Appendix A:
Methodology for the Analyses

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This appendix describes the data sources, samples included in the analysis, and analytic approach for the set of analyses in this report, as well the approach used to address missing data issues. For additional information about data collection procedures and observer training, see the Baby FACES 2018 Data Tables.[1]

Data sources and measures used in the analyses

The current analyses used cross-sectional data collected in spring 2018 from multiple sources, including surveys with program and center directors, teachers, and parents; teachers child reports; and observations of classrooms. Exhibit A.1 provides an overview of the measures used to describe the overall quality in Early Head Start classrooms; those used in the multivariate models to examine the factors associated with teacher–child relationship quality, and the associations of teacher–child relationship quality and child outcomes.

Exhibit A.1. Overview of key measures used for the analysis

Measure	Brief description of measure	Descriptions of classroom quality	Associated with relationship quality (RQ4)	Quality-outcomes associations (RQ5)
Child and family characteristics and child outcomes				
Child and family characteristics	The parent survey included information about family and child characteristics, such as the child's age, gender, race and ethnicity, family income, and languages spoken in the home.			X
Family demographic risk index	The family demographic risk index captures the multiple dimensions of the risk of poor developmental outcomes that children may face as a consequence of their mother's socioeconomic circumstances. The index comprises three risk groups: low (0–2 risks), moderate (3 risks), and high (4–5 risks). The index is constructed by summing the number from the following risk factors (based on the parent survey) that the mother faced: (1) being a teenage mother, (2) having no high school credential, (3) receiving public assistance, (4) not being employed or in school or training, and (5) being a single mother.			X
The Brief Infant Toddler Social Emotional Assessment (BITSEA),[2] teacher reports	The BITSEA, which is reported by teachers, is the screener version of the longer ITSEA, which is designed to detect delays in the acquisition of social and emotional competencies as well as social and emotional and behavior problems in children age 12 months to 36 months.			X
MacArthur-Bates Communicative Development Inventories (CDI),[3] teacher reports	The CDI, which is reported by teachers, assesses children's early receptive and expressive language and communication skills in English using different age forms. We added selected items from each form to the adjacent age forms and used an item response theory approach to estimate children's scores on the same scale across the different forms.			X
Teacher–child relationship quality				
Classroom Assessment Scoring System (CLASS-Infant)[4] or CLASS-Toddler[5]	The CLASS-Infant and CLASS-Toddler focus on the quality of teacher–child interactions in classrooms where infants and toddlers are cared for. Two trained observers rated classroom quality for each classroom during the same observation period. with one observer using the CLASS, and the other observer using the Q-CCIIT. The CLASS-Toddler has two domains: (1) Engaged Support for Learning, with dimensions for Facilitation of Learning and Development, Quality of Feedback, and Language Modeling, and (2) Emotional and Behavioral Support, with dimensions for Positive and Negative Climate, Teacher Sensitivity, Regard for Children's Perspectives, and Behavior Guidance. The CLASS-Infant includes only one domain for Responsive Caregiving, with dimensions for Sensitivity, Language Stimulation, Scaffolding, and Relational Climate.	X	X	X
Quality of Caregiver-Child Interactions with Infants and Toddlers (Q-CCIIT)[6]	The Q-CCIIT assesses the quality of caregiver-child interactions for infants and toddlers in non-parental care settings and includes three domains: Support for Social-Emotional Development (for example, responding to emotional cues); Support for Cognitive Development (for example, supporting object exploration); and Support for Language and Literacy Development (for example, extending children's language use); as well as Areas of Concern (such as harshness, ignoring children, and health and safety issues).	X	X	X

Exhibit A.1 *(continued)*

Measure	Brief description of measure	Descriptions of classroom quality	Associated with relationship quality (RQ4)	Quality-outcomes associations (RQ5)
Student–Teacher Relationship Scale, Short Form (STRS-SF)[7]	The STRS-SF assesses teachers' perceptions of their relationships with individual children in the classroom and includes two subscales: (1) Closeness and (2) Conflict. The Closeness subscale (eight items) measures the extent to which a teacher believes that his or her relationship with a child is characterized by warmth, affection, and open communication; for example, "I share an affectionate, warm relationship with this child." The Conflict subscale (seven items) assesses the degree to which a teacher believes that his or her relationship with a particular child is characterized by negativity; for example, "This child and I always seem to be struggling with each other." The STRS was originally developed for use with teachers of preschool children and children in the early elementary grades. However, it has been used successfully in other studies to investigate relationships between teachers and infants and toddlers.[8,9]	X	X	
Parent–teacher relationship quality				
Cocaring Relationship Questionnaire-Adapted (CRQ-Adapted)[10]	The CRQ-Adapted measures parent–teacher relationships in infant and toddler classrooms reported by both parents and teachers and captures nuanced aspects of the parent–teacher relationship by providing scores on four dimensions: (1) Support (five items; for example, parent and teacher discuss the best way to meet the child's needs); (2) Endorsement (five items; for example, parent has a lot of patience with his or her child or the teacher believes the child's parent is a good parent); (3) Undermining (four items; for example, parent believes the teacher does not trust his or her abilities, or the teacher tries to show that he or she is better at caring for the child than the parent is); and (4) Agreement (three items for parents and four items for teachers; for example, the parent and teacher have different ideas for raising the child). We used teacher reports in multivariate analysis.	X	X	
National Center for Early Development and Learning (NCEDL) Teacher-Student Report on the Quality of Parent–Teacher Relationship[11]	The NCEDL Quality of Parent–Teacher Relationship measure is a seven-item scale that assesses the teacher's perception of the quality of the relationship that the teacher has with each study child's parent (for example, "How would you describe the degree of trust between you and this child's parents?").	X		
Teacher and classroom characteristics				
Teacher background characteristics	The teacher survey collects information about teachers' background characteristics, including their race and ethnicity, language spoken, years of experience in Early Head Start, education level, degrees in early childhood, and Child Development Associate credentials.	X	X	
Teacher professional development and training	The teacher survey also includes information about the frequency of coaching and whether the teacher has received a lot of support from a coach about teacher–child interactions and training from the program on teacher–child relationships.		X	

Exhibit A.1 *(continued)*

Measure	Brief description of measure	Descriptions of classroom quality	Associated with relationship quality (RQ4)	Quality-outcomes associations (RQ5)
Teacher Beliefs About Infant and Toddler Care and Education[12]	We assessed teacher beliefs using the Teacher Beliefs About Infant and Toddler Care and Education measure, a measure developed by Mathematica for Baby FACES 2018. This 20-item measure includes two subscales, with 10 items in each subscale: (1) teacher beliefs about the importance of relationship and responsiveness (for example, when infants are crying, you should respond to them right away) and (2) teacher beliefs about the role of the adult in child learning (for example, what teachers do with infants and toddlers makes a difference in their development).	X	X	
Teacher Job Satisfaction subscale from the Texas Christian University Survey of Organizational Functioning (TCU SOF)[13]	We included several items from the TCU SOF to assess teachers' satisfaction with their job. Higher scores for the Satisfaction subscales indicate more positive attitudes towards their job.		X	
The Center for Epidemiologic Studies Depression Scale-Revised (CESD-R)[14]	The CESD-R is a 20-item self-administered screening tool to identify symptoms of depression or psychological distress. Teachers reported the frequency of symptoms in the past week or so on a 5-point scale ranging from 0 (less than one day) to 4 (nearly every day for two weeks).		X	
Child-to-adult ratio and group size	Classroom observations collected information about child-to-adult ratios and group size in the classroom. Teachers also reported child-to-adult ratios and group size in the teacher survey. We used the information collected during classroom observations for the multivariate analysis of the CLASS and Q-CCIIT and teacher-reported information for the multivariate analysis of the teacher-reported STRS-SF.	X	X	
Infant versus toddler classroom	This is a binary variable indicating toddler classrooms (as opposed to infant classrooms). Toddler classrooms have a majority of children between the ages of 16 months and 36 months. Infant classrooms have a majority of children who are newborns to 15 months. We used this variable to separate infant versus toddler classrooms for the analysis.	X[a]	X[a]	X[a]
Variety of materials available to children	This is a measure created by the Baby FACES team that uses data collected from classroom observations. It is a count of the types of materials available to children in the classrooms: books, toys for dramatic or pretend play, toys and objects that promote scientific understanding, toys that promote gross motor and large muscle development, toys that promote fine motor development, sensory toys, or art materials. Possible scores of the measure range from 0 to 5.	X	X	
Smooth transitions between activities in the classroom	This measure assesses the nature of transitions between activities in the classrooms using data collected from classroom observations. It is the mean of three items (with rating options ranging from 1 = strongly agree to 6 = strongly disagree): (1) activities flow easily from one to the next, (2) caregivers tell children about the next activity, and (3) the extent to which transitions take a long time. The items are coded so that higher scores indicate more smooth transitions in the classrooms.	X	X	

Exhibit A.1 *(continued)*

Measure	Brief description of measure	Descriptions of classroom quality	Associated with relationship quality (RQ4)	Quality-outcomes associations (RQ5)
How well classroom is organized	This measure is a binary variable indicating whether the classroom is well organized, based on observer ratings of the extent to which children can see and reach toys and materials during the classroom observation (rated as well-organized versus somewhat organized, or not organized).	X	X	
Center characteristics				
Center size	This is the number of EHS children enrolled in the center. This is information collected for the Baby FACES 2018 sampling frame.		X	
Adapted Continuity of Care items[15]	We adapted items from a short instrument used in a recent study by Ruprecht and colleagues (2016) to measure continuity of care in Early Head Start classrooms. We asked center directors about their policies and practices regarding continuity of care—including how frequently children typically transition to new caregivers, whether the caregiver transitions with the children to a new classroom, the number of caregivers involved in caring for the child each day, and responsibility for primary caregiving tasks. We also collected information about group size and child-to-adult ratios from the teacher survey. Responses to each of the five items correspond to scores ranging from 0 to 2 points, with higher scores indicating stronger use of continuity of care practices. Item scores are summed together (for a maximum of 10 possible points) for the Continuity of Care score. A developer defined cutoff score of 6 points (or more) indicates that the center implements continuity of care practices.	X	X	
Program characteristics				
Program option	The program option at the program level is based on directors' reports of the types of services their programs offer (center-based versus multiple approach).		X	
Program size	This is the cumulative enrollment reported by programs in the Office of Head Start (OHS) 2015–2016 Program Information Report (PIR).		X	
Program metropolitan status	Using information in the PIR, we categorized programs as urban if their zip code is part of a metropolitan statistical area (MSA), based on census data updated with annual population estimates. An MSA usually includes one city with 50,000 or more inhabitants and the county that the city falls within. Nearby counties can also be included if they are within commuting distance. All other programs are considered rural or non-MSA.		X	
Program serving more families with high family demographic risks	This is a binary variable indicating a program that serves 25 percent or more of families with more than three demographic risks (see above for family demographic risk).		X	

Exhibit A.1 *(continued)*

Measure	Brief description of measure	Descriptions of classroom quality	Associated with relationship quality (RQ4)	Quality-outcomes associations (RQ5)
Program serving more families with any psychological risks	This is a binary variable indicating a program that serves 25 percent or more of families with any psychological risks based on the family psychological risk index. The family psychological risk index is a measure of cumulative family risk of poor parental mental health and unfavorable family functioning. The number of risks is based on the following measures: (1) depressive symptoms with clinical significance; (2) parenting stress, which indicates a total stress score above the 90th percentile; and (3) substance use problems, which include parent reports of substance abuse in the past year.		X	

[a] This variable is used to split the infant and toddler classrooms.

Analytic sample

Samples for descriptive analyses. These analyses include all children and parents who receive center-based services, teachers or classrooms, centers, and programs with valid data. They are weighted by the appropriate instrument weights to describe the populations in Early Head Start. For example, analyses on variables from the teacher survey are weighted by the teacher survey weight.

Samples for multivariate analyses on the associations of classroom practices and other aspects of classroom quality with observed measures of teacher–child relationship quality. These analyses include a nationally representative sample of 148 infant classrooms in 144 centers from 77 programs and 709 toddler classrooms in 453 centers from 119 programs in Early Head Start that have nonzero weights. These analyses are weighted using the weight class_teacher_obs_wt.

Samples for multivariate analyses on the associations of teacher-reported relationships with children (STRS-SF scores) with classroom practices and other aspects of classroom quality. These analyses include 375 children in 145 infant classrooms in 140 centers from 76 programs and 1,753 children in 690 toddler classrooms in 445 centers from 119 programs. These analyses are weighted using the weight SCR_class_wt.

Samples for multivariate analyses on the associations of teacher–child relationship quality measures with child outcomes. These analyses include 328 children who are at least 8 months old in 143 infant classrooms in 138 centers from 76 programs and 1,740 children who are at least 8 months old in 690 toddler classrooms in 445 centers from 119 programs. These analyses are weighted using the weight SCR_class_wt.

Analytic approach

This report answers the following research questions:

1. Who are the children and families in Early Head Start center-based programs, what services do they receive, and who are their teachers?
2. What is the structural quality of Early Head Start classrooms?
    a. What are the qualifications, teaching experience, and beliefs about infant and toddler care and education of Early Head Start teachers?
    b. What are the features of and practices used in Early Head Start classrooms?
3. What is the quality of teacher–child and parent–teacher interactions and relationships in Early Head Start classrooms?
4. How are classroom practices and other aspects of classroom structural quality associated with teacher–child relationship quality?
5. Is the quality of teacher–child interactions and relationships associated with infant and toddler outcomes?

Descriptive analysis. To address Research Questions 1 to 4, which are descriptive, we calculated descriptive statistics (means and percentages) by using the appropriate analysis weights to account for complex multilevel sampling and unit nonresponse at particular levels. We also calculated the descriptive statistics for variables of interest separately for infant and toddler classrooms when appropriate. Classrooms are categorized as infant classrooms if more than 50 percent of the children in the classroom were younger than 16 months old. In toddler classrooms, 50 percent or more of the children are 16 months old or older.

Analysis on factors associated with teacher–child relationship quality. To address Research Questions 5 and 6, we conducted multilevel models to account for the nested data structure. In these analyses, we implemented multiple imputation with 20 imputed data sets to account for missing data. This process is described in more detail in the multiple imputation section below. The missing data are generally less than 5 percent for most of the variables.

For Research Question 5, we conducted three-level HLM to examine the associations of observed teacher–child relationship quality in Early Head Start classrooms with classroom features and practices; teacher qualifications and experience; and teacher beliefs, mental health, and job satisfaction, while controlling for center and program characteristics. In these analyses, teachers or classrooms (Level 1) are nested within centers (Level 2), and

centers are nested within programs (Level 3). Level 1 includes teacher and classroom characteristics, Level 2 included center characteristics, and Level 3 included program characteristics.

We conducted four-level HLM to examine the associations of teacher-reported teacher–child relationships with the same set of variables, adding one more level (children nested within teachers or classrooms) to account for children nested within teachers or classrooms. Each teacher rated the teacher–child relationship with up to three different children in the sample.

Exhibit A.2 lists the variables (factors examined and covariates controlled for) that were used in these analyses. We conducted these analyses in infant and toddler classrooms separately. All the continuous variables in these analyses were *z*-scored so that the regression coefficients could be interpreted as effect sizes.

Exhibit A.2. Variables for HLM analyses of factors associated with teacher–child interaction and relationship quality

Category of variables	Variables
Dependent variables	CLASS scores, Q-CCIIT scores, teacher-reported STR-SF scores[a]
Teacher variables (Level 1)	**Factors:** Whether the teacher has a bachelor's degree or higher, a degree in early childhood education, a CDA credential; years of experience in Early Head Start; teacher beliefs, job satisfaction, and depressive symptoms (CESD-R scores); teacher-reported parent–teacher relationships (CRQ-Adapted scale scores aggregated to the teacher level); professional development and training (frequency of receiving support from a coach, teacher perception of support provided by coach on teacher–child interactions, teacher received training from program on teacher–child interactions) **Covariates:** Teacher's race and ethnicity, teacher speaks a language other than English
Classroom variables (Level 1)	**Factors:** Child-to-adult ratio in the classroom, group size, variety of materials available to children, smooth transitions between activities in the classroom, and classrooms are well organized[b]
Center variables (Level 2)	**Factor:** Continuity of care practices **Covariate:** Center size
Program variables (Level 3)	**Covariates:** Program approach (center-based versus multiple service options), program size, program metropolitan status, and indicators of whether the program has a high percentage (more than 25 percent) of families who experience multiple demographic risks or who have any psychological risks

[a] Four-level HLMs were used for the models with teacher-reported STRS-SF scores, with children nested within teachers or classrooms.

[b] Other classroom context variables, such as the age of the children in the classroom and the proportion of dual-language learners in the classroom, might also be related to teacher–child relationships. However, information about these variables was not collected in the teacher survey. Further, aggregating these variables from the child level to the classroom level might not be reliable because each classroom only has up to three children sampled. Therefore, we did not include these variables in the models.

CDA = Child Development Associate; CESD-R = Center for Epidemiologic Studies Depression Scale–Revised; CLASS = Classroom Assessment Scoring System; CRQ = Cocaring Relationship Questionnaire; HLM = hierarchical linear modeling; Q-CCIIT = Quality of Caregiver-Child Interactions with Infants and Toddlers; STRS-SF = Student–Teacher Relationship Scale, Short Form.

Analysis on the associations of teacher–child relationship quality and child outcomes. To address Research Question 6, we conducted three-level HLM models, with data on children and families nested within classrooms or teachers and classrooms or teachers nested within programs. We used the analytic approach similar to that used for the Child Care and Early Education Quality Features, Thresholds, and Dosage and Child Outcomes (Q-DOT) project to examine the associations between teacher–child relationship quality and infant and toddler outcomes.[16] We focused on the classroom observation measures of teacher–child relationship quality in these analyses because cut points were available for these measures from developers and previous research. Moreover, aggregating teacher-reported measures of teacher–child relationships might not be reliable because each classroom only has up to three children sampled.

We first used piecewise regression multilevel analyses to test whether the associations between observed teacher–child relationship quality and child outcomes are stronger in higher versus lower quality classrooms, based on the threshold defined by the developer guidelines, literature, and preliminary analyses. For each teacher–child relationship measure, we explored two cut points to define lower quality and higher quality classrooms. Exhibit A.3 shows the different cut points we tried in the piecewise regression models.

Exhibit A.3. Cut points on teacher–child relationship quality measures for piecewise regressions

Teacher–child relationship quality measure	Cut point 1	Cut point 2	Rationale for cut point
CLASS-Infant			
Responsive Caregiving	4	5	Based on distribution of the sores: 74% of infant classrooms ≥ 4 and 30% ≥ 5
CLASS-Toddler			
Emotional and Behavioral Support	5	5.5	Cut point at 5 in Baby FACES 2009 data (75% of toddler classrooms ≥ 5 and 50% ≥ 5.5
Engaged Support for Learning	3.5	4	Cut point at 3-4 in Baby FACES 2009 data (26% of toddler classroom ≥ 3.5 and 13% ≥ 4)
Q-CCIIT			
Support for Social-Emotional Development	4	5	Based on distribution of the sores: 62% of classrooms ≥ 4 and 20% ≥ 5
Support for Cognitive Development	3.5	4	Based on distribution of the sores: 65% of classrooms ≥ 3 and 20% ≥ 4
Support for Language and Literacy Development	3.5	4	Based on distribution of the sores: 62% of classrooms ≥ 3.5 and 37% of classrooms ≥ 4

The piecewise regression model estimates separate linear slopes for lower quality and higher quality classrooms to test whether the association between observed teacher–child relationship quality and child outcomes in lower quality and higher quality classrooms are different. If the two slopes were not statistically different, we then estimated a single slope for observed teacher–child relationship quality to test its linear associations with child outcomes.

The models for these analyses include key demographic characteristics as covariates. Child age, gender, race and ethnicity, dual-language learner status, family demographic risks, and poverty ratio are important variables to consider and control at Level 1 of the models to account, in part, for child and family differences among children who were enrolled in classrooms of different quality.[17] Teacher–child relationship quality variables were included in Level 2.

Multiple imputation of missing data for analytic models

Like most survey studies, Baby FACES experienced missing data due to both unit (participant) nonresponse and item (within participant) nonresponse, which create the potential for bias in the estimates. To address potential bias due to unit nonresponse, we constructed statistical weights and used them in the analytic models. To address potential bias due to item nonresponse, we used multiple imputation for missing data to maximize the number of individuals included in the analytic models.

Extent of missing data. Data on program, center, teacher, child and family, and classroom characteristics for our analyses come from surveys with program and center directors, teachers, and parents; teacher child reports; and observations of classrooms. We assessed the extent of missing data on the variables used in our analytic models by calculating the percentage of programs, centers, teachers, classrooms, or children and families with missing data on each variable. There are varying levels of missingness across variables at different levels, with more missing data at the child and family level. Across program-level variables, we found missing data for up to 3 percent of the programs in the study. Across center-level variables, we found missing data for up to 5 percent of centers. For teacher- and classroom-level variables, we found missing data for up to 3 percent of teachers and classrooms. Finally, for child- and family-level variables, we found missing data for 3 percent to 28 percent of children and families (including both unit and item nonresponse).

The extent of missing data across several instruments suggests that estimates obtained from these data would likely be biased if we used listwise deletion excluding individuals with missing data on any of the variables. Therefore, we imputed missing data through multiple imputation, using a comprehensive imputation model made possible by Baby FACES' rich data sources.

Imputation method. We imputed missing data through multiple imputation by chained equations (MICE) using the "mi" suite of commands in Stata. Prior to imputation, we converted all special codes for missing data (.m, .d, .r, etc.) to system missing (.). We conducted separate multiple imputations within each of the levels: program, center, classroom and teacher, and child and family. We created 20 imputed data sets at each level and then merged the imputed data sets to create a complete analytic data set. Box A.1 lists the variables in our imputation models. We include the Stata code for multiple imputation in Appendix C. We imputed missing data for both the dependent and independent variables for the analytic models and used the imputed versions of all the variables in the final analyses.

For the program-level variables, we had missing data on two variables: (1) program option and (2) programs that serve 25 percent or more of families with any psychological risks. There were three programs missing on the program option variable. Examination of the data at other levels indicated that these programs offer both center-based and home-based services; therefore, we coded these programs as "multiple" for the program option variable. We then imputed missing data for the psychological risk variable in the program-level data set.

To impute the center-level data, we created a center-level data set containing variables in the imputation model. We also included non-imputed program-level variables and aggregated teacher education and degree in early childhood variables to help with the imputation. We then dropped these variables from the imputed data set after imputation was completed.

To impute the teacher and classroom data, we created a teacher- and classroom-level data set containing variables in the imputation model. We also included non-imputed program- and center-level variables and aggregated child demographics and scores to help with imputation. We then dropped these variables from the data set after imputation was completed. We only imputed CLASS-Infant and CLASS-Toddler scores for infant and toddler classrooms, respectively.

To impute the child and family data, we created a child-level data set containing variables in the imputation model. We also included non-imputed program-, center-, and teacher- and classroom-level variables to help with imputation. We dropped these variables from the data set after imputation. We did not impute the BITSEA and CDI scores for children younger than 8 months because the measures were not applicable to these children.

Estimation and analysis

Our estimates for multivariate models are based on analyses conducted across 20 multiply imputed datasets. We obtained each estimate by calculating the regression coefficient within each imputation and then averaging across imputations using the MIANALYZE procedure in SAS. The standard errors of these statistics account for two sources of variance: (1) sampling variance, which is based on the average standard errors within each imputed data set, and (2) imputation variance, which is the variance in estimated averages across imputations. We used the imputed versions of variables for both the dependent and independent variables in the final analyses. The reported results were weighted to account for unit nonresponse as well as to adjust for consent status and the probability of selection into the sample.

Box A.1. Variables in imputation models

Program level

- Program options (center-based only versus multiple options)
- Program size
- Metropolitan status
- Program serving 25 percent or more of families with high (more than three) demographic risks (based on aggregated family-level demographic risks)
- Program serving 25 percent or more of families with any psychological risks

Center level

- Center size
- Center climate (cohesion, communication, leaders' supportive behavior)
- Percentage of teachers with a bachelor's degree or higher
- Percentage of teachers with a degree in early childhood education
- The program-level variables listed above (to help with imputation; deleted after multiple imputation)

Classroom and teacher level

- Teacher's race and ethnicity
- Teacher speaks a language other than English
- Teacher's years of experience in Early Head Start
- Teacher's education
- Teacher has a degree in early childhood education
- Teacher has a Child Development Associate credential
- Frequency of coaching that teacher received
- Teacher received a lot of support from coach on teacher–child interactions
- Teacher received training from program on teacher–child relationships
- Teacher's depressive symptoms
- Teacher's beliefs (importance of relationship and responsiveness, role of the adult in child learning)
- Teacher-reported child-to-adult ratio and group size
- Teacher-reported CRQ-Adapted scores
- Teacher-reported job satisfaction and stress
- CLASS-Infant and CLASS-Toddler scores
- Observed child-to-adult ratio and group size during CLASS observation
- Q-CCIIT scores
- Observed child-to-adult ratio and group size during Q-CCIIT observation
- Infant or toddler classroom
- Smooth transitions between activities
- Variety of materials available to children in the classroom
- Well-organized classroom
- Aggregated child demographics and scores (to help with imputation; deleted after multiple imputation)
  - Percentage of dual-language learners in the classroom
  - Percentage of Black or African Americans in the classroom
  - Percentage of Hispanics or Latinos in the classroom
  - Percentage of families with high demographic risks
  - Percentage of families with any psychological risks
  - Mean teacher-reported BITSEA scores in the classroom
  - Mean teacher-reported English CDI scores in the classroom
- Program- and center-level variables listed above

Child and family level

- Child's gender
- Child's age
- Child's race and ethnicity
- Dual-language learner status
- Born premature
- Household poverty ratio
- Immigrant status
- Family demographic risks
- Family psychological risks
- Teacher-reported BITSEA scores
- Teacher-reported English CDI scores
- Teacher-reported teacher–child relationship scores

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Appendix B:
Reliability Estimates of Measures Used in the Report

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Exhibit B.1. Reliability of classroom observations and teacher-reported teacher–child relationship measures

Measure	Number of items	Sample size	Possible response range	Cronbach's alpha
Classroom observation				
CLASS-Infant				
Responsive Caregiving	4	149	1–7	0.86
CLASS-Toddler				
Emotional and Behavioral Support	5	713	1–7	0.82
Engaged Support for Learning	3	713	1–7	0.85
Q-CCIIT				
Support for Social-Emotional Development[a]	8	436	1–7	0.92
Support for Cognitive Development[a]	8	615	1–7	0.87
Support for Language and Literacy Development	10	824	1–7	0.92
Areas of Concern	16	817	n.a.[b]	0.79
Teacher-reported				
STRS-SF Teacher–Child Relationship				
Closeness	7	2,128	7–35	0.76
Conflict	8	2,115	8–40	0.82

Source: Spring 2018 Baby FACES Classroom Observation and Staff (Teacher) Child Report.

Note: Statistics are unweighted.

The sample size column presents unweighted sample sizes to identify the number of classrooms with valid data on each of the constructs or scores out of a total sample of 149 infant classrooms and 715 toddler classrooms and 2,139 teacher child report responses.

Reliability estimates are based on responses with complete data on that measure.

[a] There are some items in Support for Social-Emotional Development and Support for Cognitive Development that have some "not applicable" responses, which are treated as missing. Those responses were not included when calculating reliability estimates.

[b] The Areas of Concern score is a *z*-score because the items are on different scales.

CLASS = Classroom Assessment Scoring System; n.a. = not applicable; Q-CCIIT = Quality of Caregiver-Child Interactions with Infants and Toddlers; STRS-SF = Student–Teacher Relationship Scale, Short Form.

Exhibit B.2. Reliability of teacher well-being and teacher beliefs measures

Measure	Number of items	Sample size	Possible response range	Cronbach's alpha
CESD-R total score	**20**	**845**	**0–60**	**0.90**
Teacher Beliefs About Infant and Toddler Care and Education				
Importance of relationship and responsiveness	10	858	1–6	0.64
Role of the adult in child learning	10	858	1–6	0.72
Organizational functioning (teacher TCU SOF scores)				
Job Satisfaction	5	855	10–50	0.83

Source: Spring 2018 Baby FACES Staff (Teacher) Survey

Note: Statistics are unweighted.

The sample size column presents unweighted sample sizes to identify the number of teacher and home visitor surveys with valid data on each item out of a total sample of 859 teacher survey responses.

Reliability estimates are based on responses with complete data on that measure.

CESD-R = Center for Epidemiologic Studies Depression Scale–Revised; TCU SOF = Texas Christian University Survey of Organizational Functioning.

Exhibit B.3. Reliability of teacher-reported parent–teacher relationship measures

Measure	Number of items	Sample size	Possible response range	Cronbach's alpha
CRQ-Adapted				
Support	5	2,053	0–15	0.88
Endorsement	5	2,046	0–15	0.82
Undermining	4	2,076	0–12	0.58
Agreement	4	2,046	0–12	0.68
NCEDL Quality of Parent–Teacher Relationship	7	2,091	1–4	0.90

Source: Spring 2018 Baby FACES Parent Survey and Staff (Teacher) Child Report.

Note: Statistics are unweighted.

The sample size column presents unweighted sample sizes to identify the number of parent survey or teacher child report responses with valid data on each measure out of total samples of 1,788 parent survey responses for parents of children receiving center-based services and 2,139 teacher child report responses.

Reliability estimates are based on responses with complete data on that measure.

CRQ-Adapted = Cocaring Relationship Questionnaire-Adapted; NCEDL = National Center for Early Development and Learning.

Exhibit B.4. Reliability of child social and emotional and language measures

Measure	Number of items	Sample size	Possible response range	Cronbach's alpha
Staff-reported BITSEA raw score				
Problem domain	31	1,737	0–62	0.84
Competence domain	11	1,867	0–22	0.79
Staff-reported English CDI				
Staff-reported English CDI IRT score[a]	258	2,490	n.a.	0.99

Source: Spring 2018 Baby FACES Staff (Teacher or Home Visitor) Child Report.

Note: Statistics are unweighted. Reliability estimates for the BITSEA scores are based on complete data on the teacher reports.

[a] Rasch person reliability estimate, based on all children ages 8 months or older who have staff-reported CDI English scores.

BITSEA = Brief Infant-Toddler Social and Emotional Assessment; CDI = MacArthur-Bates Communicative Development Inventories; IRT = Item Response Theory; n.a. = not applicable.

Appendix C:
Stata Code for Multiple Imputation

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Code for imputation at the program level

```
/*
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 permission of Mathematica Policy Research, Inc.

 PROGRAM:          10a_MI_execute_program
 PROJECT:          Baby FACES
 PURPOSE:          Conduct multiple imputations for program-level dataset
*/


/*list of variables to be imputed*/
local ovars D1_PRGOPT D1PRGOPTC D1PRGOPTH D1PRGOPTM D1PIR1SIZ D1PRMETR D1PRISKH
D1PSYRISK


/* MI registration */
mi set flong

mi register imputed `ovars'
mi register regular D1_ID


/* chained equation */
mi impute chained (pmm, knn(3)) `ovars', add(20) chaindots rseed(52354)


/* output */
sort _mi_m D1_ID

mi describe

save "[INSERT OUTPUT DIRECTORY AND FILE NAME HERE]", replace
```

Code for imputation at the center level

```
/*
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 PROGRAM:          10b_MI_execute_center
 PROJECT:          Baby FACES
 PURPOSE:          Conduct multiple imputations for center-level dataset
*/



/*list of variables to be imputed*/
local ovars C1_CONTINUITY_TOT C1_CONTINUITY_NUMSUB C1SZSAMP C1SOFCHM C1SOFCMM SI1OCDQC
C1GEBAM C1ECBIM ///
            D1_PRGOPT D1PRGOPTC D1PRGOPTH D1PRGOPTM D1PIR1SIZ D1PRMETR D1PRISKH
D1PSYRISK
```

```
/* MI registration */
mi set flong

mi register imputed `ovars'
mi register regular CENTERID D1_ID


/* chained equation */
mi impute chained (pmm, knn(3)) `ovars', add(20) chaindots rseed(52354)


/* output */
sort _mi_m CENTERID

mi describe

* Drop program variables and aggregated teacher education and ECE variables
* These variables are only used to inform the model
drop D1_PRGOPT D1PRGOPTC D1PRGOPTH D1PRGOPTM D1PIR1SIZ D1PRMETR D1PRISKH D1PSYRISK ///
     C1GEBAM C1ECBIM

save "[INSERT OUTPUT DIRECTORY AND FILE NAME HERE]", replace
```

Code for imputation at the teacher/classroom level

```
/*
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 PROGRAM:          10c_MI_execute_class_teach
 PROJECT:          Baby FACES
 PURPOSE:          Conduct multiple imputations for staff-level dataset
*/


/*list of variables to be imputed*/
local ovars SI1HISPA SI1BLACK SI1OTHER SI1ELONLY SI1F06 SI1GEBA SI1ECBI  SI1_CDAR
SI1B06 SI1FRQCO SI1COSUP SI1B13C ///
            SI1CESDRT SI1CESDSIG SI1TBLRR SI1TBLRA SI1RATIO SI1RATIO2 SI1A01 SR1CRQSUM
SR1CRQENM SR1CRQUNM SR1CRQAGM ///
            SR1NCPSRM PI1CRQSUM PI1CRQENM PI1CRQUNM PI1CRQAGM SI1SOFSA SI1SOFST
O1CLSIRE O1CLSIRT O1CLSICH O1CLSTES ///
            O1CLSTIS O1CLSTRT O1CLSTCH O1QCSES O1QCCOGS O1QCLLS O1QCACTS O1QCCART
O1QCNCH O1TODDLER O1TRANS O1TYPETOY ///
            O1RMORG OI1_DLLM O1CBLACKM O1CHISPM O1DRISKM O1PSYRISK O1BITSC O1BITSP
O1SECDI ///
            C1_CONTINUITY_TOT C1_CONTINUITY_NUMSUB C1SZSAMP ///
            D1_PRGOPT D1PIR1SIZ D1PRMETR D1PRISKH D1PSYRISK


/* MI registration */
mi set flong

mi register imputed `ovars'
mi register regular CPID CLASSID CENTERID D1_ID
```

```
/* chained equation */
mi impute chained (pmm, knn(3)) `ovars', add(20) chaindots rseed(52354)


/* output */
sort _mi_m CPID

mi describe

* Drop program variables, center variables
* These variables are only used to inform the model
drop D1_PRGOPT D1PIR1SIZ D1PRMETR D1PRISKH D1PSYRISK C1*

* Drop aggregated child demographics and scores
* These variables are only used to inform the model
drop OI1_DLLM O1CBLACKM O1CHISPM O1DRISKM O1PSYRISK O1BITSC O1BITSP O1SECDI

* Replace non-infant/toddler specific scores with .s
foreach var of varlist O1CLSIRE O1CLSIRT O1CLSICH {
   replace `var' = .s if O1TODDLER == 1
}

foreach var of varlist O1CLSTES O1CLSTIS O1CLSTRT O1CLSTCH {
   replace `var' = .s if O1TODDLER == 0
}

save "[INSERT OUTPUT DIRECTORY AND FILE NAME HERE]", replace
```

Code for imputation at the child/family level

```
/*
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 PROGRAM:         10d_MI_execute_child
 PROJECT:         Baby FACES
 PURPOSE:         Conduct multiple imputations for child-level dataset
*/

/*list of variables to be imputed*/
local ovars PI1C_MALE PI1CAGE_MTH SR1CAGE PI1CBPREM PI1_DLL PI1CHISP PI1CBLACK
PI1COTHER PI1HH_PPVTY PI1P_IMGRN1 PI1P_IMGRN2 PI1RISKM PI1RISKH P1ANYPSYRISK ///
            SR1BITSCR SR1BITSPR SR1ECDIRT SR1STRCL SR1STRCO SI1HISPA SI1BLACK SI1OTHER
SI1ELONLY SI1F06 SI1GEBA SI1ECBI SI1_CDAR SI1B06 SI1FRQCO SI1COSUP ///
            SI1B13C SI1CESDRT SI1CESDSIG SI1TBLRR SI1TBLRA SI1RATIO SI1RATIO2 SI1A01
SI1SOFSA SI1SOFST O1CLSIRE O1CLSIRT O1CLSICH O1CLSTES  O1CLSTIS ///
            O1CLSTRT O1CLSTCH O1QCSES O1QCCOGS O1QCLLS O1QCACTS O1QCCART O1QCNCH
O1TODDLER O1TRANS O1TYPETOY O1RMORG ///
            C1_CONTINUITY_TOT C1_CONTINUITY_NUMSUB C1SZSAMP ///
            D1_PRGOPT D1PIR1SIZ D1PRMETR D1PRISKH D1PSYRISK PR1BITSCR PR1BITSPR
PR1ECDIRT


/* MI registration */
```

```
mi set flong

mi register imputed `ovars'
mi register regular CHILDID CPID CLASSID CENTERID D1_ID


/* chained equation */
mi impute chained (pmm, knn(3)) `ovars', add(20) chaindots rseed(52354)


/* output */
sort _mi_m CHILDID

mi describe

* Drop program variables, center variables, and teacher/classroom variables
* These variables are only used to inform the model
drop D1_PRGOPT  D1PIR1SIZ D1PRMETR D1PRISKH D1PSYRISK ///
     C1* O1* SI1*


* Replace bitsea scores with .s for ages < 8 months
foreach var of varlist SR1BITSCR SR1BITSPR SR1ECDIRT  {
   replace `var' = .s if SR1CAGE < 8
}

save "[INSERT OUTPUT DIRECTORY AND FILE NAME HERE]", replace
```

Appendix D:
Detailed Results for Research Question 4

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This appendix includes tables of results for Research Question 4: How are classroom practices and other aspects of classroom structural quality associated with teacher–child relationship quality?

Exhibit D.1. Associations of teacher, classroom, center, and program characteristics with quality of teacher–child interactions in Early Head Start classrooms, as measured by the CLASS-Infant and CLASS-Toddler

Variable	CLASS-Infant scores	CLASS-Toddler scores	
	Responsive Caregiving	Emotional and Behavioral Support	Engaged Support for Learning
Teacher variables			
Race and ethnicity (versus White)			
Non-Hispanic Black or African American	0.090 (0.20)	-0.108 (0.08)	0.012 (0.09)
Hispanic or Latino	0.086 (0.25)	-0.117 (0.10)	-0.069 (0.11)
Other race	0.180 (0.39)	-0.015 (0.14)	0.030 (0.16)
Speaks language other than English	0.236 (0.20)	-0.124 (0.07)	-0.014 (0.08)
Years of experience in Early Head Start	-0.041 (0.07)	0.019 (0.03)	0.049 (0.04)
Has a bachelor's degree or higher	-0.012 (0.21)	-0.156 (0.07)*	0.006 (0.08)
Has a degree in early childhood	-0.142 (0.17)	0.007 (0.07)	0.073 (0.08)
Has a CDA credential	-0.015 (0.17)	0.037 (0.06)	0.098 (0.07)
Professional development and training			
Frequency of support from a coach	0.041 (0.05)	0.007 (0.02)	-0.014 (0.02)
Teacher perception of support provided by coach on teacher–child interactions	0.094 (0.24)	-0.061 (0.08)	-0.025 (0.09)
Teacher perception of training from program on teacher–child interactions	0.569 (0.30)	0.185 (0.12)	-0.100 (0.13)
Teacher beliefs			
Importance of relationship and responsiveness	-0.054 (0.10)	0.089 (0.03)*	0.153 (0.04)*
Role of the adult in child learning	0.006 (0.10)	0.018 (0.04)	-0.082 (0.04)*
Teacher depressive symptoms	0.028 (0.10)	-0.010 (0.03)	0.028 (0.03)
Job satisfaction	0.071 (0.08)	0.012 (0.03)	0.017 (0.04)
Teacher-reported parent–teacher relationships[a]			
CRQ-Adapted			
Support	0.089 (0.10)	0.061 (0.04)	0.054 (0.04)
Endorsement	-0.064 (0.10)	-0.090 (0.04)*	-0.085 (0.04)*
Undermining	-0.133 (0.08)	0.011 (0.03)	-0.053 (0.03)
Agreement	-0.016 (0.09)	0.033 (0.04)	-0.001 (0.04)
Classroom characteristics			
Child-to-adult ratio	-0.064 (0.10)	-0.153 (0.04)*	0.008 (0.04)
Class size	-0.131 (0.10)	-0.001 (0.04)	-0.074 (0.04)
Variety of materials available to children	0.059 (0.09)	0.113 (0.04)*	0.169 (0.04)*
Well-organized classroom	0.424 (0.32)	0.072 (0.11)	0.256 (0.12)*
Smooth transitions between activities	0.493 (0.09)*	0.583 (0.03)*	0.452 (0.03)*
Center characteristics			
Center size	-0.075 (0.06)	0.000 (0.03)	-0.005 (0.04)
Continuity of care practices	0.054 (0.08)	-0.030 (0.04)	-0.081 (0.04)*
Program characteristics			
Multiple approach[b]	-0.279 (0.18)	0.010 (0.09)	-0.068 (0.12)
Program size	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)
Metropolitan status	-0.076 (0.22)	0.032 (0.11)	0.038 (0.14)

Exhibit D.1 *(continued)*

Variable	CLASS-Infant scores	CLASS-Toddler scores	
	Responsive Caregiving	Emotional and Behavioral Support	Engaged Support for Learning
Population served			
25% or more of families with more than three demographic risks	0.037 (0.27)	-0.138 (0.14)	-0.128 (0.17)
25% or more of families with any psychological risks	0.513 (0.30)	-0.342 (0.13)*	-0.029 (0.16)

Source: Spring 2018 Baby FACES Classroom Observation, Staff Survey, Center Director Survey, and Program Director Survey.

Note: Statistics are weighted to represent all Early Head Start programs. Table presents regression coefficients (with standard errors in parentheses) from HLM models. Infant classrooms have a majority of children who are newborns to 15 months. Toddler classrooms have a majority of children who are between the ages of 16 months and 36 months.

*p < .05; **p < .01; ***p < .001.

[a] This represents the average teacher-reported parent–teacher relationship calculated across sample children in the classroom.

[b] This indicates programs that offer both center- and home-based services (as opposed to center-based only).

CDA = Child Development Associate; CLASS = Classroom Assessment Scoring System; CRQ-Adapted = Cocaring Relationship Questionnaire-Adapted; HLM = hierarchical linear modeling.

Exhibit D.2a. Associations of teacher, classroom, center, and program characteristics with quality of the teacher–child relationship in Early Head Start classrooms, as measured by the Q-CCIIT (infant classrooms)

Variable	Q-CCIIT scores		
	Support for Social-Emotional Development	Support for Cognitive Development	Support for Language and Literacy Development
Teacher variables			
Race and ethnicity (versus White)			
Non-Hispanic Black or African American	0.223 (0.23)	0.417 (0.20)*	0.291 (0.21)
Hispanic or Latino	0.359 (0.27)	0.583 (0.25)*	0.403 (0.25)
Other race	0.602 (0.43)	0.615 (0.39)	0.839 (0.40)*
Speaks language other than English	0.114 (0.22)	0.078 (0.20)	0.254 (0.21)
Years of experience in Early Head Start	-0.025 (0.08)	-0.067 (0.07)	-0.022 (0.07)
Has a bachelor's degree or higher	-0.137 (0.23)	0.020 (0.21)	-0.321 (0.21)
Has a degree in early childhood	0.167 (0.19)	0.194 (0.17)	0.393 (0.18)*
Has a CDA credential	-0.257 (0.19)	-0.016 (0.17)	0.051 (0.17)
Professional development and training			
Frequency of support from a coach	-0.045 (0.06)	-0.094 (0.05)	-0.069 (0.05)
Teacher perception of support provided by coach on teacher–child interactions	0.275 (0.27)	0.361 (0.25)	0.344 (0.25)
Teacher perception of training from program on teacher–child interactions	-0.378 (0.33)	0.083 (0.29)	-0.555 (0.30)
Teacher beliefs			
Importance of relationship and responsiveness	0.163 (0.11)	-0.006 (0.10)	0.077 (0.10)
Role of the adult in child learning	-0.089 (0.11)	-0.010 (0.10)	-0.025 (0.10)
Teacher depressive symptoms	-0.366 (0.11)*	-0.297 (0.10)*	-0.305 (0.10)*
Job satisfaction	-0.129 (0.08)	-0.039 (0.08)	-0.153 (0.08)

Exhibit D.2a *(continued)*

Variable	Q-CCIIT scores		
	Support for Social-Emotional Development	Support for Cognitive Development	Support for Language and Literacy Development
Teacher-reported parent–teacher relationships[a]			
CRQ-Adapted			
Support	0.129 (0.11)	0.180 (0.10)	0.129 (0.10)
Endorsement	-0.241 (0.12)*	-0.168 (0.11)	-0.266 (0.11)*
Undermining	-0.002 (0.09)	-0.069 (0.08)	-0.098 (0.08)
Agreement	-0.055 (0.11)	-0.128 (0.10)	-0.070 (0.10)
Classroom characteristics			
Child-to-adult ratio	-0.165 (0.13)	-0.141 (0.11)	-0.077 (0.12)
Class size	-0.002 (0.12)	0.126 (0.11)	0.067 (0.11)
Variety of materials available to children	0.090 (0.09)	-0.037 (0.09)	-0.009 (0.09)
Well-organized classroom	0.377 (0.35)	0.130 (0.32)	0.233 (0.32)
Smooth transitions between activities	0.115 (0.10)	0.111 (0.08)	0.071 (0.09)
Center characteristics			
Center size	-0.083 (0.06)	-0.067 (0.05)	-0.007 (0.05)
Continuity of care practices	0.114 (0.09)	0.155 (0.09)	0.109 (0.09)
Program characteristics			
Multiple approach[b]	-0.131 (0.19)	-0.184 (0.19)	-0.035 (0.19)
Program size	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)
Metropolitan status	0.055 (0.25)	-0.042 (0.23)	-0.043 (0.24)
Population served			
25% or more of families with more than three demographic risks	-0.108 (0.30)	-0.429 (0.27)	-0.251 (0.28)
25% or more of families with any psychological risks	0.432 (0.32)	0.062 (0.30)	0.229 (0.30)

Source: Spring 2018 Baby FACES Classroom Observation, Staff Survey, Center Director Survey, and Program Director Survey.

Note: Statistics are weighted to represent all Early Head Start programs. Table presents regression coefficients (with standard errors in parentheses) from HLM models. Infant classrooms have a majority of children who are newborns to 15 months.

*p < .05; **p < .01; ***p < .001.

[a] This represents the average teacher-reported parent–teacher relationship calculated across sample children in the classroom.

[b] This indicates programs that offer both center- and home-based services (as opposed to center-based only).

CDA = Child Development Associate; CRQ-Adapted = Cocaring Relationship Questionnaire-Adapted; HLM = hierarchical linear modeling; Q-CCIIT = Quality of Caregiver-Child Interactions with Infants and Toddlers.

Exhibit D.2b. Associations of teacher, classroom, center, and program characteristics with quality of the teacher–child relationship in Early Head Start classrooms, as measured by the Q-CCIIT (toddler classrooms)

Variable	Q-CCIIT scores		
	Support for Social-Emotional Development	Support for Cognitive Development	Support for Language and Literacy Development
Teacher variables			
Race and ethnicity (versus White)			
Non-Hispanic Black or African American	-0.181 (0.09)	-0.190 (0.10)*	-0.263 (0.10)*
Hispanic or Latino	-0.023 (0.11)	-0.073 (0.11)	-0.118 (0.12)
Other race	0.150 (0.17)	0.044 (0.17)	0.023 (0.18)

Exhibit D.2b *(continued)*

Variable	Q-CCIIT scores		
	Support for Social-Emotional Development	Support for Cognitive Development	Support for Language and Literacy Development
Speaks language other than English	-0.072 (0.08)	-0.033 (0.08)	0.059 (0.09)
Years of experience in Early Head Start	-0.017 (0.04)	-0.017 (0.04)	0.041 (0.04)
Has a bachelor's degree or higher	0.056 (0.08)	0.046 (0.08)	-0.033 (0.08)
Has a degree in early childhood	0.084 (0.08)	0.105 (0.08)	0.125 (0.09)
Has a CDA credential	0.052 (0.07)	0.057 (0.07)	-0.027 (0.08)
Professional development and training			
Frequency of support from a coach	-0.008 (0.02)	-0.023 (0.02)	-0.010 (0.02)
Teacher perception of support provided by coach on teacher–child interactions	-0.025 (0.09)	0.115 (0.09)	0.008 (0.10)
Teacher perception of training from program on teacher–child interactions	0.113 (0.14)	0.054 (0.13)	0.064 (0.14)
Teacher beliefs			
Importance of relationship and responsiveness	-0.032 (0.04)	-0.026 (0.04)	-0.020 (0.04)
Role of the adult in child learning	0.063 (0.04)	0.038 (0.04)	0.067 (0.04)
Teacher depressive symptoms	-0.014 (0.03)	-0.010 (0.03)	-0.012 (0.04)
Job satisfaction	0.077 (0.04)*	0.087 (0.04)*	0.074 (0.04)
Teacher-reported parent–teacher relationships[a]			
CRQ-Adapted			
Support	0.083 (0.04)*	0.084 (0.04)*	0.095 (0.04)*
Endorsement	-0.063 (0.04)	-0.099 (0.04)*	-0.094 (0.05)*
Undermining	0.018 (0.04)	-0.046 (0.03)	-0.012 (0.04)
Agreement	0.054 (0.04)	0.011 (0.04)	0.069 (0.04)
Classroom characteristics			
Child-to-adult ratio	-0.037 (0.05)	0.038 (0.05)	-0.010 (0.05)
Class size	-0.092 (0.05)	-0.049 (0.05)	-0.006 (0.05)
Variety of materials available to children	0.083 (0.04)	0.064 (0.04)	0.012 (0.04)
Well-organized classroom	0.278 (0.13)*	0.094 (0.13)	0.076 (0.14)
Smooth transitions between activities	0.244 (0.04)*	0.215 (0.04)*	0.218 (0.04)*
Center characteristics			
Center size	-0.139 (0.04)*	-0.062 (0.04)	-0.113 (0.04)*
Continuity of care practices	-0.023 (0.04)	-0.007 (0.05)	-0.058 (0.04)
Program characteristics			
Multiple approach[b]	-0.132 (0.12)	-0.095 (0.14)	-0.073 (0.12)
Program size	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)
Metropolitan status	0.260 (0.14)	0.270 (0.16)	0.122 (0.15)
Population served			
25% or more of families with more than three demographic risks	0.101 (0.17)	0.075 (0.20)	0.111 (0.18)
25% or more of families with any psychological risks	-0.112 (0.17)	0.002 (0.20)	-0.098 (0.18)

Source: Spring 2018 Baby FACES Classroom Observation, Staff Survey, Center Director Survey, and Program Director Survey.

Note: Statistics are weighted to represent all Early Head Start programs. Table presents regression coefficients (with standard errors in parentheses) from HLM models. Toddler classrooms have a majority of children who are between the ages of 16 months and 36 months.

*$p < .05$; **$p <. 01$; ***$p < .001$.

[a] This represents the average teacher-reported parent–teacher relationship calculated across sample children in the classroom.

[b] This indicates programs that offer both center- and home-based services (as opposed to center-based only).

Exhibit D.2b *(continued)*

CDA = Child Development Associate; CRQ-Adapted = Cocaring Relationship Questionnaire-Adapted; HLM = hierarchical linear modeling; Q-CCIIT = Quality of Caregiver-Child Interactions with Infants and Toddlers.

Exhibit D.3a. Associations of teacher, classroom, center, and program characteristics with quality of the teacher–child relationship in Early Head Start classrooms, as measured by teacher reports (infant classrooms)

Variables	STRS-SF scores	
	Closeness	Conflict
Teacher variables		
Race and ethnicity (versus White)		
Non-Hispanic Black or African American	0.133 (0.18)	-0.142 (0.12)
Hispanic or Latino	0.426 (0.20)*	0.012 (0.15)
Other race	-0.120 (0.32)	-0.131 (0.22)
Speaks language other than English	0.060 (0.17)	0.132 (0.12)
Years of experience in Early Head Start	0.059 (0.06)	-0.038 (0.04)
Has a bachelor's degree or higher	0.404 (0.17)*	-0.015 (0.12)
Has a degree in early childhood	-0.187 (0.15)	0.176 (0.10)
Has a CDA credential	-0.129 (0.14)	0.092 (0.10)
Professional development and training		
Frequency of support from a coach	0.077 (0.04)	-0.021 (0.03)
Teacher perception of support provided by coach on teacher–child interactions	-0.259 (0.20)	0.321 (0.14)*
Teacher perception of training from program on teacher–child interactions	0.013 (0.26)	0.081 (0.18)
Teacher beliefs		
Importance of relationship and responsiveness	-0.029 (0.09)	-0.138 (0.06)*
Role of the adult in child learning	0.043 (0.08)	-0.001 (0.06)
Teacher depressive symptoms	-0.004 (0.08)	0.127 (0.06)*
Job satisfaction	0.032 (0.06)	0.013 (0.04)
Teacher-reported parent–teacher relationships[a]		
CRQ-Adapted		
Support	0.324 (0.08)*	-0.123 (0.06)*
Endorsement	-0.104 (0.09)	-0.113 (0.06)
Undermining	-0.041 (0.07)	0.074 (0.05)
Agreement	0.146 (0.08)	0.006 (0.06)
Classroom characteristics		
Child-to-adult ratio	-0.029 (0.08)	0.057 (0.06)
Class size	0.032 (0.07)	0.026 (0.05)
Variety of materials available to children	0.054 (0.07)	0.082 (0.05)
Well-organized classroom	-0.360 (0.28)	-0.407 (0.20)*
Smooth transitions between activities	0.098 (0.07)	-0.070 (0.05)
Center characteristics		
Center size	-0.108 (0.04)*	-0.034 (0.03)
Continuity of care practices	-0.010 (0.07)	-0.029 (0.05)
Program characteristics		
Multiple approach[b]	-0.042 (0.16)	-0.208 (0.10)*
Program size	0.000 (0.00)	-0.001 (0.00)*
Metropolitan status	0.078 (0.20)	0.105 (0.14)
Population served		
25% or more of families with more than three demographic risks	0.084 (0.24)	0.075 (0.16)
25% or more of families with any psychological risks	0.153 (0.25)	0.370 (0.17)*

Exhibit D.3a *(continued)*

Source: Spring 2018 Baby FACES Classroom Observation, Staff Survey, Center Director Survey, and Program Director Survey.

Note: Statistics are weighted to represent all Early Head Start programs. Table presents regression coefficients (with standard errors in parentheses) from HLM models. Infant classrooms have a majority of children who are newborns to 15 months.

*p < .05; **p < .01; ***p < .001.

[a] This represents the average teacher-reported parent–teacher relationship calculated across sample children in the classroom.

[b] This indicates programs that offer both center- and home-based services (as opposed to center-based only).

CDA = Child Development Associate; CRQ-Adapted = Cocaring Relationship Questionnaire-Adapted; HLM = hierarchical linear modeling; STRS-SF = Student–Teacher Relationship Scale, Short Form.

Exhibit D.3b. Associations of teacher, classroom, center, and program characteristics with quality of the teacher–child relationship in Early Head Start classrooms, as measured by teacher reports (toddler classrooms)

Variables	STRS-SF scores	
	Closeness	Conflict
Teacher variables		
Race and ethnicity (versus White)		
Non-Hispanic Black or African American	-0.042 (0.08)	-0.200 (0.07)*
Hispanic or Latino	-0.149 (0.10)	-0.023 (0.09)
Other race	-0.176 (0.14)	0.089 (0.14)
Speaks language other than English	-0.146 (0.07)*	0.074 (0.07)
Years of experience in Early Head Start	0.041 (0.03)	-0.026 (0.03)
Has a bachelor's degree or higher	-0.022 (0.07)	-0.101 (0.07)
Has a degree in early childhood	-0.019 (0.07)	0.079 (0.07)
Has a CDA credential	0.021 (0.06)	0.012 (0.06)
Professional development and training		
Frequency of support from a coach	-0.006 (0.02)	0.012 (0.02)
Teacher perception of support provided by coach on teacher–child interactions	0.041 (0.08)	-0.097 (0.08)
Teacher perception of training from program on teacher–child interactions	0.046 (0.12)	0.114 (0.12)
Teacher beliefs		
Importance of relationship and responsiveness	0.060 (0.04)	-0.014 (0.03)
Role of the adult in child learning	0.105 (0.04)*	-0.062 (0.03)
Teacher depressive symptoms	-0.086 (0.03)*	0.126 (0.03)*
Job satisfaction	-0.004 (0.03)	0.000 (0.03)
Teacher-reported parent–teacher relationships[a]		
CRQ-Adapted		
Support	0.162 (0.04)*	0.004 (0.03)
Endorsement	0.104 (0.04)*	-0.183 (0.04)*
Undermining	-0.004 (0.03)	0.076 (0.03)*
Agreement	0.008 (0.04)	-0.122 (0.03)*
Classroom characteristics		
Child-to-adult ratio	0.007 (0.03)	-0.074 (0.03)*
Class size	-0.001 (0.03)	0.034 (0.03)
Variety of materials available to children	-0.003 (0.04)	-0.015 (0.04)
Well-organized classroom	-0.168 (0.11)	-0.076 (0.10)
Smooth transitions between activities	0.043 (0.03)	0.010 (0.03)
Center characteristics		
Center size	-0.006 (0.03)	0.002 (0.03)
Continuity of care practices	0.017 (0.03)	0.003 (0.03)

Exhibit D.3b *(continued)*

Variables	STRS-SF scores	
	Closeness	Conflict
Program characteristics		
Multiple approach[b]	-0.051 (0.08)	0.050 (0.07)
Program size	0.000 (0.00)	0.000 (0.00)
Metropolitan status	-0.166 (0.09)	-0.020 (0.08)
Population served		
25% or more of families with more than three demographic risks	0.047 (0.11)	-0.118 (0.10)
25% or more of families with any psychological risks	0.059 (0.11)	0.027 (0.10)

Source: Spring 2018 Baby FACES Classroom Observation, Staff Survey, Center Director Survey, and Program Director Survey.

Note: Statistics are weighted to represent all Early Head Start programs. Table presents regression coefficients (with standard errors in parentheses) from HLM models. Toddler classrooms have a majority of children who are between the ages of 16 months and 36 months.

*p < .05; **p < .01; ***p < .001.

[a] This represents the average teacher-reported parent–teacher relationship calculated across sample children in the classroom.

[b] This indicates programs that offer both center- and home-based services (as opposed to center-based only).

CDA = Child Development Associate; CRQ-Adapted = Cocaring Relationship Questionnaire-Adapted; HLM = hierarchical linear modeling; STRS-SF = Student–Teacher Relationship Scale, Short Form.

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Appendix E:
Detailed Results for Research Question 5

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This appendix presents the table of results for Research Question 5: Is the quality of teacher–child interactions and relationships associated with infant and toddler outcomes?

Exhibit E.1. Associations between observed teacher–child relationship quality and teacher-reported child outcomes

	CLASS-Infant Responsive Caregiving[a]			CLASS-Toddler Emotional and Behavioral Support[b]		
CLASS	**English CDI IRT scores**	**BITSEA Competence**	**BITSEA Problem**	**English CDI IRT scores**	**BITSEA Competence**	**BITSEA Problem**
CLASS	**0.057 (0.05)**	**0.081 (0.07)**	**-0.025 (0.07)**	**-0.035 (0.02)**	**0.011 (0.03)**	**-0.071* (0.03)**
Covariate						
Age	1.074*** (0.07)	0.482*** (0.09)	-0.034 (0.08)	0.706*** (0.02)	0.332*** (0.03)	0.027 (0.03)
Male	-0.133 (0.08)	-0.372** (0.11)	0.183 (0.11)	-0.116** (0.04)	-0.292*** (0.05)	0.163*** (0.05)
Race/ethnicity						
Hispanic	0.006 (0.15)	0.130 (0.21)	0.084 (0.19)	-0.166* (0.07)	0.009 (0.09)	-0.201* (0.10)
Non-Hispanic African American	0.095 (0.14)	0.172 (0.18)	0.181 (0.16)	-0.006 (0.06)	0.030 (0.08)	-0.166 (0.09)
Other	0.139 (0.18)	0.312 (0.24)	0.178 (0.21)	-0.079 (0.08)	-0.036 (0.11)	-0.096 (0.11)
Dual language learner	-0.053 (0.12)	0.071 (0.15)	-0.026 (0.14)	0.030 (0.05)	0.019 (0.07)	0.060 (0.07)
Family poverty ratio	-0.021 (0.04)	-0.034 (0.04)	0.038 (0.04)	0.015 (0.01)	0.005 (0.02)	-0.021 (0.02)
Family demographic risks						
Medium risk	0.012 (0.10)	0.103 (0.13)	0.063 (0.13)	-0.079 (0.04)	-0.035 (0.06)	0.001 (0.06)
High risk	0.060 (0.15)	-0.136 (0.19)	0.347 (0.18)	-0.034 (0.06)	-0.111 (0.09)	-0.047 (0.09)
	Infant classrooms			**Toddler classrooms**		
Q-CCIIT	**English CDI IRT scores**	**BITSEA Competence**	**BITSEA Problem**	**English CDI IRT scores**	**BITSEA Competence**	**BITSEA Problem**
Support for Social-Emotional Development	**-0.010 (0.06)**	**-0.070 (0.07)**	**0.057 (0.07)**	**-0.040 (0.02)**	**0.006 (0.03)**	**-0.040 (0.03)**
Covariate						
Age	1.067*** (0.07)	0.458*** (0.10)	-0.021 (0.08)	0.708*** (0.02)	0.332*** (0.03)	0.027 (0.03)
Male	-0.134 (0.08)	-0.375*** (0.11)	0.186 (0.11)	-0.117** (0.04)	-0.292*** (0.05)	0.162** (0.05)
Race/ethnicity						
Hispanic	0.012 (0.15)	0.150 (0.21)	0.075 (0.19)	-0.165* (0.07)	0.008 (0.09)	-0.196* (0.10)
Non-Hispanic African American	0.101 (0.14)	0.188 (0.18)	0.173 (0.16)	-0.004 (0.06)	0.028 (0.08)	-0.157 (0.09)
Other	0.149 (0.18)	0.339 (0.24)	0.170 (0.21)	-0.079 (0.08)	-0.036 (0.11)	-0.091 (0.11)

Exhibit E.1 *(continued)*

Dual language learner	-0.050 (0.12)	0.084 (0.15)	-0.033 (0.15)	0.031 (0.05)	0.019 (0.07)	0.061 (0.07)
Family poverty ratio	-0.021 (0.04)	-0.032 (0.04)	0.038 (0.04)	0.015 (0.01)	0.005 (0.02)	-0.021 (0.02)
Family demographic risks						
Medium risk	0.009 (0.10)	0.096 (0.13)	0.066 (0.13)	-0.079 (0.04)	-0.035 (0.06)	0.001 (0.06)
High risk	0.070 (0.15)	-0.099 (0.19)	0.331 (0.18)	-0.034 (0.06)	-0.110 (0.09)	-0.048 (0.09)
	Infant classrooms			**Toddler classrooms**		
CLASS - Toddler	**English CDI IRT scores**	**BITSEA Competence**	**BITSEA Problem**	**English CDI IRT scores**	**BITSEA Competence**	**BITSEA Problem**
Engaged Support for Learning	**n.a.**	**n.a.**	**n.a.**	**-0.025 (0.02)**	**0.008 (0.03)**	**-0.027 (0.03)**
Covariate						
Age	n.a.	n.a.	n.a.	0.706*** (0.02)	0.331*** (0.03)	0.026 (0.03)
Sex	n.a.	n.a.	n.a.	-0.117** (0.04)	-0.292*** (0.05)	0.163** (0.05)
Race/ethnicity						
Hispanic	n.a.	n.a.	n.a.	-0.167* (0.07)	0.009 (0.09)	-0.198* (0.10)
Non-Hispanic African American	n.a.	n.a.	n.a.	-0.003 (0.06)	0.028 (0.08)	-0.156 (0.09)
Other	n.a.	n.a.	n.a.	-0.079 (0.08)	-0.036 (0.11)	-0.090 (0.11)
Dual language learner	n.a.	n.a.	n.a.	0.030 (0.05)	0.019 (0.07)	0.060 (0.07)
Family poverty ratio	n.a.	n.a.	n.a.	0.015 (0.01)	0.005 (0.02)	-0.021 (0.02)
Family demographic risks						
Medium risk	n.a.	n.a.	n.a.	-0.079 (0.04)	-0.035 (0.06)	0.001 (0.06)
High risk	n.a.	n.a.	n.a.	-0.034 (0.06)	-0.111 (0.09)	-0.048 (0.09)
	Infant classrooms			**Toddler classrooms**		
Q-CCIIT	**English CDI IRT scores**	**BITSEA Competence**	**BITSEA Problem**	**BITSEA Competence**	**English CDI IRT scores**	**BITSEA Problem**
Support for Language and Literacy Development	**-0.029 (0.06)**	**-0.069 (0.08)**	**0.044 (0.07)**	**-0.017 (0.02)**	**-0.001 (0.03)**	**-0.064* (0.03)**
Covariate						
Age	1.067*** (0.07)	0.469*** (0.09)	-0.029 (0.08)	0.707*** (0.02)	0.332*** (0.03)	0.035 (0.03)
Male	-0.135 (0.08)	-0.378*** (0.11)	0.187 (0.11)	-0.117** (0.04)	-0.292*** (0.05)	0.161** (0.05)

Exhibit E.1 *(continued)*

Race/ethnicity						
Hispanic	0.012 (0.15)	0.142 (0.21)	0.081 (0.19)	-0.163* (0.07)	0.008 (0.09)	-0.197* (0.10)
Non-Hispanic African American	0.101 (0.14)	0.183 (0.18)	0.177 (0.16)	-0.002 (0.06)	0.028 (0.08)	-0.160 (0.08)
Other	0.150 (0.18)	0.336 (0.24)	0.172 (0.21)	-0.076 (0.08)	-0.037 (0.11)	-0.088 (0.11)
Dual language learner	-0.048 (0.12)	0.083 (0.15)	-0.031 (0.14)	0.030 (0.05)	0.019 (0.07)	0.059 (0.07)
Family poverty ratio	-0.020 (0.04)	-0.031 (0.04)	0.037 (0.04)	0.015 (0.01)	0.005 (0.02)	-0.020 (0.02)
Family demographic risks						
Medium risk	0.009 (0.10)	0.098 (0.13)	0.065 (0.13)	-0.079 (0.04)	-0.035 (0.06)	0.002 (0.06)
High risk	0.071 (0.15)	-0.109 (0.19)	0.338 (0.18)	-0.034 (0.06)	-0.110 (0.09)	-0.046 (0.09)
	Infant classrooms			**Toddler classrooms**		
CLASS	**English CDI IRT scores**	**BITSEA Competence**	**BITSEA Problem**	**English CDI IRT scores**	**BITSEA Competence**	**BITSEA Problem**
Engaged Support for Learning	**n.a.**	**n.a.**	**n.a.**	**-0.025 (0.02)**	**0.008 (0.03)**	**-0.027 (0.03)**
Covariate						
Age	n.a.	n.a.	n.a.	0.706*** (0.02)	0.331*** (0.03)	0.026 (0.03)
Male	n.a.	n.a.	n.a.	-0.117** (0.04)	-0.292*** (0.05)	0.163** (0.05)
Race/ethnicity						
Hispanic	n.a.	n.a.	n.a.	-0.167* (0.07)	0.009 (0.09)	-0.198* (0.10)
Non-Hispanic African American	n.a.	n.a.	n.a.	-0.003 (0.06)	0.028 (0.08)	-0.156 (0.09)
Other	n.a.	n.a.	n.a.	-0.079 (0.08)	-0.036 (0.11)	-0.090 (0.11)
Dual language learner	n.a.	n.a.	n.a.	0.030 (0.05)	0.019 (0.07)	0.060 (0.07)
Family poverty ratio	n.a.	n.a.	n.a.	0.015 (0.01)	0.005 (0.02)	-0.021 (0.02)
Family demographic risks						
Medium risk	n.a.	n.a.	n.a.	-0.079 (0.04)	-0.035 (0.06)	0.001 (0.06)
High risk	n.a.	n.a.	n.a.	-0.034 (0.06)	-0.111 (0.09)	-0.048 (0.09)

Exhibit E.1 *(continued)*

Q-CCIIT	Infant classrooms			Toddler classrooms		
	English CDI IRT scores	BITSEA Competence	BITSEA Problem	English CDI IRT scores	BITSEA Competence	BITSEA Problem
Support for Cognitive Development	**-0.016 (0.06)**	**0.011 (0.08)**	**0.010 (0.08)**	**-0.031 (0.02)**	**-0.034 (0.03)**	**-0.024 (0.03)**
Covariate						
Age	1.067*** (0.07)	0.475*** (0.09)	-0.031 (0.08)	0.708*** (0.02)	0.338*** (0.03)	0.027 (0.03)
Male	-0.134 (0.08)	-0.373** (0.11)	0.184 (0.11)	-0.117** (0.04)	-0.294*** (0.05)	0.163** (0.05)
Race/ethnicity						
Hispanic	0.012 (0.15)	0.137 (0.21)	0.081 (0.19)	-0.163* (0.07)	0.007 (0.09)	-0.194 (0.10)
Non-Hispanic African American	0.102 (0.14)	0.180 (0.18)	0.177 (0.16)	-0.002 (0.06)	0.024 (0.08)	-0.156 (0.09)
Other	0.149 (0.18)	0.328 (0.24)	0.174 (0.21)	-0.077 (0.08)	-0.040 (0.11)	-0.088 (0.11)
Dual language learner	-0.049 (0.12)	0.074 (0.15)	-0.028 (0.14)	0.031 (0.05)	0.020 (0.07)	0.061 (0.07)
Family poverty ratio	-0.020 (0.04)	-0.033 (0.04)	0.038 (0.04)	0.015 (0.01)	0.005 (0.02)	-0.021 (0.02)
Family demographic risks						
Medium risk	0.010 (0.10)	0.099 (0.13)	0.063 (0.13)	-0.078 (0.04)	-0.033 (0.06)	0.001 (0.06)
High risk	0.069 (0.15)	-0.118 (0.19)	0.341 (0.18)	-0.034 (0.06)	-0.109 (0.09)	-0.048 (0.09)

Source: Spring 2018 Baby FACES Classroom Observation, Parent Survey, and Staff (Teacher) Child Report.

Notes: Statistics are weighted to represent all Early Head Start classrooms and children in center-based care. The referent for race/ethnicity is non-Hispanic White and for family demographic risks, the referent is low risk.

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

[a] Infant classrooms have a majority of children who are newborns to 15 months.

[b] Toddler classrooms have a majority of children who are between the ages of 16 months and 36 months.

BITSEA = Brief Infant-Toddler Social and Emotional Assessment; CDI = MacArthur-Bates Communicative Development Inventories; CLASS = Classroom Assessment Scoring System; IRT = Item Response Theory; n.a. = not applicable; Q-CCIIT = Quality of Caregiver-Child Interactions with Infants and Toddlers.

Endnotes

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[17] No other covariates were included in the models to keep the models parsimonious.