



National Profiles of classroom quality and family involvement: A multilevel examination of proximal influences on Head Start children's school readiness

Rebecca J. Bulotsky-Shearer^{a,*}, Xiaoli Wen^b, Ann-Marie Faria^c, Debbie L. Hahs-Vaughn^d, Jon Korfmacher^e

^a University of Miami, Coral Gables, FL, United States

^b National-Louis University, Chicago, IL, United States

^c American Institutes for Research, Washington, DC, United States

^d University of Central Florida, Orlando, FL, United States

^e Erikson Institute, Chicago, IL, United States

ARTICLE INFO

Keywords:

Head Start
Developmental ecological model
Classroom quality
Parent involvement
Latent profile analysis
School readiness

ABSTRACT

Guided by a developmental and ecological model, the study employed latent profile analysis to identify a multilevel typology of family involvement and Head Start classroom quality. Using the nationally representative Head Start Family and Child Experiences Survey (FACES 1997; $N = 1870$), six multilevel latent profiles were estimated, characterized by distinct patterns of parent school involvement, parent home involvement, and classroom quality. The most prevalent profile (47.5% of children within the national sample) reflected low levels of parent home and school involvement practices, but above average classroom quality. Significant differences were found among the six profiles on (a) child, family, classroom, and program demographic characteristics, and (b) children's literacy, language, mathematics, and social skills at the end of children's first Head Start year. The strongest positive associations between profile membership and child outcomes were seen for children in profiles characterized by high levels of parent involvement and above-average levels of Head Start classroom quality, although there were several nuanced distinctions that emerged. Children within the profile characterized by low parent involvement and low classroom quality exhibited lower academic and social outcomes relative to children in higher quality profiles. Implications for early childhood practice, policy, and research are discussed.

© 2012 Elsevier Inc. All rights reserved.

High quality early childhood educational experiences are identified as important protective interventions, with particular benefits afforded to children living in low-income families (McCartney, 2010; Peisner-Feinberg et al., 2001). Research suggests that quality learning opportunities in the home and school contexts can promote school success and buffer some of the negative effects of living in poverty (Christenson & Reschly, 2010; Mashburn, 2008; McCartney, Dearing, Taylor, & Bub, 2007). As the nation's largest, most comprehensive response to the needs of low-income preschool children, Head Start is in the unique position to provide quality early educational experiences that foster social and academic readiness skills for children living in poverty. From its inception, Head Start has recognized the protective influence of quality educational experiences in both the family and school contexts (Head Start Performance Standards, U.S. DHHS, 1996).

There is a growing body of research examining how both parent involvement and quality classroom experiences promote early learning for low-income children; however, this research has typically employed a variable-centered theoretical and statistical approach. Increasingly, early childhood researchers are employing person-centered approaches to identify variation within young children's early learning environments. Viewed as complementary to variable-centered models, person-centered models permit identification of structural patterns among several multidimensional constructs simultaneously (e.g., Curby et al., 2009; Glutting, McDermott, & Konold, 1997). Typically, a person-centered approach is applied at the child level where the researcher identifies common patterns that exist within homogenous groups of children on certain variables of interest (e.g., Hirsh-Pasek, Kochanoff, Newcombe, & deVilliers, 2005; McWayne, Fantuzzo, & McDermott, 2004). This approach facilitates identification of unique subgroups of children that may require individualized early intervention efforts.

Of interest to us was to identify variations in the quality of early learning experiences in the home and in the school where interventions could be most effective in promoting low-income children's academic and social skills (Downer, Campos, McWayne,

* Corresponding author: University of Miami, Department of Psychology, Child Division, 5665 Ponce de Leon, Coral Gables, FL 33146, United States.
Tel.: +1 305 284 8439.

E-mail addresses: rshearer@miami.edu, rshearer@psy.miami.edu (R.J. Bulotsky-Shearer).

& Gartner, 2010). A person-centered approach was most appropriate to identify a set of distinct profiles that captured variation among multiple dimensions of parent involvement and classroom quality as they were experienced for unique subgroups of children. In addition, a person-centered approach has the advantage of empirically identifying rich variation among multiple dimensions simultaneously. Parent involvement and classroom quality measures often are comprised of multiple distinct, but correlated dimensions; when summed to form composite scores in a variable-centered analysis, they may lose unique information and no longer represent a child's distinct profile of experiences (LoCasale-Crouch et al., 2007). We adapted the person-centered approach to incorporate two levels of analysis: the child level (i.e., parent involvement, where each child experienced a unique level of parent home and school involvement) and a higher level within which children were nested (i.e., classrooms, where children experienced shared levels of quality). This provided a comprehensive picture of the nature and prevalence of experiences among Head Start children not possible to obtain with a variable-centered approach. We capitalized on the Head Start Family and Child Experiences Survey (FACES) to obtain a descriptive national picture. We examined whether there were differences among these profile types on important child, family, and programmatic characteristics; and identified which profile types were at greatest risk with respect to school readiness outcomes at the end of children's first year in Head Start.

1. Developmental ecological framework

Within a developmental ecological framework, the family and early childhood classroom environment are important proximal microsystem contexts that most directly influence children's early learning and development (Bronfenbrenner & Morris, 1998). In this model, children's cognitively stimulating and emotionally supportive interactions with parents and teachers support their language and literacy, cognitive, and social emotional development (Mashburn, 2008; Pianta & La Paro, 2003). Consistency across home and school contexts is important; particularly for low-income children, the greatest benefits are accrued when experiences in the home and school are mutually supportive (e.g., Weiss, Caspe, & Lopez, 2006). In fact, positive effects are most likely when high quality early home and school experiences in concert support children's learning (Crosnoe et al., 2010; Votruba-Drzal, Coley, & Chase-Lansdale, 2004). On the other hand, consistently low-quality experiences in the home and school contexts may place children at risk for poor academic and social outcomes.

1.1. Contribution of parent involvement to school readiness

It is generally accepted that supports for learning within the family environment are the most proximal and exert the strongest influence, particularly for low-income children (Dearing, Kreider, & Weiss, 2008; Jeynes, 2008). Parent involvement has been conceptualized as a multidimensional construct comprised of parents' involvement in school-based activities, home-based activities, and home-school communication (Fantuzzo, Tighe, & Childs, 2000). Home-based activities include learning opportunities at home and in the community, such as providing a place and materials for homework, book reading, teaching about letters and numbers, and visiting the library or museum (Fantuzzo et al., 2000). For preschool children, cognitively stimulating literacy practices in the home have been identified as important to support early language and reading development (Burgess, Hecht, & Lonigan, 2002; Roberts, Jurgens, & Burchinal, 2005). Studies with low-income preschool children provide evidence that home-based involvement is strongly and positively associated with receptive vocabulary

skills, competence motivation, attention and persistence, attitudes toward learning and positive engagement with peers in the school context, and negatively associated with classroom conduct problems and problematic behavior with peers (Fantuzzo, Tighe, McWayne, Davis, & Childs, 2002; Fantuzzo, McWayne, Perry, & Childs, 2004). A recent study, however, examining whether parent home involvement predicted growth in literacy and mathematics skills from Head Start through first grade, did not find any significant associations (Hindman, Skibbe, Miller, & Zimmerman, 2010).

School-based involvement is commonly measured by parents' involvement in school activities, such as volunteering at school, attending school events, and participating in parent-teacher meetings (Fantuzzo et al., 2000). Research suggests that parents' school-based involvement is positively associated with the development of literacy, mathematics, and social skills (Hill & Craft, 2003) and growth in kindergarten children's literacy skills (Dearing, Kreider, Simpkins, & Weiss, 2006). Head Start studies find positive associations between parent school involvement and children's social competence and literacy skills (Arnold, Zeljo, Doctoroff, & Ortiz, 2008; Parker, Boak, Griffin, Ripple, & Peay, 1999).

Other Head Start research, however, provides conflicting evidence. Fantuzzo et al. (2004) initially identified school-based involvement in Head Start as a significant predictor of higher approaches to learning, receptive vocabulary skills, and lower classroom problem behavior. However this association disappeared when considered simultaneously with home-based involvement, suggesting that home-based involvement may be a more salient predictor of academic outcomes for Head Start children. In addition, Hindman et al. (2010) using the Head Start FACES sample, found no significant associations between parent school involvement and children's academic growth after controlling for child's initial academic skills and family demographic variables. In short, while the literature supports positive associations among parent school involvement, academic, and social outcomes, there remain gaps in our current knowledge base with regard to this construct in low-income samples.

1.2. Contribution of classroom quality to school readiness

In addition to parent involvement, classroom quality (both structural and process quality) has been identified as a key proximal influence on school readiness, particularly for low-income children. Structural quality refers to those aspects of classroom quality that are subject to regulation, such as adult to child ratio, class size, length of day, provisions for hygiene and safety, availability of developmentally appropriate materials, and physical space (Lambert, Abbott-Shim, & Sibley, 2005). Process quality encompasses dynamic social and instructional interactions that support learning (Mashburn, 2008). Research suggests that higher-quality classrooms are characterized by higher adult-to-child ratios, smaller class sizes, and longer length of day (Lambert et al., 2005). Large-scale studies suggest positive associations between high process quality in preschool and higher academic, language, and social skills at kindergarten entry, particularly for low-income children (Howes et al., 2008; Lambert et al., 2005; Magnuson, Meyers, Ruhm, & Waldfogel, 2004; Mashburn, 2008; Mashburn et al., 2008; NICHD ECCRN, 2005). However, positive associations between aspects of the classroom environment and outcomes are not consistently found; and effect sizes for these associations are small, especially when more proximal family involvement variables are considered (Downer & Pianta, 2006; Mashburn, 2008). A number of researchers have, in fact, suggested that for low-income children, associations between classroom quality and readiness are moderated by parent involvement in the home (Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Downer & Pianta, 2006; Mashburn, 2008; McCartney et al., 2007). In order to fully capture

variation among multiple dimensions of home and school learning as they are experienced by a national sample of low-income children, it is critical to employ a person-centered approach and to examine how distinctive profiles of each set of dimensions are associated with school readiness outcomes.

A recent study employed a person-centered approach (multi-stage cluster analyses) to identify profiles of observed classroom quality for a large sample of 692 classrooms across 11 state-funded prekindergarten programs (LoCasale-Crouch et al., 2007). Five distinct and reliable profiles were identified comprised of varying patterns of high and low overall emotional and instructional support. The most prevalent profile (31.4% of the sample) reflected positive emotional climate, but mediocre instructional quality. The least prevalent profile was comprised of classrooms with high emotional and instructional support (14.5%) while 18.8% of the classrooms reflected a pattern of low emotional and instructional support and high negative climate. The classrooms comprising the low-quality profile reflected teacher and program characteristics generally associated with fewer resources or served populations at greater risk (e.g., were more likely to contain children of minority status, African American teachers, longer program days, lower adult-to-child ratios, and to receive Head Start funding). In a follow up study, Curby et al. (2009) found that children in the profile who experienced the highest quality of instructional support showed the greatest gains in receptive vocabulary and mathematics in preschool; children in the profile with the highest quality of emotional support were rated higher by teachers on social competence in kindergarten.

1.3. Summary and critique of the literature

While these studies are the first to examine patterns of classroom quality in state-funded prekindergarten programs (which included a small proportion of Head Start classrooms), to date, there have been no studies examining profiles of classroom quality or family involvement conducted specifically within Head Start, or studies examining both simultaneously in a multilevel profile analysis. Understanding variation within the Head Start program is needed to inform program practices for the nation's largest federally funded intervention. In addition, previous variable-centered research using Head Start FACES that examines the contribution of parent involvement to academic outcomes has been limited by sparse or null findings (Hindman et al., 2010). Therefore, the purpose of the present study was to employ multilevel latent profile analyses that capitalized on the heterogeneity within a national sample of Head Start children to identify profiles of early learning experiences in both home and school contexts.

Based on extant literature, we hypothesized that we would identify at least four latent profiles, distinguished by high and low mean levels of parent home and school involvement, among above average and low levels of classroom quality. Given prior research indicating family and program demographic disparities in patterns of parent involvement (Fantuzzo et al., 2000; McWayne, Campos, & Owsianik, 2008) and classroom quality (LoCasale-Crouch et al., 2007), we expected that resultant profiles would be differentiated by family, classroom, and program demographic characteristics. Specifically, profiles characterized by low levels of classroom quality would be associated with lower adult-to-child ratios and higher percent minority enrollment. Given conflicting findings in the literature with regard to teacher experience and education it was unclear whether profiles would show significant differences on these teacher characteristics (Early et al., 2007; LoCasale-Crouch et al., 2007). Profiles characterized by low parent involvement would be associated with greater family risks (e.g., lower monthly income, less parental education, greater parental depression). Finally, we expected given the importance of continuity in

high-quality experiences within the home and school that profiles comprising higher parental home involvement and higher classroom quality would be associated with higher academic and social skills.

2. Method

2.1. Participants

The Head Start Bureau Family and Child Experience Survey (FACES 1997; U.S. DHHS, 2002, 2005) is a nationally representative descriptive study of Head Start programs, children, and families. FACES 1997 used a probability sample drawn to be representative of the total universe of 1734 Head Start programs nationwide, stratified across four geographic regions, urbanicity, and percent minority enrollment (U.S. DHHS, 2002). Data were collected through multiple sources and methods, including direct child assessment, teacher interviews and self-report, parent interviews, center director interviews, and classroom observations.

2.1.1. Children and families

The FACES dataset included 1968 children in 40 Head Start centers who were followed from the start of their first year in Head Start (fall 1997) to the end of first grade. Our final analytic sample included 1870 children who had complete classroom quality data at the end of their first Head Start year (spring 1998). Gender was split evenly (51% boys); mean age of children in the fall of 1997 was 49 months ($SD = 6$, range 36–68 months); 17% had identified disabilities, 37% were African-American, 28% were Hispanic, and 26% were White. Thirty-three percent of children were from a language-minority family. Forty-two percent of children lived in a mother and father household. Twenty-seven percent of the primary caregivers did not finish high school, 36% held a high school diploma or GED, and 34% had some college or associate's degree. Most children (72%) lived in households below the federal poverty line, 28% of families received welfare support, 47% of parents were unemployed, and the average age of primary caregivers was 30 years ($SD = 8$, range 17–79 years).

2.1.2. Teachers

Of the lead teachers ($N = 506$), the majority were between 30–49 years of age (67%), and reported their ethnicity as White (40%), Black (36%), or Hispanic (21%). Most teachers reported having some college (but no degree, 32%), with 22% having an associate's or a bachelor's degree (21%). Most teachers reported majoring in early childhood education (77%) and having early childhood credentials (77%). Teacher experience in early childhood varied: 18% of teachers had less than 4 years, 27% had 5–9 years, 35% had 10–19 years, and 20% had 20 or more years. Classrooms served, on average, 14 children ($SD = 4.95$) with an average adult to child ratio of one to six ($M = 6.48$, $SD = 2.66$).

2.2. Measures

2.2.1. Parent school involvement

Family school and home involvement were measured via parent (or primary caregiver) interview in the spring of the first Head Start year, 1998 (U.S. DHHS, 2002). School involvement was assessed by a 7-item scale adapted from the Head Start Quality Research Consortium (QRC). Parents reported on how often they had participated in their child's Head Start center or classroom (e.g., volunteer in classroom, attended parent meetings or workshops, field trip) on a 3-point Likert scale (1 = not yet; 2 = once or twice; 3 = three or more times). Reliability for this scale was adequate (Cronbach's $\alpha = 0.75$).

2.2.2. Parent home involvement

Home involvement was assessed by parents' report of their weekly and monthly activities using an adapted version of the National Household Education Survey (National Center for Education Statistics, 2008). Weekly home involvement was comprised of 8 items indicating the frequency of (0, 1–2, or 3 times in the past week) parents were involved with their children's education in the home setting (e.g., told a story, taught letters, words, or numbers). Monthly home involvement was measured by a total score of 7 dichotomous items (1 = yes, 0 = no) indicating whether or not during the past month parents participated with their children on educational or cultural outings (e.g., visited a zoo, museum, library, playground, aquarium, or sporting event). Reliability for these scales was relatively low (Cronbach's alpha = 0.58 and 0.49, for weekly and monthly activities, respectively). However, these were the best available measures for home involvement in FACES.

2.2.3. The Early Childhood Environment Rating Scale (ECERS)

The Early Childhood Environment Rating Scale (ECERS) was used to assess global classroom quality in the spring of 1998 (Harms & Clifford, 1980). For the FACES 1997 study, 32 of the 37 available items were used to assess seven areas of classroom quality: personal care routines, furnishings and display for children, language/reasoning experiences, fine and gross motor activities, creative activities, social development, and adult needs, rated on a 7-point scale (1 = inadequate, 3 = minimal, 5 = good, and 7 = excellent). Each of the seven areas was rated by an observer trained to reliability (average inter-observer agreement > 0.85, U.S. DHHS, 2005). The overall ECERS mean score used had an internal consistency reliability of 0.90.

2.2.4. The Assessment Profile for Early Childhood Programs: Research Edition II (Abbott-Shim & Sibley, 1998)

The Assessment Profile for Early Childhood Programs: Research Edition II (Abbott-Shim & Sibley, 1998) was used to measure the observed quality of the learning environment and teaching practices. Two subscales were available in FACES 1997: Scheduling and Learning Environment. In the present study, only the Learning Environment subscale (comprised of 18 items) was used to assess the "richness" and developmental appropriateness of the learning environment, including whether a variety of learning materials were accessible to children and whether classroom space arrangement encouraged child independence. For the present study, internal consistency reliability for the Learning Environment was 0.65. Criterion-related validity for this scale was established adequately with the ECERS (U.S. DHHS, 2005).

2.2.5. The Arnett Caregiver Interaction Scale (Arnett, 1989)

The Arnett Caregiver Interaction Scale was used to measure teacher-child relationships and interactions (Arnett, 1989). Trained observers rated teachers' behavior on 30 items comprising five dimensions: teacher sensitivity, punitiveness, detachment, permissiveness, and prosocial interaction on a 4-point Likert scale ranging from "never seen" to "always or almost always." The lead teacher total score was used for the present study. Internal consistency reliability for the scale was high, Cronbach's alpha = 0.93, in the study sample.

2.2.6. Classroom climate

Trained observers rated the overall classroom emotional climate on 4 items: to what extent the atmosphere was tense, children were engaged in cooperative interactions, and teachers and children were engaged in laughter. Items were rated on a 4-point scale (1 = not at all, 2 = somewhat, 3 = quite a bit, 4 = very much). A total

score of the 4 items was computed (with the negative item reverse coded); reliability for the total score was 0.86.

2.2.7. Child academic and social outcomes

Academic outcomes were directly assessed and social emotional outcomes assessed by teacher report in the spring of 1998. For all academic outcomes, the one parameter item response theory (IRT) *W* scores were used.

2.2.7.1. Receptive vocabulary. The Peabody Picture Vocabulary Test (Dunn & Dunn, 1997) is a norm-referenced assessment of receptive vocabulary skills. The test is suitable for ages from 2.5 through adulthood with age norms based on a national sample of 2725 children and adults. Internal consistency reliability in the spring of 1998 was high (Cronbach's alpha = 0.96).

2.2.7.2. Early reading achievement. The Woodcock-Johnson Achievement Battery, Dictation scale (Woodcock & Johnson, 1989) or Woodcock-Munoz (Woodcock & Munoz-Sandoval, 1996) was used to assess children's literacy skills. The Dictation subscale consists of 12 items, measuring children's prewriting skills (e.g., drawing lines and copying letters) and children's skills in providing written responses when asked to write letters of the alphabet, words, phrases, and punctuation. Internal consistency reliability for this scale in the current sample was 0.80. In addition, the Woodcock-Johnson Letter Word Identification subscale was used to assess children's ability to identify symbols, pictures of objects, letters, and words. Reliability was 0.85.

2.2.7.3. Early mathematics achievement. The Woodcock-Johnson Achievement Battery, Applied Problems scale (Woodcock & Johnson, 1989) or Woodcock-Munoz (Woodcock & Munoz-Sandoval, 1996) was used to assess early mathematics skills. The scale consists of 23 items, measuring children's ability to analyze and solve mathematics problems including simple counting, addition, or subtraction operations. Internal consistency reliability was 0.91.

2.2.7.4. Cooperative classroom behavior. Cooperative classroom behavior (social competence) was assessed by teacher report of 12 items adapted from the Personal Maturity Scale (Alexander & Entwisle, 1988) and the Social Skills Rating System (Elliott, Gresham, Freeman, & McCloskey, 1988). A summary score was created, with higher scores indicating more cooperative behavior. Cronbach's alpha was 0.87.

2.2.7.5. Behavior problems. Behavior problems were assessed by teacher report of 14 items derived from the Personal Maturity Scale (Alexander & Entwisle, 1988), the Child Behavior Checklist for Preschool-Aged Children, Teacher Report (Achenbach, Edelbrock, & Howell, 1987), and the Behavior Problems Index (Zill, 1990). The total scale measured aggression, hyperactivity, and anxious/withdrawn behavior. Internal consistency reliability was 0.85.

2.2.8. Child, family, teacher, classroom, and program characteristics

Two sets of demographic variables were used. The first set included child, family, classroom, and teacher demographic covariates employed in the multilevel models in order to examine the unique associations between profile classification and academic and social skills, and to control for any initial selection effects that might be attributed to children's outcomes (McCartney, Bub, & Burchinal, 2006). Covariates were selected based on prior theory and research and included (a) child gender, age, ethnicity, and disability classification; (b) whether the child was from a language-minority family, parent-reported monthly income, and parental

education; and (c) teachers' years of teaching experience, education level, and adult-to-child ratio in the classroom.

In order to examine mean differences among the final multilevel profile solutions on family, teacher, classroom, and program characteristics, a second set of demographic variables were included in the latent profile models as distal outcomes. These variables included: (a) whether the child lived in a two-parent household, parental employment status, frequency of reading to the child at home, parental depressive symptoms (Center for Epidemiologic Studies-Depression Scale; Radloff, 1977), and self-efficacy and locus of control (Pearlin Mastery Scale; Pearlin & Schooler, 1978); (b) number of annual trainings teachers attended, teacher ethnicity, and whether English was predominantly spoken in the classroom; and (c) program urbanicity and percentage minority enrollment.

2.3. Data analytic approach

2.3.1. Missing data

The final sample of 1870 included children who had complete data on classroom quality variables in the spring of 1998. Any remaining incomplete data on independent variables (5% on parent involvement variables) or child and family covariates (ranging from 5% to 7%) were estimated using FIML in *Mplus* (Hancock & Mueller, 2006). FIML uses all available data for each case when estimating parameters and has been shown to be less biased when data are missing at random (Enders & Bandalos, 2001).

2.3.2. Sampling weights

Due to the complex sampling design of FACES, data were weighted with the longitudinal child base weight (CHLGWTO) to adjust for unequal selection probability. Because multilevel analysis is a model-based approach (Heck & Mahoe, 2004), variance estimation due to the stratification and clustering in the sampling design is addressed through the within and between partitioning of variation in the multilevel model.

2.3.3. Multilevel latent profile analysis

Multilevel latent profile analysis (MLPA) in *Mplus* 6.0 (Muthén & Muthén, 1998–2010) was used to empirically identify latent profiles of parent involvement and classroom quality. Multilevel LPA is a model-based approach similar to cluster analysis that uncovers homogenous groups of children within a population (Asparouhov & Muthén, 2008). Statistically, multilevel LPA combines multilevel and mixture models by modeling within a multilevel framework, subpopulations where classes are not known but inferred from the data. Individual children are thought to belong to one K latent group underlying the population where the number of groups is not known a priori; comprised of variables are simultaneously modeled at both level 1 (parent involvement) and level 2 (classroom quality). Profiles of homogenous groups of children are estimated by maximizing within-group similarity according to the *mean level*, *dispersion*, and *profile shape* of observed variables and maximizing between-type separation.

The ideal number of profiles (within and between classrooms) was determined via multiple criteria as recommended by Vermunt (2008) and Jung and Wickrama (2008): (a) fit indices including the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), and the sample size adjusted Bayesian Information Criterion (BIC) (lower values are better) (Nylund, Asparouhov, & Muthén, 2007); (b) entropy value (ranging from zero to one), greater than 0.70 indicating classification accuracy (Jung & Wickrama, 2008); and (c) profile size (comprised of at least 1% of the sample to ensure generalizability and replicability) (Nylund et al., 2007); and (d) criterion-related validity. Standardized z scores for

parent involvement and classroom quality variables were used to facilitate model convergence and interpretation.

2.3.4. Profile differences across family, teacher, classroom, and program characteristics

Significant mean differences among latent profile types on family, teacher, classroom, and program demographic characteristics were determined using the Wald equality tests of means (Wang, Brown, & Bandeen-Roche, 2005). The procedure provides an overall omnibus Chi-square significance test as well as pairwise comparisons of mean differences among the latent profile groups, with a corrected adjustment for unequal group sizes.

2.3.5. Child academic and social outcome differences across profiles

To examine concurrent associations between profile membership and academic and social outcomes, a series of two-level hierarchical linear models were analyzed using HLM v. 6.06 (Raudenbush, Bryk, Cheong, & Congdon, 2004). Separate models were estimated for each child academic (PPVT, W-J Letter Word Identification, W-J Dictation, W-J Applied Problems) and social outcome (social competence and problem behavior) assessed in the spring of 1998.

The first set of models specified was fully unconditional in order to determine the distribution of variance in each of the outcomes attributable to level 1 (variability due to differences within children) and level 2 (variability due to differences between classrooms). Variables were entered in a series of steps. First, demographic covariates were entered at the child level [child age in months, gender (male = 1), and child ethnicity (dummy coded, with White as the reference group), disability classification status (yes = 1), whether the child was from a language-minority family (yes = 1), parent-reported monthly income (continuous), and parental education (high school or above = 1)]. Second, two sets of variables were entered simultaneously (a) children's profile membership was entered at level 1 (all dummy coded with reference profile = 4, the profile containing the largest proportion of children within the sample), and (b) classroom and teacher covariates were entered at level 2 to control for between classroom variation in outcomes attributable to: the number of years teacher teaching in Head Start, teacher education level (bachelor's degree or above = 1), and adult to child ratio. All variables at levels 1 and 2 were grand-mean centered, except for dummy coded profiles (Enders & Tofghi, 2007).

3. Results

3.1. Descriptive statistics

Tables 1 and 2 present descriptive statistics and bivariate correlations among the parent involvement and classroom quality variables. The descriptive statistics were generated using SPSS Complex Samples with the longitudinal child weight (CHLGWTO), strata (VARSTRAT) and cluster (VARUNIT) applied.

3.2. Multilevel latent profile types

The best fitting model consisted of three within- (parent involvement) and two between- (classroom quality) profiles resulting in a total of six distinct latent profiles in the final multilevel model. The final model was selected based on adequate fit indices: (a) Loglikelihood = -9885.08, AIC = 19,842.16, BIC = 20,041.37, and the sample size adjusted BIC = 20,021.07; (b) entropy = 0.74. To avoid local maxima, as model estimation became more complex, random starts and the number of iterations were increased (Hipp & Bauer, 2006).

Table 1
Weighted descriptive statistics of family involvement and classroom quality variables in the spring of children's first year of Head Start (1998).

	N	Mean	SE	Range (unweighted)
Parent involvement variable				
Parent involvement weekly at home	1767	3.35	0.11	0–7
Parent involvement monthly at home	1770	1.61	0.11	0–7
Parent school involvement	1770	3.27	0.13	0–7
Classroom quality variable				
ECERS overall mean	1870	5.10	0.06	2–7
Assessment profile–learning environment	1870	56.48	0.42	45.80–64.70
Arnett scale	1870	73.18	0.93	18–90
Classroom climate	1870	9.10	0.14	1–12

Note. Unweighted N; all other statistics were computed with the longitudinal child weight, longitudinal strata, and longitudinal cluster applied using SPSS Complex Samples v. 17.0.

Table 2
Bivariate Correlations among Parent Involvement, Classroom Quality, and Child Outcome Variables in the Spring of Head Start.

	Academic outcome				Social outcome	
	W-J Dictation	W-J Letter Word	W-J Applied Problems	PPVT	Behavior problems	Social skills
Parent involvement variable						
Parent weekly home activities	–0.02	0.03	0.05*	0.10**	0.02	0.00
Parent monthly home activities	0.03	0.07**	0.06*	0.04	–0.06*	0.04
Parent school involvement	0.04	0.03	0.09**	0.05	–0.00	0.06*
Classroom quality variable						
ECERS overall mean	0.05	–0.01	0.03	0.05*	0.07**	–0.05*
AP–learning environment	0.02	0.02	0.03	0.03	0.01	0.02
Arnett caregiver interaction	0.02	–0.02	0.01	0.02	0.02	0.03
Classroom climate	0.01	–0.04	0.03	0.03	0.01	0.06**

* $p < 0.05$.

** $p < 0.01$.

Table 3 shows the mean z scores for each combined profile type and Fig. 1 presents a graphic display of the patterns of the six distinctive profiles within the national Head Start sample. Profiles are presented in order of increasing levels of quality, with Profile 1 exhibiting consistently low levels of parent involvement and classroom quality and Profile 6 exhibiting the highest levels of parent involvement and classroom quality.

Profiles 1 through 3 were characterized by varying levels of parent home and school involvement, and low and slightly above-average levels of classroom quality. Profile 1: *Low parent school & home involvement, very low classroom quality*, comprised 8.8% of the national sample. Children in this profile experienced low parent school, home weekly, and monthly involvement and very low classroom quality in Head Start. Profile 2: *High parent school involvement, very low classroom quality* (5.0% of the sample) characterized children who experienced high parent school involvement, average home weekly, and average home monthly involvement. However, children were enrolled in classrooms of very low overall structural

and process quality. Profile 3: *High parent home involvement, very low classroom quality* (2% of the sample) reflected very high home monthly involvement but classrooms of very low quality.

Profiles 4 through 6 were characterized by varying levels of parent home and school involvement, with average to above-average levels of classroom quality (with quality means ranging from 0.06 to 0.35). Profile 4: *Low parent school & home involvement, above average classroom quality* comprised the largest proportion (47.5%) of children. Children classified within this profile experienced low levels of parent school and home involvement, and average to above average classroom quality relative to the overall sample. Profile 5: *High parent school involvement, above average classroom quality* (24% of children) was the next most prevalent profile. Children within this profile experienced very high parent school involvement, average or slightly below-average home weekly, and home monthly involvement, and average to above-average classroom quality. Profile 6: *High parent school & home involvement, above average classroom quality* (12.6% of the national sample) included

Table 3
Prevalence, mean z scores (standard errors) for the final multilevel latent profile solution.

Latent profile ^a	Parent involvement				Classroom quality			
	n (%)	School involvement	Home weekly	Home monthly	ECERS overall	AP learning environment	Arnett	Classroom climate
1 (low/low)	165 (8.8%)	–0.86 (0.07)	–0.20 (0.10)	–0.46 (0.06)	–0.90 (0.16)	–0.44 (0.14)	–1.64 (0.29)	–1.28 (0.17)
2 (high school/low)	93 (5.0%)	0.94 (0.12)	0.17 (0.10)	0.23 (0.28)	–0.90 (0.16)	–0.44 (0.14)	–1.64 (0.29)	–1.28 (0.17)
3 (high home monthly/low)	37 (2.0%)	–0.38 (0.53)	0.28 (0.26)	1.41 (0.45)	–0.90 (0.16)	–0.44 (0.14)	–1.64 (0.29)	–1.28 (0.17)
4 (low/above average)	889 (47.5%)	–0.74 (0.04)	–0.26 (0.05)	–0.35 (0.07)	0.22 (0.06)	0.06 (0.05)	0.35 (0.05)	0.24 (0.07)
5 (high school/above ave.)	449 (24.0%)	0.85 (0.04)	–0.01 (0.07)	–0.22 (0.07)	0.22 (0.06)	0.06 (0.05)	0.35 (0.05)	0.24 (0.07)
6 (high/above average)	236 (12.6%)	0.74 (0.13)	0.78 (0.07)	1.39 (0.10)	0.22 (0.06)	0.06 (0.05)	0.35 (0.05)	0.24 (0.07)

N = 1870. Note. Multilevel profiles estimated applying the longitudinal child weight and accounting for clustering at classroom level.

^a Latent profile Type 1 = low parent school and home involvement, very low classroom quality, Type 2 = high parent school involvement, very low classroom quality, Type 3 = high parent home involvement, very low classroom quality, Type 4 = low parent school and home involvement, above average classroom quality, Type 5 = high parent school involvement, above average classroom quality, Type 6 = high parent school and home involvement, above average classroom quality.

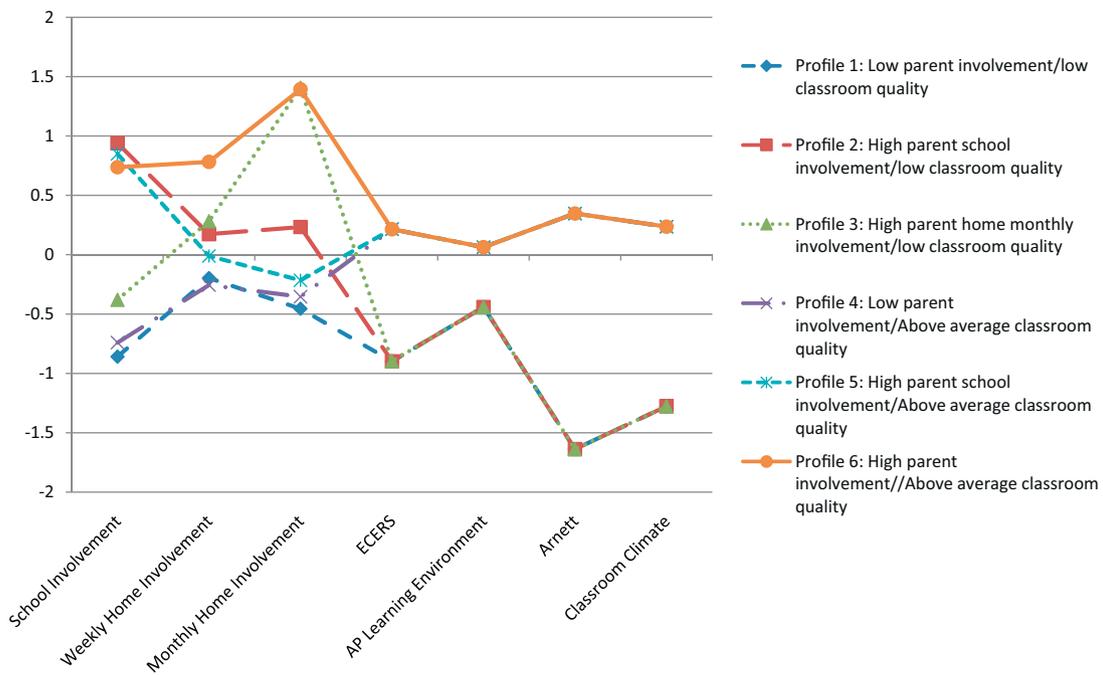


Fig. 1. Mean z scores for combined multilevel parent involvement and classroom quality latent profiles for the national sample.

children who experienced consistently high parent involvement, and average or above average classroom quality.

3.2.1. Significant differences among profiles on family, teacher, classroom, and program demographic characteristics

In general, profiles comprised of children whose parents reported greater involvement with children’s education at home or school, and in particular, higher involvement in school activities, were associated with higher parental education, a two-parent household, and more frequent book reading to the child every week (see Table 4). In profiles with higher mean levels of parent school-based involvement (e.g., Profile 5), parents were less likely to be working in comparison to Profiles 3 or 4. In addition, children in Profile 5 were more likely to be from language-minority families than children classified within profiles 1 or 4 (characterized by low levels of parent involvement). There were no significant differences among profiles with respect to family income, parental depression, or parental locus of control.

There were no significant differences among profiles with respect to teacher work experience, number of professional trainings attended, or teacher education level. However, there were significant differences among profiles on classroom and program characteristics. Profiles with lower levels of classroom quality had lower adult to child ratios (e.g., Profiles 1 and 3), a greater percentage of Black lead teachers (Profiles 1 and 2), and greater percentage of minority children (Profiles 1 and 3) relative to profiles with higher classroom quality (Profiles 4–6).

3.2.2. Profiles in relation to academic outcomes

We tested the hypothesis that profiles characterized by higher parental involvement and higher classroom quality would be associated with higher academic and social skills. Intraclass correlations (indicating variation attributable to between classroom differences) across outcomes ranged from about 18 to 30% (PPVT = 30.2%; W-J Dictation = 22.7%; W-J Letter-Word Identification = 17.6%; W-J Applied Problems = 18.2%). Across all academic outcomes, the greatest amount of variance was attributable to the

child (PPVT = 69.8%; W-J Dictation = 77.3%; W-J Letter-Word Identification = 82.4%; W-J Applied Problems = 81.8%).

Child and family demographic covariates (child gender, age, ethnicity, language minority status, family income, and parental education) as a set accounted for approximately 5–31% of the incremental child-level variance in the academic outcomes (PPVT = 30.8%; W-J Dictation = 14.2%; W-J Letter-Word Identification = 10.3%; W-J Applied Problems = 5.0%). Latent profile classification (with Profile 4, the largest profile group, as the reference category) and classroom-level covariates as a set, accounted for a small proportion of child-level variance (1% or less in all outcomes) but a considerable amount of variance attributable to differences between classrooms (PPVT = 80.5%; W-J Dictation = 40.2%; W-J Letter-Word Identification = 21.0%; W-J Applied Problems = 62.0%).

The following equations are the final models for Head Start academic outcomes. In the level-1 equation, the academic outcome score (Y) for a child (i) who is in classroom (j) is a function of the intercept (β_{0j} ; the estimated classroom average score) after adjusting for child and family demographic covariates (β_{1j} , β_{2j} , β_{3j} , β_{4j} , β_{5j} , β_{6j} , β_{7j} , β_{8j} , and β_{9j}), latent profile membership (β_{10j} , β_{11j} , β_{12j} , β_{13j} , and β_{14j}), and the error term associated with this estimated mean (r_{ij}). In the level-2 equation, the adjusted average academic outcome for children in each classroom (β_{0j}) is a function of the grand mean score (γ_{00}), the classroom-level means for teacher and classroom covariates (γ_{01} , γ_{02} , and γ_{03}), and the error term associated with this estimated mean (u_{0j}).

$$\begin{aligned}
 \text{Level 1 : Academic outcome} &= \beta_{0j} + \beta_{1j}(\text{Child male}) \\
 &+ \beta_{2j}(\text{Child age}) + \beta_{3j}(\text{Child Black}) + \beta_{4j}(\text{Child Hispanic}) \\
 &+ \beta_{5j}(\text{Child other}) + \beta_{6j}(\text{Disability}) + \beta_{7j}(\text{Language minority}) \\
 &+ \beta_{8j}(\text{Family income}) + \beta_{9j}(\text{Parental bachelors degree or above}) \\
 &+ \beta_{10j}(\text{membership in profile 1}) + \beta_{11j}(\text{membership in profile 2}) \\
 &+ \beta_{12j}(\text{membership in profile 3}) + \beta_{13j}(\text{membership in} \\
 &\text{profile 5}) + \beta_{14j}(\text{membership in profile 6}) + r_{ij} \quad (1)
 \end{aligned}$$

Table 4
Significant mean (standard errors) differences among multilevel latent profiles on child, family, teacher, classroom, and program characteristics.

Demographic variable	Profile 1 ^a (low/low)	Profile 2 (high school/low)	Profile 3 (high home/low)	Profile 4 (low/above average)	Profile 5 (high school/above average)	Profile 6 (high/above average)	Significant differences ^b
Child characteristic							
Black	0.52 (0.05)	0.42 (0.06)	0.55 (0.10)	0.36 (0.02)	0.28 (0.02)	0.41 (0.04)	5 < 1, 2, 3, 4, 6 and 4 < 1
Hispanic	0.24 (0.04)	0.24 (0.05)	0.26 (0.09)	0.28 (0.02)	0.32 (0.02)	0.24 (0.03)	ns
Language minority family	0.27 (0.04)	0.34 (0.06)	0.32 (0.09)	0.31 (0.02)	0.38 (0.03)	0.31 (0.03)	ns
Family characteristic^c							
Family monthly income	1128.55 (70.47)	1203.16 (92.90)	1199.79 (151.78)	1193.81 (29.02)	1222.23 (38.42)	1260.15 (57.58)	ns
Parent depression	7.45 (0.56)	8.05 (0.90)	8.00 (1.23)	7.49 (0.27)	7.55 (0.36)	6.77 (0.46)	ns
Parent locus of control	14.95 (0.30)	15.20 (0.41)	15.41 (0.63)	14.70 (0.13)	14.88 (0.17)	15.25 (0.22)	ns
Two parent household	0.37 (0.05)	0.49 (0.06)	0.33 (0.09)	0.40 (0.02)	0.51 (0.03)	0.47 (0.04)	5 > 1, 3, 4
Parent education (≥HS)	0.73 (0.04)	0.76 (0.05)	0.84 (0.07)	0.69 (0.02)	0.74 (0.02)	0.81 (0.03)	4 < 3, 6
Parent employed	0.54 (0.05)	0.53 (0.06)	0.68 (0.09)	0.57 (0.02)	0.47 (0.03)	0.55 (0.04)	5 < 3, 4
Parent reads to child 0 times/week	0.07 (0.02)	0.03 (0.02)	0.00 (0.01)	0.05 (0.01)	0.05 (0.01)	0.01 (0.01)	1 > 3, 6 and 4 > 3, 5, 6 and 5 > 6
Parent reads to child daily	0.26 (0.04)	0.32 (0.06)	0.35 (0.09)	0.27 (0.02)	0.33 (0.02)	0.48 (0.04)	6 > 1, 2, 4, 5 and 5 > 4
Teacher characteristic^c							
Number of years teaching	15.03 (0.85)	15.06 (1.07)	12.35 (1.63)	11.95(0.32)	11.65 (0.40)	11.92 (0.55)	ns (overall p = 0.06)
Number annual trainings	12.76 (0.18)	12.92 (0.25)	12.61 (0.42)	13.20 (0.06)	13.29 (0.08)	13.29 (0.12)	ns
Teacher education (≥BA)	0.27 (0.04)	0.26 (0.05)	0.30 (0.08)	0.32 (0.02)	0.35 (0.03)	0.35 (0.03)	ns
Black teacher	0.52 (0.05)	0.47 (0.06)	0.48 (0.10)	0.35 (0.02)	0.27 (0.02)	0.37 (0.03)	1 > 3, 4, 5, 6 and 2 > 5, 5 > 4, and 6 > 5
Hispanic teacher	0.19 (0.04)	0.23 (0.05)	0.24 (0.08)	0.20 (0.02)	0.25 (0.02)	0.22 (0.03)	ns
Classroom characteristic							
Child to adult ratio	7.62 (0.28)	6.84 (0.37)	8.06 (0.68)	6.52 (0.12)	6.24 (0.15)	6.51 (0.21)	1 > 4, 5, 6 and 3 > 4, 5, 6
English predominantly spoken ^d	1.03 (0.02)	1.04 (0.03)	1.03 (0.04)	1.02 (0.01)	1.08 (0.01)	1.05 (0.02)	5 > 1, 4
Program characteristic							
Percent minority ^e	1.85 (0.03)	1.79 (0.05)	1.89 (0.06)	1.71 (0.02)	1.69 (0.02)	1.76 (0.03)	1 > 4, 5, 6 and 3 > 4, 5, 6
Urbanicity ^f	1.36 (0.04)	1.34 (0.06)	1.28 (0.08)	1.32 (0.02)	1.29 (0.02)	1.27 (0.03)	ns

^a Latent profile Type 1 = low parent school and home involvement, very low classroom quality, Type 2 = high parent school involvement, very low classroom quality, Type 3 = high parent home involvement, very low classroom quality, Type 4 = low parent school and home involvement, above average classroom quality, Type 5 = high parent school involvement, above average classroom quality, Type 6 = high parent school and home involvement, above average classroom quality.

^b Statistically significant differences among profiles ($p < 0.05$).

^c Dichotomous child, family, and teacher demographic variables were dummy coded as follows: 1 = yes; 0 = no.

^d Whether English was the language predominantly spoken in classroom was coded as follows: 1 = yes; 2 = no.

^e Program percent minority was coded as follows: 1 = less than 50% minority; 2 = more than 50% minority.

^f Program metropolitan status was coded as follows: 1 = urban, 2 = rural.

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Years teaching}) + \gamma_{02}(\text{Teacher education}) + \gamma_{03}(\text{Adult to child ratio}) + u_{0j} \quad (2)$$

Table 5 displays the fixed and random effects for each of the Head Start academic outcome models, displaying differential associations between latent profile classification and academic outcomes, after accounting for child, family, and classroom demographic covariates. Relative to Profile 4 (the largest group: *low parent school and home involvement, above average classroom quality*), children within Profile 3 (*high school and home involvement*) displayed higher letter-word identification scores and higher receptive vocabulary outcomes; Profile 6 (*high parent involvement and above average classroom quality*) was associated with higher receptive vocabulary scores; and Profiles 2, 5, and 6 (*high school involvement*) were associated with higher mathematics outcomes. A follow up set of analyses were conducted to examine whether there were distinctions among the profiles in child outcomes, when the reference group was set to Profile 1 (theoretically the most appropriate profile from which to make comparisons since it was characterized by the lowest parent involvement and classroom quality). Findings indicated that children within Profile 1 exhibited significantly lower receptive vocabulary and letter-word

identification skills, relative to children within Profile 3: *High parent home involvement, very low classroom quality* ($B = 3.72, p < 0.05$; and $B = 6.19, p < 0.05$, respectively), and significantly lower receptive vocabulary relative to children within Profile 6: *High parent school & home involvement, above average classroom quality* ($B = 2.91, p < 0.05$).

3.2.3. Profiles in relation to social outcomes

Intraclass correlations indicating variation in social outcomes attributable to between-classroom differences were 35.2% for problem behavior and 36.5% for social skills. The greatest amount of variance was attributable to the child (problem behavior = 64.8%; social skills = 63.5%).

Child and family demographic covariates (child gender, age, ethnicity, language-minority status, family income, and parental education) accounted for 10.1% and 15.4% of the incremental child-level variance in problem behavior and social skills, respectively. Latent profile classification (with Profile 4 set as a reference group) and classroom-level covariates entered in the second step, accounted for a minimal amount of child-level variance in social outcomes (1% or less) but a considerable amount of variance was attributable to differences between classrooms (problem behavior = 14.9%; social skills = 18.0%).

The final models for the Head Start social outcomes were identical to those for the academic outcomes (see Table 5). Latent profile

Table 5
Multilevel model examining relationship between profile classification, academic, and social outcomes in the spring of Head Start.

	PPVT		W-J Dictation		W-J Letter-word Identification		W-J Applied Problems		Problem behavior		Social skills	
	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Fixed effect												
Intercept (β_{0j})	68.95***	0.46	359.99***	2.09	357.69***	0.91	401.10***	1.33	4.99***	0.28	16.48***	0.23
Classroom and teacher variables												
Years teaching	-0.02	0.04	0.07	0.17	0.07	0.07	0.04	0.09	-0.01	0.03	-0.01	0.02
Teacher ed (\geq BA)	0.66	0.69	4.04	3.03	1.14	1.15	1.02	1.90	-0.71	0.43	1.08*	0.39
Adult:child ratio	-0.10	0.13	-0.33	0.54	-0.26	0.23	-0.17	0.36	0.01	0.09	0.14	0.08
Child background												
Male	0.44	0.57	-8.75***	2.28	-3.31*	1.06	-1.59	1.73	1.85***	0.28	-1.84***	0.26
Age (months)	0.82***	0.05	2.20**	0.25	0.58***	0.11	1.40***	0.19	-0.10***	0.03	0.13***	0.02
Black	-7.60***	0.82	-9.22*	3.68	-0.47	1.57	-12.10***	2.39	-0.75	0.58	0.41	0.42
Hispanic	-7.24***	1.19	-0.21	5.10	-3.36*	1.83	-4.91	3.69	-1.12*	0.58	0.10	0.54
Other	-1.05	1.01	1.74	4.91	1.56	1.68	-0.22	3.01	-2.11***	0.46	1.39*	0.53
Disability	-1.35	0.92	-10.01*	3.86	-3.36*	1.46	-6.60*	2.29	2.09***	0.49	-1.84***	0.41
Language minority	-6.54***	1.10	-3.98	4.41	-0.38	1.75	-9.65*	3.36	-0.07	0.46	0.39	0.43
Family income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.00	0.00
Parent educ. (\geq HS)	3.93***	0.64	4.72	2.88	3.21*	1.09	3.38	2.11	-0.12	0.31	0.52	0.30
Profile classification ^a												
Profile 1 (high school/low)	-0.73	1.30	-0.01	5.40	-0.29	1.90	2.65	3.91	0.82	0.84	-1.29*	0.56
Profile 2 (high home/low)	1.22	1.33	3.20	4.48	0.68	2.07	6.36*	2.89	1.75	1.09	-0.49	0.90
Profile 3 (low/above ave)	2.99*	1.20	-5.40	7.70	5.91*	2.72	7.88	6.22	0.04	0.79	-0.85	0.90
Profile 5 (high school/above)	0.58	0.85	-2.50	2.94	1.01	1.29	4.49*	1.98	0.07	0.34	0.07	0.31
Profile 6 (high/above)	2.18*	1.06	-0.02	3.99	3.01*	1.72	7.68*	2.37	0.08	0.49	0.42	0.39
Random effect	Variance	χ^2 (df)	Variance	χ^2 (df)	Variance	χ^2 (df)	Variance	χ^2 (df)	Variance	χ^2 (df)	Variance	χ^2 (df)
Level 1 child (σ^2)	62.81		815.36		157.26		415.45		13.36		10.58	
Level 2 classroom ^b (τ_{00})	7.72	662.10(433)	166.70	778.91(433)	29.72	766.53(430)	37.97	626.04(432)	6.90	1355.49(466)	5.93	1454.86(466)

^a Reference profile group = 4 (low parent school and home involvement, above average classroom quality). Models estimated applying the longitudinal child weight using Full Information Maximum Likelihood estimation.

^b All level 2 variance components were significant, $p < 0.001$.

* $p < 0.05$.

*** $p < 0.001$.

+ $p < 0.10$.

classification was associated with children's social skills, but not with problem behavior. When compared to the reference Profile 4, classification within Profile 1: *Low parent school and home involvement, very low classroom quality* was associated with significantly lower social skills. Again, a follow up set of analyses examined differential associations among profiles and social outcomes when Profile 1 was set as the reference group. Classification within Profiles 5 and 6 (characterized by above average classroom quality) were associated with higher social skills ($B = 1.36$, $p < .05$; and $B = 1.71$, $p < .05$, respectively), relative to Profile 1: *Low parent involvement and very low classroom quality*.

4. Discussion

Identifying proximal influences in the home and school context that promote early learning for low-income children is a national priority. As programs statewide expand to provide early childhood educational services to more children, the onus is upon the research community to provide evidence that programs are providing quality experiences to support children's learning. In response to this need, the present study employed a person-centered approach to identify multilevel latent profiles of parent involvement and classroom quality for a nationally representative sample of Head Start children. The study extends the current knowledge base by identifying distinctive national profile types comprised of varying levels of parent involvement and classroom quality. More importantly, these profiles were associated with family, classroom, and program characteristics and were differentially associated with academic and social outcomes at the end of children's first Head Start year.

The present study extends prior research by providing a comprehensive national picture of the variation in the quality of home and classroom experiences for Head Start children. Six distinct latent profiles were identified empirically through a rigorous multilevel latent profile analytic procedure. In the national Head Start sample, the most prevalent profile was Profile 4 (comprising 47.5% of the sample), which indicates that the most normative experiences for Head Start children were low levels of parent involvement in their school activities and slightly below-average levels of involvement in weekly home activities such as reading books, talking about what happened in school or television programs, or playing counting or alphabet games, as well as monthly activities (going on cultural outings, or to the library). In addition, children in this profile experienced above-average quality classroom environments. As we discuss below, academic and social outcomes for children within this most prevalent profile were higher than children experiencing the lowest levels of parent involvement and classroom quality; however, other distinctions emerged, supporting the use of a person-centered approach.

4.1. Profile classification and academic outcomes

There were two sets of promising profile types with respect to children's outcomes: (a) Profile 3 which was characterized by high parent home involvement and above average home weekly involvement, and (b) Profiles 4, 5, and 6 which were distinguished by above average classroom quality. In general, relative to the low parent involvement and low classroom quality group (Profile 1) academic outcomes were higher for children classified within these two sets of profiles characterized by either higher parent involvement or classroom quality. Other distinctions emerged when children's academic outcomes were examined with reference to Profile 4 (the largest group of children, experiencing relatively higher classroom quality but lower parent involvement). Again, despite their experiencing relatively lower levels of classroom quality (relative to children within Profile 4), children within Profiles 3

and 2 (reflecting higher parent involvement), demonstrated higher letter-word identification and receptive vocabulary skills (Profile 3), and higher mathematics skills (Profile 2). This finding suggests that parent home involvement through cognitively stimulating activities, may serve an important protective function in supporting academic learning for Head Start children (Bradley & Corwyn, 2006; Dearing et al., 2006).

In addition, while classification within Profiles 4–6 (the three higher classroom quality profiles) was associated with positive academic outcomes, associations varied among the three profiles as they were distinguished by varying levels of parent involvement. For example, when compared to Profile 4, children in Profiles 5 and 6 (who experienced the same level of classroom quality but higher parent home and school involvement) performed significantly higher on receptive vocabulary and mathematics skills. Thus, variation among parental involvement practices experienced by children within these high-classroom-quality profiles was associated with differential academic outcomes for children. This pattern of findings is supported by research acknowledging the foundational role that the home and early parenting environment play in low-income children's early development (Bradley & Corwyn, 2006).

Taken together, these sets of findings provide evidence to support the use of a person-centered approach. Our latent profile models identified substantial heterogeneity among parental involvement practices for children experiencing the same levels of classroom quality. Our most consistent finding suggested that outcomes were higher when children experienced high-quality interactions in both the home and classroom contexts; however, patterns of higher parental involvement served a protective function for children who did *not* experience higher levels of classroom quality. It is not surprising that children classified within profiles characterized by higher home involvement demonstrated higher academic outcomes, since the FACES home involvement variables measured cognitively stimulating home activities. These findings are supported by variable-centered research that suggests that associations between classroom quality and academic skills are moderated by parent involvement practices in the home (Burchinal et al., 2002; Downer & Pianta, 2006; McCartney et al., 2007); but also extends previous research which has found few associations between parent involvement and classroom quality variables when they were considered simultaneously in the prediction of Head Start children's academic outcomes (Hindman et al., 2010; Wen, Bulotsky-Shearer, Hahs-Vaughn, & Korfmacher, 2012, *this issue*). By adopting a person-centered approach, our study revealed unique combinations of early experiences that were most beneficial for children.

4.2. Profile classification and social outcomes

Children in Profiles 4–6 (higher classroom quality profiles) evidenced significantly higher social skills relative to children in the lowest quality profile (Profile 1). This finding makes sense in that these profiles were characterized by higher quality teacher-child interactions and positive social emotional climate. Several large scale studies suggest that preschool classrooms characterized by sensitive, warm teacher-child interactions, and positive social emotional climate promote social competence (Burchinal et al., 2008; Curby et al., 2009; Howes, 2000; Mashburn et al., 2008). Given research underscoring the contribution of the classroom environment to early learning, particularly for low-income children (e.g., Burchinal et al., 2008; Mashburn et al., 2008; NICHD ECCRN, 2005), it is also a hopeful finding that despite lower levels of parent-reported home and school involvement in Profile 4,

the social development of children in this set of profiles was not significantly compromised.

4.3. Profile classification and family, teacher, classroom, and program demographics

In general, demographic characteristics associated with profile classification reflected socioeconomic inequities affecting families in early childhood education. Child and family demographic characteristics associated with higher classroom quality profiles (Profiles 4–6) included a lower percentage of Black children, a higher proportion of two-parent-headed households, and parents reporting more frequent book reading to children at home. Higher classroom quality profiles were associated with classrooms with a higher adult-to-child ratio and programs with lower percent-minority enrollment. However, no significant differences were found among profiles for teacher years' experience, training, or level of education. These findings with respect to classroom quality and teacher training, education, and experience are consistent with previous research. For example, LoCasale-Crouch et al. (2007) found that in state prekindergarten programs, higher-quality classroom profiles were associated with higher adult-to-child ratios and teachers with more experience, but were not necessarily associated with higher teacher education or certification. Early et al. (2007) similarly found inconsistent associations between teacher education and classroom quality across several large scale studies.

Of greatest concern was the profile characterized by very low levels of parent involvement and low levels of classroom quality (Profile 1, 8.8% of the sample). In this profile, classroom quality was particularly low in areas related to supports for children's language skills and reasoning, creativity, and social skills (as assessed by the ECERS), as well as low in teacher-child interactions and overall emotional climate. Classification within this profile was associated with greater family, classroom, and programmatic demographic risks relative to other profiles. For example, Profile 1 included a greater percentage of Black children, and families that were less likely to be headed by two parents, relative to higher classroom quality profiles. Parents also reported reading fewer books to their children at home; children were enrolled in classrooms with lower adult-to-child ratios, and were more likely to have a Black teacher, relative to higher-quality profiles. Finally, children within the lowest-quality profile were enrolled in programs characterized by higher percent minority enrollment, relative to higher-quality profiles.

These patterns are consistent with early childhood studies identifying family and program characteristics associated with lower-quality classrooms and lower parental involvement. LoCasale-Crouch et al. (2007) found that lower-quality classrooms were more likely to contain children living in low-income families, children of minority status, and mothers with lower levels of education. In addition, lower-quality classrooms were more likely to contain lower adult-to-child ratios. With regard to parent involvement, research identifies several demographic correlates of involvement such as parent education, marital status, employment, and primary language (Fantuzzo et al., 2000; McWayne et al., 2008). In general, studies suggest that parents with higher levels of education are more involved with school and home-based activities (Dearing et al., 2006; Fantuzzo et al., 2000; McWayne et al., 2008).

4.4. Limitations and directions for future research

There are several limitations that must be acknowledged. First, our study was limited by the archival nature of the variables collected for FACES, particularly those that measured our primary constructs of interest: parent involvement and classroom quality. The parent involvement measures were brief, measured by parent

self-report, and exhibited relatively low internal consistency in this sample. In addition, parent involvement was measured as the frequency count of parental home or school-based activities, rather than via a multidimensional scale of the quality of involvement, which might have reduced our ability to detect significant associations. Research has shown that quantity does not always capture quality with regard to parent involvement; a richer portrait of low-income families might be found using more comprehensive measures (Fantuzzo et al., 2000; Pomerantz, Moorman, & Litwack, 2007).

In addition, Head Start classroom quality as assessed by the ECERS, the Assessment Profile, and the Arnett scale demonstrated some constricted variance, as most classrooms exhibited adequate or fairly "good" quality, perhaps due to the fact that this was a Head Start sample only and there are strict federal regulations guiding the operations of Head Start programs. This might have influenced our ability to detect meaningful profiles at the classroom level. Further, once we controlled for child, family, and classroom demographic characteristics, relatively few significant associations were found between children's classification within profiles characterized by above-average classroom quality and academic outcomes. The lack of significant differences on academic outcomes among the profile types was surprising. However, it could be the case that the higher-classroom-quality profiles in our study from FACES were differentiated more by process quality indicators measured (suggesting higher social emotional climate and positive teacher-child interactions), and therefore perhaps related more closely to social emotional outcomes. In addition, future studies that examine variations in classroom quality among other types of early educational or child care settings with more heterogeneous samples of low-income children are needed (Li-Grining & Coley, 2006).

One limitation which must be acknowledged regarding the use of a person-centered (LPA) approach is that in comparison to a variable-centered approach, some degree of subjectivity on the part of the researcher is required when deciding upon the final number of profile solutions (Jung & Wickrama, 2008). Latent profile analysis within a structural equation modeling framework minimizes some of this subjectivity, as it provides model fit indices to guide each decision step, however it must be acknowledged that this could introduce some error in our final models. In addition, while we controlled for a comprehensive set of child, family, and classroom demographic variables both within our LPA and HLM analyses, our findings could be attributed to selection bias; given this is a correlational study, findings should be interpreted with this limitation in mind.

It would be important for future studies to replicate the present findings in additional Head Start samples, in particular, across more recent nationally representative FACES cohorts. We chose the FACES 1997 cohort because of its unique longitudinal design feature permitting future studies to examine associations among our profile classifications and growth in academic and social outcomes into children's first grade year (FACES 1997 is the only cohort that includes a longitudinal design into first grade). However, we acknowledge that studies employing more recent FACES cohorts may be more relevant for informing current program practices, and that findings from the present study may be different if conducted with more recent cohorts.

Future studies could also extend the present study by examining the effects of the multilevel latent profiles on growth in academic and social outcomes through first grade. Previous studies employing the FACES data have identified a positive growth trajectory for Head Start children in early literacy, language, and mathematics skills (Hindman et al., 2010; Wen et al., 2012, this issue). However, these studies have not consistently identified significant associations between parent involvement and classroom quality variables in FACES and growth in children's outcomes.

Combining a person-centered approach with growth modeling would provide the opportunity to examine whether variability in parent involvement and classroom quality as captured in the latent profiles predicted growth in these same outcomes across the transition to elementary school (Laursen & Hoff, 2006).

One additional finding worth noting from our multilevel models was that most of the variance in children's academic and social outcomes was attributed to level 1 (child and family level) rather than level 2 (classroom level). While research suggests that child and family variables play a proximal role in children's academic and social outcomes (e.g., Burchinal et al., 2002; Downer & Pianta, 2006), at least in our study, it is important to note that there was considerable between-classroom variance left unaccounted for in our models. This suggests that there were still meaningful classroom or program variables that could account for this variation. Indeed, there is a large body of developmental research providing evidence that between classroom and program variation exists; thus, early interventions targeting classroom and program quality are still important, particularly within programs serving low-income children.

4.5. Implications for early childhood practice and policy

The present study findings raise questions about our nation's continued investment in children's early education. Head Start, our nation's largest, most comprehensive early intervention program, was created to foster the health and educational well-being of low-income children and families. Our study findings suggest that, at least in the 1997 Head Start FACES cohort, high-quality experiences in terms of parent involvement and classroom quality were not as prevalent as average or lower quality experiences. While we expand early childhood programs to reach more children nationally, we must be mindful that the provision of quality services is not compromised (LoCasale-Crouch et al., 2007).

In addition, we have much more work to do to identify programmatic barriers that interfere with parent involvement and the provision of high-quality classroom experiences within Head Start. More research is needed to understand more fully the challenges that low-income families face as they are involved with their children's learning at home and in school. From a strengths based perspective, identifying programmatic factors that promote family involvement is also important.

Finally, our study replicates prior research identifying socioeconomic variables associated with disparities in quality early educational experiences in the home and school context (Duncan & Magnuson, 2005; Hart & Risley, 1995; LoCasale-Crouch et al., 2007; Magnuson et al., 2004). Lower quality profiles were disproportionately associated with programs serving ethnic minority families and parents with lower levels of education. High quality profiles, however, were more likely comprised of well trained teachers, more opportunities for children to develop language, creativity, and social skills within the classroom, and highly engaged parents. If the goal of early childhood compensatory interventions is to level the playing field for our nation's most at-risk children, then programs must target those families in greatest need. Investing in low-income children should be a national priority (McCartney, 2010). In this age of educational accountability, supports are needed for early childhood programs that struggle the most to meet quality standards. Such programs are likely the programs reaching children and families in greatest need.

Acknowledgments

This project was funded by the Office of Planning, Research & Evaluation, Administration for Children and Families by a research grant awarded to the first, second, and fifth authors (90YR0009).

References

- Abbott-Shim, M., & Sibley, A. (1998). *Assessment profile for early childhood programs: Research Edition II*. Atlanta, GA: Quality Assist.
- Achenbach, T. M., Edelbrock, C., & Howell, C. T. (1987). Empirically based assessment of the behavioral/emotional problems of 2–3 year-old children. *Journal of Abnormal Child Psychology*, 15, 629–650.
- Alexander, K. L., & Entwisle, D. R. (1988). Achievement in the first 2 years of school: Patterns and processes. *Monographs of the Society for Research in Child Development*, 53(2, Serial No. 218).
- Arnett, J. (1989). Caregivers in day-care centers: Does training matter? *Journal of Applied Developmental Psychology*, 10(4), 541–552.
- Arnold, D. H., Zeljo, A., Doctoroff, G. L., & Ortiz, C. (2008). Parent involvement in preschool: Predictors and relation of involvement to preliteracy development. *School Psychology Review*, 37, 74–90.
- Asparouhov, T., & Muthén, B. (2008). Pearson and log-likelihood chi-square test of fit for latent class analysis estimated with complex samples. In *Mplus users' guide, technical appendix*. Los Angeles, CA: Muthén & Muthén. Retrieved from: <http://www.statmodel.com/download/Chi2Complex4.pdf>
- Bradley, R. H., & Corwyn, R. F. (2006). The family environment. In L. B. Balter, & C. Tamis-LeMonda (Eds.), *Child psychology: A handbook of contemporary issues*, (2nd ed., pp. 493–520). New York, NY: Psychology Press.
- Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon, & R. M. Lerner (Eds.), *Handbook of child psychology. Vol. 1: Theoretical models of human development* (5th ed., pp. 993–1023). New York, NY: Wiley.
- Burchinal, M., Howes, C., Pianta, R., Bryant, D., Early, D., Clifford, R., et al. (2008). Predicting child outcomes at the end of kindergarten from the quality of pre-kindergarten teacher-child interactions and instruction. *Applied Developmental Science*, 12, 140–153.
- Burchinal, M. R., Peisner-Feinberg, E., Pianta, R., & Howes, C. (2002). Development of academic skills from preschool through second grade: Family and classroom predictors of developmental trajectories. *Journal of School Psychology*, 40, 415–436.
- Burgess, S. R., Hecht, S. A., & Lonigan, C. J. (2002). Relations of the home literacy environment (HLE) to the development of reading-related abilities: A one-year longitudinal study. *Reading Research Quarterly*, 37, 408–426.
- Christenson, S. L., & Reschly, A. L. (Eds.). (2010). *Handbook of school-family partnerships*. New York, NY: Routledge.
- Crosnoe, R., Leventhal, T., Wirth, R. J., Pierce, K. M., Pianta, R. C., & NICHD Early Child Care Research Network. (2010). Family socioeconomic status and consistent environmental stimulation in early childhood. *Child Development*, 81(3), 972–987.
- Curby, T. W., LoCasale-Crouch, J., Konold, T. R., Pianta, R. C., Howes, C., Burchinal, M., et al. (2009). The relations of observed pre-k classroom quality profiles to children's achievement and social competence. *Early Education and Development*, 20(2), 346–372.
- Dearing, E., Kreider, H., Simpkins, S., & Weiss, H. B. (2006). Family involvement in school and low-income children's literacy: Longitudinal associations between and within families. *Journal of Educational Psychology*, 98(4), 653–664.
- Dearing, E., Kreider, H., & Weiss, H. B. (2008). Increased family involvement in school predicts improved child teacher relationships and feelings about school for low-income children. *Marriage & Family Review*, 43, 226–254.
- Downer, J., Campos, R., McWayne, C., & Gartner, T. (2010). Father involvement and children's early learning: A critical review of published empirical work from the past 15 years. *Marriage & Family Review*, 43, 67–108.
- Downer, J. T., & Pianta, R. C. (2006). Academic and cognitive functioning in first grade: Associations with earlier home and child care predictors and with concurrent home and classroom experiences. *School Psychology Review*, 35(1), 11–30.
- Duncan, G. J., & Magnuson, K. A. (2005). Can family socioeconomic resources account for racial and ethnic test score gaps? *The Future of Children*, 15(1), 35–54.
- Dunn, L. M., & Dunn, L. M. (1997). *Peabody Picture Vocabulary Test. Third Edition. Examiner's manual and norms booklet*. Circle Pines, MN: American Guidance Service.
- Early, D. M., Maxwell, K. L., Burchinal, M., Bender, R. H., Ebanks, C., Henry, G. T., et al. (2007). Teachers' education, classroom quality, and young children's academic skills: Results from seven studies of preschool programs. *Child Development*, 78(2), 558–580.
- Elliot, S. N., Gresham, F. M., Freeman, R., & McCloskey, G. (1988). Teacher and observer ratings of children's social skills: Validation of the Social Skills Rating Scales. *Journal of Psychoeducational Assessment*, 6, 152–161.
- Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal*, 8, 430–457.
- Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods*, 12(2), 121–138.
- Fantuzzo, J., McWayne, C., Perry, M. A., & Childs, S. (2004). Multiple dimensions of family involvement and their relations to behavioral and learning competencies for urban, low-income children. *School Psychology Review*, 33(4), 467–480.
- Fantuzzo, J., Tighe, E., & Childs, S. (2000). Family involvement questionnaire: A multi-variate assessment of family participation in early childhood education. *Journal of Educational Psychology*, 92(2), 367–376.
- Fantuzzo, J. W., Tighe, E., McWayne, C. M., Davis, G., & Childs, S. (2002). Parent involvement in early childhood education and children's peer play

- competencies: An examination of multivariate relationships. *NHSA Dialog: A Research-to-Practice Journal for the Early Intervention Field*, 6, 3–21.
- Glutting, J. J., McDermott, P. A., & Konold, T. R. (1997). Ontology, structure and diagnostic benefits of a normative subtest taxonomy from the WISC-III standardization sample. In D. P. Flanagan, J. L. Genshaft, & P. L. Harrison (Eds.), *Contemporary intellectual assessment: Theories, tests, and issues* (pp. 349–372). New York, NY: Guilford.
- Hancock, G. R., & Mueller, R. O. (Eds.). (2006). *Structural equation modeling: A second course*. Greenwich, CT: Information Age.
- Harms, T., & Clifford, R. (1980). *Early Childhood Environment Rating Scale*. New York, NY: Teachers College Press.
- Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore, MD: Brookes.
- Heck, R. H., & Mahoe, R. (2004, April). An example of the impact of sample weights and centering on multilevel SEM models. In *Paper presented at the annual meeting of the American Educational Research Association* San Diego, CA.
- Hill, N. E., & Craft, S. (2003). Parent–school involvement and school performance: Mediated pathways among socioeconomically comparable African American and Euro-American families. *Journal of Educational Psychology*, 95(1), 74–83.
- Hindman, A. H., Skibbe, L. E., Miller, A., & Zimmerman, M. (2010). Ecological contexts and early learning: Contributions of child, family, and classroom factors during Head Start, to literacy and mathematics growth through first grade. *Early Childhood Research Quarterly*, 25, 235–250.
- Hipp, J. R., & Bauer, D. J. (2006). Local solutions in the estimation of growth mixture models. *Psychological Methods*, 11, 36–53.
- Hirsh-Pasek, K., Kochanoff, A., Newcombe, N. S., & deVilliers, J. (2005). Using scientific knowledge to inform preschool assessment: Making the case for empirical validity. *Society for Research in Child Development Social Policy Report*, 19(1), 3–19.
- Howes, C. (2000). Social–emotional classroom climate in child care, child–teacher relationships and children’s second grade peer relations. *Social Development*, 9(2), 191–204.
- Howes, C., Burchinal, M., Pianta, R., Bryant, D., Early, D., Clifford, R., et al. (2008). Ready to learn? Children’s pre-academic achievement in pre-Kindergarten programs. *Early Childhood Research Quarterly*, 23, 27–50.
- Jeynes, W. H. (2008). The salience of family factors in children’s school experiences. *Marriage & Family Review*, 43(1), 4–13.
- Jung, T., & Wickrama, K. A. S. (2008). An introduction to latent class growth analysis and growth mixture modeling. *Social and Personality Psychology Compass*, 2(1), 302–317.
- Lambert, R., Abbott-Shim, M., & Sibley, A. (2005). Evaluating the quality of early childhood educational settings. In B. Spodek, & O. Saracho (Eds.), *Handbook of research on the education of young children* (2nd ed., pp. 457–475). Mahwah, NJ: Erlbaum.
- Laursen, B., & Hoff, E. (2006). Person-centered and variable-centered approaches to longitudinal data. *Merrill-Palmer Quarterly*, 52(3), 377–389.
- Li-Grining, C. P., & Coley, R. L. (2006). Child care experiences in low-income communities: Developmental quality and maternal views. *Early Childhood Research Quarterly*, 21, 125–141.
- LoCasale-Crouch, J., Konold, T., Pianta, R., Howes, C., Burchinal, M., Bryant, D., et al. (2007). Observed classroom quality profiles in state-funded pre-kindergarten programs and associations with teacher, program, and classroom characteristics. *Early Childhood Research Quarterly*, 22, 3–17.
- Magnuson, K., Meyers, M., Ruhm, C., & Waldfogel, J. (2004). Inequality in preschool education and school readiness. *American Educational Research Journal*, 41, 115–157.
- Mashburn, A. J. (2008). Quality of social and physical environments in preschools and children’s development of academic, language, and literacy skills. *Applied Developmental Science*, 12(3), 113–127.
- Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O. A., Bryant, D., et al. (2008). Measures of classroom quality in prekindergarten and children’s development of academic, language, and social skills. *Child Development*, 79, 732–749.
- McCartney, K. (2010, June). Why the environment matters more for children in poverty. In *Plenary presentation at Head Start’s 10th National Research Conference* Washington, DC.
- McCartney, K., Bub, K. L., & Burchinal, M. R. (2006). Selection, detection, and reflection. In K. McCartney, M. R. Burchinal, & K. L. Bub (Eds.), *Best practices in quantitative methods for developmentalists. Monographs of the Society for Research in Child Development*, 71(3), 105–126.
- McCartney, K., Dearing, E., Taylor, B. A., & Bub, K. L. (2007). Quality child care supports the achievement of low-income children: Direct and indirect pathways through caregiving and the home environment. *Journal of Applied Developmental Psychology*, 28, 411–426.
- McWayne, C., Campos, R., & Owsianik, M. (2008). A multidimensional, multilevel examination of mother and father involvement among culturally diverse Head Start families. *Journal of School Psychology*, 46, 551–573.
- McWayne, C. M., Fantuzzo, J. W., & McDermott, P. A. (2004). Preschool competency in context: An investigation of the unique contribution of child competencies to early academic success. *Developmental Psychology*, 40, 633–645.
- Muthén, L. K., & Muthén, B. O. (1998–2010). *Mplus user’s guide* (6th ed.). Los Angeles, CA: Muthén & Muthén.
- National Center for Education Statistics. (2008). *National household education survey*. Retrieved from <http://nces.ed.gov/nhes/questionnaires.asp>
- NICHD Early Child Care Research Network. (Ed.). (2005). *Child care and child development*. New York, NY: Guilford Press.
- Nylund, K. L., Asparouhov, T., & Muthén, B. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*, 14, 535–569.
- Parker, F. L., Boak, A. Y., Griffin, K. W., Ripple, C., & Peay, L. (1999). Parent–child relationship, home learning environment, and school readiness. *School Psychology Review*, 28, 413–425.
- Pearlin, L. J., & Schooler, C. (1978). The structure of coping. *Journal of Health and Social Behavior*, 19, 2–21.
- Peisner-Feinberg, E., Burchinal, M., Clifford, R., Culkin, M., Howes, C., Kagan, S., et al. (2001). The relation of preschool child–care quality to children’s cognitive and social developmental trajectories through second grade. *Child Development*, 72, 1534–1553.
- Pianta, R. C., & La Paro, K. M. (2003). Improving early school success. *Educational Leadership*, 60(7), 24.
- Pomerantz, E. M., Moorman, E. A., & Litwack, S. D. (2007). The how, whom, and why of parents’ involvement in children’s academic lives: More is not always better. *Review of Educational Research*, 77(3), 373–410.
- Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401.
- Raudenbush, S. W., Bryk, A. S., Cheong, Y. F., & Congdon, R. (2004). *Hierarchical Linear and Nonlinear Modeling* (Version 6.01a) [Computer software]. Lincolnwood, IL: Scientific Software International.
- Roberts, J., Jurgens, J., & Burchinal, M. (2005). The role of home literacy practices in preschool children’s language and emergent literacy skills. *Journal of Speech, Language, and Hearing Research*, 48, 345–359.
- U.S. Department of Health and Human Services. (1996). *The revised Head Start program performance standards and guidance*. Washington, DC: Author.
- U.S. Department of Health and Human Services. (2002). *A descriptive study of Head Start children and families: FACES Technical Report I*. Washington, DC: Author.
- U.S. Department of Health and Human Services. (2005). *Head Start Family and Child Experiences Survey (FACES) 1997 Cohort: User’s guide*. Washington, DC.
- Vermunt, J. K. (2008). Latent class and finite mixture models for multilevel data sets. *Statistical Methods in Medical Research*, 17, 33–51.
- Votruba-Drzal, E., Coley, R. L., & Chase-Lansdale, P. L. (2004). Child care quality and low-income children’s development: For who is child care most important? *Child Development*, 75, 296–312.
- Wang, C., Brown, C. H., & Bandeen-Roche, K. (2005). Residual diagnostics for growth mixture models: Examining the impact of a preventive intervention on multiple trajectories of aggressive behavior. *Journal of the American Statistical Association*, 100(3), 1054–1076.
- Weiss, H., Caspe, M., & Lopez, M.E. (2006). Family involvement in early childhood education. Family involvement makes a difference. *Family Involvement Research Digest*, 1. Cambridge, MA: Harvard Family Research Project. Online at <http://www.hfrp.org/publications-resources/browse-our-publications/family-involvement-in-early-childhood-education>.
- Wen, X., Bulotsky-Shearer, R., Hahs-Vaughn, D., & Korfmacher, J. (2012). Examination of Head Start program quality: Combining classroom quality and parent involvement to understand children’s language, literacy, and mathematics achievement trajectories. *Early Childhood Research Quarterly*, 27, 640–653.
- Woodcock, R. W., & Johnson, M. B. (1989). *Woodcock-Johnson Revised Tests of Achievement*. Itasca, IL: Riverside.
- Woodcock, R. W., & Munoz-Sandoval, A. F. (1996). *Bateria Woodcock-Munoz-Revisada*. Itasca, IL: Riverside.
- Zill, N. (1990). *Behavior Problems Index based on parent report*. Washington, DC: Child Trends. [memorandum]