PROFILES OF KINDERGARTEN CLASSROOM AND ELEMENTARY SCHOOL CONTEXTS

Associations with the First-Grade Outcomes of Children Transitioning from Head Start

ABSTRACT

Poor-quality classroom and school contexts may impede the academic and behavioral adjustment of low-income students when they transition into kindergarten. Several studies have examined the impact of teacher-student interactions on student progress, whereas others have explored the impact of school-level adversity (e.g., student poverty, school achievement levels). Expanding on prior findings, this study used latent profile analysis to characterize kindergarten contexts in terms of both classroom teacher-student interaction quality and school-level adversity. Following 164 children longitudinally and accounting for functioning in Head Start prior to kindergarten entry, associations between kindergarten context profiles and first-grade outcomes revealed that children who experienced dual-risk contexts in kindergarten (classrooms with poor-quality teacher-student interactions in schools with high levels of adversity) demonstrated the greatest aggression and social difficulties in first grade. Associations between kindergarten context profiles and first-grade academic outcomes were less clear.

Phyllis Lee
UNIVERSITY OF CONNECTICUT HEALTH CENTER

Karen L. Bierman
PENNSYLVANIA STATE UNIVERSITY

L OW-INCOME children are less likely than their more advantaged peers to enter kindergarten with the social-emotional and cognitive skills required to succeed in school (Rimm-Kaufman, Pianta & Cox, 2000). In addition, low-income children are more likely to enter lower quality elementary schools (Currie & Thomas, 2000; Lee & Loeb, 1995). Particularly when children first transition into elementary school, exposure to adverse school and classroom contexts may intensify socioeconomic disparities in social-emotional functioning and academic engagement, and place children at increased risk for poor outcomes (Pianta, Belsky, Vandegrift, Houts, & Morrison, 2008).

Prior studies suggest that the quality of teacher-student interactions children experience in elementary classrooms has an impact on their rate of academic progress and social-emotional adjustment (Mashburn et al., 2008; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). Schools also vary in the level of adversity that characterizes the student body, and school levels of student poverty and low achievement may also affect student progress and outcomes (NICHD ECCRN, 2002; Wong et al., 2014). There are only modest correlations between classroom teacher-student interaction quality and school-level adversity (average $r = -.20$; Pianta, La Paro, Payne, Cox, & Bradley, 2002), suggesting that these different levels of classroom and school context may have different (unique or additive) effects on student adjustment.

This study expanded the existing research by exploring profiles of kindergarten context experienced by Head Start children, including variation in both the quality of classroom teacher-student interactions and in levels of poverty and low achievement experienced by peers at school (e.g., school-level adversity). Following 164 4-year-old children longitudinally as they transitioned from Head Start into 113 kindergarten classrooms in 53 different schools, the study examined associations between kindergarten context profiles and first grade outcomes.

Quality of Classroom Teacher-Student Interactions and Child Outcomes

A well-recognized aspect of the classroom context is the quality of teacher-student interactions, which includes the amount of emotional and instructional support provided by the teacher and the quality of behavioral and organizational management (Hamre et al., 2013). Classroom emotional support refers to the level of warmth and responsiveness shown by teachers, as well as the avoidance of critical comments; organization and management reflect the teacher's use of positive behavior supports with clear expectations and nonpunitive consequences, along with proactive efforts to support on-task learning (Hamre et al., 2013; NICHD ECCRN, 2002; O'Connor, Dearing, & Collins, 2011). From a conceptual standpoint, supportive and well-managed classrooms may enhance children's school adjustment in many ways. Classrooms that are characterized by organized class rules and routines may provide clear expectations and models for adaptive classroom behaviors supporting the development of positive social and self-regulation skills, and conversely offer few distractions to interfere with learning engagement (Thomas, Bierman, Thompson, Powers, & CPPRG, 2008). Conversely, in classrooms characterized

by a lack of warmth and heightened teacher-student conflict, rates of student disruptiveness and aggression often increase, as children model the negative interactions of teachers and peers, with little guidance or support for alternative behavior (O'Connor et al., 2011; Thomas et al., 2008).

Supporting these conceptual links, several studies have demonstrated a positive impact of high quality teacher-student interactions on children's increased prosocial engagement and decreased levels of student aggression in early elementary school, as well as higher rates of attentive, on task, and engaged learning behavior (Burchinal et al., 2008; Mashburn et al., 2008; Pianta et al., 2002). Even controlling for kindergarten levels of aggression and attention problems, experiencing a well-managed and supportive classroom is associated with significant decreases in aggressive-disruptive behavior over the course of first grade (Thomas et al., 2008).

In addition to positive associations with student behavioral and social-emotional functioning, the quality of teacher-student interactions may also affect academic learning (Hamre et al., 2013; Reyes, Bracket, Rivers, White, & Salovey, 2012). Specifically, when teachers use developmentally sensitive teaching strategies and include a variety of engaging learning formats, they provide a strong scaffold to help children learn academic skills which, in turn, may motivate learning engagement and effort (La Paro et al., 2009; Pianta et al., 2002). Teachers' use of cognitive facilitation strategies (e.g., concept development, quality of feedback) in interactions with children supports children's developing thinking skills necessary for academic performance, and research suggests that teachers' cognitive facilitation may also capture instruction of specific content areas (Cabell, DeCoster, LoCasale-Crouch, Hamre, & Pianta, 2013). Results from an extensive study on classroom observations, the Measures of Effective Teaching (MET) project (Kane & Staiger, 2012), demonstrated that effective teacher behaviors can be observed reliably, and these classroom observations are associated with academic achievement (see also Hamre et al., 2013). Interestingly, observations of teacher-student interactions are stable across content areas so that observations of teacher supports in one content area are associated with academic functioning in other content areas (Kane & Staiger, 2012). Given the importance of teacher-student interaction quality for both social-emotional and academic functioning, these aspects of classroom context deserve further study in terms of their potential role in promoting (or impeding) the initial school adjustment of low-income students who often enter school with emotional and behavioral difficulties (Hamre et al., 2013).

School Adversity and Child Outcomes

Conceptually, children who enter kindergarten in schools that serve communities characterized by high levels of adversity also face increased risk for behavioral and academic problems (Battistich, Solomon, Kim, Watson, & Schaps, 1995). For example, when schools serve many low-income children (usually indexed by the number of children who qualify for free/reduced-price lunch), they are often located in communities with elevated rates of disorganization and violence, exposing children to stressors that impede learning and reduce support for positive social-emotional development (McCoy, Roy, & Sirkman, 2013; Raver, McCoy, Lowenstein, & Pess,

2013). Social disorganization theory suggests that student body poverty represents a structural feature of schools that is often associated with unsafe and chaotic conditions that expose children to negative social interactions and aggression, which increase the likelihood of behavioral maladjustment (McCoy et al., 2013). Indeed, several studies have shown that when children are in classrooms with many aggressive classmates, they are likely to show increased aggression over time (Kellam, Ling, Merisca, Brown, & Ialongo, 1998; Powers, Bierman, & CPPRG, 2013). This effect may occur through processes of peer contagion, in which children model and reinforce aggressive behaviors, or because teachers are unable to effectively control aggressive-disruptive behavior when it occurs at high rates (Thomas et al., 2008).

School-level poverty is highly correlated with school achievement levels (Currie & Thomas, 2000; Raver et al., 2013). Schools serving many low-income and low-achieving students often lack the economic and personnel resources to effectively support students. For example, schools characterized by high levels of student poverty often have larger class sizes and fewer classroom aides compared to schools serving fewer low-income students (NICHD ECCRN, 2004). In larger classes with less adult support, teachers must often focus more time on responding to problems that disrupt learning and less time scaffolding instruction for diverse student needs or supporting social-emotional development, contributing to greater behavioral difficulties and lower achievement (Ehrenberg, Brewer, Gamoran, & Willms, 2001; NICHD ECCRN, 2004). Perhaps as a function of these difficult teaching conditions, high-poverty, low-achieving schools often find it difficult to attract and retain teachers who are able to provide high-quality academic instruction (Ronfeldt, Loeb, & Wyckoff, 2013).

Profiles of Kindergarten Classroom and School-Level Contexts

A number of prior researchers have used cluster or profile analyses to characterize the multidimensional nature of preschool or early elementary classroom contexts (Curby et al., 2009; de Kruif, McWilliam, Ridley, & Wakely, 2000; Stuhlman & Pianta, 2009). In one of these studies, Curby and colleagues (2009) found variations in student outcomes associated with different profiles of preschool classroom teacher-student interaction quality. Students in preschool classrooms characterized by moderate emotional and organizational support and high instructional support (especially concept development) showed the greatest gains in vocabulary and math growth in preschool, whereas students in preschool classrooms characterized by high levels of emotional, organizational, and instructional support showed the greatest gains in social competence after the transition into kindergarten (Curby et al., 2009).

There is an important need to understand variability in the quality of children's kindergarten experiences and how that variability may affect their academic and behavioral outcomes, since the transition into kindergarten sets the stage for children's adjustment to elementary school and later school success (Pianta et al., 2002). In addition, examining school-level adversity (school-level student poverty and achievement levels) as well as the quality of classroom teacher-student interactions may be critical to fully understanding kindergarten context effects on low-income

children. Two studies of elementary students provide empirical support for the hypothesis that classroom-level and school-level contexts may each make unique contributions to student outcomes. Thomas and colleagues (2008) found that classroom levels of student aggression (classroom-level influence) and levels of student body poverty (school-level influence) each made unique contributions to the prediction of child aggressive-disruptive behavior in first grade, controlling for baseline levels of child aggression. Similarly, Hoglund and Leadbeater (2004) found that higher levels of school poverty predicted increases in emotional problems for children in classrooms characterized by low levels of peer prosocial behavior and heightened victimization. These studies suggest that child outcomes are affected by both classroom-level and school-level contexts, and support the potential value of examining how kindergarten contexts representing different profiles of classroom-level and school-level characteristics may affect the initial school adjustment of low-income children.

The Current Study

The current study used latent profile analysis to examine patterns of kindergarten context experienced by Head Start children, considering both the quality of teacher-student interactions experienced in the kindergarten classroom and indices of adversity at the elementary school level (student body poverty and school achievement levels). It was hypothesized that varied context profiles would emerge, including profiles characterized by divergence in contextual risks at the classroom versus school levels. This study also explored differences in classroom characteristics that might be associated with different profiles of teacher-student interaction quality and school-level risks and might contribute to their impact on student adjustment, including class size, percentage of students likely to be retained, and presence of a classroom aide. In addition, the study examined the extent to which different kindergarten context profiles were associated with student first-grade behavioral and academic outcomes, accounting for child baseline skills at the end of Head Start. In consideration of the multiple levels of school context, it was hypothesized that classroom-level and school-level influences would have a cumulative effect on behavioral and academic adjustment, such that children at dual risk (i.e., those who experienced low-quality kindergarten classrooms in high-risk elementary schools) would exhibit the most difficulty with behavioral and academic adjustment in early elementary school.

Method

Participants

Participants included two cohorts of 4-year-old children (total $N = 164$, 14% Hispanic, 30% African American, 56% European American; 56% girls) recruited from 22 Head Start classrooms in three counties in Pennsylvania, who served as the "usual practice" comparison group for a preventive intervention study. None of these children received the intervention. At the time of baseline assessment, chil-

dren were, on average 4.49 years old ($SD = .31$, range $= 3.72–5.65$). Reflecting their participation in Head Start, families were low income, with an average income-to-needs ratio of .88. Parent education levels were generally high school or less (91%).

The two cohorts represented children who were recruited across 2 years. At the beginning of the preschool year for each cohort, brochures describing the research project were distributed to parents of all 4-year-old children in the participating classrooms, and 86% elected to participate in the study and completed initial assessments. All but seven children participated in the follow-up assessment at the end of kindergarten (96% retention). Comparison of the seven children who were missing in kindergarten with the 157 children who remained in the study revealed no significant differences on any of the preschool study measures. All but eight children participated in the follow-up assessment at the end of first grade (95% retention). Comparison of the eight children who were missing in first grade with the 156 children who remained in the study since preschool revealed no significant differences on any of the preschool study measures. Participants transitioned from the original 22 Head Start classrooms into 113 kindergarten classrooms in 53 schools and then into 121 first-grade classrooms in 55 schools.

Data Collection Procedures

Data collection for this study occurred in the spring of preschool, kindergarten, and first-grade years. Classroom observations of teacher support, management, and discipline were conducted in March and April of the kindergarten year by trained research assistants. Kindergarten teachers also responded to a questionnaire about characteristics of the students and resources available in their classrooms. State and federal records provided the student poverty levels as well as each school's performance on standardized academic assessments administered during the spring of each study year. In the spring of the preschool and first-grade years, teachers provided behavioral and academic performance ratings of the participating children in their classrooms. A research assistant met with the teachers of participating children to deliver and explain the rating scales and to obtain their informed consent to participate as raters in the study. Teachers then completed the behavioral ratings on their own time and returned them to the project. Teachers were compensated financially for their ratings. Direct child assessments were conducted at school by trained interviewers, in a location outside of the classroom to avoid distractions. Children received school supplies and stickers for their participation. All study procedures complied with the American Psychological Association standards for ethical conduct of research and were approved by the university Institutional Review Board.

Measures

Kindergarten classroom teacher-student interaction quality. Observations in kindergarten classrooms used a validated classroom observation measure, the Classroom Assessment Scoring System (CLASS; La Paro & Pianta, 2003), to rate each kindergarten classroom on 10 dimensions of teacher-student interaction quality. Research assistants, trained by certified CLASS trainers, visited each kindergar-

ten classroom and conducted four 20-minute observation sessions (usually over a period of 2–3 hours in one day), resulting in a total observation time of 80 minutes for each classroom. At the end of each 20-minute observation session, each rater used a 7-point Likert scale to assess the overall quality of teacher-student interactions during that session. The ratings for each item were averaged across the four sessions (Pianta et al., 2002). The use of global ratings of classroom processes observed during one day captures characteristics of the classroom environment and teaching style that are typically stable within teachers and thus stable across time and situations (Hamre et al., 2013). The Instructional Support subscale included five items assessing instructional behaviors, activities used to encourage learning engagement and critical thinking, the provision of quality feedback, and language modeling, which were averaged to create a total score ($\alpha = .90$). The Emotional Support subscale included five items assessing positive climate, negative climate (reverse coded), teacher sensitivity, overcontrol (reverse coded), and behavior management ($\alpha = .86$), which were averaged to form an Emotional Support score for each classroom.

Observers also used the Teacher Style Rating Scale (TSRS; Domitrovich, Cortes, & Greenberg, 2000) to rate the teachers' classroom management and positive discipline. After completing the CLASS ratings, observers rated the teacher's style of behavior management on six items, including classroom management (e.g., the teacher's preparedness, use of consistent routines, and limit setting) and positive discipline (e.g., the teachers' use of specific praise and redirection, as well as absence of negative behavior management). The observers used a 5-point Likert scale, with ratings ranging from "almost never" to "almost always," and the six items were averaged to form a management/discipline score ($\alpha = .86$).

Research assistants were required to attain 80% reliability with a training videotape on all items of both measures before collecting data. All observations were conducted live in the classroom. To avoid observer drift, spot checks were held throughout data collection. A master coder (e.g., a senior research staff member trained and certified as a CLASS trainer by the CLASS developers) attended 20% of the classroom observations and coded them independently. For 88% of the ratings in this study, research assistants scored within one scale point of this master coder. Overall interrater reliability, calculated as an intraclass correlation coefficient, was .76, which was comparable to the reliability found in other studies using the CLASS in kindergarten (e.g., La Paro et al., 2009).

Indices of school-level adversity. Federal and state records were used to identify the percentage of students who qualified for free or reduced-price lunch at each of the elementary schools that participating students attended. Standardized test scores for students in each school were obtained from state records. The scores for the lowest grade level available were the third-grade test scores, which were used to calculate the percentage of children in each school who performed "below basic" on standardized assessments of math and reading proficiency.

Child outcomes. To assess aggressive-disruptive behavior, first-grade teachers completed seven items from the Teacher Observation of Child Adaptation—Revised (TOCA-R; Werthamer-Larsson et al., 1991) describing aggression and disruptive behavior (e.g., stubborn, yells, fights). All items were rated on a 6-point Likert scale, with response options ranging from "almost never" to "almost always," and averaged to form an aggression score ($\alpha = .94$).

To assess social competence, first-grade teachers completed the Social Competence Scale (CPPRG, 1995), which included 13 items assessing prosocial behaviors (e.g., sharing, understanding others' feelings) and emotion regulation (e.g., can calm down when excited or upset). All items were rated on a 6-point Likert scale, with response options ranging from "almost never" to "almost always," and averaged to form a social competence score ($\alpha = .83$).

To assess academic performance, first-grade teachers rated the child's math, reading, and writing skills as well as general academic functioning and likelihood of proceeding to the next grade, using five items compiled for the Head Start REDI (Research-Based, Developmentally Informed) project (Bierman et al., 2008). All items were rated on a 5-point Likert scale, with response options ranging from "near the very bottom of your class" to "near the very top of your class," and averaged to form an academic performance score ($\alpha = .93$).

To assess literacy skills in first grade, the Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotte, 1999) was administered to children. The TOWRE includes two subscales, the Sight Word Efficiency subscale, which measured the number of words read accurately within 45 seconds, and the Phonemic Decoding Efficiency subscale, which measured the number of nonwords sounded out accurately within 45 seconds (test-retest reliability reported by the developers of .85 to .90). Children's age-normed standard scores on these two subscales were averaged to form a literacy skill composite ($r = .80$).

To assess math skills in first grade, the Applied Problems subtest of the Woodcock-Johnson Tests of Achievement III—Revised (Woodcock, McGrew, & Mather, 2001) provided a nationally normed, standardized test of mathematical skills (e.g., showing two fingers, counting objects, adding or subtracting small numbers). There are 39 items, which were administered orally with visual stimuli, and test administration was discontinued after six consecutive incorrect answers (test-retest reliability reported by the developers of .81 to .94). The total number of correct answers was converted to an age-normed standard score.

Baseline child functioning. To control for child differences prior to kindergarten, preschool measures of each child outcome were included in analyses. For the behavioral ratings, both lead and assistant Head Start teachers provided ratings, and these ratings were averaged, using the same measure used in first grade (correlations between lead and assistant teacher ratings: aggression $r = .69$; social competence $r = .56$). Given the rapid development of emergent literacy skills, a different set of measures was used to assess baseline emergent literacy skills in preschool. In the spring of the preschool year, two subtests from the Test of Preschool Early Literacy (TOPEL; previously labeled the Pre-CTOPP; Lonigan, Wagner, Torgesen, & Rashotte, 2007) assessing emergent literacy skills were administered. In addition, preschool measures of vocabulary (EOWPVT; Brownell, 2000) and executive functioning (Walk-a-Line Slowly; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996; Peg Tapping; Diamond & Taylor, 1996; Backward Word Span; Davis & Pratt, 1995; Adapted Leiter-R Assessor Report; Smith-Donald, Raver, Hayes, & Richardson, 2007) were included in analyses to control for differences in cognitive ability prior to kindergarten.

Characteristics of the kindergarten classroom. Kindergarten teachers responded to a questionnaire describing the characteristics of the students in their classrooms

(number of students in the class likely to repeat kindergarten, number of ethnic minority students in the class) as well as class size and the presence of a teacher's aide (coded 0 = no classroom aide; 1 = 1 part-time classroom aide; 2 = 1 full-time classroom aide).

Results

Means and standard deviations for study variables are presented in Table 1. Head Start children in this study experienced a wide range of kindergarten classrooms and school-level risks when they entered elementary school. Although all children in this sample attended Head Start and were from low-income families, they attended elementary schools with school-wide student poverty levels ranging from 0% to 93% (based on the number of students qualifying for free or reduced-price lunch). The average was 50% of the student body qualifying for free or reduced-price lunch, which was slightly below the national average of 59% during the same school years. School-wide student achievement levels also varied considerably among the schools that Head Start children attended in this study, with the percentage of students performing below basic in math and reading ranging from 0% to 38%, and averaging 11%, which was also the state average during the same school years.

Correlations among study variables are presented in Table 2. There were stronger correlations within classroom-level variables and within school-level variables, although correlations between several classroom-level and school-level variables were also significant. Four out of five indices of the quality of teacher-student interactions in the kindergarten classroom were significantly associated with each other ($r = -.20$ to $.78$, $p < .05$), whereas school-level poverty was associated only with instructional support and school-level achievement. Many of the characteristics of the kindergarten classrooms (e.g., class size, the percent of minority students, the availability of a classroom aide) were also significantly associated with school-level poverty and school achievement ($r = .20$ to $.72$, $p < .05$), but not with classroom-level teacher-student interaction quality. In general, preschool child behaviors were not associated with kindergarten context, suggesting that child functioning in Head Start was not related to the quality of elementary school or kindergarten classroom the child subsequently experienced.

Latent Profile Analysis

To identify different patterns of elementary school and classroom contexts in kindergarten, Latent Profile Analysis (LPA) was applied using Mplus version 7.11 (Muthén & Muthén, 2012). To determine the appropriate number of latent profiles, the one profile solution was first tested, and then additional classes were modeled consecutively and examined for model fit (Lanza, Collins, Lemmon, & Schafer, 2007). The fit indices for the first six models are presented in Table 3. The fit indices (AIC, BIC, a-BIC) decreased with each additional profile, and when the fit indices were plotted, the amount of decrease flattened after the five-profile solution (Foti, Bray, Thompson, & Allgood, 2012). Therefore, the interpretability and entropy of three-, four-, and five-profile solutions were examined, and the model with four

Table 1. Means, Standard Deviations, and Ranges for All Variables

Variable	Preschool			Kindergarten			First grade		
	N	M (SD)	Range	N	M (SD)	Range	N	M (SD)	Range
K context:									
Instructional support	—	—	—	153	3.03 (.88)	.90–5.45	—	—	—
Emotional support	—	—	—	153	5.22 (.70)	3.25–6.40	—	—	—
Class management	—	—	—	153	3.33 (.63)	1.67–4.00	—	—	—
% school poverty	—	—	—	148	50 (27)	0–93	—	—	—
% school low achievement	—	—	—	148	11 (8)	0–38	—	—	—
K classroom characteristics:									
Class size	—	—	—	154	19.78 (2.96)	12–28	—	—	—
% likely to repeat	—	—	—	152	4.6 (5)	0–25	—	—	—
% minority students	—	—	—	154	30 (35)	0–100	—	—	—
Classroom aide	—	—	—	153	27% PT; 21% FT	—	—	—	—
Child functioning:									
Aggression	161	2.07 (.89)	1.00–5.14	—	—	—	154	1.95 (.85)	1.00–5.00
Social competence	161	3.98 (.88)	1.62–5.92	—	—	—	154	4.04 (.99)	1.85–6.00
Academic performance	—	—	—	—	—	—	154	2.83 (1.10)	1.00–5.00
Literacy skills[a]	158	11.32 (3.4)	3–19	—	—	—	156	97.24 (10.9)	73.5–129
Math skills	156	97.21 (11.2)	68–128	—	—	—	156	100.56 (11.7)	59–137

Note.—PT = part-time aide; FT = full-time aide.

[a] Pre-K literacy total score on TOPEL subtests; first-grade literacy standard score on TOWRE subtests.

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Table 2. Correlations among Variables Within and Across Time

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
K context:																	
1. Instructional support	—																
2. Emotional support	.47**	—															
3. Classroom management	.50**	.78**	—														
4. School poverty	.19*	-.07	-.08	—													
5. School low achievement	.26**	-.20*	-.24**	.45**	—												
K classroom characteristics:																	
6. Class size	.08	-.10	-.06	.32**	.47**	—											
7. % likely to repeat	.03	.02	-.09	.20*	.40**	.16	—										
8. % minority students	.15+	-.10	-.12	.45**	.72**	.41**	.28**	—									
9. Classroom aide	.16*	.14	.11	-.36**	-.11	.05	.04	-.13	—								
Child functioning:																	
10. Pre-K aggression	-.12	.02	.01	-.06	-.08	.08	-.03	-.09	-.02	—							
11. Pre-K social competence	.24**	.13	.10	.09	.03	-.05	.04	.09	.00	-.79**	—						
12. Pre-K literacy skills	.11	.02	.06	-.11	.09	.16+	.07	-.08	.06	-.11	.22**	—					
13. Pre-K math skills	-.06	-.09	-.04	-.01	-.19*	-.15+	-.01	-.30**	-.02	-.08	.19*	.41**	—				
14. 1st grade aggression	-.04	-.18*	-.04	.17*	.20*	.07	.08	.06	-.23**	.28**	-.35**	-.06	.04	—			
15. 1st grade social competence	-.03	.18*	.08	-.12	-.18*	-.08	-.15+	-.14	.14+	-.31**	.43**	.14	.07	-.79**	—		
16. 1st grade academic performance	.03	.01	.10	.17*	.10	.05	.03	-.01	-.01	-.10	.27**	.40**	.39**	-.14+	.32**	—	
17. 1st grade literacy skills	.20*	.06	.15+	.04	-.03	-.10	.06	-.16*	.01	-.21*	.26**	.26**	.34**	-.03	.08	.56**	—
18. 1st grade math skills	-.01	-.09	-.01	-.08	.01	-.06	.06	-.18*	.01	-.11	.20*	.40**	.57**	.02	.03	.48**	.43**

Note.—In correlations with kindergarten context and first-grade outcomes, pre-K scores are partialed out.

+ $p < .10$.

* $p < .05$.

** $p < .01$.

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Table 3. Fit Indices for Latent Profile Analysis Models

No. of Profiles	Free Parameters	Log-likelihood	AIC	BIC	a-BIC	Entropy
1	10	−1,710.66	3,441.31	3,471.62	3,439.97	−
2	16	−1,624.12	3,280.23	3,328.72	3,278.08	.88
3	22	−1,589.70	3,223.39	3,290.06	3,220.43	.84
4	28	−1,567.99	3,191.98	3,276.83	3,188.21	.90
5	34	−1,540.52	3,149.03	3,252.07	3,144.45	.87
6	40	−1,526.74	3,133.49	3,254.70	3,128.10	.94

Note.—AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; a-BIC = sample-size-adjusted BIC.

latent classes was selected based on the greatest interpretability and entropy value closest to 1, indicating distinct latent classes.

The mean values for the kindergarten context measures characterizing each of the four latent profiles are presented in Table 4. The most prevalent profile, labeled *high classroom quality, low school risk* (prevalence = 35% of children in the sample), was characterized by high-quality teacher-student interactions (instructional feedback, positive emotional climate, and proactive management) and low rates of school-level adversity, which were below the average for this sample and also below state and national averages for these school-level indicators of risk (35% qualified for free/reduced-price lunch, and fewer than 10% were "below basic" academically). A second profile, labeled *high classroom quality, high school risk* (prevalence = 21% of the sample), was characterized by high-quality teacher-student interactions that were similar to the first profile, but notably elevated rates of school-level adversity, including 85% of students qualifying for free/reduced-price lunch and 16% in the "below basic" range academically, which were well above the state and national averages of school-level adversity. A third profile, labeled *low classroom quality, low school risk* (prevalence = 27% of the sample), was characterized by low levels of instructional support, emotional support, and classroom management, as well as low levels of school adversity, with 37% of students qualifying for reduced-price/free lunch and 9% in the "below basic" range academically. Finally, a fourth profile, labeled *low classroom quality, high school risk* (prevalence = 17% of the sample), was characterized by risky levels in both domains of poor-quality teacher-student interactions (low levels of instructional support, emotional support, and classroom management) and high levels of school adversity (89% of students qualified for free/reduced-price lunch and 24% "below basic" academically). Different profiles were present within schools so that both high-quality and low-quality classrooms could exist within the same school.

Next, children were assigned to one of the four latent profiles using the posterior probabilities. This allowed us to compare the first-grade outcomes of students who experienced different profiles of kindergarten context. Independent *t* tests were used because of unequal numbers of children across the subgroups and unequal variances (Glass, Peckham, & Sanders, 1972; Stapleton, Turrisi, Hillhouse, Robinson, & Abar, 2010) and this study's focus on individual contrasts between subgroups (Keselman et al., 1998). Estimated marginal means for each subgroup and significant group differences are presented in Table 5. Comparisons of the four subgroups yielded no significant differences on any preschool child characteristics,

Table 4. Raw Means of Kindergarten Context Measures for Each Latent Profile

	Profile 1: High Classroom Quality, Low School Risk (N = 54)	Profile 2: High Classroom Quality, High School Risk (N = 32)	Profile 3: Low Classroom Quality, Low School Risk (N = 41)	Profile 4: Low Classroom Quality, High School Risk (N = 26)
% of sample	35	21	27	17
Mean (SD):				
Instructional support	3.22 (.78)	3.59 (.90)	2.27 (.59)	2.84 (.63)
Emotional support	5.59 (.40)	5.56 (.39)	4.48 (.61)	4.40 (.50)
Classroom management	3.70 (.28)	3.67 (.29)	2.65 (.46)	2.35 (.41)
School poverty	35.48 (15.61)	85.13 (8.60)	37.40 (17.88)	88.53 (5.60)
School low achievement	7.75 (4.66)	16.24 (6.47)	8.91 (6.30)	23.53 (5.75)

Note.—School poverty represents the percentage of students at the school qualifying for free/reduced-price lunch. School low achievement represents the percentage of students at the school scoring "below basic" on standardized tests of math and reading.

Table 5. Mean (*SD*) Differences in Classroom Characteristics and Child Outcomes for the Four Latent Profiles

	Profile 1: High Classroom Quality, Low School Risk	Profile 2: High Classroom Quality, High School Risk	Profile 3: Low Classroom Quality, Low School Risk	Profile 4: Low Classroom Quality, High School Risk
K classroom characteristics:				
% students likely to repeat	.04 (.01)$_a$	.07 (.01)$_b$	.04 (.01)$_a$	.07 (.01)$_b$
% minority students	.14 (.03)$_a$	.63 (.05)$_b$	.20 (.04)$_a$	.76 (.07)$_b$
Class size	18.93 (.29)$_a$	21.43 (.45)$_b$	18.97 (.41)$_a$	23.84 (.68)$_c$
Have classroom aide	.92 (.10)$_a$	.73 (.15)$_{a,b}$	.83 (.14)$_a$	.23 (.23)$_b$
1st grade child outcomes:				
Aggression	1.82 (.10)$_a$	1.96 (.15)$_a$	1.91 (.13)$_a$	2.58 (.23)$_b$
Social competence	4.11 (.11)$_a$	4.09 (.17)$_a$	4.09 (.15)$_a$	3.41 (.26)$_b$
Academic performance	2.77 (.11)$_{a,b}$	3.15 (.18)$_a$	2.53 (.16)$_b$	2.75 (.27)$_{a,b}$
Literacy skills	98.54 (1.13)$_a$	97.83 (1.82)$_{a,b}$	94.22 (1.61)$_b$	96.12 (2.73)$_{a,b}$
Math skills	100.57 (1.07)	100.60 (1.71)	100.38 (1.53)	103.41 (2.58)

Note.—Effects controlled for child age, sex, race, and baseline functioning. Means with different subscripts are significantly different $p < .05$.

except for race. Minority students were concentrated in profiles 2 and 4, reflecting that they were more likely to attend high-risk schools than low-risk schools. However, minority status was not significantly associated with quality of teacher-student interactions in those schools, and minority students were fairly evenly divided across the two high-risk school profiles that varied in classroom quality. To validate the profiles, they were then compared on several independent dimensions of structural resources (e.g., class size, classroom aide) and student academic progress (e.g., teacher estimates of the number of students likely to repeat kindergarten). As shown in Table 5, kindergarten classrooms in schools with lower levels of adversity (profiles 1 and 3) were more likely to have a smaller class size and to have a classroom aide, and teachers expected about 4% of the students to repeat kindergarten. In contrast, kindergarten classrooms characterized by low-quality teacher-student interactions and high school level adversity (profile 4) had the largest class sizes and were least likely to have a classroom aide. Teachers in these classrooms expected almost twice as many children (7%) to repeat kindergarten.

First-Grade Outcomes for Children Experiencing Different Kindergarten Contexts

Next, teacher-rated social behavior in first grade was compared for students who experienced the different profiles of kindergarten context, controlling for baseline levels of social behavior at the end of Head Start. These analyses reflect change in social behavior that occurred during the kindergarten year and was still evident in first grade. As shown in Table 5, children who experienced the profile characterized by low teacher-student interaction quality and high school adversity (profile 4) showed significantly lower levels of social competence and higher levels of aggressive behavior in first grade than children experiencing any other profile of kindergarten context. These findings suggest a cumulative model of risk in which the combination of poor quality in both classroom-level and school-level indices of contextual risk are associated with decreased behavioral adjustment in early elementary school.

In terms of associations with child academic achievement measured in first grade, children who experienced kindergarten contexts that included high-quality teacher-student interactions were at an advantage, even when controlling for baseline levels of academic achievement at the end of Head Start. Teacher-rated academic performance was highest for children in profile 2, *high classroom quality, high school risk* and lowest for children in profile 3, *low classroom quality, low school risk.* Literacy skills were highest for children in profile 1, *high classroom quality, low school risk* and lowest for children in profile 3, *low classroom quality, low school risk.* In both cases, the differences between the academic outcomes of children experiencing profiles with the highest and lowest scores were significantly different, and the other scores were intermediate in value.

Discussion

Although children who attend Head Start are generally more likely than their more advantaged peers to enroll in lower quality schools (Currie & Thomas, 2000; Lee &

Loeb, 1995), there is variability in the quality of their school experiences (Bierman et al., 2014). Both the quality of the teacher-student interactions in the classroom and school-level adversity may affect the adjustment and progress of Head Start children upon entry into elementary school; this study was one of the first to examine these two aspects of kindergarten context concurrently. Latent profile analyses identified four distinct kindergarten contexts that were associated with child behavioral and academic outcomes in first grade, controlling for child characteristics at the end of Head Start.

The four profiles of kindergarten context varied along dimensions of teacher-student interaction quality (classroom-level risks) and student body adversity (school-level risks). Approximately one-third of the sample experienced high-quality classrooms in low-risk schools, confirming that some Head Start children experience positive kindergarten contexts. At the other end of the spectrum, almost one-fifth of the sample experienced the most adverse kindergarten contexts, characterized by low-quality classrooms in high-risk schools. Other children entered kindergartens characterized by mixed profiles, with about one-fourth of the sample entering low-quality classrooms in low-risk schools, and about one-fifth of the sample entering high-quality classrooms in high-risk schools. Although low-quality teacher-student interactions are more common in schools that serve many low-income children (Pianta et al., 2002), the correlations are modest. Indeed, the profiles that emerged in this study illustrate that schools that serve a lower risk student population (low levels of student poverty and academic failure) may still contain classrooms that are characterized by low-quality teacher-student interactions, and conversely, there are good teachers creating classrooms characterized by high-quality teacher-student interactions in high-risk schools that serve many low-income and low-achieving students. These findings demonstrate the necessity of considering both classroom-level and school-level factors when characterizing the kindergarten experiences of Head Start children, particularly given their associations with cumulative and differential effects on child outcomes.

Behavioral Outcomes

In this study, the behavioral and academic characteristics of children at the end of Head Start did not have a significant influence on the profile of kindergarten context they subsequently experienced. Head Start was organized at the county level, and elementary school assignment was based on local residence, creating a situation in which this Head Start sample dispersed into a wide range of elementary schools and kindergarten classrooms. Controlling for child characteristics at the end of Head Start, significant differences in behavioral outcomes (aggression and social competence) were evident in first grade, with children who had experienced low-quality kindergarten classrooms in high-risk schools displaying the worst behaviors in first grade, compared to children who experienced other kindergarten contexts.

There is extensive research on the detrimental effects of school and classroom contexts on outcomes, and this the first study we know of that examined effects of both levels of kindergarten context simultaneously for Head Start children. The quality of teacher-student interactions may influence student social competence

and aggression in two ways. First, emotionally supportive classrooms characterized by positive behavioral management may help children learn aggression control by providing models and positive reinforcement for appropriate interactions, and organizing activities in a way that scaffolds self-control and reduces disruptive behaviors (Rimm-Kaufman et al., 2009). Second, teachers may also have an indirect influence on student social behavior via their impact on peers. That is, the quality of teacher-student interactions affects the classroom as a whole and thus may contribute to peer norms and peer contagion within classrooms, which in turn affect prosocial and aggressive-disruptive behaviors (Barth, Dunlap, Dane, Lochman, & Wells, 2004). Classrooms that are characterized by well-mannered peers and by organized class rules and routines may provide clear expectations and models for adaptive classroom behaviors supporting the development of positive social and self-regulation skills, and conversely offer few distractions to interfere with learning engagement and low levels of peer deviant support for aggression (Pianta et al., 2008; Thomas et al., 2008). The findings are consistent with social setting theory (Tseng & Seidman, 2007), which emphasizes the importance of children's exposure to the interactions that the teacher has with other students as well as interactions among peers in the classroom as contextual influences on their social behavior and engagement in learning.

The impact on social competence and aggression appeared greatest for children who experienced the dual elevated risk of poor classroom quality interactions and elevated levels of school-level student body risk. The indices of school-level risk used in this study (e.g., percent of the school's students who are low-income and low-achieving) may also be associated with peer norms that undermine adaptive learning behaviors. For example, in schools serving a high proportion of low-income and low-achieving students, higher rates of student aggressive-disruptive behavior may create peer norms that are more accepting of aggression, relative to schools with a greater proportion of students who avoid aggression (Mercer, McMillen, & DeRosier, 2009). In addition to the influence of peer norms, there is extensive research on peer contagion and the negative effects of exposure to problematic peer behaviors on social-emotional development (e.g., Gifford-Smith, Dishion, Dodge, & McCord, 2005). Peer contagion is a broad term associated with deviancy training, in which peers model, provoke, and reinforce problematic behaviors (Snyder et al., 2005). For example, in a school serving socioeconomically disadvantaged students, Snyder and colleagues (2005) demonstrated growth in conduct problems for kindergarten children exposed to peer interactions characterized by deviant talk and role taking. Although this study cannot determine the specific mechanisms that account for the observed effects, the findings suggest that classroom teacher-student interaction quality and school-level risks function cumulatively to affect behavioral outcomes, with Head Start students who experience dual-risk kindergarten contexts (low-quality classrooms, high-risk schools) showing the greatest behavioral difficulties.

Academic Outcomes

It is less clear how different profiles of kindergarten context were associated with academic outcomes. Children in profile 3 (low-quality classroom, low-risk school) had significantly worse literacy outcomes than children in profile 1 (high-quality

classroom, low-risk school) and academic performance outcomes than children in profile 2 (high-quality classroom, high-risk school), suggesting that the quality of teacher-student interactions in the classroom may have a greater impact on academic outcomes than school-level risks. The quality of instructional support was lowest for children in profile 3, indicating that low-quality instructional support may have detrimental effects on learning behaviors and academic knowledge acquisition that carries forward into first grade. In contrast to findings for behavioral outcomes, however, children in dual-risk profile (profile 4) did not display the lowest academic abilities in first grade. On average, children in profile 4 demonstrated academic outcomes that were above but not significantly different from the academic outcomes of children with the lowest instructional support (profile 3). In addition, no differences associated with kindergarten context emerged for math outcomes.

There may have been other factors not studied here that contributed to the mixed findings for academic outcomes. For example, research on tracking or ability grouping of students with other low-achieving peers reveals that tracking children into lower ability groups increases the academic and behavioral achievement gap between disadvantaged and advantaged children (Carbonaro, 2005), perhaps due to lowered academic expectations, less cognitively demanding work, or fewer peer supports. In addition, the amount of time spent on academic instruction, quality of the curriculum, and complexity of academic content may all affect student academic progress (Claessens, Engel, & Curran, 2014). These factors were not examined in the present study and deserve attention in future research. Interestingly, findings from one of the largest studies of elementary school teaching (MET project; Kane & Staiger, 2012) found that measures of content-specific instruction were moderately to highly correlated with general observations of teacher-student interactions, including the CLASS. Additional research is needed to better understand the roles of kindergarten curriculum content, student grouping, and teacher-student instructional quality in promoting positive academic outcomes for economically disadvantaged children.

Correlates of High-Risk Schools

The measures used to assess risk at the classroom level in this study were specifically focused on the quality of observed teacher-student interactions, which may have a very proximal impact on the day-to-day instructional and social-emotional experiences of young children (Rimm-Kaufman et al., 2009). The measures used to assess risk at the school level in this study included characteristics of the student body percent of children qualifying for free/reduced-price lunch and percent falling "below basic" in academic testing at third grade. There may be several different mechanisms of action that account for the effects of these school-level risks. For example, findings from this study revealed that in the profile classes that were characterized by high-risk schools (profiles 2 and 4), kindergarten classrooms were more likely to have racial/ethnic minority status students, and more students likely to be retained in grade. These descriptive characteristics are consistent with findings that minority children and low-performing students are more likely to be concentrated in schools that serve economically disadvantaged communities (Pianta et al., 2002). High-risk schools may have a negative impact on student adjustment or pro-

gress because they reflect risk characteristics of the communities they serve, such that children in these communities are more often exposed to community disorganization, family instability, violence, and other stressors associated with poverty (McCoy et al., 2013; Raver et al., 2013). Another possibility, noted above, is that student progress is affected by peer influences, either because a high density of high-risk peers contributes to more disruptive classrooms that encourage aggressive-disruptive behavior (Kellam et al., 1998; Thomas et al., 2008) or because students learn more when they are with peers who have higher levels of competencies (Mashburn, Justice, Downer, & Pianta, 2009).

In addition, in this study, higher risk schools (e.g., those serving a higher proportion of low-income and low-achieving students) were more likely to have larger kindergarten class sizes, which is consistent with prior findings (Ehrenberg et al., 2001; NICHD ECCRN, 2002; Stuhlman & Pianta, 2009). In this study, the largest class sizes were in the profile characterized by both high-risk schools and low-quality classrooms, suggesting that large class sizes may undermine the quality of teacher-student interactions. In addition, classroom aides were least likely to be present in classrooms of low quality in high-risk schools, further increasing the adult-to-child ratio in the classroom. Particularly in schools serving children facing greater adversity, smaller class sizes and classroom aides may allow teachers to spend more time on individualized instruction and emotional support, rather than behavior management, which is a greater problem in high-risk schools (Ehrenberg et al., 2001). When the class size is large in a high-risk school and there is no aide, the teacher may engage in more teacher-directed activities, fewer positive teacher-student interactions, and lower levels of instructional support (Blatchford, Moriarty, Edmonds, & Martin, 2002; NICHD ECCRN 2004). Some schools have decreased class size as a strategy to improve student outcomes (Ehrenberg et al., 2001).

In this study, we are not able to determine the specific mechanism that accounts for the associations found in child outcomes for children attending high-risk schools (profiles 2 and 4) relative to low-risk schools (profiles 1 and 3), and whether these differences reflect community influences, peer influences, differences in resources, classroom size, and adult-to-child ratio, or other factors. However, the findings suggest the importance of further research on these factors as they appear to influence student progress in ways that add to the influence associated with classroom teacher-student interaction quality.

It is notable that, in this study, approximately similar numbers of children in the Head Start sample were likely to enter high-risk schools and experience high-quality teacher-student interactions (21%) and to enter high-risk schools and experience low-quality teacher-student interactions (17%). These findings contrast with Stuhlman and Pianta (2009), who found that lower quality classrooms were more likely when schools served many low-performing students. Our findings suggest that some teachers are able to create classrooms that support diverse learners even in the context of a student body facing a high level of adversity in a poorly resourced school.

Strengths and Limitations

The use of a person-centered approach (LPA) was a strength of this study, which allowed for the identification of subgroups of Head Start attendees who experienced

different kindergarten contexts based on multiple indicators of classroom-level and school-level characteristics. The longitudinal design of this study allowed for control of individual child characteristics at the end of Head Start before the transition into kindergarten, providing more support for the hypothesis that kindergarten context affected their developmental progress. Even so, it is not possible to draw causal inferences on the basis of longitudinal associations. In addition, the first-grade outcomes studied here were likely affected by classroom or school contexts experienced during the first-grade year, which were not included in this study. We chose to focus on the kindergarten context because of the importance of the initial school experience, and we explored the persistence of effects on child outcomes one year later. This strategy may have reduced the magnitude of school context effects evident during the kindergarten year, but it provides a very conservative estimate of sustained effects associated with different kindergarten experiences.

Although this study used empirically supported and validated observation measures of teacher-student interaction quality (CLASS and TSRS) and followed recommended protocols to maintain sufficient reliability among observers, there was still some variability in observer ratings, which serves as a limitation. The classroom measures used in this study assessed overall teacher-student interaction quality in the classroom, but it is possible that an individual child's experience is different from the general quality of teacher-student interactions. Also, this study focused on instructional teacher-student interaction quality and did not assess curriculum content, which may provide independent contributions to academic outcomes.

Another limitation of the study is that there are school context variables that were not measured in this study. For example, multiple aspects of school context (e.g., safety, school connectedness, leadership) were not studied here and might affect student behavioral adjustment or academic progress. Finally, this study focused on the kindergarten experiences of Head Start attendees, so findings may not generalize to all children.

Implications and Future Directions

Children growing up in poverty often lack the social-emotional and cognitive skills necessary to engage in learning (Blair, 2002; Rimm-Kaufman et al., 2000), so Head Start was designed to provide early educational enrichment to low-income children to help close the socioeconomic gap in school readiness and later educational attainment (ACF, 2010). A number of studies have demonstrated significant benefits for children who attend Head Start in preschool, but these gains typically fade in the early elementary years (ACF, 2010; Currie & Thomas, 2000; Lee & Loeb, 1995). A key hypothesis is that early gains fade out when Head Start children attend low-quality elementary schools that fail to support sustained academic progress or positive behavioral adjustment (Lee & Loeb, 1995).

Findings from this study demonstrate the variability in kindergarten contexts that Head Start children experience after preschool enrollment, and the associations of these contexts with behavioral and academic outcomes in the early elementary school years. Initial kindergarten classroom and school experiences may play a critical role in setting the trajectory of social-emotional functioning and achievement that affects later school attainment. Further exploration of the gains made during

the Head Start preschool program and effects of subsequent elementary school experiences are warranted. Understanding how both school-level and classroom-level factors are associated with the elementary school progress of low-income children after attending Head Start preschool may inform support strategies at both levels that can help sustain early intervention effects and reduce the socioeconomic gap in educational attainment.

Note

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