



School Readiness

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School readiness includes the readiness of the individual child, the school's readiness for children, and the ability of the family and community to support optimal early child development. It is the responsibility of schools to meet the needs of all children at all levels of readiness. Children's readiness for kindergarten should become an outcome measure for a coordinated system of community-based programs and supports for the healthy development of young children. Our rapidly expanding insights into early brain and child development have revealed that modifiable factors in a child's early experience can greatly affect that child's health and learning trajectories. Many children in the United States enter kindergarten with limitations in their social, emotional, cognitive, and physical development that might have been significantly diminished or eliminated through early identification and attention to child and family needs. A strong correlation between social-emotional development and school and life success, combined with alarming rates of preschool expulsion, point toward the urgency of leveraging opportunities to support social-emotional development and address behavioral concerns early. Pediatric primary care providers have access to the youngest children and their families. Pediatricians can promote and use community supports, such as home visiting programs, quality early care and education programs, family support programs and resources, early intervention services, children's museums, and libraries, which are important for addressing school readiness and are too often underused by populations who can benefit most from them. When these are not available, pediatricians can support the development of such resources. The American Academy of Pediatrics affords pediatricians many opportunities to improve the physical, social-emotional, and educational health of young children, in conjunction with other advocacy groups. This technical report provides an updated version of the previous iteration from the American Academy of Pediatrics published in 2008.

EARLY EXPERIENCE MATTERS

All of a child's early experiences, whether at home, in child care, or in other preschool settings, are educational. When early experiences are

abstract

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consistent, developmentally sound, and emotionally supportive, children learn optimally and develop resilience for life. To focus only on the education of children beginning with kindergarten is to ignore the science of early development and to deny the importance of early experiences. Our current understanding of the importance of experiences in early brain development and in cognitive and social-emotional outcomes for children converge in our contemporary conceptualization of school readiness. Children who enter school ready to learn are expected to achieve more academically. Academic success has been linked to improved social, economic, and health outcomes.¹⁻³

The Adverse Childhood Experiences Study revealed that multiple factors can cause toxic stress that results in changes in brain circuitry with subsequent negative effects on physical and mental health.^{4,5} Toxic stress occurs when a child experiences strong, frequent, and/or prolonged adversity, such as physical or emotional abuse, chronic neglect, caregiver substance abuse or mental illness, exposure to violence, and/or the accumulated burdens of family economic hardship, without adequate adult support.⁶

According to data from the National Child Abuse and Neglect Data System, 12.5% of all US children have had a documented episode of child abuse or neglect reported by 18 years of age.^{7,8} According to data from the National Survey of Children's Health, 48% of US children have had at least 1 of the 9 key adverse childhood experiences, and 22.6% of children between 0 and 17 years of age had experienced 2 or more of the experiences, although the data exhibit considerable variability across states.⁹

Authors of a recent study used 2011–2012 data from the National Survey of Children's Health to

examine the impact of adverse childhood experiences on school success.¹⁰ Data analysis revealed that children with 2 or more adverse childhood experiences were 2.67 times more likely to repeat a grade in school compared with children without any adverse experiences. Children without adverse childhood experiences were 2.59 times more likely to be usually or always engaged in school compared with their peers with 2 or more adverse experiences.¹⁰ Resilience, defined in that study as “staying calm and in control when faced with a challenge,” ameliorated these effects. Clearly, there is a role for minimizing toxic stress and building resilience in children as a way of promoting school readiness.

One of the most widely recognized risk factors for school readiness is poverty. Fewer than half (48%) of poor children are ready for school at 5 years of age as compared with 75% of children from moderate- or high-income households.¹¹ Poverty affects school readiness across racial and ethnic divisions, likely because of both lack of financial resources and parents having less education, higher rates of single and teenage parenthood, poorer health, etc. When family demographics are controlled for factors such as single parenthood and maternal education the poverty-related gap decreases; differences in parent characteristics and parent-child interactions account for much of the gap and have the potential for remediation to break the cycle of negative relationships that often impact 1 generation to the next.¹² Children in foster or kinship care or otherwise involved with child welfare may be less ready for school for several reasons: the impact of childhood trauma and loss on the developing brain (cognitive and emotional) and less access to early childhood education and programs that may help to remediate losses. Children in foster care are at

particular risk, especially if their placement is unstable. These children demonstrate higher rates of internalizing problems, such as depression, poorer social skills, lower adaptive functioning, and more externalizing behavioral problems such as aggression and impulsivity.¹³ Furthermore, there is evidence that the foster care experience itself (eg, instability of placements) may be further damaging to the developmental outcomes of children who are maltreated.¹⁴ Other risk factors that have been shown to have an effect on school readiness are prenatal exposure to tobacco and alcohol, low birth weight, developmental disability, and maternal depression.¹⁵ Interventions such as home visitation programs, smoking cessation programs, and preschool programs have the potential of ameliorating these negative factors and creating more positive early childhood experiences that may translate into improved school readiness.^{16,17} Pediatric primary care has recently been shown to have potential to facilitate school readiness through both primary prevention programs that seek to prevent disparities by working directly with parents to enhance interactions (eg, within the context of reading, talking, and play) and through referral to secondary and/or tertiary prevention programs that identify and treat families at increased risk (eg, maternal depression) or children with already existing difficulties in 1 or more school readiness domains (behavioral health or education).¹⁸

HOW HAS SCHOOL READINESS BEEN DEFINED?

“Ready to Learn” became a national mantra in 1991 when the National Education Goals Panel adopted as its first goal that “by the year 2000, all children will enter school ready to learn.”¹⁹ This panel identified readiness in the child as determined

by a set of interdependent developmental trajectories. Three components of school readiness were broadly described as follows:

1. readiness in the child, defined by the following:
 - physical well-being and sensory motor development, including health status and growth;
 - social and emotional development, including self-regulation, attention, impulse control, capacity to limit aggressive and disruptive behaviors, turn-taking, cooperation, empathy, and the ability to communicate one's own emotions; identification of feelings facilitates accurate communication of these feelings;
 - approaches to learning, including enthusiasm, curiosity, temperament, culture, and values;
 - language development, including listening, speaking, and vocabulary, as well as literacy skills, including print awareness, story sense, and writing and drawing processes; and
 - general knowledge and cognition, including early literacy and math skills;
2. schools' readiness for children, illustrated by the following:
 - smooth transition between home and school, including cultural sensitivity;
 - opportunities for parent engagement with schools;
 - understanding of early child development and that children learn through play and natural experiences;
 - continuity between early care, intervention, and education programs and elementary school;
 - use of high-quality instruction, provided within the context of

- relationships and at a rate designed to challenge but not overwhelm a child;
 - demonstration of commitment to the success of every child through awareness of the needs of individual children, including the effects of adverse childhood experiences, including poverty and racial discrimination, and trying to meet special needs within the regular classroom; implementation of individualized education programs that include adaptations to support children with disabilities;
 - demonstration of commitment to the success of every teacher in providing effective instruction to children;
 - introduction of approaches that raise achievement, such as parent involvement and early intervention for children falling behind;
 - alteration of practices and programs if they do not benefit children;
 - provision of services to children in their communities within the context of a safe, secure, and inclusive environment that supports student health and wellness and promotes learning;
 - willingness to take responsibility for results; and
 - strong leadership; and
3. family and community supports that contribute to child readiness:
 - excellent prenatal care and ongoing primary care within a medical home setting that is comprehensive, compassionate, and family centered;
 - optimal nutrition and daily physical activity so that children arrive at school with healthy minds and bodies;
 - access to high-quality preschool and child care for all children; and

- time set aside daily for parents to help their child learn along with the supports that allow parents to be effective teachers.

WHAT DETERMINES SCHOOL READINESS?

An individual child's school readiness is determined in large measure by the environment in which he or she lives and grows. The Child Welfare League of America described a vision for the United States in which every child is healthy and safe and develops to his or her full capacity.²⁰ Five universal needs of all children were described. First, children need the basics of proper nutrition, economic security, adequate clothing and shelter, appropriate education, and primary and preventive physical and mental health services. Second, children need strong nurturing relationships within their families, their communities, and their peer groups. Third, children need opportunities to develop their talents and skills and to contribute to their communities. Children with indications of disability need early assessment and intervention to prevent later, more serious problems. Fourth, children need protection from injury, abuse, and neglect as well as from exposure to violence and discrimination. Fifth, children have a basic need for healing. When caregivers and providers have not been able to protect them, children need us to ease the effects of any harm they have suffered by providing emotional support, by addressing physical and mental health care needs, and by sometimes making amends through restorative judicial practices. Meeting these needs builds resilience and requires collaborative comprehensive approaches so that children become a priority at the levels of the family, the community, and the nation.²⁰

Although various constructs of school readiness have been proposed in the past, the conceptualization of school readiness that is widely accepted at

present is an “interactional relational” model. This model is focused on the ongoing interaction between the child and the environment. The model suggests that school readiness is “the product of a set of educational decisions that are differentially shaped by the skills, experiences and learning opportunities the child has had and the perspectives and goals of the community, classroom and teacher.” This construct suggests that readiness assessments “can only be done over time and in context” rather than by means of a 1-time screening test.²¹ This conceptualization is most consistent with the current understanding of the importance of early experiences and early relationships at home and in community and early education settings in promoting child development.²²

SCHOOL READINESS TESTING

Six fundamental misconceptions prevalent regarding school readiness are as follows: (1) learning happens only at school; (2) readiness is a specific condition within each child; (3) readiness can be measured easily; (4) readiness is mostly a function of time (maturation), and some children need a little more; (5) children are ready to learn when they can sit quietly at a desk and listen; and (6) children who are not ready do not belong in school.²³

An emphasis on kindergarten readiness that only considers the skills of a child places an undue burden of proof of readiness on that child and is particularly unfair because of economic, experiential, and cultural inequities in our society. Typical or normal development in 4- and 5-year-old children is highly variable, so labeling children as not being school ready at such an early age may cause them to be isolated from a more appropriate learning environment. In a 1988 national survey, 10% to 50% of children in

various states who were eligible to enter kindergarten on the basis of age did not enter because of readiness test scores.²⁴ A follow-up survey in 1996²⁵ revealed a response to growing concerns about misuse of these kinds of data. Since that time, there has been increased recognition that school readiness assessment should not be used to exclude age-eligible children from kindergarten. In 2010, only 6% of children in kindergarten were delayed entry.²⁶

Although the use of readiness assessments to restrict kindergarten entry has markedly decreased, a growing number of states are using readiness assessments for other purposes. At least 25 states in 2010 reported mandatory kindergarten assessments. These assessments varied significantly in scope: 11 evaluated between 5 and 9 domains of school readiness, 4 evaluated only reading readiness, 2 evaluated math and reading, and 2 evaluated unspecified domains. Of the states that assessed multiple domains, 7 used a state-created assessment instrument and 4 used a commercial instrument. Authors of a technical report from the National Conference of State Legislatures (NCSL) noted that although state-created instruments are less costly and better reflect state-specific learning requirements, they need to meet standards for reliability and validity.²⁷ Most state readiness assessments used single teacher checklists completed on the basis of child observation; these can be inaccurate because of rater bias and can have problems with reliability between raters and consistent over- or underrating on the basis of a general impression of the child.

Reported use of assessments included guidance for planning, curriculum, and instruction (18 states), informing policy decisions or tracking kindergarten readiness at the state level (12 states), feedback to parents (4 states), and evaluation of the

readiness of schools to receive incoming students (2 states). Of the 25 states that required kindergarten assessment, 12 did not publish any results. Of the 13 that published results, 4 published only state-level data, and 7 reported results by geographic region. In general, these data were much less detailed than student performance results required for later grades by the No Child Left Behind Act, which was in place from 2002 to 2015. Of concern is the fact that only 22 states in 2010 had a formal definition of school readiness.²⁸

Recent federal initiatives have bolstered funding for state early childhood assessments. The federal Race to the Top Early Learning Challenge allowed 9 states to put sizeable funding from their grant into development and implementation of kindergarten entry assessment. Other states received funding through the federal Enhanced Assessment Grants program to develop comprehensive kindergarten through third-grade assessment systems. An update by the NCSL in 2014 documented an additional 14 states that established or amended school readiness assessments of young children, yielding a total of 34 states and the District of Columbia, which now use a state-approved assessment for children entering kindergarten.²⁹ Approaches to school readiness testing are subject to frequent change. The most recent information on state laws is available through the American Academy of Pediatrics (AAP) Division of State Government Affairs (<https://www.aap.org/en-us/advocacy-and-policy/state-advocacy/Pages/State-Advocacy.aspx>).

A position paper by the Early Childhood Education State Collaborative on Assessment and Student Standards in 2011 stated that kindergarten readiness assessments can be helpful if used to directly support children’s developmental and academic achievement to improve

educational outcomes.³⁰ Such assessment efforts should (1) use multiple tools for multiple purposes, (2) address multiple developmental domains and diverse cultural contexts, (3) align with early learning guidelines, (4) collect information from multiple sources, (5) implement a systems-based approach, and (6) avoid inappropriate use of assessment, such as labeling children, restricting kindergarten entry, and predicting children's future academic success.

As the NCSL data from 2010 reveal, there is considerable variability in the approach taken to kindergarten readiness on the state and national level, both with regard to assessment tools and use of test results. One effort at standardizing results for state reporting is the Early Development Instrument created by Transforming Early Childhood Community Systems, a collaboration between the University of California, Los Angeles Center for Healthier Children, Families, and Communities and the United Way Worldwide.³¹ This initiative currently operates in more than 40 communities across the country and reports the percentage of children who are developmentally vulnerable in 5 areas (physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication and child knowledge). Transforming Early Childhood Community Systems states that the reports help guide community efforts to help children reach school healthy and ready to succeed. To the extent that such efforts decrease the disparity between school and child readiness by using the assessments as a tool to help schools prepare for the children they will be serving and promote opportunities for early childhood experiences leading to educational success, readiness assessments can be highly useful.

SCHOOLS' READINESS FOR CHILDREN

The current disparity between school and child readiness may be attributable to schools not being prepared to offer the necessary and appropriate educational setting for age-eligible children, not because children cannot learn in an appropriate educational setting. If there is a predetermined set of skills necessary for school enrollment, then commitment to promoting universal readiness must address early-life inequities in experience. Promoting universal readiness may be accomplished by providing access to opportunities that promote educational success, recognizing and supporting individual differences among children, and establishing reasonable and appropriate expectations of children's capabilities at school entry for all children.³² The data gained from testing children at kindergarten entry need to be interpreted carefully. Ideally, data can be used as a tool to help prepare schools for the diverse group of children they will be serving. It is the responsibility of the schools to be ready for all children and to work with families to make the school experience positive for all children, even those who may be at varying stages of readiness. School programs should be flexible and adaptable to each child's level of readiness.

One example of schools seeking to address the school readiness needs of low-income and ethnically diverse populations is the Boston Public School System. In 2006, this school system implemented full-day preschool programming for 25% of 4-year-old children in the city and identified key elements of a successful prekindergarten program: a strong curriculum with focus on language, social skills, and concept development (manuals); significant educational supports for teachers in implementing the curriculum; adequate staffing; coaching and training of preschool

teachers; and ongoing, independent assessment of instruction and children's skills.³³ The results of this effort were significant: participants in the prekindergarten program scored higher on third-grade language arts tests than did nonparticipants, and the African American-white achievement gap was one-third smaller among prekindergarten participants than among nonparticipants. In addition, the prekindergarten program was able to close the gap between children from low-income and affluent families by more than half. The authors of *Restoring Opportunity: The Crisis of Inequality and the Challenge for American Education* conclude that "well-designed and well-implemented pre-K programs have the potential to be a vital component of a strategy to improve the life chances of children from low income families."³³

HOW READY ARE CHILDREN IN THE UNITED STATES AS THEY ENTER KINDERGARTEN?

A landmark study by the National Center for Education and Statistics (NCES) (1998–1999) surveyed a nationally representative sample of 22 000 first-time kindergarten students and their schools, classroom teachers, and families.^{34,35} The Early Childhood Longitudinal Study (ECLS) was designed to gather information about the entry status of the nation's kindergarteners. Progress of this cohort is still being monitored to inform educational policy and practice. Information was obtained regarding children's cognitive, emotional, social, and physical development as well as their family interactions and home literacy environment. In the study, children "at risk for school difficulty" were defined as children whose mothers had less than a high school education, children who were being raised by single mothers, children whose families had received public assistance, and children in families

whose primary language was not English.^{34,35}

Fifty-one percent of parents of children who entered kindergarten for the first time in 1998 rated their child's general health as excellent, and 32% rated it as very good.^{34,35} Kindergarteners whose mothers had higher levels of education, who were from 2-parent families, whose families had not used public assistance, and who were of white non-Hispanic descent were rated as having generally better health by their parents. Six percent of first-time kindergartners were experiencing vision problems, and 3% were identified as having hearing problems. In that study, 12% of boys and 11% of girls were at risk for overweight, defined as BMI at or above age- and sex-specific guidelines. The risk was greater for children whose mothers had not attained a bachelor's degree and for children from homes in which the primary language spoken was not English.^{34,35}

The study attempted to examine the social and emotional status of first-time kindergartners. Teachers reported that 10% to 11% of children often argued or fought with others or were angered easily. Single parents were more likely to report behavior problems, such as fighting, arguing, and getting angry. Parents with partners, those with higher education, and those who had not received public assistance were more likely to have kindergartners with prosocial behaviors, such as often forming friendships. Teachers were less likely than parents to report that children were eager to learn (75% vs 92%). Children with lower maternal education, those from single-mother homes, and those whose families had received public assistance were less likely to be viewed as eager to learn by their teachers.^{34,35}

Variability also was seen in home literacy environments and in family

interactions for first-time kindergartners. Forty-five percent of all parents reported reading with their child every day, and this value decreased to 36% if mothers had less than a high school education, 38% if English was not the primary language spoken at home, 35% for African American non-Hispanic children, and 39% for Hispanic children. Almost three-fourths of parents reported having more than 25 children's books at home, but this was true for only 38% of kindergartners whose mothers had not graduated from high school and only 35% of those from homes where English was not the primary language spoken. Approximately half of kindergartners from African American non-Hispanic, Hispanic, or American Indian or Alaskan native families had more than 25 children's books at home.^{34,35}

Early academic competencies were also surveyed in the study. In 1998 in the United States, as children entered kindergarten for the first time, two-thirds recognized their letters, and 29% also recognized beginning sounds; 94% recognized single numerals and shapes and could count to 10, and 58% could count beyond 10, recognize sequence patterns, and use nonstandard units of length to compare objects. Of those children, 37% demonstrated strong print familiarity skills, including knowing that print reads from left to right and knowing where to go when a line of print ends. Kindergartners' performance on math, reading, and general knowledge items increased with the level of their mothers' education and was higher for children from 2-parent families.^{34,35}

Overall, children with few risk factors were more likely to have attained these various proficiencies and were in better general health than were children at risk. Follow-up evaluation of the same children in the spring of first grade revealed that children who demonstrated early literacy skills and who came from a positive literacy

environment, who possessed a positive approach to learning, and who enjoyed very good or excellent general health at kindergarten entry performed better in both reading and mathematics after 2 years of formal schooling than did children who did not have these resources. The relationships between the resources children possessed at kindergarten entry and their reading and mathematics performance in the spring of first grade remained significant after controlling for the influence of children's poverty status and their race and/or ethnicity.³⁶

When these children were evaluated after 4 years of education, in the spring of third grade, children with more family risk factors (eg, living below the poverty level, primary language spoken in the home was not English, mother had not completed high school, and single-parent home) demonstrated lower mean achievement scores in reading, mathematics, and science. Over that time, children with more family risk factors made smaller gains in math and reading, so the achievement gaps between disadvantaged and more advantaged children grew wider over the first 4 years of school. The third-graders also completed self-descriptive questionnaires evaluating internalizing (eg, shy, withdrawn, or sad) and externalizing (eg, fighting, arguing, or distractibility) behavior problems. Overall, problem behavior scores were low; however, children with lower achievement and more family risk factors tended to rate themselves higher on both of the problem behavior scales.³⁷

These findings, although they are disturbing, are not surprising to pediatricians, who have long been advocates for underserved pediatric populations. This inequity in school readiness, which is apparent at school entry and is associated with persistent academic underachievement and social-emotional risk, points to a need to

address these differences before children enter kindergarten, especially for families and children at risk.

More recent studies have also addressed school readiness. Data from the 2007 National Household Education Surveys Program of the NCES were used to look at how parents perceived the school readiness of their young children.³⁸ Among the findings were that 58% of children 3 to 6 years of age and not yet in kindergarten were reported to be attending preschool or a child care center. Eighty-nine percent of children's parents planned to enroll them into kindergarten on time; 7% planned delayed enrollment. A higher percentage of boys (9% vs 4%) had parents who planned to delay kindergarten entry. When surveyed about literacy issues, 55% of children were read to every day, 28% were read to 3 or more times in the past week, 13% were read to once or twice a week, and 3% were not read to at all in the past week; mean daily reading time was 21 minutes. A lower percentage of children residing in poor households (40%) were read to every day compared with children residing in households living above the poverty level (60%).

Average television or video time for those who watched was 2.6 hours daily. Television time was somewhat longer for children of mothers who worked 35 hours or more (3 hours daily) as compared with mothers who worked less than 35 hours weekly (2.5 hours daily) or were not in the labor force (2.4 hours). With regard to school readiness skills, 93% of parents reported that their child had speech that was understandable to a stranger, 87% of children could hold a pencil, 63% could count to 20 or higher, 60% could write their first name, 32% could recognize all the letters of the alphabet, and 8% could read written words in books. Alphabet recognition varied by age, with only 13% of 3-year-olds, 38% of

4-year-olds, and 59% of 5- and 6-year-olds not enrolled in kindergarten recognizing all letters. When parents were surveyed regarding essential skills needed to prepare for kindergarten, 62% reported that sharing was essential, 56% reported that teaching the alphabet was essential, 54% reported that teaching numbers was essential, 45% reported reading was essential, and 41% reported holding a pencil was a needed skill.³⁸

Child Trends analysis of the National Household Education Surveys data in 2015 indicates an increase in early literacy skills over time.³⁸ The percentage of 3- to 6-year-old children able to recognize all letters increased from 21% in 1993 to 38% in 2012, and those able to count to 20 or higher increased from 52% to 68% during that period. Between 1999 and 2007, the percentage of these young children who read words in a book increased from 8% to 22%. Significant discrepancies exist between early childhood readiness skills on the basis of factors such as poverty status, parents' educational status, and race and/or ethnicity. In 2007, only 21% of children living below the poverty level were able to recognize all letters of the alphabet compared with 35% of those living above the poverty level; similarly, counting to 20 was a skill that 49% of poor children at this age achieved compared with 67% of those above poverty.³⁹ In 2012, only 15% of children between 3 and 6 years of age (not yet in kindergarten) whose parents had not completed high school could recognize all letters of the alphabet and only 38% could count to 20, which is between 46% and 142% lower than for children whose parents had completed some college. Young Hispanic children were less likely to demonstrate the ability to recognize all letters (27%) than white (41%) or African American (44%) children in 2012; Asian American and Pacific Islander

children had the highest rate of letter recognition (58%). The sex gap in readiness skills has disappeared; although girls in 1999 were significantly more likely to have achieved skills for letter recognition and counting than boys, there were no such differences by 2012. These data reflect improvement in overall readiness skills of young children from earlier studies, but gaps in achievement based on poverty and race and/or ethnicity are still readily apparent.³⁹

THE RELATIONSHIP BETWEEN EARLY CHILDHOOD EDUCATION AND SCHOOL READINESS

Measurements from 2016 of the benefits of early childhood education vary depending on the type of program studied and educational outcomes tracked. In general, benefits on standardized academic achievement tests are higher for model programs (0.57 SD; 95% confidence interval [CI], 0.24 to 0.81) than for those organized at the district, state (0.32 SD; 95% CI, 0.25 to 0.38), or federal (Head Start; 0.17 SD; 95% CI, 0.12 to 0.23) levels.⁴⁰ Model programs, such as the Abecedarian Project and Perry Preschool Program, have generally been implemented as part of well-funded research projects and are closely monitored for fidelity of implementation and staffed by highly trained individuals. Evaluation of programs at the school district and state level found a statistically significant positive effect on student self-regulation (0.23 SD; 95% CI, 0.12 to 0.33), whereas a nonsignificant benefit was shown for Head Start (0.16 SD; 95% CI, -0.09 to 0.41). Long-term follow-up of participants in Head Start revealed a positive effect on high school graduation rate (0.18 SD; 95% CI, 0.03 to 0.33). Nonsignificant beneficial effects are also reported on measures of grade retention, assignment to special

education, teenage birth rates, and criminality.¹⁶

A study from 2005 that evaluated the economic features of investing in a 1-year, high-quality, universal, preschool education in California estimated a \$7000 net present-value benefit per child. This benefit equaled a return of \$2.62 for every \$1 invested, with an annual return rate of 10% over 60 years. This model did not include other benefits to society, such as the improved health and well-being of participating children and the potential intergenerational transmission of favorable benefits.^{41,42} Economists at the Federal Reserve Bank of Minneapolis examined the rate of return on investment for early education. When considering the Perry Preschool Program, conducted in Michigan in the 1960s, which provided high-quality preschool to 3- and 4-year-old children in poverty, along with home visitation to involve parents, the economists found a “real” return on investment, adjusted for inflation, of 16%, with at least 75% of those benefits going to the general public.^{43,44} The benefit/cost ratio (the ratio of the aggregate program benefits over the life of the child to the input of costs) was found to be greater than 8:1.⁴¹ These benefits persisted to age 40, at which time more of the program group were employed than the nonprogram group (76% vs 56%), more earned over \$20 000 dollars per year (60% vs 40%), and fewer were arrested more than 5 times (36% vs 55%).⁴⁵ The Carolina Abecedarian Project conducted in 1972 provides data that support the developmental and behavioral benefits of quality education provided within the context of day care programs into adulthood.⁴⁶ Economic benefits were reported in maternal earnings, decreased schooling costs from kindergarten through grade 12, increased lifetime earnings, and decreased costs related to smoking.

A position paper by the National Institute for Early Education Research was published in 2013, concluding that expanding access to quality prekindergarten programs is sound public policy.⁴⁷ That authors pointed to a meta-analysis that summarizes the effects of preschool programs, the results of which pointed to 2 basic findings: (1) state and local prekindergarten programs, almost without exception, improve academic readiness for school; and (2) there are persistent impacts on achievement well beyond school entry, even though these are somewhat smaller than short-term impacts.

Enrollment of children in state-funded preschool programs nationwide doubled from 2001 to 2016, with states serving nearly 33% of 4-year-old children in 2016.⁴⁷ However, enrollment of 3-year-old children has changed little (5% total of 3-year-old children served in public preschools in 2016). Those numbers improve when looking at all public preschool programs (including special education and Head Start) to 43% of 4-year-old and 16% of 3-year-old children. Provision of preschool services is highly variable from state to state, with some states offering nearly universal services at 4 years of age and others having no programs. A negative trend of decreased state expenditure per child occurred from 2008 to 2014, but that trend has reversed from 2014 to 2016, with total state funding for preschool programs increasing to almost 7.4 billion dollars. There has also been a positive move toward improvement in developing and implementing early learning standards and developing quality standards.⁴⁸ Benchmarks need to be applied to preschool programs, including teacher training requirements, rules on class size and staff/child ratios, adequate teacher compensation, adherence to early learning standards, provision of comprehensive services, provision of

at least 1 meal, and monitoring quality of sites. In 2016, many states met fewer than half of the current quality standards benchmarks, and charter schools are not required to meet these benchmarks.⁴⁷

The data are not as clear-cut for the benefits of child care programs. Approximately 58% of children 4 and 5 years of age received center-based care in 2012, 13% received home-based relative care, and 19% had no early childhood education arrangement on a regular basis.⁴⁹ The National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (2006) found that children in higher-quality nonmaternal child care had somewhat better language and cognitive development during the first 4.5 years of life but that those children with high number of hours in child care demonstrated more behavior problems; parent and family characteristics were more associated with developmental outcome than were facility features.⁵⁰

In general, school readiness appears to have improved over the past 2 decades. The NCES tracked 2 large, nationally representative cohorts of children entering kindergarten through its ECLS.⁵¹ The study compared school readiness in the 1998 kindergarten cohort versus the 2010 cohort. Children in the 2010 cohort were more proficient across a variety of math and reading skills, regardless of race or socioeconomic status, with particularly large gains in math and literacy proficiency among African American children. The authors suggested that early achievement gaps are narrowing and that the skills and knowledge children possess when entering school are increasing. However, they also noted that teachers rated the 2010 cohort somewhat less favorably with respect to their “approaches to learning,” a measure that encompasses eagerness to learn, ability to work independently,

persistence, and attention. Authors of another study using the same ECLS data concluded that “despite widening income inequality, increasing income segregation, and growing disparities in parental spending on children, disparities in school readiness narrowed from 1998 to 2010.”⁵² The authors hypothesized that the narrowing of the disparity was attributable to a relatively rapid increase in overall school readiness levels among poor and Hispanic children, along with less rapid increases in readiness among high-income and white children. Although these findings are encouraging, there is still reason for concern. Authors of a previously mentioned article on school readiness in poor children noted that preschool programs offer the best chance to increase school readiness in this population.¹¹ Although investment in early childhood education programs increased for most states from 2001 to 2009, that trend has changed since the recession in 2008. Early childhood programs receive much less funding than public education and are often at greater risk for federal and state budget cuts. Continued recognition of the importance of quality early childhood programs and the need for adequate funding will be critical.

CHILDREN WITH SPECIAL EDUCATIONAL NEEDS

Children with developmental disabilities are particularly at risk for deficits in school readiness. The Individuals with Disabilities Education Act (IDEA) of 2004 was enacted to ensure that children with special needs have access to a free and appropriate education in the least restrictive environment with adequate supports and services. Part B of the IDEA covers children with developmental disabilities from 3 to 21 years of age, and Part C addresses the need for early intervention services for children from birth to

3 years of age with qualifying conditions.

Approximately 6% of children between 3 and 5 years of age in the United States are served under Part B of IDEA with significant variability among states (4% in AL to 14% in WY).⁵³ The majority of these children are served under a speech and language delay category (3.1%). The second largest category is developmental delay (2.5%), and the third largest category is autism (0.6%). White children account for 52% of this population with special needs, Hispanic children represent 25%, and African American children account for 13%. This disparity of services among ethnic minority groups likely represents underidentification of minority children with disabilities at an early age, especially given the fact that African American children represent a higher percentage (15%) than do white children (13%) when evaluating the number of children in special education services between 3 and 21 years of age.⁵³

With regard to early intervention services covered under Part C of IDEA, approximately 3% of children 0 to 3 years of age are served, with boys accounting for 64% of children.⁵⁴ The categories under which children received services were not available, but white children accounted for 52.6%, Hispanic children accounted for 25.9%, and African American children accounted for 12.4%. The majority (approximately 86%) of these developmental intervention services were provided in home settings. Approximately 8% of children receiving Part C services were no longer eligible for Part B services at 3 years of age, perhaps reflecting the effectiveness of early intervention.

These data seem to reflect an underrepresentation of minorities in early childhood intervention programs. Pediatricians, through

developmental surveillance and screening, play an important role in identifying all children with developmental disabilities at an early age. It also appears from the data that autism spectrum disorders may be underrecognized at an early age. The prevalence of autism spectrum disorders has increased drastically, and there is evidence that intensive early intervention makes a positive impact in school readiness.^{43–57} Addressing the needs of children with developmental disabilities in a timely fashion with appropriate educational services and family resources improves potential outcomes.⁵⁸

HOW SCHOOLS AND COMMUNITIES PROMOTE SCHOOL READINESS

Limited research is available regarding readiness of schools and communities to meet the needs of the diverse population of children. One approach to identifying and tracking indicators of school and community preparedness is the School Readiness Indicators: Making Progress for Young Children program, a partnership of 16 states funded by the David and Lucile Packard Foundation, the Ford Foundation, and the Ewing Marion Kauffman Foundation.⁵⁹ This initiative has 3 goals: (1) to create a set of measurable indicators related to and defining school readiness that can be tracked at the state and local levels; (2) to have states adopt this indicator-based definition of school readiness, to fill in gaps in data, to track data, and to report findings to their citizens; and (3) to stimulate policies, programs, and other actions to improve the ability of children to read at grade level by third grade. Sample system indicators tracked by this group include (1) the proportion of children with health coverage; (2) the proportion of 3- and 4-year-old children enrolled in high-quality early education and child care programs; (3) the proportion of schools offering

universal access to full-day kindergarten; (4) the proportion of children with hearing, vision, or dental problems not detected at school entry; (5) the number of adults enrolled in adult education programs or programs teaching English as a second language per 100 adults seeking those services; (6) the proportion of births to mothers with less than a 12th-grade education; and (7) the proportion of children younger than 6 years in foster care who have had more than 2 placements in 24 months. The complete set of indicators selected by each state is available online (<http://www.rikidscount.org/IssueAreas/EarlyLearning&Development/GettingReady.aspx>). It is the belief of those investigators that this work will play an important role in shaping the educational agenda for young children and their families across the country.^{60,61}

Evidence-based interventions with substantial effects on school readiness include early intervention programs for formerly preterm infants, which have been shown to prevent developmental delay, to improve grade retention, and to accelerate placement into special education.^{62–64} Food supplement programs, such as the Supplemental Nutrition Program for Women, Infants, and Children, have been shown to reduce rates of low birth weight⁶⁵ and iron deficiency.^{66,67} Children attending schools with school nutrition programs have improved scores on standardized academic tests.⁶⁸ Home visiting by nurses has been shown consistently to reduce rates of childhood injury, to increase fathers' involvement, to reduce family welfare dependency, and to improve school readiness.^{69,70} Housing subsidies have resulted in improved neighborhood safety and reduced exposure to violence.^{71,72}

In addition, there are numerous pediatric primary care programs that

have been shown to have impacts across varying domains of school readiness.⁷³ These programs include both primary prevention programs (which seek to prevent gaps in readiness before they emerge) as well as secondary and/or tertiary prevention programs (which seek to provide additional services for families at increased risk and/or for children with observed gaps in child school readiness); these target early literacy and/or social-emotional development. All of these programs capitalize on the unique reach of pediatric well-child visits for families with young children, especially from birth to 3 years of age, and facilitate population-level intervention at a low cost. The most studied and scaled primary prevention program is Reach Out and Read (<http://www.reachoutandread.org/>), which impacts more than 25% of all children in low-income families by improving child language skills and increasing reading aloud activities, according to more than 15 published studies.⁷⁴ An enhancement to Reach Out and Read, the Video Interaction Project, promotes parental self-reflection and positive actions through review of videotaped parent-child interactions and was recently found to have positive impact on child social-emotional development.⁷⁵ HealthySteps uses a specialist who facilitates the delivery of well-child care on the basis of the standards in *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents, Fourth Edition*, and provides primary prevention through enhanced parenting and secondary prevention through appropriate screening and referral for services.^{76,77} A primary care adaptation of The Incredible Years has been shown to promote effective parenting and improve child behavior for families with children with behavior problems.⁷⁸ Two additional programs, Assuring Better Child Health and Development and Help Me Grow, provide effective

secondary prevention by linking families with appropriate community services.^{79,80}

WHAT PEDIATRICIANS DO TO SUPPORT SCHOOL READINESS

The role of the pediatrician in promoting school readiness was previously delineated in a recent AAP policy statement, "The Pediatrician's Role in Optimizing School Readiness."⁸¹ It is clear that pediatric health care providers promote school readiness in the children they serve in many ways. In their office practices, they provide medical homes that promote optimal nutrition, growth, development, and physical health as part of health maintenance. Full implementation of the recommendations in *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents, Fourth Edition*, includes not only provision of immunizations in a timely manner but also anticipatory guidance regarding nutrition, safety issues, vision and hearing screening, lead and anemia screening, advice regarding dental needs, and developmental surveillance and/or screening.⁷⁷ By providing ongoing surveillance and information regarding injury prevention, pediatric providers help protect children from injury and abuse.

Pediatric health care providers promote positive parent-child relationships by screening for psychosocial risks, such as parental mental illness, substance abuse, family violence, poverty, and lack of connection to community and family supports, and then identifying appropriate community resources for families.⁸² The AAP Web site on social determinants of health offers numerous screening and toolkit resources for pediatric primary care providers (<https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Screening/Pages/Social-Determinants-of-Health.aspx>). Modeling appropriate interactions in

the office and providing materials and educational opportunities that promote parental knowledge of child development enhance parent-child interactions. Ongoing assessment of the interactions between the parent and child and guidance regarding behavior, temperament, and development facilitate parent understanding of child differences. Primary care parenting models such as HealthySteps, Very Important Parenting, and colocated behavioral health models have been found to be effective in supporting positive parent-child relationships and model appropriate disciplinary strategies. For families whose children present with significant behavior concerns, use of evidence-based models, such as the Positive Parenting Program and Circle of Security, and referral to appropriate behavioral health resources provide assistance to families. The Positive Parenting Program is designed to prevent and treat behavioral and emotional problems in children and teenagers by equipping parents with skills and confidence to address these problems. The Circle of Security seeks to support secure parent-child relationships by helping parents read their child's emotional needs, enhance the child's self-esteem, and support the child's ability to manage emotions.⁸³ Resources available to pediatricians in promoting early literacy include such evidenced-based programs as Reach Out and Read and the AAP Books Build Connections Toolkit, as well as community libraries and early childhood education programs. Pediatricians often provide guidance to parents regarding quality early child care and child education programs, including information from the National Association for the Education of Young Children, Children's Home Society, Child Care and Resource and Referral Centers, and Help Me Grow. Pediatricians also encourage communication between parents and early learning centers.⁸⁴ Pediatric

health care providers identify children with delays in their development by integrating regular, systematic, developmental screening and surveillance into their practices. Children identified as having delays and children at risk for delays can then be referred to community-based services, such as early intervention programs, home visitation programs, Head Start, and special education programs available through school departments.⁸⁵

Many pediatricians take an active role in advocating for those evidence-based practices that promote optimal early brain and child development. Some examples include (1) access to health care, including mental health services, for all children; (2) standards for state Medicaid and Early and Periodic Screening, Diagnosis, and Treatment programs that conform, at a minimum, to AAP policy recommendations⁸⁶; (3) universal funding for clinic-based early literacy programs such as Reach Out and Read; (4) Head Start and Early Head Start programs; and (5) federal child care subsidies. AAP chapters can be centers for advocacy because they have experience, resources, and established relationships with policy makers who will be making decisions at the state level. The AAP offers opportunities to effect these policies through their state AAP chapters and in collaboration with state early childhood comprehensive systems. On a national level, the Federal Advocacy Action Network provides an additional avenue of advocacy for interested pediatricians.

Pediatricians, in their work with young children and families, provide the skills and expertise that promote not only physical health but also social-emotional health and guidance with regard to development. Their partnership with families allows for ongoing assessment of strengths and stressors and the development of

collaborative strategies and interventions, which support optimal child well-being.^{82,87} Pediatricians, in collaboration with school, community, and national agencies, contribute to the school readiness of young children.⁸¹

CONCLUSIONS

Knowledge of early brain and child development has revealed that modifiable factors in a child's early experience can greatly affect that child's learning trajectory. Several qualities that are necessary for children to be ready for school are physical and nutritional well-being, intellectual skills, motivation to learn, and strong social-emotional capacity and supports. These qualities are influenced by the health and well-being of the families and neighborhoods in which children are raised. Many US children enter kindergarten with limitations in their social-emotional, physical, and cognitive development that might have been significantly diminished or eliminated through early recognition of and attention to child and family needs. School readiness testing, when used appropriately, can yield helpful information regarding the progress of communities and states in meeting the needs of young children. Early childhood education programs can lessen the disparity in school readiness created by poverty and other toxic stressors. Community and national programs that support young children and their families also play a significant role in optimizing school readiness. Pediatricians, by the nature of their work with young children and families, are at the forefront of the effort to promote school readiness. Pediatric primary care providers can both model and promote effective early childhood practices and interventions to promote school readiness and collaborate with communities and schools to ensure their implementation.

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ABBREVIATIONS

AAP: American Academy of Pediatrics
CI: confidence interval
ECLS: Early Childhood Longitudinal Study
IDEA: Individuals with Disabilities Education Act
NCES: National Center for Education and Statistics
NCSL: National Conference of State Legislatures

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