding child functioning across domains. This study demonstrated the utility of the ICF-CY in research, suggesting its role and use in future studies.

Suggestions for Future Research and Practice

Future analyses could consider the prior EI experiences of the children in each cluster, including the types and frequencies of received EI services. It would also be intriguing to explore the level of family involvement in service provision. While the Part C disability description is known for each cluster, examining other issues related to the children's functioning at the time of entry to Part C would be interesting. For example, it would be helpful to better understand the described level of severity of impairment, the perceived level of need, and the described strengths or abilities of each child at time of entry to Part C, in light of their later functioning in kindergarten. Another potential future investigation would be to refine the identified clusters using consideration of supports and barriers in the children's environment in their kindergarten year. This approach would be consistent with a functioning approach based in the ICF-CY, and it may provide information on how environmental factors can impact profiles of functioning in kindergarten.

This study demonstrates the utility of using the ICF-CY in future research. The lack of consistency in defining variables and constructs across studies impedes the ability of professionals to meaningfully interpret and utilize findings for practice or future research. Data collection can be enhanced when using reliable measures, capable of capturing precise estimates of universal domains of functioning. Communicating findings can also be more systematic and clear when using a common language which is meaningful to professionals across disciplines serving children and families. The ICF-CY provides the needed structure, organization, clarity, and universal language for consistently documenting and discussing findings to advance research and practice.

There are several important suggestions for applied practice which arise from this study, as well. Describing children in a meaningful way is an important aspect of any field, but is particularly important when attempting to identify salient interventions to enhance children's development. Prevention and intervention efforts will only be successful if the complexity of the child, represented by a constellation of variables and factors, is understood beyond a consideration of a single factor or domain of functioning (Sameroff & Fiese, 2000). Within the field of EI or school psychology practice, describing children's functioning across a variety of domains, and not just problems in their functioning within one domain, respects the child as an integrated individual with strengths as well as weaknesses. Describing the child as a functioning whole is also more salient than describing discrete scores from various measures. A focus on the collection of data which can describe children's functioning, for use in a profile of strengths and weaknesses across domains, could potentially enhance understanding of children's abilities and needs in an applied context. This process could help reduce the experiences

of many teachers and parents, who expend a great deal of time, effort, and money to collect data which in turn provides little to no benefit or information for the purposes of understanding the child or need for specific interventions (McConnell, 2000).

Additionally, if a common profile of functioning is utilized, the effects of intervention across domains of children's development could be documented over time. A common profile of functioning, describing key domains in all children's development, also would allow for continuity in how children's functioning is discussed with parents, teachers, and other professionals. That is, a common profile could provide needed consistency in documenting children's functioning over time, from entry to Part C, through transition, into kindergarten, and further into the elementary years. Such continuity could be crucial in understanding children's developmental progress and needs, providing a common approach and language for parents over their child's development and educational history.

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