

# Are Neighborhood Factors Associated with the Quality of Early Childhood Education in North Carolina?

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# Are Neighborhood Factors Associated with the Quality of Early Childhood Education in North Carolina?

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Evidence suggests that participation in high quality early childhood education supports the school readiness of young children. Therefore, it is important to understand whether children from different geographic regions, such as urban and rural neighborhoods, have comparable access to high quality programs. This study explores whether neighborhood (that is, census tract) characteristics are associated with the quality rating scores of early childhood education sites in North Carolina, after site-level characteristics are controlled for. The results suggest that neighborhood characteristics are only weakly associated with the quality rating scores. Results also indicate that the number of early childhood education sites within a neighborhood or adjacent neighborhood does not predict a site's quality rating scores, nor does the distance between a site and the nearest postsecondary institution with degree or certificate programs in early childhood education.

## Why this study?

Participating in higher quality early childhood education is associated with better school readiness among young children, particularly children of economically disadvantaged backgrounds (Burchinal et al., 2010; Sabol & Pianta, 2015). In North Carolina, as in most states, opportunities for early childhood education for children ages 3–5 are provided through a patchwork of federally supported, state-supported, and privately funded child care, pre-school, and prekindergarten programs. For example, North Carolina has a state-funded prekindergarten program, Title I-funded public school–based prekindergarten, Head Start centers, private child care centers, and family child care homes. North Carolina has been at the vanguard of supporting high quality early childhood education by working consistently on improving the quality of its varied early childhood education programs. In particular, North Carolina, again like many other states, has invested in the quality of both means-tested programs for families based on household income or other risk status and programs that are open to all children, such as private fee-for-service child care.

North Carolina has demonstrated its commitment to supporting high quality across all types of early childhood education and care programs through its Quality Rating and Improvement System (QRIS), which has been a part of the Star Rated License state licensing program since 1999 (see box 1 for definitions of key terms). The QRIS allocates points to participating early childhood education sites (licensed early childhood education schools and centers and family child care homes).

Points are awarded in two key areas: the educational credentials and experience of the teaching and administrative personnel (Education Standards) and program-related standards that include aspects of the physical space and interactions of teaching personnel with children (Program Standards). Sites earn points under the Education Standards based on the percentages of teachers and administrators who have earned higher education degrees and credentials; points are also earned based on teachers' number of years of relevant work experience. Sites earn points under the Program Standards based on the site's average score on a standardized early childhood environment rating scale, staff–child ratios, and other programmatic standards. Criteria differ slightly between center- and school-based sites and family child care home sites. Although participation in the Star Rated License process is voluntary for some types of early childhood education sites (for example, sites managed by

For additional information, including technical methods, access the report appendix at <https://go.usa.gov/xGMch>.

faith-based providers that receive an exemption to the licensure rules), most early childhood education sites in the state (90 percent of them as of December 2017) participate (Child Care Services Association, n.d.).

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## Box 1. Key terms

**Census tract.** A geographic designation used by the U.S. government to report data from the census and from similar annual household surveys. An intermediate level within the hierarchy of geographic designations, it is designed to have an average of 4,000 and no more than 8,000 people. Census tracts are subdivisions within a county and are typically geographically smaller than a county. Census tract boundaries are based on population size as well as geography, whereas county borders do not represent population size. North Carolina has more than 2,000 census tracts but just 100 counties. This report uses census tracts to represent the neighborhood of an early childhood education site. *Census tract* and *neighborhood* are used interchangeably in the report.

**Center-based early childhood education site.** A site that provides early education and child care in a school or similar educational setting, such as a private child care center building. Centers accounted for 67 percent of the analytic sample (3,542 of 5,254 sites).

**Counts of early childhood education sites.** The study used two different count variables, total count and adjacent count. Total count is the number of identified sites within a neighborhood (census tract) that offer early education or child care services. Adjacent count is the number of early childhood education sites in all census tracts that are adjacent to the tract for each site included in the study. Adjacent and total counts represented sites that were included in the study sample along with other early childhood education sites that did not meet the inclusion criteria (see box 2 and appendix A) but that were conceptually considered possible competitors to the study sites.

**Early childhood education site.** Any of the different types of early childhood education sites included in the North Carolina quality rating system. These sites include child care centers, Head Start centers, preschool/prekindergarten programs within public elementary schools or private schools, and family child care homes.

**Education Standards.** A subcomponent score within the North Carolina Star Rated License system based on the educational credentials and years of experience of the teaching and administrative personnel within an early childhood education site. Education Standard scores range from a minimum of 1 point to a maximum of 7 points.

**Family child care home.** An early child education site in which a licensed provider provides professional child care to unrelated children within the provider's home. Family child care homes accounted for 33 percent of the analytic sample (1,712 of 5,254 sites).

**Neighborhood.** Used interchangeably with *census tract* in the report to represent the neighborhood of an early childhood education site.

**Neighborhood characteristics.** The neighborhood characteristics analyzed in this study are described in the variables section of box 2.

**Postsecondary institutions.** Public or private institutions that grant higher education degrees or state-recognized professional certificates. To be counted in this study, an institution had to be within North Carolina or within 50 miles of the border in an adjacent state and had to offer a certificate or degree in early childhood education, elementary education, or similar education major such as early childhood special education.

**Program Standards.** A subcomponent score within the North Carolina Star Rated License system based on policies, physical space, activities, instructional programming, staff-child ratio, and environmental rating scales for a preschool or child care site. Program Standard scores range from a minimum of 1 point to a maximum of 7 points.

**Quality Rating Improvement System (QRIS).** A system of quality ratings applied to individual early childhood education sites, such as a state-funded prekindergarten program or a countywide program. In this report the QRIS ratings are designated at the state level as part of the licensing system for early childhood education sites in North Carolina known as a Star Rated License.



**Rural–Urban Continuum Code.** The code on a nine-point scale that designates whether a county is considered metropolitan or nonmetropolitan and also designates counties by their degree of population density. This code is applied by the U.S. Department of Agriculture. The most recent version, from 2013, is used in this report.

**Total score.** The score within the North Carolina Star Rated License system that combines the **Education Standards** score (for the educational credentials and experience of the teaching and administrative personnel, with a maximum score of 7) and the **Program Standards** score (for aspects of the physical space and interactions of teaching personnel with children, with a maximum score of 7), plus 1 Quality Point earned for exceeding the minimum criteria for certain staff education or program standards. The maximum Total Score is 15 points. For ease of interpretation the points are converted into a rating system of 1–5 stars. Sites earning 1–3 points receive 1 star, sites earning 4–6 points receive 2 stars, 7–9 points receive 3 stars, 10–12 points receive 4 stars, and 13–15 points receive 5 stars.

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North Carolina’s efforts to raise the minimum quality of early childhood education sites using the QRIS have yielded substantial progress, but some early childhood education sites are still of low to moderate quality (3 or fewer stars), and some neighborhoods might lack access to higher quality early childhood education sites. For example, a 2014 study found that a quarter of some 4,800 center-based sites had earned 3 or fewer stars, out of a possible total of 5 (see box 1 on how quality rating score points are converted to stars; Child Care Services Association, n.d.). About 57 percent of family child care homes had earned 3 or fewer stars.

One important question of interest to policymakers and education leaders is whether the location of early childhood education sites is associated with their quality, meaning that access to higher quality sites could differ for families residing in different parts of a state. Given the importance of supporting school readiness for children from all backgrounds, education policymakers, educators, and parents have a clear interest in reducing any disparities that may exist across neighborhoods.

There is reason to believe that neighborhoods differ in the quality of the early childhood education opportunities they provide to families. For example, research indicates that neighborhoods differ in the number of child care slots available to families (Malik et al., 2018) and that some neighborhoods lack sufficient slots to meet local demand (Malik & Hamm, 2017; T.H. Chan School of Public Health, 2016). Similarly, some research suggests that neighborhoods may differ in how many distinct child care options (such as home based and center based or with extended hours) are available as well as in the number of higher quality sites available (De Marco & Vernon-Feagons, 2013; National Survey of Early Care and Education Project Team, 2015; Tang et al., 2012). Some of the differences in the number and quality of early childhood education sites across neighborhoods may relate to population characteristics in the neighborhood, including socioeconomic status, number of residents, and number of families with young children (Liu & Anderson, 2012; Malik et al., 2018; Owens & Rennhoff, 2014).

There are also reasons to anticipate that characteristics of the neighborhood in which early childhood education sites are located might be associated with the quality of sites in the neighborhood. For example, in urban areas with a higher population density and more early childhood education sites, sites might try to distinguish themselves from one another by earning a higher star quality rating than other sites in the same neighborhood. In more rural or less wealthy neighborhoods, early childhood education sites might face more challenges in achieving the education and program standards that contribute to higher star ratings because they might have greater difficulty attracting and retaining teachers and directors with higher levels of education and experience (Gagnon & Mattingly, 2015; Monk, 2007). Aspiring teachers or teachers already employed in rural locations might have difficulty continuing their education if they are farther from postsecondary institutions with degree or certificate programs in early childhood education (Card, 1993; Frenette, 2006; Turley, 2009). Rural early childhood education sites might also have fewer financial resources to support improvements in the materials and instructional content in classrooms (Blau & Mocan, 2002). For example, having more picture books and math manipulatives can enhance the score an early childhood education site receives on the observational tool used to evaluate some aspects of program quality within the QRIS.

This study was initiated to explore whether neighborhood characteristics are associated with the quality of early childhood education opportunities available to children and their families in North Carolina. Specifically, the study examined whether the geographic location of early childhood education sites in North Carolina is associated with aspects of the quality of these sites, as characterized by their quality rating scores, and if so, how. Knowing whether the location of a site is associated with the quality of early education it offers can support policy decisions by North Carolina on how to allocate professional development resources and how to support continuous improvement efforts among sites. To that end the study focused on geographic, demographic, and socioeconomic characteristics of the neighborhood in which an early childhood education site is located and on whether these characteristics predict the quality of an early childhood education site.

The study was developed in collaboration with the North Carolina Department of Public Instruction, the North Carolina Division of Child Development and Early Education, and the Regional Educational Laboratory Southeast School Readiness Partnership.

## Research questions

The study addressed three research questions related to the role of geographic location in predicting the quality rating scores of early childhood education sites within North Carolina:

1. Are neighborhood characteristics such as demographic characteristics and urban or rural locale associated with the quality rating scores of early childhood education sites in North Carolina, after site-level differences are controlled for?
2. Is the number of early childhood education sites within a neighborhood associated with the quality rating scores of early childhood education sites, after other neighborhood characteristics are controlled for?
3. Is the distance between an early childhood education site and a postsecondary institution with degree or certificate programs in early childhood education associated with the quality rating scores of early childhood education sites, after other neighborhood characteristics are controlled for?

Research question 1 investigates whether variables at the neighborhood level are associated with differences among early childhood education sites in their quality rating scores over and above variables at the site level. Research questions 2 and 3 test the extent to which competition from other early childhood education sites in the neighborhood and proximity to a postsecondary institution are associated with differences in sites' quality rating scores. The study explored each research question separately for the two components of the quality rating score and for the Total Score.

The outcome variables in the study included the Total Score for each site and the two main components of the Total Score: Education Standards and Program Standards (see box 1). Among early childhood education sites with scores, 9 percent earned 2 or fewer stars, 23 percent earned 3 stars, 29 percent earned 4 stars, and 39 percent earned 5 stars.

Brief descriptions of the data sources, sample, and methods used in this analysis are in box 2; more detail is provided in appendix A.

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## Box 2. Data sources, sample, and methods

**Data sources.** The study used data from numerous publicly available sources:

- Data on the Quality Rating Improvement System (QRIS) rating scores and site-level characteristics for early childhood education sites as of December 2017 are from the North Carolina Division of Child Development and Early Education (DCDEE, 2017).
- Data on other early childhood education sites that were not included in the study but that were included in the two early childhood education site count variables (total count and adjacent count) were obtained from the DCDEE licensing website, directly from the North Carolina Department of Public Instruction, and from publicly available web-based listings of Head Start and other education organizations, such as the Southern Association of Independent Schools (n.d.).
- Data on the characteristics of census tracts are from the American Community Survey (ACS), collected annually between the decennial censuses by the U.S. Census Bureau (2018). The ACS data were obtained from the five-year estimate data spanning 2012–16.
- Data on public elementary schools (School Performance Grade numerical scores) in North Carolina for the 2017/18 school year are from the publicly available website hosted by the North Carolina Department of Public Instruction (2018).
- Data on the nine-point rurality score, the Rural–Urban Continuum Code for 2013 (the most recent year available), are from the publicly available website hosted by the U.S. Department of Agriculture (2013).
- Data on postsecondary institutions are from the National Center for Education Statistics (n.d.) Integrated Postsecondary Education Data System and verified on each institution’s website.

**Sample.** The analytic sample of 5,254 early childhood education sites represents a subset of sites within the population of interest, namely the 6,271 licensed early childhood education sites in North Carolina in December 2017. To be eligible for the study, a site had to have numerical scores available for Education Standards, Program Standards, and Total Score variables and had to meet a standard of confidence regarding their exact physical location to enable the geographic plotting required for the analyses. Only early childhood education sites serving children ages 3 and 4 were included in the study. Infant-only sites, those serving only school-age children, and those providing exclusively before- or after-school care were not included. Approximately 99 percent of the population of licensed sites that served the early childhood age group of interest and had available scores were retained for analyses based on the geocoding processes. (Details on eligibility criteria are in appendix A.)

The analytic sample of 5,254 early childhood education sites included all sites from the DCDEE dataset that met all the eligibility criteria. Of these, 3,542 (67 percent) were center-based sites and 1,712 (33 percent) were family child care homes. The sites were located in 1,714 census tracts throughout North Carolina, which represent 79 percent of the 2,170 populated census tracts defined for North Carolina in the 2010 census. North Carolina includes 100 counties, all of which are represented in the sample.

**Variables.** The outcome variables in the study included the Total Score of the QRIS rating for each site and two component scores, Education Standards and Program Standards. Among North Carolina early childhood education sites with all three scores as of December 2017, the correlation between Education Standards and Program Standards was .44, which provides support for treating each component score as a distinct yet related construct. The correlation between Education Standards and Total Score was .83, and the correlation between Program Standards and Total Score was .87. Despite the strong correlations between the component scores and the Total Score, which limits the uniqueness of findings by outcome, the Total Score was included in the analyses because it is the metric used to assign star ratings, which is how parents typically compare early childhood education sites.

Site-level variables for each early childhood education site included whether the site was a center/school or a family child care home; the minimum and maximum age of children served; and whether the site participated in the school readiness subsidy program, a proxy for serving at least some children from lower income homes. Other site-level variables were total enrollment capacity during the primary daytime shift; whether the site provided additional shifts, such as afternoon or evening child care in addition to typical daytime services; whether the site was nationally accredited;<sup>1</sup> and whether the site provided home pick-up transportation. The calculated variable of distance to the nearest eligible postsecondary institution was also included as a site-level variable. Site-level variables for each site were those documented in publicly available records as of the end of 2017. Sites update these data with each periodic renewal of their license, which typically occurs every three years (North Carolina Rated License Assessment Project, n.d.). Renewals for the early childhood education sites included in the analyses occurred between 2006 and 2017, with more than 97 percent occurring between 2014 and 2017. Some sites might update their information between license renewals, so their data could be more recent than is documented.

Census tract–level variables from the U.S. Census Bureau for the five-year estimate spanning 2012–16 included population; percentage of households with children younger than age 6, a proxy for the likely need for early education/child care within the neighborhood; and five racial/ethnic characteristics (proportion of the population that is African American, not Hispanic; proportion Asian, not Hispanic; proportion Hispanic; proportion other race/ethnicity, not Hispanic; and proportion White, not Hispanic). Census tract–level variables for socioeconomic status included proportion of the population living below the federal poverty line, proportion older than age 16 unemployed for the past 12 months, proportion older than age 25 with no high school diploma, proportion older than age 25 with high school as the highest level of education, proportion older than age 5 speaking only English, and median household income. The variables also included the Gini index of income inequality (0 is total equality and 1 is extreme inequality). Finally, the variables included a county-level average quality score for the public elementary schools serving children in kindergarten to grade 3<sup>2</sup> and a rural–urban index (a higher score indicates greater rurality).

The two count variables (total count and adjacent count) were calculated by geolocating all early childhood education sites included in the study and other early childhood education sites that did not meet the study’s inclusion criteria.

**Methodology.** Regression analysis using multilevel structural equation modeling was used to assess the strength of any association between neighborhood characteristics and each of the quality outcomes for early childhood education sites (Education Standards, Program Standards, and Total Score; research question 1). These multilevel models account for the fact that early childhood education sites are nested within neighborhoods. In addition, latent profile analysis using a subset of the tract-level variables was used to describe the extent to which census tracts were demographically and socioeconomically similar. The classifications derived through the latent profile analysis were used as predictors in the multilevel models to simplify interpretation of the results. Sensitivity analyses supported this approach (see appendix A).

To answer the three research questions, an initial step was to determine how much quality rating scores differed within and between neighborhoods. Understanding where the most variability occurs is important in building this type of regression model because, in general, when there is only a small amount of variability between groups—in this case, between neighborhoods—there is little opportunity to improve the regression model without making it unnecessarily complex. Then, for research question 1 the study team used a model-building approach that advanced in steps from the least to most complex to select the best prediction model with the least number of predictors and complexity.

To answer research question 2, the study team tested the strength of the association between the count of early childhood education sites in the neighborhood and the quality rating scores of early childhood education sites by adding the count variables (total count and adjacent count) to the final model for research question 1. The additional variables were retained in the model if they improved the model fit. To answer research question 3, the study team tested the strength of the association of the distance between an early childhood education site and a postsecondary institution with degree or certificate programs in early childhood education by adding the distance to the final model selected under research question 1. Comparisons were made to determine whether this additional variable improved the model fit enough to justify the additional complexity.

A more detailed description of the methodology is in appendix A.

#### Notes

1. Early childhood education sites can choose to participate in a national accreditation process provided by one of three organizations: National Association for the Education of Young Children, National Accreditation Commission for Early Care and Education Programs, and National Early Childhood Program Accreditation.
2. A school had to include at least one of the four grades to be included but could include higher grades and prekindergarten.

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## *Location and quality distribution of early childhood education sites*

To provide context for the study findings, this section briefly describes the distribution of early childhood education sites across neighborhoods and their quality rating scores. The total count of early childhood education sites averaged 3.5 sites per neighborhood, with a median of 3 and a range of 1–23 across the 1,714 included neighborhoods. The average for the adjacent count was 18.5 sites, with a range of 0–111 across adjacent neighborhoods.

Two-thirds of sites were of moderate to high quality, earning at least 10 of 15 possible Total Score points (4 out of a possible 5 stars) in 2017. Previous reporting that used the total number of sites participating in the quality rating program in 2009 noted that approximately 47 percent of center-based sites and 31 percent of family child care

home sites earned points equivalent to 4 or 5 stars (Office of Planning, Research and Evaluation, 2010). Therefore, the 2017 data appear to indicate an upward shift in the quality of participating early childhood education sites in North Carolina. On average, center-based sites achieved higher quality rating scores than family child care home sites (table 1), a finding that is consistent with prior literature (Dowsett et al., 2008).

As would be anticipated, there are fewer sites in more rural census tracts than in more urban tracts. In both rural and urban tracts 65 percent or more of the early childhood education sites earned at least 10 Total Score points (table 2). As was the case for sites overall, early childhood education centers in both rural and urban areas earned higher quality rating scores than did family child care home sites (table 3). However, quality ratings are relatively consistent within site type across the rural–urban continuum.

**Table 1. Mean Quality Rating Improvement System scores of early childhood education sites in North Carolina, by quality score component and site type, 2017**

Quality score component	All sites (n = 5,254)		Center-based sites (n = 3,542)		Home-based sites (n = 1,712)	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Education Standards	5.25	1.97	5.55	1.60	4.62	2.46
Program Standards	4.27	2.34	5.03	2.09	2.69	2.02
Total Points	10.44	3.82	11.54	3.26	8.15	3.87

Note: Education Standards scores and Program Standards scores range from 1 to 7; the maximum possible score on the Total Points is 15 because this score includes the possible addition of 1 Quality Point, earned by exceeding the minimum criteria for certain staff education or program standards.

Source: Authors' analysis using data from North Carolina Division of Child Development and Early Education (2017).

**Table 2. Percent of early childhood education sites in North Carolina, by Quality Rating Improvement System score range and Rural–Urban Continuum Code, 2017**

Score range	Sites in very urban metropolitan tracts (RUCC = 1)	Sites in moderately urban metropolitan tracts (RUCC = 2)	Sites in somewhat urban metropolitan tracts (RUCC = 3)	Sites in somewhat urban nonmetropolitan tracts (RUCC = 4)	Sites in moderately rural nonmetropolitan tracts (RUCC = 5–6)	Sites in very rural nonmetropolitan tracts (RUCC = 7–9)
	n = 1,451	n = 1,988	n = 494	n = 671	n = 468	n = 182
Percent of total	27.6	37.8	9.4	12.8	8.9	3.5
Percent of sites earning 10 or more Total Score points (4 or 5 stars)	68.8	67.1	67.5	65.4	72.9	72.5
Percent of sites earning 6 or fewer Total Score points (1 or 2 stars)	11.9	7.7	8.1	6.7	6.0	8.2

RUCC is Rural–Urban Continuum Code. See U.S. Department of Agriculture (2013) for more detail.

Note: n = 5,254.

Source: Authors' analysis using data from Division of Child Development and Early Education (2017), U.S. Census Bureau (2018), and U.S. Department of Agriculture (2013).



**Table 3. Percent of early childhood education sites in North Carolina, by site type and Rural–Urban Continuum Code, 2017**

Site type	Sites in very urban metropolitan tracts (RUCC = 1)	Sites in moderately urban metropolitan tracts (RUCC = 2)	Sites in somewhat urban metropolitan tracts (RUCC = 3)	Sites in somewhat urban non-metropolitan tracts (RUCC = 4)	Sites in moderately rural non-metropolitan tracts (RUCC = 5–6)	Sites in very rural non-metropolitan tracts (RUCC = 7–9)
Center-based sites	<i>n</i> = 955	<i>n</i> = 1,320	<i>n</i> = 322	<i>n</i> = 479	<i>n</i> = 322	<i>n</i> = 144
Centers as percent of total sites per RUCC category	65.8	66.4	65.2	71.4	68.8	79.1
Percent of total centers in each RUCC category	27.0	37.3	9.1	13.5	9.1	4.0
Percent of centers earning 10 or more Total Score points (4–5 stars)	80.1	76.4	78.6	71.8	81.6	82.0
Percent of centers earning 6 or fewer Total Score points (1 or 2 stars)	4.2	2.1	2.5	1.3	1.9	2.8
Home-based sites	<i>n</i> = 496	<i>n</i> = 668	<i>n</i> = 172	<i>n</i> = 192	<i>n</i> = 146	<i>n</i> = 38
Family child care homes as percent of total sites	34.2	33.6	34.8	28.6	31.2	20.9
Percent of total family child care homes in each RUCC category	29.0	39.0	10.1	11.2	8.5	2.2
Percent of family child care homes earning 10 or more Total Score points (4–5 stars)	47.0	48.5	47.6	49.5	53.5	36.8
Percent of family child care homes earning 6 or fewer Total Score points (1 or 2 stars)	26.8	18.7	18.6	20.3	15.1	28.9

RUCC is Rural-Urban Continuum Code. See U.S. Department of Agriculture (2013) for more detail.

Note: *n* = (5,254).

Source: Authors’ analysis using data from Division of Child Development and Early Education (2017), U.S. Census Bureau (2018), and U.S. Department of Agriculture (2013).

As a preliminary exploration of the potential link between location and quality, the study team determined that 89 percent of the 1,714 census tracts included at least one early childhood education site with a Total Point score of 10 or higher (equivalent to 4 or 5 stars). Although a large majority of census tracts thus had at least one higher quality site, many census tracts had a wide range of quality across sites: 20 percent of tracts had at least one site with a Total Point score of 5 or lower, and 47 percent had at least one site with a Total Point score of 7 or lower.

### **Neighborhood groupings by key characteristics**

In preparation for the primary analyses, the study team used a statistical grouping technique to assign the 1,714 included neighborhoods into profile groups based on their key characteristics. This technique yielded three profiles. Tracts assigned to the same profile have similar demographic and socioeconomic characteristics. For ease of exposition, the three profiles are named for their highest concentration (relative to the average for all census tracts) of specific demographic or socioeconomic variable values (table 4). For example, Profile 1 is named “Above average White and below average in poverty.” References to “below” or “above” average are used to distinguish a profile from other profiles and are generally relative judgments that allow for an understanding of the overall similarities and differences across neighborhoods in North Carolina. This is especially helpful for a study that includes a large number of descriptive variables. In addition to the use of these profiles to characterize neighborhoods in North Carolina, the profiles were used as predictors of quality outcomes in the multilevel analyses.

**Table 4. Three profiles of North Carolina census tracts based on tracts' highest concentrations of neighborhood characteristics, 2012–16 (mean percent of population, unless otherwise noted)**

Neighborhood characteristic/variable	All census tracts	Profile 1: Above average White and below average in poverty	Profile 2: Above average African American and above average in poverty	Profile 3: Average racial composition and poverty level
	<i>n</i> = 2,161	<i>n</i> = 572	<i>n</i> = 347	<i>n</i> = 1,242
African American not Hispanic	21.4	11.2	51.0	17.9
Asian not Hispanic	2.4	4.7	1.6	1.5
Hispanic	8.6	5.5	13.1	8.8
Other race/ethnicity not Hispanic	3.3	2.6	5.9	3.0
White not Hispanic	64.3	76.1	28.4	68.8
Below federal poverty line	17.8	7.2	35.6	17.7
Older than age 16 unemployed for past 12 months	5.2	3.3	8.6	5.2
Older than age 25 with no high school diploma	14.2	4.6	25.8	15.4
Older than age 25 with high school diploma as highest education	26.5	15.1	32.0	30.2
Proportion of households receiving public assistance income or food stamps/SNAP benefits	15.7	4.6	34.8	15.5
Older than age 5 speaking only English	89.1	89.2	85.6	90.0
Completely rural or less than 2,500 urban population <sup>a</sup>	3.0	0.0	2.6	4.4
Gini inequality index (0–1) <sup>b</sup>	.43	.42	.46	.43
Median household income (dollars)	51,267.72	80,492.70	27,952.39	44,322.26

SNAP is the federal Supplemental Nutrition Assistance Program for low-income families.

Note: *n* = 2,161. Not all variables in the table were included in the latent profile analyses. Details are in appendix A.

a. Based on a 2013 Rural–Urban Continuum Code of 8 or 9.

b. Where 0 indicates complete equality and 1 indicates complete inequality.

Source: Authors' analysis using data from U.S. Census Bureau (2018) and U.S. Department of Agriculture (2013).

## Findings

### *None of the neighborhood-level variables was associated with the quality rating scores of early childhood education sites*

Only a small percentage of the differences across sites in the three QRIS rating scores could be attributed to neighborhood characteristics, meaning that there was little difference in quality rating scores across neighborhoods. For Education Standards, neighborhood characteristics accounted for just 4.2 percent of the total differences in quality rating scores across sites (see appendix A). Similarly, for Program Standards, neighborhood characteristics accounted for just 8.4 percent of the total differences in quality rating scores across sites, and for the Total Score, neighborhood characteristics accounted for 5.1 percent. Variations in rating scores across sites in the same neighborhood accounted for the largest proportion of differences in quality rating scores.

Although no neighborhood-level characteristics were associated with quality rating scores across early childhood education sites, some site-level characteristics were associated with one or more of the three quality rating scores (see appendix A for more detail). Variables representing the age range served by the early childhood education site and whether the site participated in the school readiness subsidy program both predicted quality rating scores. Notably, the percentage of the differences across sites that was attributable to neighborhood characteristics declined

after site-level variables were included in the statistical models, with the percentage of differences accounted for by neighborhood characteristics declining to 3.6 percent for Education Standards, 4.7 percent for Program Standards, and 2.8 percent for Total Score (see table A3 in appendix A). Thus, overall, the differences in quality among early childhood education sites are greater within neighborhoods than across neighborhoods.

One possible explanation for the finding that the age range served by a site predicted quality rating scores may be that higher quality is easier to achieve when the developmental levels of the children being served are less varied because their education and care needs may also be less varied. Or it could be that sites operated by public schools, where the focus is primarily on four-year-old children and thus the age range is narrower, are generally of higher quality (Coley et al., 2016; Pianta et al., 2005). Age range may also be a proxy for other variables that may predict quality, such as organizational climate (Slot, 2018), caregiver beliefs (Hughes-Belding et al., 2012), teacher salary, or access to specialists (Madill et al., 2015). For example, child care sites serving infants through preschool-age children may embrace a traditional child care model (Martinez-Beck & Zaslow, 2006; Susman-Stillman et al., 2013) in contrast to school-based prekindergarten sites serving only preschool-age children, which may be more focused on early education goals. Relatedly, Head Start sites, which usually serve only preschool-age children, frequently pay teachers higher salaries than do community child care sites, which usually serve a broader age range (Whitebook et al., 2014). Additional research is needed to assess these possible explanations, including studies that separate center-type early childhood education sites by their primary organizational sector (public, private, Head Start).

The finding that sites that participated in the school readiness subsidy program had higher quality rating scores should be interpreted with caution. Only early childhood education sites that earn Total Score points equivalent to a 3-star rating or better (7 or more points) are eligible to participate in the subsidy program (North Carolina Division of Child Development and Early Education, n.d.). However, this finding may also suggest that sites that are motivated to take the necessary steps to support low-income families are also more likely to take steps to boost their quality rating score. The design of the current study is unable to establish whether this explanation is accurate. Prior studies have mixed findings on whether participation in the school readiness subsidy program is associated with higher quality (Jones-Branch et al., 2004; Krafft et al., 2017), although most studies have evaluated the association between families' use of subsidies and the quality of the site in which their child was enrolled, rather than whether the site participated in the subsidy program (for example, Johnson et al., 2012).

After accounting for the characteristics of early childhood education sites, the study team investigated whether neighborhood characteristics predicted quality rating scores. For research question 1, neighborhood-level variables included socioeconomic characteristics, as represented by profile membership, tract population size, and the proportion of households with children younger than age 6. None of these neighborhood-level variables explained the between-site differences in the quality rating scores over and above the already included key site-level variables, which is consistent with the small proportion of the differences among sites that is attributable to neighborhoods.

This study's finding of no meaningful association between neighborhood socioeconomic characteristics and quality rating scores differs from the findings of some prior studies for the United States and Australia, which did find meaningful associations (for example, Burchinal et al., 2008; Cloney et al., 2016). In particular, one study for North Carolina found that quality rating scores varied by location, with more disadvantaged zip codes having lower quality sites (Hatfield et al., 2015). The difference in findings between that study and the current study may reflect that study's use of less precise zip codes rather than census tracts to identify geographic areas. In addition, the Hatfield et al. (2015) study used 2008 data; the number of neighborhoods and larger regions in the state that include sites with higher quality rating scores might have increased since then. The results of the current study are more consistent with those of De Marco and Vernon-Feagans (2013), who reported that an index of

neighborhood disadvantage—where neighborhood was defined as census block groups that are subsumed within tracts—did not predict child care quality for their sample from rural areas in two states.

In addition, the use of census tracts to represent neighborhoods could influence the findings if census tracts were either too large or too small to detect possible associations between neighborhood characteristics and quality rating scores. The census tract is a frequently used intermediate geographic unit (Messer et al., 2006), including for research on child care (Herbst & Barnow, 2008; Neidell & Waldfogel, 2009; Queralt & Witte, 1998). Census tracts have the advantage of being more fine-grained than counties but less fine-grained than the smaller block group option. Although research suggests that the characteristics of block groups and tracts are well correlated (Roux et al., 2001), future research could explore how the size of geographic areas affects the robustness of the findings.

### ***The counts of early childhood education sites in a neighborhood or in adjacent neighborhoods were not associated with quality rating scores after site-level characteristics were accounted for***

Neither of the additional variables for research question 2 (counts of early childhood education sites in the neighborhood and in adjacent neighborhoods) was associated with differences in the quality rating scores over and above the differences associated with already included key site-level variables. Research question 2 was included to explore whether neighborhoods with more early childhood education sites had sites with higher quality rating scores because sites might compete with each other for enrollment on the basis of quality rating scores.

Beyond the overall finding of little variability across neighborhoods in the three quality outcomes, there are other potential explanations for why the count of early childhood education sites in a neighborhood was not a meaningful predictor. One possibility is that because the average number of sites within each neighborhood was relatively low, there was not enough competition to exert an effect. However, the count of sites in adjoining neighborhoods, which had a wider range, also was not a meaningful predictor. Future analyses could explore alternative versions of count variables, such as including all other sites within a particular distance of a focal site.

Alternatively, sites may rely on characteristics other than quality ratings, such as cost, to compete for enrollment. Although quality rating scores are available online, parents might not have access to site-level quality information, or they might not share the state’s perspective on what defines quality (Mocan, 2007). The literature on parental decisionmaking related to child care suggests that family characteristics plus convenience, costs, and participation in the school readiness subsidy program are all relevant factors (Henly & Lyons, 2000; Hirshberg et al., 2005; Raikes et al., 2012). Not all parents appear to consider the instructional content and quality of programs when selecting child care (De Marco, 2008; Gamble et al., 2009; Kensinger Rose & Elicker, 2008). As also discussed in the limitations section below, family-level data were not available, so it was not possible to determine the proximity of a family to its selected early childhood education site, nor whether a family’s home and its selected early childhood education site were in the same or similar neighborhoods.

### ***Distance to the nearest postsecondary institution with degree or certificate programs in early childhood education was not associated with quality rating scores***

When the distance to the nearest postsecondary institution with degree or certificate programs in early childhood education was added to the multilevel regression models (research question 3), that distance was not associated with variability in the quality rating scores over and above the variability associated with already included key site-level variables.

Research question 3 was included to explore whether the distance to a postsecondary institution with degree or certificate programs in early childhood education might be associated with the quality of early childhood education sites. This might be the case if site administrators and directors had more difficulty hiring and retaining



high-quality personnel with more advanced degrees (factors that directly contribute to points on Education Standards) if teachers in the area were not close to an institution with degree or certificate programs in early childhood education. One limitation with this distance metric is that teachers might have obtained their credentials in other locations before moving to the area or through an online distance learning program. Although this predictor was not important in the current analyses, that does not mean that challenges finding and retaining highly qualified personnel were not relevant to a site's efforts to achieve and maintain quality (Gable et al., 2007; Whitebook et al., 2014).

## Limitations

The study's nonexperimental design means that it cannot establish cause and effect. For example, finding a significant association between the age range served or participation in the school readiness subsidy program and quality rating scores does not mean that these characteristics are the cause of higher scores. The study's findings reveal only the strength of the associations.

The analyses conducted for this study focused on characteristics of early childhood education sites and of their neighborhoods but could not directly include any variables characterizing the families who enrolled their child at each early childhood education site. Thus, enrolled children might not reside in the same neighborhood as the site. Parents might enroll their child at a site closer to where they work than to where they live, or they might select a site for reasons other than travel distance from home (Kim & Fram, 2009; Weber et al., 2018). Early childhood education sites within the same neighborhood thus might serve families with differing sociodemographic characteristics. In addition, all families living near or within a particular neighborhood might not have equivalent access to the higher quality sites within the neighborhood because of constraints related to affordability, logistics, or other factors.

Another limitation is the exclusion from the analysis of the numerous early childhood education sites licensed in North Carolina that are exempt from the Star Rated License system, that chose not to participate, or that had probationary temporary licenses. Many of the sites choosing not to participate in the Star Rated License system were operated by faith-based institutions that are exempt from some state oversight processes, which is common practice across the country (Goldman & Boylan, 2010). However, these sites were included in the site counts so that the analyses accounted for their presence within the tract in relation to the quality of other sites in the same neighborhood.

Although a diverse set of site-level characteristics were considered in the analysis (those for which data were included in the North Carolina Division of Child Development and Early Education dataset), other factors likely explain additional differences in quality rating scores across sites. For example, the number of hours a day that each site is open, the pedagogical knowledge and training of its educators, the physical environment of classrooms, and the condition of playground equipment all may vary and could contribute to sites' scores on Program Standards under the environmental quality measure in these scores. Similarly, using alternative or additional census variables might have identified more differentiated features across neighborhoods that could have been important predictors of quality outcomes.

## Implications

The study findings suggest that the geographic location and sociodemographic characteristics of a neighborhood need not be impediments to providing or ensuring access to higher quality early childhood education, as represented by higher scores on quality rating measures. Neighborhood-related predictors, such as socioeconomic characteristics, were only weakly associated with quality rating scores. Many different types of neighborhoods in many different locations appear able to support higher quality early education sites. On the other

hand, neighborhood characteristics also do not seem to preclude sites from being of lower quality. The lack of association of between neighborhood characteristics and variables representing competition from other early childhood education sites and their quality rating scores suggests that these factors may not be useful to early childhood education leaders in allocating quality improvement resources. Given that higher quality sites appear to be available in neighborhoods throughout the state, policymakers may want to consider efforts to maximize parents' awareness of and access to the quality rating scores of sites in their neighborhoods to inform their family decisionmaking.

More research is needed to understand what characteristics of sites and their context might best predict whether an early childhood education site will be of higher or lower quality. This study examined whether the count of early childhood education sites in and near a neighborhood and the distance to a postsecondary institution with degree or certificate programs in early childhood education explained some of the differences in quality rating scores. None of these predictors was significant. The lack of association between proximity to the nearest post-secondary institution with degree or certificate programs in early childhood education and quality rating scores similarly suggests that such proximity might not be useful in making decisions about resource allocation to help sites improve their quality.

In contrast, the characteristics of the early childhood education sites themselves were more consistently and strongly associated with the three quality rating scores. In particular, the site type, the age range of children served, and whether a site participated in the school readiness subsidy program for child care services were significantly associated with at least one of the quality rating outcome measures and explained some of the variability in quality rating scores. Variability in quality rating scores across early childhood education sites means that it is important to search for characteristics that meaningfully predict these scores as part of continuing efforts to improve and maintain the quality of all early childhood education sites.

The statistically significant association between some early childhood education site characteristics and quality rating scores suggests some directions for further investigating why quality differs across sites in order to inform the targeting of supports. For example, the finding that early childhood education sites serving children across a wider age range tend to have lower quality scores suggests further research into the reasons for this association so that early childhood education leaders can develop appropriate supports.

Because the study used data that many states routinely collect or that are publicly available, other states might begin to analyze their own quality ratings data to determine whether associations exist between the location and the density of early childhood education sites and their quality.

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