Oklahoma School Readiness Risk Report 2013

Predictors in School Readiness

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Predictors in School Readiness:

Oklahoma School Readiness Risk Factors Index (SRRI)

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ABSTRACT

Background: Numerous factors influence young children's readiness to learn when they enter kindergarten. An index that quantifies the risk of inadequate preparation for school among children across Oklahoma could help the state track the prevalence of risk factors and target programming to areas most in need. This paper describes the development of the Oklahoma School Readiness Risk Index (SRRI) 2013, which updates the SRRI originally developed in 2011.

Methods: Based on a review of the empirical literature that identifies factors related to school readiness, and on availability of data at the county level, 18 variables were selected for analysis and organized into Infant/Child, Maternal, and Family related factors. Data for these variables were compared to national-level data. Principal Components Analysis (PCA) was used as a dimension reduction technique to analyze the 18 variables, followed by multivariate regression methods to identify factors that significantly explain school readiness, using third-grade reading and mathematics proficiency as outcome variables.

Results: The PCA yielded four components comprised of 12 variables, with 6 variables that did not correlate with any component. Regression analysis showed that, when combined, variables on 3 components (low maternal education, Hispanic ethnicity, English language learners, young maternal age, single-parent family, family poverty status, American Indian race, abuse and neglect, and children in foster care) and 1 individual variable (child migrant status), significantly explained third-grade reading skills but were not significantly associated with third-grade mathematics skills. These variables were then used to calculate scores on the SRRI for each county, which show that 58 out of 77 Oklahoma counties have, on average, higher risk indices than national rates. In other words, approximately 79% of all Oklahoma children from infancy to age 5 are at high risk of coming to school unprepared to learn.

Conclusion: Development of the Oklahoma SRRI 2013 is an important step in monitoring the severity of risks for poor school readiness faced by Oklahoma's children, and highlights the extreme need for early childhood education programs across the state.

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I. INTRODUCTION

Every year over six million children across the United States enter kindergarten,[i] each with a different set of strengths, weaknesses, and needs. Even though individual differences in children's early academic skills and behaviors can be expected, research shows that socioeconomic factors significantly explain gaps in school readiness (Fryer & Levitt, 2004; Denton & West, 2002; Lee & Burkham, 2002). Research on early childhood risk factors and how these factors could lead to negative child outcomes is abundant in the literature. Evidence suggests that it is the cumulative effect of multiple risks that leads to poor school-entry academic achievement (Webster-Stratton & Reid, 2010; LaParo & Pianta, 2000). For example, children from families with multiple risk factors, such as poverty and low maternal education, have lower cognitive development, lower social and emotional growth, more health problems, and demonstrate academic achievement gaps at kindergarten entry compared to peers without these risk factors (Halle, Forry, Hair, Perper, & Wandner, 2009; NRCIM, 2000; West, Denton, & Germino-Hausken, 2000; Smith, Brooks-Gunn, & Klebanov, 1997).

Without adequate education and support, children facing early academic challenges will also have higher risk in terms of long-term education and employment achievements. Evidence shows they are more likely to drop out of school, have greater difficulty finding high-paying employment, depend on the support of welfare programs, or even commit crime (Rolnik & Grunewald, 2003; Brooks-Gunn & Duncan, 1997; Duncan, Brooks-Dunn, & Klebanov, 1994). Identification of risk factors that hinder cognitive, social and mental development of children is the essential first step toward preventing negative outcomes and promoting successful lives. Research shows young children living in high-risk environments can be successful if they participate in high-quality early education programs (Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Hamre & Pianta, 2001; NRCIM, 2000; Tucker, Zayco, Herman, & Reinke, 2002).

In recent years, state and federal governments have paid increasing attention to these problems, making efforts to identify factors explaining school readiness and implement evidence-based programs that could narrow the gap (Scott-Little, Lesko, Martella, & Milbum, 2007; Barnett, Epstein, Friedman, Sansanelli, & Hustedt, 2009). In a comprehensive nationwide report, Daily, Burkhauser, and Halle (2010) show that all states have successfully identified the skills and abilities children need to develop before entering school. Few states, however, are tracking children's readiness along those expectations statewide, or have developed multi-domain readiness measures for at-risk populations at the state level.

One of the pioneers in identifying and measuring school readiness risk factors is Pennsylvania. In 2006, it created an index that includes early childhood risk factors and program reach by county. The index was last updated in 2012 and is used to monitor changes in risk and reach factors across the state. The 2012 risk index includes 15 indicators organized into five categories: economic, maternal, birth outcome, academic, and toxic stress. Data on these indicators is used to calculate an overall Average Risk Level (ARL) for each county, which groups them into four risk categories ranging from high to low risk. The risk classification is used to evaluate the reach of 10 major programs serving children at school-entry level (Pennsylvania Department of Education and Public Welfare, 2012). Following Pennsylvania, a few other states have created risk and reach indicators using a similar methodology. In 2010, Louisiana

developed its early childhood risk index which was updated and expanded in 2012 to include program reach. The risk index consists of 11 indicators related to economic, health, and education factors; the reach index includes 10 major publicly funded preschool programs (Tulane Early Childhood Policy and Data Center, 2012). Kingsley & Hendey (2010) used a similar methodology to evaluate school readiness in 8 cities across the United States and explore better approaches to strengthening local school readiness systems. Neighborhood-level data on over 70 indicators was used to assess school readiness risk and the availability and need of services that support readiness. An overall index to summarize risk at the neighborhood level was then compiled and a risk/service use ratio was calculated for all census tracts in the county.

Oklahoma started to identify early childhood risk and reach factors at the county level in 2011, when the state created a partnership to coordinate resources and support state efforts to assess needs. Using several variables reported in the literature as associated with early learning development and school preparedness, the state created its own summary measure of school readiness with 18 factors grouped into four categories: Infant/Child, Mother, and Family related factors, and Special Populations. Data on the factors were used to create the composite Oklahoma School Readiness Risk Index (SRRI), which was used to group counties into quartiles and rank into four groups according to their school readiness risk (Lazarte-Alcala, 2011).

This study builds upon previous school readiness research in several ways. First, we include as predictors a wide representation of school readiness risk indicators used in previous research. Second, we identify a smaller set of variables and describe the most important profiles of children at higher risk of poor academic performance. Third, we implement rigorous analytic methods to examine the explanatory power of the school readiness risk variables. Finally, we create the SRRI 2013 by implementing a new methodology that uses the national average for each of the key risk dimensions of school readiness. The rest of the paper is organized into three sections. A brief literature review relating to early childhood development and the school readiness risk factors is presented in section II. The data used in this study, and the methodologies used to estimate school readiness and compute the SRRI, are explained in Section III. The results of data analyses and Oklahoma counties ranked according to their SRRI scores are presented in Section IV, parts A and B. Finally, in Section V we discuss the results and present some conclusions and next steps for the School Readiness Risk Index.

II. REVIEW OF THE LITERATURE: SCHOOL READINESS RISK FACTORS

The concept of school readiness has been approached from several different perspectives, including readiness as skill-based to readiness as a holistic construct that considers both cognitive and population-level factors. With the current interest among researchers, policy makers, and community members in school readiness, it is generally accepted that readiness is a multidimensional construct highly influenced by interrelated factors occurring in the context of home, school, and community (Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006; High, 2008).

Brain development and early learning experiences significantly impact school readiness, and opportunities for these experiences are highly dependent on the environment within which a child

grows (NRCIM, 2000; Glaser, 2000; Kelley, 2003; Rodriguez & Tamis-LeMonda, 2011; Thompson, Levitt, & Stanwood, 2009). Nurturing early environments contribute to normal brain maturation and appropriate development of cognitive, linguistic, and social/emotional skills (NRCIM, 2000; NICHD, 2002; Peisner-Feinberg et al., 2001). Early learning skills can significantly impact subsequent achievement in reading and mathematics at later primary grades (Claessens, Duncan, & Engel, 2009), high school completion (Garnier, Stein, & Jacobs, 1997), and college enrollment (Brooks-Gunn, Guo, & Furstenberg Jr., 1993).

A. NATIONAL SCHOOL READINESS INDICATORS

Numerous factors have been identified that impact school readiness. The National School Readiness Indicators Initiative (NSRII, 2005) identified five domains that contribute to a child's readiness for school,[ii] each domain is comprised of indicators that reflect the concept of readiness as children, families, communities, health services, early child care and education, and schools possessing characteristics that, when combined, lay a solid foundation for student achievement. Indicators for three of these characteristics (i.e., families, communities, and health services) are included in the Oklahoma School Readiness Risk Index (SRRI).[iii] Additionally, the State Early Childhood Comprehensive System Initiative (ECCS) is a project to monitor early childhood outcomes with a focus on school readiness (Johnson, Davidson, Theberge, & Knitzer, 2008). An assessment of state ECCS reports resulted in the recommendation of 36 indicators of school readiness which reflect those identified by the NSRII and some used in the SRRI.[iv]

Variables used in the Oklahoma SRRI 2013 are derived from the recommended indicators and a comprehensive review of empirical studies related to school readiness. Due to availability of data a total of 18 variables were selected. The variables are grouped into three categories of infant/child, maternal and family factors.

B. INFANT/CHILD FACTORS

Several factors regarding the health and cognitive abilities of infants and young children, such as low birth weight, behind on immunization schedule, learning disability, kindergarten retention, and child abuse and neglect, have been found to affect school readiness, with many of these factors occurring at a higher rate among children in poverty (Reichman, 2005; NEGP, 1997). Low birth weight, which can lead to permanent restrictions in physical and cognitive development (Kramer, 2003), contributes to racial and ethnic disparities in educational attainment, and can reduce a child's future earnings potential (Behrman & Rosenzweig, 2004; Fiscella & Kitzman, 2009). Children with low weight at birth are likely to have learning or other types of disability at the start of kindergarten (Hair et al., 2006). A longitudinal study of the effects of learning disabilities on academic achievement suggests gaps in intelligence quotient (IQ) between students with mathematics learning disabilities and those without widened between the second and eighth grades (Scarborough & Parker, 2003).

Childhood immunizations are important to maintaining the health of children and reducing the risk of cognitive impairments that stem from preventable diseases, such as measles (Bloom, Canning, & Weston, 2005; Robinson, Sepe, & Lin, 1993; NEGP, 1997). Bloom et al. (2005) found that immunizations were positively related to IQ and language and mathematics performance among young children.

Several studies have identified factors that contribute to under-immunization, which include race/ethnicity, low maternal education, single-mothers, poverty, and birth outside the United States (Findley, Irigoyen, & Schulman, 1999; Luman, McCauley, Shefer, & Chu, 2003).

Being retained in kindergarten is another important factor in a child's academic achievement. Numerous studies demonstrate that kindergarten retention, compared to non-retention, can have several negative effects, such as low skills in reading and writing in the elementary grades (Hong & Yu, 2007; Malone, West, Flanagan, & Park, 2006); increased likelihood of dropping out of high school (Jimerson, Anderson, & Whipple, 2002); poor attitudes toward school and low self-esteem (Carlton & Winsler, 1999); and lower performance on standardized achievement tests than non-retained children (Dennebaum & Kulberg, 1994).

Chronic stress from exposure to abuse and neglect presents serious risk factors for poor school readiness. Children in abusive and neglectful environments are at higher risk for slowed brain development and poor academic performance than those raised in nurturing environments (NRCIM, 2000; Knitzer & Lefkowitz, 2005). Longitudinal studies have demonstrated that adults who were abused or neglected as children have lower IQ scores, shorter attention spans, poorer memories, and increased risk of dropping out of school than non-abused or neglected children (Erickson & Egeland, 1996; Sapolsky, 1996; Widom, 2000).

C. MATERNAL FACTORS

School readiness is also affected by several maternal factors, including young maternal age, low maternal education, tobacco use during pregnancy, and lack of prenatal care. Enrollment rates in early learning programs decline with lower maternal education level (Barnett & Yarosz, 2007), which may partially explain the negative effect of under-educated mothers on a child's school performance (West et al., 2000; Zill & West, 2001). Using data from the National Evaluation of Welfare-to-Work Strategies Child Outcomes Study, Magnuson (2003) found that increases in maternal education positively affected school readiness.

Low educational level is also a contributor to young maternal age and poor prenatal care (Abrahamse, Morrison, & Waite, 1988; Fiscella & Kitzman, 2009). As of 2010, Oklahoma was among the top five states in terms of births to teen mothers at 50% or more (Hamilton & Ventura, 2012). Several studies have found negative relationships between teenage pregnancies and birth outcomes, such as low birth weight and inadequate prenatal care (Chen et al., 2007; Fraser, Brockert, & Ward, 1995), which can inhibit healthy in utero development of an infant's brain (NEGP, 1997; Thompson et al., 2009). Tobacco use during pregnancy and second-hand smoke exposure have been noted as among the primary contributors to negative birth outcomes (Bloch et al., 2010; Kramer, Séguin, Lydon, & Goulet, 2001), with research suggesting tobacco use may mediate the effect of maternal education on low birth weight (Finch, 2003).

Several studies have found that poverty and racial/ethnic minority status (Abrahamse et al., 1988; Chandra, Schiavello, Ravi, Weinstein, & Hook, 2002; Hamilton, Martin, & Ventura, 2012; Martin et al., 2012), in addition to being an immigrant (McLafferty & Grady, 2004) contribute to teen pregnancies and poor prenatal care. Being poor not only exacerbates negative birth outcomes, but also places teen

mothers at a disadvantage in terms of continuing their own education, which perpetuates a cycle of poverty for both mother and child (SmithBattle, 2007).

D. FAMILY FACTORS

Another important set of issues related to school readiness includes family-related factors, such as poverty, race/ethnicity, foster care, limited or no English in the home, homelessness, single-parent families, and migrant parents. A strong relationship exists between poverty and risk of adverse child outcomes, including low academic skills at kindergarten entry (Schulman & Barnett, 2005). Data from the Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS-K) of 1998-1999 showed that poverty was negatively related to literacy development from kindergarten to first grade (Kaplan & Walpole, 2005) and overall academic abilities (West et al., 2000; Zill & West, 2001). Children in poverty are three times more likely than those not in poverty to be born to an unmarried teenager; twice as likely to be retained a grade in school or to drop out of high school; nearly twice as likely to be born at low birth weight; 1.4 times as likely to have a learning disability; and nearly seven times as likely to experience child abuse and neglect (NRCIM, 2000).

Factors associated with being from a single-parent family, such as poverty and decreased parental interaction with children, place a child at high risk of delayed social and academic development (NRCIM, 2000). Of single parents, most are mothers, and research shows that households headed by single mothers are more likely to be impoverished than two-parent households (NRCIM, 2000; McLanahan, 2004). Amato (2001) found that children of divorced parents had significantly lower academic achievement than children of married parents.

Foster care placement is predicated by severe child abuse and neglect (Stovall-McClough & Dozier, 2004), and is most prominent among the poor (Barth, Wildfire, & Green, 2006) and racial/ethnic minorities, (Carter, 2010; Courtney & Skyles, 2003; Needell, Brookhart, & Lee, 2003). Several studies have demonstrated a strong relationship between foster care placement and poor academic outcomes (Knitzer & Lefkowitz, 2005; Pears, Fisher, & Bronz, 2007; Fantuzzo & Perlman, 2007). Homelessness, along with child abuse and neglect, has been found to mediate the effects of foster care placement on academic and behavioral skills (Fantuzzo & Perlman, 2007). Homelessness significantly contributes to low cognitive development (Shinn et al., 2008), poor reading and language skills (Fantuzzo & Perlman, 2007), and classroom behavioral problems (Rouse, Fantuzzo, & LeBoeuf, 2011).

Being of a racial/ethnic minority group increases the likelihood of experiencing multiple school readiness risk factors (West et al., 2000; Zill & West, 2001). Evidence shows that nearly 75% of Black and Hispanic children experience one or more risk factors, compared to 29% of White children (Zill & West, 2001). Considerably more Black and Hispanic kindergarteners live in poverty and have higher rates of low maternal education, teen mothers, and single parents (Ducan & Magnuson, 2005). Regarding health factors, Black and Hispanic females have higher rates of teen pregnancies than Whites (Chandra et al., 2002; Hamilton et al., 2012; Martin et al., 2012); and Black mothers are twice as likely as White mothers to have low birth weight infants (Martin et al., 2012). Children least represented in early childhood education programs are American Indian/Alaskan Native (Saluja, Early, & Clifford, 2002) followed by Hispanic (Laosa & Ainsworth, 2007). Black and Hispanic children have been found to have lower

socioemotional, cognitive, and language skills compared to White children (Carneiro & Heckman, 2003), with children living in homes where little to no English is spoken being at a greater disadvantage for language development (Hair et al., 2006; West et al., 2000; Zill & West, 2001). American Indian children are overrepresented in learning disability status (Hosp & Reschly, 2004), and nearly 40% of Hispanic fourth graders are English language learners (NCES, 2011). Research also shows that minority children have lower scores in grade-level mathematics and reading tests (NCES, 2009, 2011) and higher school dropout rates, when compared to their White peers (NCES, 2012). Of all major groups in the nation, migrant workers are recognized as the most poorly educated (Nevárez-La Torre, 2012). Poverty is endemic among migrant families (Mathur & Parameswaran, 2011), with many speaking little to no English (Nevárez-La Torre, 2012). Migrant children lack continuity of schooling and are often significantly behind in academic development (Green, 2003; Piacentini, Valentine, & Cockrell, 2007).

In conclusion, the literature cites numerous critical factors that affect school readiness and academic achievement. We have used these indicators in the development of the Oklahoma SRRI 2013, described in the following sections.

III. DATA AND METHODS

Data at the national and county levels were collected for this study from multiple secondary sources. The 18 school readiness risk factors selected for the analysis, including data sources used at the county level, are described in Table 1. The factors listed relate to young children and their close environment even before they are born, and have been broadly comprised into 3 groups: Infant/Child, Mother, and Family related factors. All of the variables are calculated in proportion to the relevant population. The table also lists the two variables we use as proxies for school readiness: insufficient third-grade reading and mathematics progress. The county-level data came primarily from publicly accessible databases. The Oklahoma State Department of Health (OSDH) OK2SHARE web-based query system has records on Vital Statistics, such as births for all Oklahoma residents since 1975, who have been born in and out of state. It includes various demographics of the child and mother that undergo a review process by the National Center for Health Statistics (NCHS) before published as final. Another data source is the OSDH Immunization Information System (OSIS), a statewide immunization registry that has collected and maintained current immunization records for Oklahomans of all ages since 1994. Although not all clinics report to it, it is the most complete statewide available source of immunization records. We also used the Oklahoma Department of Human Services (OKDHS) KIDS system, a statewide child welfare information source that provides centralized information pertaining to children and families served by the Title IV-B/IV-E state agency. Data has been stored in this system since 1994 and provides comprehensive information on adoptions and foster care, child support, abuse and neglect, etc. Additionally, the State Department of Education Student Information System (WAVE) was used, which is a comprehensive repository of statewide student record tracking and reporting information, beginning with the 2005-2006 school year. It maintains statistics of students and teachers at the school and district levels. Finally, the 2007-2011 American Community Survey (ACS) was used for various socio-demographic characteristics.

Table 1. School readiness risk variables, definitions, values and sources: County Level

Variable	Definition
Child Related Factors	
Child abuse and neglect	Children under 6 years of age who have been confirmed by Oklahoma Department of Human Services (OKDHS) as suffering abuse or neglect (FY2012).[a]
Children behind immunization schedule	Children 19-35 months who are behind current immunization schedule rates (i.e. 4DTaP, 3 Polio, 1MMR, 3Hib, and 3 Hepatitis B doses) as recommended by the Advisory Committee on Immunization Practices, the American Association of Pediatrics, and the American Academy of Family Physicians (2011).[b]
Children's disability status	Children in pre-kindergarten and kindergarten who are served by an Individual Education Program (IEP) (2009-2010).[c]
Kindergarten retention	Children in kindergarten who were retained and have to repeat kindergarten (2009-2010).[c]
Low birth-weight	Infants born in 2012 weighing less than 2500g (5.115 lbs.) (2012).[d]
Insufficient reading progress	Children in third grade that score below proficient in reading on a four level scale (i.e. advanced, proficient, limited knowledge and unsatisfactory) in the Oklahoma Core Curriculum Tests (OCCT) (2009-2010).[c]
Insufficient mathematics progress	Children in third grade that score below proficient in mathematics on a four level scale (i.e. advanced, proficient, limited knowledge and unsatisfactory) in the Oklahoma Core Curriculum Tests (OCCT) (2009-2010).[c]
Mother Related Factors	
Low maternal education	Infants born to mothers with less than 12 years of education (2008).[e]
Pregnancies without prenatal care	Infants born to mothers who had no prenatal care (2012).[d]
Tobacco usage during pregnancy	Infants born to mothers who use tobacco during the pregnancy (2012).[d]
Young maternal age	Infants born to mothers ages 10-19 (2012).[d]
Family Related Factors	
African-American/Black race	Children under 5 years of age who are African-American/Black (2011).[f]
American Indian/Alaskan Native race	Children under 5 years of age who are American Indian or Alaskan Native (2011).[f]
Children in foster care	Children under 6 years of age who are in OKDHS custody (FY2012).[a]
English language learners	Children in Pre-Kindergarten and Kindergarten who are English Language Learners (ELL) (2009-2010).[c]
Family poverty status	Children under 6 years of age living under 200% of the National Poverty Level (2011).[f]
Hispanic ethnicity	Children under 5 years of age of Hispanic or Latino ethnicity (2011).[f]
Homeless children	Children under 6 years of age who are defined as such according to section 725(2) of the McKinney-Veto Homeless Assistance Act (425 U.S.C. 11434a(2)) (2009-2010).[c]
Migratory children	Children under 6 years of age who participate in Migrant Education Programs (MEP) under title 1, Part C of the *No Child Left Behind Act of 2001*, including those served under continuation of services authority.[c]
Single-Parent Family	Children under 6 years of age living in single-parent headed households.[f]

[a] Oklahoma Department of Human Services (OKDHS), State FY 2012.
[b] 2011 Oklahoma State Immunization Information System (estimated rates for children born from 1-30-2009 through 5-31-2010).
[c] Oklahoma State Department of Education (OSDE), School year 2009-2010.
[d] Oklahoma State Department of Health (OSDH). Center for Health Statistics, Health Care Information, Vital Statistics 2012, on Oklahoma Statistics on Health Available for Everyone (OK2SHARE). Accessed at http://www.health.ok.gov/ok2share.
[e] Oklahoma State Department of Health (OSHD). Center for Health Statistics, Health Care Information, Vital Statistics 2008, on Oklahoma Statistics on Health Available for Everyone (OK2SHARE). Accessed at http://www.health.ok.gov/ok2share .
[f] US Census, 2007-2011 American Community Survey (ACS) 5-year estimates: Table B01001 (Sex by Age), B01001B (Sex by Age – Black or African American Alone), B01001C (Sex by Age – American Indian or Alaskan Native Alone), B01001I (Sex by Age, Hispanic or Latino), B17024 (Age by ratio of income to poverty level in the past 12 months), B09002 (Own children under 18 years by family type and age).

Table 2. School readiness risk variables definitions, values and sources: National level

Variable: National Value	Definition
Child Related Factors	
Child abuse and neglect: 1.3%	Children under 6 years of age who have been confirmed as suffering abuse or neglect (2011).[a]
Behind immunization schedule: 29.0%	Children ages 19-35 months who are behind current immunization schedule rates (i.e. 4DTaP, 3 Polio, 1MMR, 3Hib, and 3 Hepatitis B doses) (2011).[b]
Children's disability status: 6.0%	Children ages 3-5 years of age who are served by an Individual Education Program (IEP) (SY 2009-2010).[c]
Kindergarten retention: 5.0%	Children who were required to repeat kindergarten (SY 2010-2011).[d]
Low birth-weight: 8.1%	Infants weighing less than 2500g (5.115 lbs.) at birth (Avg. 2010 -211).[e]
Mother Related Factors	
Low maternal education: 19.9%	Infants born to mothers with less than a high school diploma (2010).[e]
Pregnancies without prenatal care: 1.6%	Infants born to mothers who had no prenatal care (2010).[e]
Tobacco usage during pregnancy: 10.8%	Infants born to mothers who used tobacco during the pregnancy (Avg. 2009-2010).[e,f]
Young maternal age: 10.1%	Infants born to mothers 10-19 years of age (Avg. 2007-2011).[e,g]
Family Related Factors	
African-American/Black race: 14.1%	Children under 5 years of age who are African-American or Black (2007-2011).[h]
American Indian/Alaskan Native race: 1.0%	Children under 5 years of age who are American Indian or Alaskan Native (2007-2011).[h]
Children in foster care: 0.6%	Children under 6 years of age who are in state protective custody (2011).[i]
English language learners: 16.0%	Children in Kindergarten who are English Language Learners (ELL) (SY 2010-2011).[d]
Family poverty status: 45.6%	Children under 6 years of age living under 200% of the National Poverty Level (2007-2011).[h]
Hispanic ethnicity: 28.6%	Children under 5 years of age of Hispanic or Latino ethnicity (2007-2011).[h]
Homeless children: 0.3%	Children 3-5 years of age who are homeless and enrolled in public schools in local education agencies with or without McKinney-Vento sub-grants (SY 2010-2011).[j]
Migratory children: 0.4%	Children 3-5 years of age who meet the statutory definition of a migratory child found in Migrant Education Programs (MEP) under title 1, Part C of the *No Child Left behind Act of 2001* (SY 2010-2011).[j]
Single-Parent Family: 28.6%	Children under 6 years of age living in single-parent headed households (2007-2011).[h]

[a] U.S. Department of Health and Human Services (U.S. DHHS), Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2012). *Child Maltreatment 2011*.
[b] U.S. Department of Health and Human Services, Centers for Disease Control and Prevention (CDC), *National Immunization Survey*, Q1/2011-Q4/2011.
[c] U.S. Department of Education, Office of Special Education Programs, Data Analysis System (DANS), OMB #18200-0043: "Children with Disabilities Receiving Special Education Under Part B of the Individuals with Disabilities Education Act," 2011.
[d] Mulligan, G.M., Hastedt, S., and McCarroll, J.C. (2012). First-Time Kindergartners in 2010-2011: First findings from the Kindergarten rounds of the Early Childhood Longitudinal Study, Kindergarten Class of 2010-11 (ECLS-K: 2011) (NCES 2012-049). U.S. Department of Education. Washington, DC: NCES.
[e] (U.S. DHHS) (CDC), National Center for Health Statistics (NCHS), Division of Vital Statistics, Natality public-use data 2007-2010, on CDC WONDER Online Database, December 2012. Low Birth Weight: 2010 (final), 2011 (preliminary); Low Maternal Education: 2010 (final); Prenatal care: 2010 (final); Young Maternal Age: 2007-2010 (final); Tobacco usage during pregnancy: 2010 (final)
[f] U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Pregnancy Risk Assessment Monitoring System, *Tobacco Use Annual Report*, 2009.
[g] Hamilton, BE, Martin JA, Ventura SJ. *Births: Preliminary Data for 2011*. National Vital Statistics Reports; 61(5). Hyattsville, MD: National Center for Health Statistics. 2012.
[h] US Census, 2007-2011 American Community Survey (ACS): Table B01001 (Sex by Age), B01001B (Sex by Age – Black or African American Alone), B01001C (Sex by Age – American Indian or Alaskan Native Alone), B01001I (Sex by Age, Hispanic or Latino), B17024 (Age by ratio of income to poverty level in the past 12 months), B09002 (Own children under 18 years by family type and age).
[i] U.S. Department of Health and Human Services, Adoption and Foster Care Analysis and Reporting System (AFCARS) FY 2011.
[j] U.S. Department of Education, EDFacts/Consolidated States Performance Report, 2010-2011.

The national statistics for the 18 school readiness risk factors included in Table 1 are listed in Table 2 alongside their definition, year(s) of coverage and sources. Most of the national measures included are the same as the county-level data. When data for the same age group were not available, highly comparable measures were used. Some of the sources used for the national statistics provide data for the entire population and some are derived from representative sampling; all sources came from publicly accessible databases. Data on child abuse, neglect and foster care came from two systems within the Administration on Children, Youth and Families (ACYF): The National Child Abuse and Neglect Data Systems (NCANDS), which centralizes annual data about child maltreatment from 52 states, and the Adoption and Foster Care Analysis and Reporting System (AFCARS), which collects national information on all children in foster care, including those who have been adopted with Title IV-E agency involvement. Most education data came from the National Center for Education Statistics (NCES). Specifically, we used the Data Accountability Center (DAC) for data on children with disabilities served under the Individuals with Disabilities Education Act (IDEA)-Part B and C, and the Early Childhood Longitudinal Study (ECLS) program sample data for children born in 2001 and followed from birth through kindergarten entry, regarding kindergarten retention information. We also used the website of the National Evaluation and Technical Assistance Center for the Education of Children and Youth who are neglected, delinquent, or at risk (NDTAC), which contains information on homeless and migratory children. Data in this system is collected on an annual basis from all states that receive Title I, Part D funding and then centralized in the Consolidated State Performance Report (CSPR). Data on vital statistics came primarily from the National Vital Statistical System of the Centers for Disease Control and Prevention (CDC), an intergovernmental data initiative that provides information of vital events such as births, deaths, marriages and divorces. National data on immunization records were taken from the 2011 National Immunization Survey (NIS), conducted by the National Center for Immunizations and Respiratory Diseases and the National Center for Health Statistics of the CDC. Finally, data on child ethnicity and race, poverty status, and family arrangements were obtained from the 2007-2011 American Community Survey (ACS).

From the data collected for the SRRI, Principal Components Analysis (PCA) was performed for the following four purposes: 1) transform the 18 variables into a smaller set of uncorrelated variables; 2) identify the variables with high correlations in each set; 3) obtain suitable variables for a multiple regression model; and 4) use a smaller set of the risk factors to calculate the School Readiness Risk Index for the counties in the state. Various tests were performed in order to validate the applicability of the data. To assess sampling adequacy and inter-item correlations, we used the Bartlett's sphericity test (Bartlett, 1954) and the Kaiser-Meyer-Olkin (KMO) measure (Kaiser, 1970). The former test assesses whether all the correlations among the variables included in the model are or are not significantly different from 0, whereas the second measure is a rough indicator of how adequate the correlations among the variables are for the PCA model. Variables with diagonal partial correlation coefficients - in the Anti-image correlation matrix - 0.5 or smaller were excluded from the model (Child, 2006). The criterion of eigenvalues greater than 1 was used to determine the number of components to extract (Kaiser, 1960). To assess the correlations between the original variables and the components, we followed the minimum component loading cutoff of 0.4, recommended by most textbooks (Meyers,

Gamst, & Guarino, 2006; Munro, 2005). Orthogonal rotation, which assumes components are uncorrelated, was used following the varimax method.

Multivariate regression was used to examine the explanatory power of the school readiness risk components and the individual variables that were excluded from the PCA. As customary, the linear regression model used operates within a classical framework where certain assumptions hold (Gujarati, 2004).[v] Several tests were performed to assess the appropriateness of the school readiness risk sample data. Perfect multicollinearity among the explanatory variables was evaluated using the Tolerance and Variance-Inflating Factor (VIF) indicators. If the variables that enter the regression are highly correlated, it is not possible to separate the effect of each of them on the dependent variable. A cutoff value of 10 was followed for this procedure (Stevens, 2002). We tested for outlier observations in the sample using scatterplots of the standardized residuals and predicted values and Cook's Distance value method (Cook, 1977). The inclusion or exclusion of such observations without further analysis can substantially alter the results, especially if the sample size is small. The normality distribution of the residuals[vi] in the regression was explored using a histogram of the residuals and later tested formally using two tests of model adequacy, namely the Kolmogorov-Smirnov (Kolmogorov, 1933; Smirnov, 1948) and the Shapiro-Wilk (Shapiro & Wilk, 1965) tests. The normality assumption allows us to draw conclusions from the data by, for example, testing the significance of the coefficients' estimates and the overall significance of the model. Possible heteroscedasticity in the sample data was assessed using a visual inspection of the residuals plotted against the predicted values of school readiness (Gujarati, 2004). Heteroscedasticity, or observations unequally spread around the mean for different values of the explanatory variables, could invalidate the statistical tests of significance. Analysis of variance and *t* and *F* tests were conducted to evaluate model fit and the significance of the explanatory variables in the school readiness model.

The items in the components and the individual variables that significantly explained school readiness risk among Oklahoma counties were used to calculate the state SRRI as a summary measure of key risk dimensions of school readiness. There are two steps to calculating the SRRI. In Step 1 we created the dimension indices for each of the 10 variables (one individual variable and those comprising three components that significantly explain school readiness) following two steps. First a national average was used as the median value for each dimension index; values below the national statistic level were assigned a value of 1 if the observed number was greater than 0, and assigned a value of 0 otherwise. Second, a median value was obtained for data above the national level; counties below this median value were assigned a value of 2, and counties performing above it were assigned a value of 3. Table 3 shows an example of how we assigned values in the calculation of the children living in poverty dimension index.

Table 3. Example of dimension indices calculation

Children living in poverty index

Indicator	Value
National average	0.46
Median above the national average	0.59
Rogers county	0.38
Value assigned	1
Oklahoma City county	0.58
Value assigned	2
Tillman county	0.68
Value assigned	3

Note: Values are rounded.

In Step 2 we aggregated the dimension indices for each county into the composite risk index value using the arithmetic mean.[vii] Counties were ranked by their 2013 SRRI value and further classified according to the aggregate average value into three groups: low risk, medium risk, and high risk.

IV. RESULTS

A. COMPONENTS AND ESTIMATES RESULTS

The 18 items selected were entered into the Principal Components Analysis (PCA), and the final model revealed the following 12 variables: young maternal age, low maternal education, tobacco usage during pregnancy, single-parent family, family poverty status, Hispanic ethnicity, American Indian race, children's disability status, children behind immunization schedule, abuse and neglect, children in foster care, and English language learners. The remaining six variables were removed from the model because they did not meet the statistical requirements in terms of sampling adequacy and inter-item correlations.

A dataset suitable for PCA requires that the variables are related. The results obtained from the Bartlett sphericity and the Kaiser-Meyer-Olkin (KMO) measure tests[viii] confirmed the adequacy of the data to proceed with the analysis (Meyers et al., 2006). The results of the PCA yielded a four-component solution accounting for 74% of the total variance in the data.[ix] The proportion of each of the 12 variables' variance that can be explained by the model ranged from 0.56 to 0.92. Table 4 shows how the 12 variables were grouped by component, and the factor loadings.[x] *Component 1* included low maternal education, Hispanic ethnicity and English language learners. *Component 2* consisted of young maternal age, single-parent family, family poverty status, and American Indian race. The two items loading on *Component 3* were abuse and neglect, and children in foster care. Finally, *Component 4* included tobacco usage during pregnancy, children behind immunization schedule, and children's disability status. Each component is unrelated to each other and adds unique information to the variance. Component loadings ranged from 0.55 to 0.96 for all 12 items, fulfilling the minimum requirement.

Table 4. Factor loading for the school readiness risk variables

Variable	Component 1	Component 2	Component 3	Component 4
Hispanic or Latino ethnicity	0.954			
English language learners	0.927			
Low maternal education	0.684			
American Indian or Alaskan Native race		0.698		
Single-parent family		0.788		
Family poverty status		0.784		
Young maternal age		0.617		
Abuse and neglect			0.903	
Children in foster care			0.902	
Children's disability status				0.693
Tobacco usage during pregnancy				0.549
Children behind immunization schedule				-0.807

Note: Scales that loaded with less than 0.40 coefficients on any of the factors, or that loaded on more than one factor were removed

To assess the relative contribution of the variables that the literature suggests to explaining school readiness, we subsequently estimated a linear regression model of academic performance with the four components and the six individual variables excluded from the PCA. We used the percentage of students scoring below Proficient/Satisfactory level in third grade reading as a proxy for school readiness due to the lack of data for a standardized statewide measure at school entry.[xi] Column 1 in Table 5 displays the estimates of the regression coefficients obtained and their standard errors. The results show that 3 out of 4 components are significantly associated with academic performance across Oklahoma counties: *Components 1*, *2* and *3*. Among the individual variables included in the estimation model, only the percentage of migratory children under six years of age had a statistically significant association with academic performance. All estimated coefficients of the variables and components significantly associated with the dependent variable show a direction of relationship consistent with what the literature explains. The goodness of fit or adjusted R^2 [xii] value for the regression is 0.16; since R^2 lies between 0 and 1, the variation in the explanatory variables included in the model account for 16% of the variation in school readiness. Low R^2 values in cross-sectional data involving several observations are not uncommon. They reflect the diversity of cross-sectional units and one should not be surprised or worried about them (Gujarati, 2004). The overall significance of the model is shown using the *F* statistic, which tests the hypothesis that all estimated coefficients in Table 5 are equal to 0. The explanatory variables are jointly significant at the 5% level (*p* value < 0.05).

Table 5. Coefficients from regressions of county-level third grade insufficient reading progress

Independent Variable	(1)	(2)
Constant	35.364***	36.430***
	(3.894)	(3.607)
Low birth-weight	-.292	-.466
	(.479)	(.445)
Migratory children	5.285*	5.248*
	(3.161)	(2.917)
Homeless children	.016	.004
	(.335)	(.309)
Kindergarten Retention	.148	.193
	(.250)	(.231)
Pregnancies without prenatal care	-.320	-.541
	(.484)	(.451)
African American or Black race	-.236	-.197
	(.196)	(.182)
Component 1	1.347*	1.552**
	(.819)	(.758)
Component 2	2.162***	2.233***
	(.719)	(.663)
Component 3	1.310**	1.559**
	(.764)	(.709)
Component 4	.194	-.077
	(.746)	(.693)
Observations	77	76
R^2	0.16	0.24

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

All tests performed to assess the appropriateness of the sample data validated the results. The VIF scores showed no multicollinearity in the model; the mean value of the 10 explanatory variables included (i.e., four components and six individual variables) is 1.2.[xiii] The Cook's Distance method confirmed the existence of one influential observation with a standard residual greater than 3 (and Cook's Distance of 0.255). Following Rencher and Schaalje (2007), the dataset was analyzed both with and without the outlier. None of the estimated coefficients were qualitatively different (see Column 2 in Table 5). The fit of the model improved to an adjusted R^2 of 0.24, and no other outliers were detected after the first one was removed. The sample data were not found significantly different than a normal population. The validity tests of model adequacy results showed it does not display a significant departure from normality (p values > 0.096 and 0.063). Cross-sectional heteroscedasticity was not present in the data.

B. SCHOOL READINESS RISK INDEX

The variables that significantly explain school readiness risk among Oklahoma counties were used to calculate the Oklahoma School Readiness Risk Index (SRRI) 2013. It measures the average performance in a county in 10 basic dimensions linked to school readiness: low maternal education, Hispanic ethnicity, English language learners, young maternal age, single-parent family, family poverty status, American Indian race, abuse and neglect, children in foster care, and migratory children. The composite

index was calculated by first ranking each county from 0—no risk—to 3—high risk—in comparison to the relevant national rates for each of the 10 variables. The average of these 10 indicators was then calculated for each county as the overall risk index. Table 6 lists Oklahoma counties ranked according to their SRRI value.

Table 6. School Readiness Risk Index (SRRI), 2013

SRRI rank		Risk value
LOW RISK		
1	Roger Mills	1.0
2	Cleveland	1.1
3	Kingfisher	1.1
4	Logan	1.1
5	Alfalfa	1.2
6	Canadian	1.2
7	Ellis	1.2
8	Grady	1.2
9	McClain	1.2
10	Rogers	1.2
11	Major	1.3
12	Noble	1.3
13	Wagoner	1.3
14	Dewey	1.4
15	Grant	1.4
16	Latimer	1.4
17	Lincoln	1.4
18	Payne	1.4
19	Washita	1.4
MEDIUM HIGH RISK		
20	Stephens	1.5
21	Tulsa	1.5
22	Woods	1.5
23	Blaine	1.6
24	Cotton	1.6
25	Creek	1.6
26	Garfield	1.6
27	Garvin	1.6
28	Harper	1.6
29	Kiowa	1.6
30	Love	1.6
31	Mayes	1.6
32	Osage	1.6
33	Beaver	1.7
34	Haskell	1.7
35	Pontotoc	1.7
36	Washington	1.7
37	Woodward	1.7
38	Atoka	1.8
39	Beckham	1.8

SRRI rank		Risk value
MEDIUM HIGH RISK (*Cont.*)		
40	Cimarron	1.8
41	Comanche	1.8
42	Craig	1.8
43	Custer	1.8
44	Greer	1.8
45	Jackson	1.8
46	Jefferson	1.8
47	McIntosh	1.8
48	Murray	1.8
49	Nowata	1.8
50	Bryan	1.9
51	McCurtain	1.9
52	Oklahoma	1.9
53	Pawnee	1.9
54	Pittsburg	1.9
55	Pottawatomie	1.9
56	Caddo	2.0
57	Carter	2.0
58	Cherokee	2.0
59	Delaware	2.0
60	Le Flore	2.0
61	Marshall	2.0
62	Okfuskee	2.0
63	Ottawa	2.0
64	Texas	2.0
65	Adair	2.1
66	Hughes	2.1
67	Johnston	2.1
68	Kay	2.1
69	Muskogee	2.1
70	Okmulgee	2.1
71	Sequoyah	2.1
72	Choctaw	2.2
73	Coal	2.2
74	Pushmataha	2.2
75	Seminole	2.3
76	Tillman	2.3
HIGH RISK		
77	Harmon	2.5

Based on the average scores, the counties were divided into three risk categories: low risk with a score of 1, which includes counties that on average have lower risk indices than the national rates (19 counties); medium risk with a score of 2, with counties that on average have higher risk indices than the national rates (57 counties); and high risk with a score of 3 (one county) that shows a significant deviation from the national rate. Therefore, 58 out of 77 Oklahoma counties, on average, have higher risk indices than the national rates. A summary of these results is presented in Table 7. The first column, overall score, is the average of the 10 risk indicators calculated for each county.

Table 7. Summary findings : Oklahoma young chindren's school readiness risk levels

Overall score	Number of counties	Number of children (0-5)	Percent of all children 0-5 in Oklahoma	Risk level
0.00 - 1.49	19	54,698	21.00%	Low risk
1.50 - 2.49	57	205,325	78.90%	Medium risk
2.50 - 3.00	1	219	0.10%	High risk
Total	77	260,242	100%	

Note: Population data comes from the American Community Survey (2007 - 2011).

As the data in this table indicate, 205,325 Oklahoma children below 5 years of age (79% of all children 0 to 5 years of age) are, on average, at higher risk of inadequate school readiness. This means they are entering school behind their national counterparts, and they are more likely to fall behind further as they grow. The data show the extent to which early childhood programming and funding are needed for over two-thirds of the Oklahoma counties, if we don't want our children to fall consistently behind other children in the country.

V. DISCUSSION AND CONCLUSIONS

We have presented results from the analysis of a county-level data set relating various characteristics of young children —including their close environment even before they are born — to school readiness. Our results suggest the existence of high correlations within four sub-sets (*components*) of variables that have been found to influence the readiness of a child to succeed in school. The effect on academic achievement of the variables in the first sub-set (i.e., Hispanic or Latino ethnicity, English language learner, and low maternal education) is significant. This sub-set suggests one important profile of children in elementary school that face higher risk for poor school readiness/academic performance. The confluence of such characteristics confirms what the empirical evidence has shown. Latino young children frequently enjoy warm home environments with robust social relations that contribute to their social skills development (Guerrero, Fuller, Chu, Kim Franke, Bridges, & Kuo, 2012). However, Latino toddlers are usually engaged less frequently in learning opportunities, which can negatively affect their literacy skills and subsequent academic performance (Jung, Fuller, & Galindo, 2012). Additionally, children of Latino parents are much less likely than other children to attend preschool programs, they do not usually speak English at home—60% of Hispanic children 5 and 6 years old in Oklahoma speak Spanish at home[xiv], and frequently have parents who lack English proficiency. All of these factors contribute to their lag in English competence that has been positively linked to the children's initial poor school readiness (Waldfogel, 2012). Finally, Hispanic mothers have on average very low educational attainment, below that of all other races and ethnicities (Aud, Fox, & KewalRamani, 2010). As it is

widely known, one of the most important variables that explains gaps in academic performance is the mother's education (Carneiro & Heckman, 2003).

Equally important, we find that children of American Indian or Alaskan Native race, with a single-parent family, facing poverty, and born to a young mother, shape the second profile of children in elementary school who are at higher risk of low school readiness. Research shows the existence of disparities, by racial group, in certain developmental skills and academic performance among children entering school (Carneirio et al., 2003). Among other minorities, American Indian/Alaskan Native children, on average, demonstrate significantly lower academic skills at this stage (Sadowski, 2006), and also in later academic achievement. Most researchers agree that race and ethnicity are closely related to socioeconomic status (Sadowski, 2006; Thomas & Stockton, 2003). This factor has been found to be a very important determinant of gaps in academic performance at early ages (Carnerio & Heckman, 2003). According to Duncan and Magnuson (2005) both race/ethnicity and socioeconomic status could account for about half of these gaps. In Oklahoma, the percentage of American Indian/Alaskan Native children (5 years of age younger) that are poor is higher than the overall rate for all races.[xv] Another risk factor within this component is motherhood at a young age. Studies (Mathews & Hamilton, 2009) show that although the average age of first-time mothers has increased over the last decade for all races, American Indian/Alaskan Native mothers are still the youngest. Additionally, data show that American Indians/Alaskan Natives fare better than other races in terms of single-parenthood; however data from the 2011 ACS show that single parent families, especially single-mother families, have higher rates of poverty than non-single parent families. The interactions of this risk factor with the others in the component warrants further investigation.

The significant effect of the third sub-set of variables confirms the higher school readiness risk of children abused and neglected, and in foster care. These variables are, by definition, very closely related and describe the last profile of children in Oklahoma at higher risk of inadequate school readiness according to this study. One of the major reasons why children in the United States enter foster care is abuse and neglect (USDHHS, 1999), with neglect being the most common type of maltreatment, and the child's parents most often the perpetrators (USDHHS, 2007). Maltreatment affects the child's physical, cognitive, psychological and behavioral development, may have long-lasting consequences, and increases the risk of lower academic achievement (Goldman, Salus, Wolcott, & Kennedy, 2003). Children that come into foster care frequently suffer health and developmental problems, which sometimes are further exacerbated if they experience multiple placements (Barbell & Freundlich, 2001). All of these problems can negatively affect the academic performance of the child in terms of achievement test scores, grade promotion and school completion. Children with risk factors in this sub-set represent one of the most academically at-risk populations (Zetlin, Weinberg & Kimm, 2004).

Our analysis did not find a statistical relationship between an alternative proxy for school readiness, namely mathematics proficiency, and the explanatory variables used in the model. This is important to note because it might be that reading and mathematics achievement, as measured by the OCCT tests, require different skills/competencies that develop at different times, as the literature has already documented (Geary, Hoard, & Hamson, 1999; Geary, 1993). As such, third-grade achievement in mathematics may not be a reliable indicator of school readiness. Additional analysis is necessary to

further elucidate the potential complex relationship between children's socio-demographic characteristics and their academic achievement.

An additional caveat is that some factors explaining school readiness at school entry might be different from factors explaining academic performance in grade levels. For example, some social-emotional skills are relatively more important in the early years, while teaching methods during the first years of school are only relevant in grade levels (Duncan, Dowsett, Claessens, Magnuson, & Huston, 2007). The availability of a standardized statewide measure of readiness at school entry would help understand these differences.

There are two particular points of interest to note from the computation process. First, during the calculation of the dimension indices, the most frequent values assigned to the counties in eight of the 10 variables[xvi] were 2 and 3, which means that the majority of Oklahoma counties have higher rates, i.e., are at higher risk of inadequate school readiness. Second, the national measures used for the calculation of the dimension indices are conservative thresholds that should represent a lower bound rather than an optimal target. When we put the U.S. measures in an international context, comparing it with "peer" countries (largely, countries with similar high income as the United States), we can better understand these reasons. Among the six variables for which comparable data were available, the United States fares poorly in four of them: rates of poverty for children,[xvii] young maternal age,[xviii] low maternal education,[xix] and low birth weight.[xx] The United States performs better in terms of tobacco usage during pregnancy[xxi] and about average in terms of child immunization.[xxii]

The overall index calculation and county classification highlights the urgent need of improvement in early childhood education in the state. Almost 8 in 10 children below 5 years of age enter school behind their national counterparts, and they are more likely to fall behind further as they grow (Waldfogel, 2012). Risk analysis for smaller geographic areas, such as school districts, could help identify areas at higher risk for school readiness within each county, and to have a more efficient and targeted use of resources. The methodology for the calculation of the SRRI will allow for follow-up over the years to assess the performance of the counties in the state compared to the national values, and eventually to the results of other states.

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NOTES

[i] National Center for Education Statistics. (2012). *Digest of Education Statistics, 2011.* (NCES 2011-015). Washington, DC: U.S. Department of Education. Chapter 1 and Chapter 2 available at: http://nces.ed.gov/fastfacts/display.asp?id=516.

[ii] Physical and motor development; social and emotional development; approaches to learning; language development; and cognition and general knowledge

[iii] NSRII indicators for each of these characteristics, with those used in the SRRI italicized, are: children's fine motor skills, social behaviors, skills in language and shape recognition at kindergarten entry, and ability to follow directions, for ready children; child's home environment and family context such as *maternal education level, births to teens, child abuse and neglect,* and *foster care status,* for *r*eady families; *child poverty rates,* enrollment in Early Head Start, blood levels of lead, and the emerging indicator of *homelessness*, for ready communities; *low birth weight*, *prenatal care*, and *immunizations*, for ready health services; enrollment of 3- and 4-year-olds in center-based programs, early childhood teacher education, rate of center and home-based care accreditation, use of child care subsidies, average teacher/child ratio in K-1 classes, and fourth-grade reading proficiency, for ready childcare and education and ready schools.

[iv] ECC indicators, with those used in the SRRI italicized, include academic outcome measures, population-based risk measures (including *poverty*, *minority status*, *low birth weight*, *birth to mother aged 15-17*, and *late or no prenatal care*), health, special needs, socio-emotional development (including *abuse and neglect*, *foster care*, and expelled from preschool or child care), and early child care and education measures (including enrollment in quality early care and education programs).

[v] It includes linearity in the parameters, fixed values of the explanatory variables in repeated sampling, and sufficient variability in the values of the explanatory variables. Additionally, we also assume a zero mean value of the disturbances, no serial correlation among them, and zero covariance between them and the explanatory variables.

[vi] Residuals are the differences between the actual and estimated values of the dependent variable in a linear regression model.

[vii] This allows perfect substitution across dimensions (UNDP 2010).

[viii] The probability obtained from the first test was <0.001, and the KMO measure of sampling adequacy is roughly 0.70.

[ix] Using the eigenvalue rule by which components with values above 1.0 should be retained (Kaiser 1960).

[x] One variable (i.e. low maternal education) had a substantial loading (i.e. >0.4) on more than one component. In the literature (Peres-Neto et al., 2005) these variables are referred to as complex. We treated this variable as belonging to the component on which it had the highest loading (i.e. 0.7).

[xi] The explanatory variables together did not significantly explain an alternative measure of academic performance, i.e. percentage of students scoring below proficient/satisfactory level in third grade mathematics.

[xii] R^2 increases with number of explanatory variables included in the model. The adjusted R^2, which considers the number of parameters in the equation and the number of data observations, is a more reliable measure of goodness of fit.

[xiii] Test values range from 1.0 to infinity, with values greater than 10.0 generally seen as indicative of severe multicollinearity.

[xiv] U.S. Census Bureau, 2011 American Community Survey.

[xv] U.S. Census Bureau, 2011 American Community Survey.

[xvi] Except Hispanic ethnicity and English language learners variables.

[xvii] The poverty rate measure used is the percentage of children (aged 0 to 17) who live in a household in which disposable income is less than 50% of the national median income (various years). The median obtained is 13.8%, which includes Canada, Italy, Germany, France, Japan, United Kingdom and United States (23.10%). Source: United Nations Children's Fund Innocenti Research Centre (2012).

[xviii] Live births rate of mothers 0 to 19 years old (various years). It includes Canada, Italy, Germany, France, Japan, United Kingdom and United States (10.4%). The mean value used is 4.1%. Source: United Nations (2012).

[xix] Mothers with less than high school diploma (2008). It includes Canada (10.6%) and United States (19.9%). Source: Public Health Agency of Canada (2008).

[xx] Weight at birth of less than 2,400 grams (5.5 pounds) (various years). It includes Canada, Italy, Germany, France, Japan, United Kingdom and United States (8.0%). The mean value used is 7.1%. Source: United Nations Children's Fund and World Health Organization (2004).

[xxi] Rate of maternal smoking during pregnancy (various years). It includes Canada (15.7%) and United States (10.8%). Source: Public Health Agency of Canada (2008).

[xxii] Percentage of 1-year-old children immunized against TB, DPT, Polio, Measles, HepB and Hip (2010). It includes Canada, Italy, Germany, France, Japan, United Kingdom and United States (94.0%). The mean value used is 91.2%. Source: United Nations Children's Fund (2012).

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