

Comparison of Literacy and Developmental Screening of Preschool-Aged Children During Primary Care

Sara M. Bode, MD,¹ Sarah Denny, MD,¹ August Masonheimer, MA,² Mary Kay Irwin, EdD,¹ John Hutton, MD, MS^{3,4}

abstract

OBJECTIVE: The AAP recommends literacy promotion and developmental surveillance during well care to support school readiness. *The Reading House (TRH)* is a children's book-based screener of emergent literacy skills, validated for preschool-aged children. The objective was to compare screening with *TRH* to a widely used general developmental screening tool during well-visits.

METHODS: Eligible children (aged 3–4 years, English-speaking household) were screened with *TRH* and the *Survey of Well-Being of Young Children (SWYC)* milestones during routine well-visits. *TRH* screening was performed by Kindergarten Readiness Coordinators, who also provided individualized literacy plans and referrals.

RESULTS: A total of 721 children completed both the *TRH* and *SWYC* milestones screenings. Scores ranged from 0 to 15 ($M = 5.12$; $SD = 3.10$) for the *TRH* and 0 to 20 ($M = 15.52$; $SD = 4.17$) for the *SWYC* milestones and displayed a low positive correlation ($r = 0.30$). A total of 339 (47.02%) children were flagged as at-risk or needing additional support in some area of development (126 by *TRH* only, 119 by *SWYC* milestones only, 94 by both). Of the 508 children who passed the *SWYC* milestones, there were 126 who failed *TRH* (24.8%). Logistic regression models indicated sociodemographic factors associated with the likelihood of being flagged as at-risk on each respective screening test (race, sex, Child Opportunity Index).

CONCLUSIONS: *TRH* identified a substantial number of children at-risk who passed general developmental screening (*SWYC* milestones). This study expands validation evidence of *TRH* and reinforces the value of emergent literacy screening at this formative age.



¹Nationwide Children's Hospital, Columbus, Ohio; ²Department of Educational Studies, The Ohio State University, Columbus, Ohio; ³Division of General and Community Pediatrics, The University of Texas Southwestern Medical Center, Dallas, Texas; and ⁴Division of General and Community Pediatrics, Cincinnati Children's Hospital and The University of Cincinnati College of Medicine, Cincinnati, Ohio

Address correspondence to: Sara M. Bode, MD, Department of Pediatrics, Nationwide Children's Hospital, 700 Children's Dr, Columbus, OH 43065. sara.bode@nationwidechildrens.org

Drs Bode, Irwin, and Denny conceptualized and designed the study and collaborated in initial drafts of the manuscript and subsequent revisions. Mr Masonheimer conducted all statistical analyses for the study and rendered respective tables and figures. Dr Hutton wrote and developed *The Reading House* book and screening measure, consulted in the study design, and collaborated in initial and revised drafts of the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

CONFLICT OF INTEREST DISCLOSURES: Dr Hutton is the author of *The Reading House* book and the related screening measure. *The Reading House* screener is registered as intellectual property by the Cincinnati Children's Research Foundation. None of the other authors have a conflict of interest to disclose.

FUNDING: No funding was secured for this study.

WHAT'S KNOWN ON THIS SUBJECT: Emergent literacy involves skills rooted in infancy vital for school readiness. The AAP recommends literacy promotion and developmental surveillance during primary care, yet literacy screening is not routinely done. The Reading House is a validated screener for preschool-aged children.

WHAT THIS STUDY ADDS: Screening with *The Reading House* was feasible and identified many children at-risk for inadequate reading readiness who passed general developmental screening. Findings reinforce the value of literacy screening during early childhood, including as a catalyst for guidance and referrals.

To cite: Bode SM, Denny S, Masonheimer A, et al. Comparison of Literacy and Developmental Screening of Preschool-Aged Children During Primary Care. *Pediatrics*. 2025;156(5):e2024069941

INTRODUCTION

A child's first 5 years are vital for healthy development, with trajectories impacted by factors including poverty, medical conditions, parental literacy, and household stress.¹ A key metric of developmental success is the child's readiness to learn in kindergarten, including social-emotional and academic skills, particularly those related to reading.² Thus, the American Academy of Pediatrics (AAP) recommends literacy promotion and developmental surveillance during well-visits in this age range, in support of school readiness.^{3,4}

Emergent literacy is a developmental continuum beginning in infancy that involves skills (eg, concepts of print, letter-sound knowledge), knowledge (eg, vocabulary), and attitudes.⁵ Given its importance for academic, vocational, and health outcomes and that component skills can be measured in early childhood coinciding with the development of a functional "reading network" in the brain,⁶ it has been proposed that emergent literacy be considered a distinct (fifth) developmental domain in Bright Futures guidelines.⁷ However, the current approach to screening groups literacy with language (and often other domains) and is most often via parent report, with no widely used standard to assess reading readiness and identify children at-risk early. This has been termed "wait to fail,"⁸ where children arrive at kindergarten unprepared to learn to read, particularly from minority, medically complex, and economically disadvantaged backgrounds where rates can exceed 50%.⁹

The AAP and Bright Futures recommend that developmental screening be conducted using validated tools.^{10,11} Parent report surveys (eg, *Ages and Stages Questionnaire [ASQ]*; the *Survey of Well-Being of Young Children [SWYC]*) are most often used, given availability, cost, and ease of administration. However, to our knowledge, none of these quantifies emergent literacy skills, nor have they been shown to predict kindergarten reading readiness. The *SWYC* milestones, which was used in the current study, assesses cognitive, language, and motor development, behavioral and emotional adjustment, and family stress, with score cut-offs flagging the child "at-risk."¹² However, it does not assess emergent literacy skills specifically. For this study, *The Reading House (TRH)* was chosen as the screening tool to assess literacy skills due to previous validation within pediatric medical homes, as well as the brief time for completion of screening, allowing for feasibility of administration during clinic visits. The assessment generates a total score and age-adjusted performance level (Ahead, On Track, Needs Support). *TRH* is a direct, interactive measure of emergent literacy skills intended to be administered by a trained user. The screening process starts by presenting *TRH* book to the child and then following the script through a series of items based on the covers and 7 interior spreads, beginning with, "I have a book to share with you. Show me the front cover." *TRH* has been validated for preschool-aged

children during primary care visits, including associations with cortical thickness in brain areas known to support reading.^{13,14} In prior, published research,¹³ the average time for screening was 5 to 7 minutes, with users reporting increased speed with practice. A recent pilot involved testing in various settings including medical assistants, pediatric residents in pediatric clinics, preschool teachers, speech-language pathologists, and community volunteers, and administration times and experience were similar. For each user type, training was completed in a single session lasting less than 1 hour, and remote training (eg, via Zoom) was also feasible and effective. *TRH* is available for \$3/copy from Blue Manatee Press and All About Books, including scoring forms, a training manual and guidance materials (tip sheets, educational video). An electronic scoring template including links to these guidance materials was also recently launched (<https://thereadinghouse.website/form/?code=abcdef>) and is available at no extra cost. It is possible/allowable for providers to bill for screening with *TRH* (code 96110), as it is validated and results in an age-adjusted score that can be shared with families and documented in the EMR, which may enhance feasibility in practice.

Historically, general developmental screening with the *SWYC* across primary care clinic study sites hosting this study has demonstrated high success rates of more than 90% completion. The introduction of a second screening tool (*TRH*) was implemented in a pilot quality improvement study from January 2022 to January 2024, with results published separately.¹⁵ Within that time period, screening rates consistently improved through optimization of the screening approach leading to a successful screening rate of more than 70% by the conclusion of the project.¹⁵ The current study was quantitative in nature and intended to compare results from the administration of the *SWYC* milestones and *TRH* concordantly in a busy pediatric setting. The hypothesis was that *TRH* and *SWYC* milestones scores would be positively correlated reflecting overall development yet, given its direct format and emergent literacy focus, *TRH* would identify a significant percentage of children at-risk who otherwise passed the *SWYC* milestones.

METHODS

This study was approved by the Nationwide Children's institutional review board.

Participants

Nationwide Children's Hospital Primary Care Network (PCN) cares for more than 120 000 mostly Medicaid-enrolled patients across 13 urban offices. PCN patients are seen by approximately 100 medical providers and, in 2022, the network completed more than 227 000 patient visits. To be eligible for the current study, families needed to be fluent in English and the child needed to be between

the ages of 3 and 4.9 and able to meaningfully participate in the assessment (calm, has some communication skills, willing to engage with KRC, etc).

At the time this study was launched, *TRH* was only available in English (it has since been published in Spanish), so non-English-speaking patients were excluded in this analysis.

Study Design/Staff

This study involved retrospective chart reviews of families seen for well-visits at participating primary care clinics. Literacy screening and subsequent family guidance were conducted via Kindergarten Readiness Coordinators (KRCs), each with backgrounds in early intervention. KRCs have a bachelor's degree, early childhood education experience, and certification in early intervention. The rationale for embedding KRCs into these clinics was the mounting evidence of benefits of specialists who can spend focused time with families from at-risk backgrounds, which is often not possible with usual physicians and staff, to help address persistent inequities described above. Another appeal was that KRCs are able to spend time with families building trust, identifying family needs and capacities, and sharing deep familiarity with community resources that are relevant and actionable and that match these needs and capacities. The model involved the KRC seeing all families with a child aged 3 to 4 years presenting for a well-visit, which is ascertainable by reviewing the electronic medical record (EMR). At 3 primary care clinics, KRCs are integrated into the primary care team. The KRC meets with the caregivers of all children aged 3 and 4 years being seen in the clinic for a well-child visit and completes a literacy assessment using *TRH*. The results are then entered in the EMR. *TRH* assessment is a 9-item, scripted scoring form, described below. It is based on a specially designed children's book that is then provided to the family after the visit to read together at home, reminding them of important early literacy skills.¹³ Based on their assessment, the KRC develops an individualized literacy plan that links the child with the appropriate local community high-quality, evidence-based, early intervention programs. The Individualized Literacy Plan is completed to address any deficits identified on *TRH* screen, including educational materials and activities to try with the child at home, as well as a literacy kit that includes magnetic letters, activity and practice books, scissors, toy clay, and educational learning links. Emerging literacy screening by the KRC engages parents by directly showing the child's current skills (ie, they watch the child's performance) and then empowers them by providing targeted guidance and resources including *TRH* materials (tip sheets, educational video) and Individualized Literacy Plans to enhance the Home Literacy Environment and help parents link with actionable, relevant community services. During this process, the KRC

spends time listening, building trust, and reinforcing a growth mindset, reassuring the parent that they play a vital role to help their child succeed. Successful linkage with support organizations is tracked by the KRCs. The KRCs follow up with the family by phone monthly to determine whether the family has connected with the community organization. If the connection has not been made, the KRC re-refers and then follows up with the family in another 30 days.

Assessments

Demographics

Demographic variables were extracted from the EMR and included the child's age, sex, and race. The Child Opportunity Index (COI) score, a validated tool for neighborhood indices, was also calculated, which includes neighborhood-level data in 3 domains: education, health and environment, and social and economic (higher suggests greater resources).

SWYC Milestones

Caregivers of children aged 4 months to 4 years seen in the PCN are asked to complete a developmental screen, the *Survey of Well-Being in Young Children (SWYC)*, at all well-child visits. This includes children aged 3 and 4 years, where caregivers complete *SWYC* milestones questions for the appropriate age at check-in electronically and the responses are automatically uploaded to the EMR upon completion of the screen. The *SWYC* includes a 10-item developmental milestone screening section, resulting in a score interpretation of "Needs review" or "Appears to meet age expectations." These 10 items cover developmental domains of cognitive, language, and motor development, but not literacy skills specifically. The additional sections of the *SWYC* that include behavioral concerns and family stress were not evaluated in this study.¹² Non-English-speaking families have *SWYC* survey questions read to them using an interpreter during the triage process. The medical provider can view the results and take appropriate action during the visit.

The Reading House

The Reading House (TRH; Blue Manatee Press) is a 14-page board-format book for young children that models early reading skills, described in a previous study (Figure 1).¹³ *TRH* screening assessment consists of 9 scripted items that follow, yet are distinct from, the book's text and is intended to be administered to preschool-aged children (aged 3–5 years). Item scores range from 0 to 3 points, which are summed to generate a total score from 0 to 14 points. Items correspond to both covers and the 7 interior page spreads, each reflecting a distinct emergent literacy skill: concepts of print, alphabet knowledge, letter-sound knowledge, phonological awareness (rhyming, alliteration, blending), expressive vocabulary, and emergent writing. Internal



FIGURE 1.
The Reading House.

consistency, reliability, concurrent validity, and associations with cortical thickness in brain areas known to support reading have been established previously.^{13,14} Total score maps to age-adjusted performance levels (Ahead, On Track, Needs Support; aged 36–47 months, aged 48+ months), and the book is intended for the family to take home and share as a reminder of these skills and motivation to practice them.

Statistical Analysis

A retrospective chart review was done of all children in our cohort who had completed both the *SWYC* milestones and *TRH*. Several methods were used to analyze these data. Descriptive statistics were used to examine trends in both screening tools and the rates at which children were flagged as at-risk (Needs Support Performance Level). A flag of at-risk indicated that the child fell below an age-adjusted scoring threshold on the respective screening test (ie, Needs Support on *TRH*, Needs Review on *SWYC* milestones), suggesting a need for additional support in the respective developmental domain (eg, emergent literacy, motor). Logistic regression models were used to examine socio-demographic variables that were associated with a child being flagged as at-risk. Specifically, we examined socio-demographic variables including gender, race and ethnicity, family English language status, and COI. Following the original COI procedure, values from 1 to 100 were assigned to an ordinal scale: “very low” (1–20), “low” (21–40), “moderate” (41–60), “high” (61–80), and “very high” (81–100).¹⁶ For our data analysis, due to the low number of children

observed in the moderate category ($N = 17$; 2.36%), this level was merged into the “low” and “high” categories. This procedure created 2 new categories, with scores of 21 to 50 forming the “low to moderate” ($N = 65$; 9.02%) and scores 51 to 80 forming the “moderate to high” ($N = 50$, 6.93%) categories.

RESULTS

Demographics/Sample

From completed well-visits between January 18, 2022, and January 31, 2024, we examined visit data for 721 children between the ages of 3 to 5 years ($M_{\text{age}} = 46.49$ months; $SD = 6.97$) who were administered both the *SWYC* milestones and *TRH*. Parents identified these children as predominantly Black or African American, female, and from English first language families and as having scored very low on the COI. Full demographic statistics can be viewed in Table 1.

Screening Scores

Scores for the *SWYC* milestones ranged from 0 to 20 ($M = 15.52$; $SD = 4.17$) and for *TRH* from 0 to 15 ($M = 5.12$; $SD = 3.10$) across both age 3 and age 4 cutoff scores. For children who qualified for the age 3 cutoff for *TRH* (3–3.9 years), scores ranged from 0 to 13 ($M = 3.83$; $SD = 2.46$), whereas scores ranged from 0 to 15 ($M = 6.23$; $SD = 3.16$) for children who qualified for the age 4 cutoff (4 years and older). Scores were normally distributed for both the entire sample and each age group. This demonstrates similar

TABLE 1. Sociodemographic Sample Statistics	
Variable	N (%)
Age 3.0–4.9 y	721 (100)
Gender	
Female	374 (51.87)
Male	347 (48.13)
Family English language status	
English first language	546 (75.73)
English second language	175 (24.27)
Race and ethnicity	
Black or African American	358 (49.65)
White	160 (22.19)
Multiracial	71 (9.85)
Latino	60 (8.32)
Asian	37 (5.13)
Other	35 (4.85)
Child Opportunity Index score	
Very low (1–20)	390 (54.09)
Low (21–40)	60 (8.32)
Moderate (41–60)	17 (2.36)
High (61–80)	38 (5.27)
Very high (81–100)	216 (29.96)

findings of *TRH* across both age groups. A low positive correlation ($r = 0.30$; $P < .01$) was observed between *TRH* and *SWYC* milestones scores (see Figure 2).

Regarding normality, scores for the *SWYC* milestones displayed a slight negative skew (skewness = -1.49) and slightly elevated kurtosis (kurtosis = 2.35). Scores for *TRH* were within normal boundaries for the overall sample (skewness = 0.66 ; kurtosis = 0.27) as well as when examined separately for the age 3 (skewness = 0.59 ; kurtosis = 0.68) and age 4 (skewness = 0.52 ; kurtosis = -0.18) cut-offs. Histograms for each screening test with normality overlays can be viewed in Figure 3.

Between the *SWYC* milestones and *TRH*, 339 children (47.02%) were flagged as at-risk. The *SWYC* flagged 213 children (29.54%) as at-risk across all cutoffs. *TRH* flagged 220 children (30.51%), with 102 (14.15%) at the year 3 cut-off and 118 (16.37%) at the year 4 cutoff. These differences by cutoff age did not differ from what would be expected by chance ($\chi^2(1) = 0.004$; $P = .95$).

Of the total children flagged as at-risk, 94 (24.61%) were flagged by both the *SWYC* milestones and *TRH*. The *SWYC* milestones flagged 119 (31.15%) unique children, whereas *TRH* flagged 126 (32.94%) unique children. These observations were significantly different from what would be expected by chance ($\chi^2(1) = 26.44$; $P < .001$) and can be viewed in Figure 4. These observations demonstrate that of the 508 children who passed the *SWYC* milestones, there

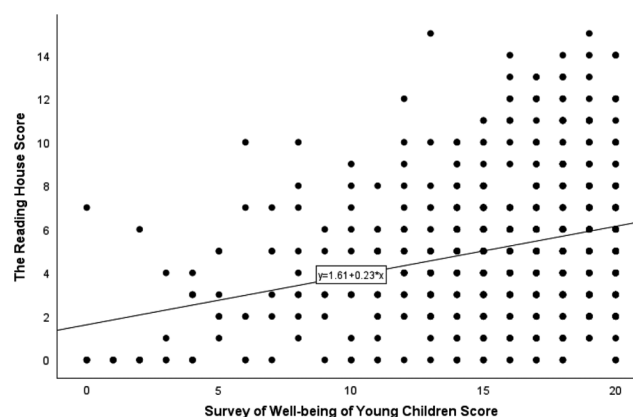


FIGURE 2.

Scatter plot for the correlation between the *Survey of Well-Being of Young Children* and *The Reading House* score with line of best fit.

were 126 who failed *TRH* (24.8%). That is, *TRH* identified 24.8% of children in the study sample as at-risk for low emergent literacy skills who scored within the normal range on the *SWYC* milestones in terms of general development.

Logistic regression models for the *SWYC* milestones ($P < .001$) and *TRH* ($P < .001$) indicated that there were associations with being flagged as at-risk on the respective screening test and key sociodemographic variables. For the *SWYC* milestones, a child was more likely to be flagged as at-risk if male (odds ratio [OR] = 2.16 ; $P < .001$) or also flagged as at-risk on *TRH* (OR = 2.20 ; $P < .001$). For *TRH*, a child was more likely to be flagged as at-risk if male (OR = 1.43 ; $P < .05$) or also flagged as at-risk on the *SWYC* milestones (OR = 2.20 ; $P < .001$). Additionally, a child was more likely to be flagged as at-risk on *TRH* if the child had a very low as compared to a moderate to high COI (OR = $P < .05$) or Black or African American as compared to white (OR = 1.43 ; $P < .05$) or the “other” race group (OR = 0.17 ; $P < .001$). Full model fit and parameter information can be viewed in Tables 2 and 3.

DISCUSSION

Emergent literacy is a developmental continuum beginning in infancy, which involves component skills that are measurable and manifest in typically developing readers during established age ranges.³ A key metric of success predicting subsequent academic, vocational, and health outcomes is kindergarten reading readiness, which is generally assessed soon after kindergarten entry.² Unfortunately, fueled by socioeconomic and other inequities, a large number of children arrive at school unprepared to learn to read, with rates exceeding 50% in marginalized communities. To address these inequities, it is vital to develop efficient, reliable means to identify children at-risk as early as possible

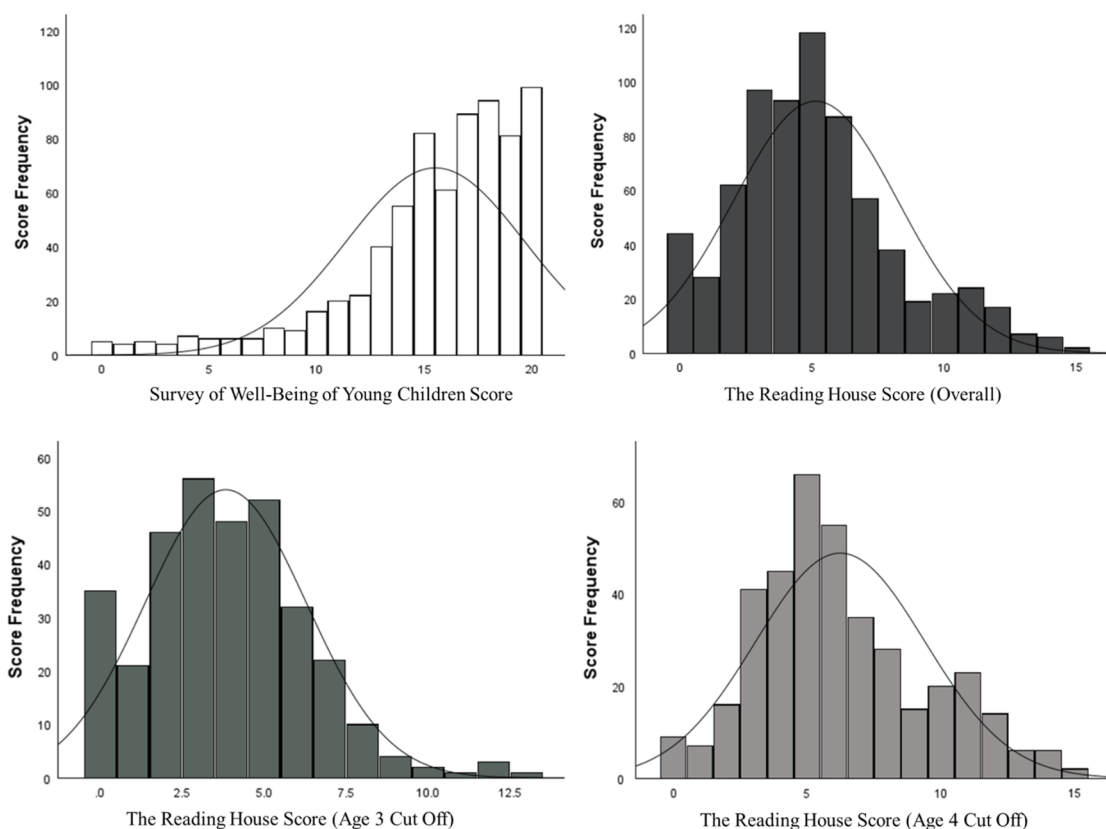


FIGURE 3.

Score frequencies for the overall sample *Survey of Well-Being of Young Children* and *The Reading House* as well as *The Reading House* age 3 and 4 cutoffs.

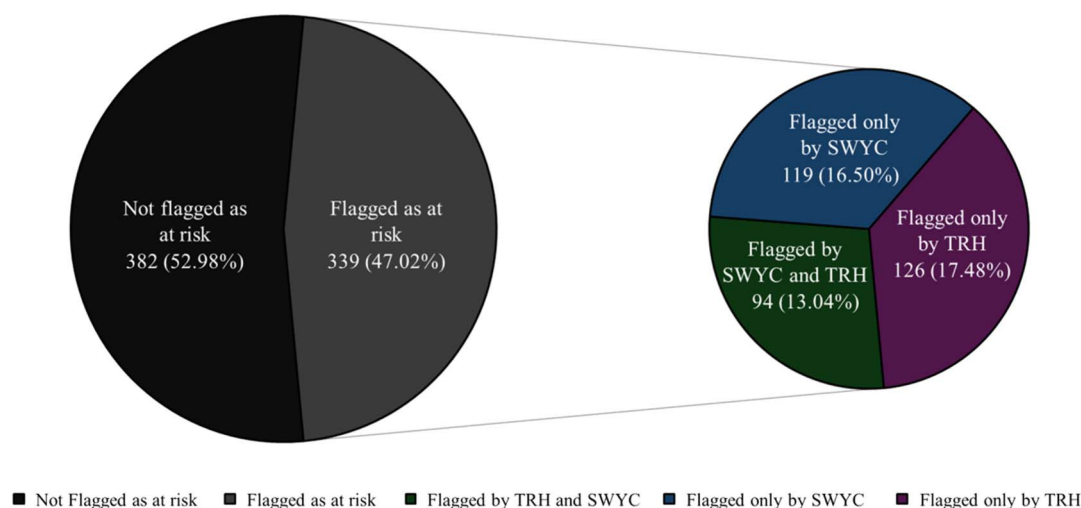


FIGURE 4.

Sample summary screening test results for child being flagged as at-risk. Note: Percentages out of overall sample (N = 721). Abbreviations: *SWYC*, *Survey of Well-Being of Young Children*; *TRH*, *The Reading House*.

and provide needed guidance and support. Given trusted, frequent access to families beginning in early infancy, pediatricians have a major opportunity to conduct such

work, aligning developmental surveillance and literacy promotion efforts recommended by the AAP with early childhood educators and advocates.

TABLE 2. Model Fit for Logistic Regression Models Examining Associations Between Sociodemographic Variables and a Child Being Flagged as At-Risk						
Screening Test	N (%) At-Risk	N (%) Not At-Risk	Model Fit			
			χ^2	df	Cox & Snell R ²	% Correctly Classified
SWYC	213 (29.54)	508 (70.46)	56.58 ^a	11	.08	71.15
TRH	220 (30.51)	501 (69.49)	56.15 ^a	11	.08	70.74
Abbreviations: N, sample population; SWYC, Survey of Well-Being of Young Children; TRH, The Reading House.						
^a $P < .001$.						

The current study builds on related, quality improvement-based work in our clinic network that established feasibility, scalability, and family/staff acceptance of conducting emergent literacy screening with *TRH*, a recently validated tool, during pediatric well-visits at ages of 3 and 4 years.^{13,14} The current study compared scores on *TRH* with those on the *SWYC* milestones, a widely used general developmental screening measure, and subsequent parental response to screening and linkage with services. This addresses common questions concerning added value by the time and resources required to screen emergent literacy directly during primary care visits and whether general developmental surveillance is adequate to identify

children at-risk. It also begins to address the question of “what to do” with screening results, in terms of guidance and resources provided to families.

Our first major finding related to score concordance from the featured screening tools. Scores on *TRH* and the *SWYC* milestones were positively correlated, which was expected, given the prominence of literacy-supporting skills in overall development, particularly language. However, the correlation was low to moderate in nature, reflecting nonoverlapping skills between these measures (eg, general language skills in *SWYC* milestones, print and alphabet knowledge in *TRH*). This modest correlation is helpful, as it shows that the measures are capturing variability in cognitively related skill domains yet provide distinct information. By contrast, if their correlation was negative or 0, this would suggest they were capturing variability in nonrelated or opposing domains, and if substantially higher close to 1, they would be colinear and not useful to administer together. This highlights the added value of screening early literacy skills, specifically in addition to general development abilities, to obtain a clearer sense of the child’s reading readiness.

Both measures identified children at-risk for developmental concerns (17.5% of the sample by *TRH*, 16.5% by the *SWYC* milestones, 13% by both), yet 24.8% of children passing the *SWYC* milestones (508 children) were flagged

TABLE 3. Parameter Estimates for Logistic Regression Models Examining Associations Between Sociodemographic Variables and a Child Being Flagged as At-Risk						
	Model Parameters					
	Screening Test					
	SWYC			TRH		
	B	SE	Odds Ratio	B	SE	Odds Ratio
Intercept	−1.33 ^c	0.26	0.27	−0.88 ^c	0.25	0.41
Gender	0.77 ^c	0.17	2.16	0.36 ^d	0.17	1.43
English second language	0.21	0.24	1.23	0.41	0.23	1.51
Black/African American ^a	−0.41	0.23	0.67	−0.51 ^d	0.23	0.60
Asian/Asian American ^a	−0.57	0.45	0.56	−0.35	0.42	0.70
Latino or Hispanic ancestry ^a	−0.73	0.37	0.48	0.09	0.34	1.09
Multiracial ^a	−0.01	0.32	0.99	−0.29	0.32	0.75
Other race ^a	−0.28	0.44	0.76	−1.80 ^c	0.58	0.17
Very high COI ^b	−0.05	0.22	0.95	−0.24	0.22	0.79
Moderate to high COI ^b	−0.01	0.36	0.99	−0.86 ^d	0.40	0.42
Low to moderate COI ^b	0.50	0.29	1.65	−0.11	0.30	0.90
TRH at-risk	0.79 ^c	0.18	2.20			
SWYC at-risk				0.79 ^c	0.18	2.20
Abbreviations: B, Beta coefficient; COI, Child Opportunity Index; SWYC, Survey of Well-Being of Young Children; TRH, The Reading House.						
^a As compared to white (white, coded as 0).						
^b As compared to very low COI (very low COI coded as 0).						
^c $P < .001$.						
^d $P < .05$.						
SWYC and TRH at-risk status coded as 1 = flagged as at-risk, 0 = not flagged as at-risk. Gender coded as 1 = male, 0 = female. English second language coded as 1 = English second language, 0 = English first language.						

at-risk on *TRH* (126 children), indicating that they would have been missed via the current standard of care. This further highlights the added value of specifically screening emergent literacy skills, particularly in populations at-risk for low kindergarten reading readiness (eg, high rates of poverty, recent immigrants). Interestingly, *TRH* scores were normally distributed, whereas *SWYC* milestones scores were positively skewed, suggesting reporting bias for the parent report measure. In addition to differences in skills screened, we attribute this to the direct format of *TRH*, which reduces the potential for reporting bias, a well-documented concern in parent report measures such as the *SWYC* milestones and *ASQ*.

A second major finding related to correlations between demographic and economic factors and *TRH* screening results. Relationships between race, sex, socioeconomic status, and multiple domains of development, notably language and emergent literacy, have been well-described.¹ The current study found significant positive correlations between being flagged at-risk on the *SWYC* milestones and male sex, but interestingly, not with race or COI (a composite measure of neighborhood resources). By contrast, there were significant positive correlations between being flagged at-risk on *TRH* and male sex, Black/African American race, and lower COI, which all align with extensive prior research,¹⁷ including *TRH* validation studies.^{13,14} This distinction is important given the need to identify risk faced by marginalized populations early to help address inequities in reading and broader educational outcomes.¹⁸

This study also provided further validation for use of *TRH* as a screening tool in primary care. Prior published research established strong internal psychometric properties (eg, internal consistency) and concurrent validity of *TRH* relative to an established standard (Get Ready to Read), other emergent literacy component skills (vocabulary, rapid naming, phonological awareness), and cortical thickness in brain areas known to support reading (ie, the emerging reading network).^{13,14} The current study expands validation evidence by differentiating *TRH* from a general developmental screening measure (*SWYC*) commonly administered at this age. This is important, as it provides compelling evidence that *TRH* can identify children who are lagging in age-normed emergent literacy skills, who otherwise screen on-track in general developmental abilities. Thus, there is added value to specifically screening emergent literacy skills at this formative age, in advance of typical kindergarten entry (ie, not “waiting to fail”). Findings from this study published previously,¹⁵ which are improvement science-based, established feasibility in “usual” clinical practice (well-visits at age 3–4 years), strong family and staff satisfaction, and family engagement with guidance targeted through screening. An additional benefit, supported by anecdotal evidence from this and prior studies, is that the screening process itself may inspire a

“lightbulb” moment where parents who were unaware of their child’s emergent literacy skills and unsure of what skills are expected at this age may engage more strongly with guidance and referrals from providers. What remains to be established is predictive validity (ie, relationship between screened *TRH* scores at age 3–4 and subsequent measures of readiness and/or reading abilities), which is planned using a longitudinal design.

This study has strengths and limitations that are important to note. First, screening with *TRH* was conducted by KRCs, which are not currently available in many clinics, especially smaller and/or private providers. However, we believe that the current and related findings¹⁵ bolster the case that KRCs are value-added given the importance of kindergarten readiness for academic, vocational, and health outcomes. Further, framing the 3- and/or 4-year-old well-visit as a “literacy visit” seems appealing and a major opportunity to engage with and empower families regarding this vital developmental domain. The sample population was primarily Black/African American with low COI, limiting generalizability, although these oft-marginalized populations are most in need of effective approaches to screening and intervention. Notably, the Reach Out and Read (ROR) program currently serves more than 25% of children in the United States living in poverty, over half of these from racial minority backgrounds, providing unique access to families who would benefit most from early detection of risk and tailored guidance.¹⁹ The *TRH*/KRC pilot originated as a quality improvement study and did not involve quantitative measures of guidance and referrals provided at screening visits, rendering these outcomes largely anecdotal at this stage. A future study, which is planned, should specifically capture these and track linkage with services over time. Although follow-up inquiries quantified high rates of linkages with services for families screened with *TRH*, their duration was relatively short. Longitudinal studies, ideally through kindergarten entry, are needed to determine the durability of this impact. Finally, it is noteworthy that 119 (31.15%) children were flagged as at-risk only by the *SWYC*. This observation is likely because the *SWYC* assesses other development aspects, such as motor skills, that the *TRH* does not,¹² which highlights the value added of incorporating both screeners into well-child visits as resources permit.

This study also had notable strengths. Its sample size was large, supporting robust statistical analyses including demographic covariates. It was conducted in a busy pediatric clinic using regular staff, scheduling, and embedded KRCs, affirming feasibility, acceptance, and scalability of *TRH* screening, while providing “real-world” data.¹⁵ It compares scores on a widely used measure (*SWYC* milestones) to one that is emerging yet has been found to be feasible and valid during clinic visits, providing insights into how the results might inform actual practice. Each of these are readily available, inexpensive, and brief and require

minimal training, which could be tested and/or used in various settings. Altogether, the current study bolsters evidence for value added from directly screening emergent literacy skills during pediatric well-visits in the early preschool age range, in addition to general development. This aligns with AAP developmental surveillance, school readiness and literacy promotion guidelines,^{3,4} the established ROR clinic-based model,^{19,20} and the need to address persistent inequities in academic and health outcomes. Further studies are needed, including more diverse populations, settings, and a longitudinal design.

CONCLUSION

This study involving preschool-aged children during pediatric well-visits found that a substantial number who passed

general developmental screening were flagged at-risk in terms of emergent literacy skills using a direct screening tool (*TRH*). The odds of being flagged were highest for children from racial minorities and socioeconomically disadvantaged backgrounds. This highlights the value added from explicitly screening emergent literacy skills in the pediatric medical home to help identify children in need of guidance and support as far in advance of kindergarten entry as possible. Given the prevalence of reading difficulties, risks faced by marginalized populations, and importance of reading as a neurobiologically based, social determinant of health, there are opportunities for pediatricians to augment customary reading guidance with emergent literacy screening and help ensure children arrive at kindergarten ready to learn.

Accepted for Publication Date: August 4, 2025

<https://doi.org/10.1542/peds.2024-069941>

Copyright © 2025 by the American Academy of Pediatrics

REFERENCES

1. McCormick BJJ, Caulfield LE, Richard SA, et al; MAL-ED NETWORK INVESTIGATORS. Early life experiences and trajectories of cognitive development. *Pediatrics*. 2020;146(3):e20193660. PubMed doi: 10.1542/peds.2019-3660
2. Fitzpatrick C, Boers E, Pagani LS. Kindergarten readiness, later health, and social costs. *Pediatrics*. 2020;146(6):e20200978. doi: 10.1542/peds.2020-0978
3. Klass P, Miller-Fitzwater A, High PC; COUNCIL ON EARLY CHILDHOOD. Literacy promotion: an essential component of primary care pediatric practice: policy statement. *Pediatrics*. 2024;154(6):e2024069090. PubMed doi: 10.1542/peds.2024-069090
4. Klass P, Mendelsohn AL, Hutton JS, et al; COUNCIL ON EARLY CHILDHOOD. Literacy promotion: an essential component of primary care pediatric practice: technical report. *Pediatrics*. 2024;154(6):e2024069091. doi: 10.1542/peds.2024-069091
5. Horowitz-Kraus T, Schmitz R, Hutton JS, Schumacher J. How to create a successful reader? Milestones in reading development from birth to adolescence. *Acta Paediatr*. 2017;106(4):534–544. doi: 10.1111/apa.13738
6. Horowitz-Kraus T, Hutton JS. From emergent literacy to reading: how learning to read changes a child's brain. *Acta Paediatr*. 2015;104(7):648–656. doi: 10.1111/apa.13018
7. Klass P, Hutton JS, DeWitt TG. Literacy as a distinct developmental domain in children. *JAMA Pediatr*. 2020;174(5):407–408. doi: 10.1001/jamapediatrics.2020.0059
8. Ozernov-Palchik O, Gaab N. Tackling the 'dyslexia paradox': reading brain and behavior for early markers of developmental dyslexia. *Wiley Interdiscip Rev Cogn Sci*. 2016;7(2):156–176. doi: 10.1002/wcs.1383
9. Groundwork Ohio. Kindergarten assessment predicts children's success through education. Accessed October 2024. <https://www.groundworkohio.org/post/kindergarten-assessment-predicts-children-s-success-through-education#:~:text=Disparities%20in%20Readiness&text=The%20data%20exposed%20an%20even,disabilities%20not%20demonstrating%20kindergarten%20readiness>
10. Hagan JF, Shaw JS, Duncan PM, eds. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*. 4th Edition. American Academy of Pediatrics; 2017.
11. Sheldrick RC, Schlichting LE, Berger B, et al. Establishing new norms for developmental milestones. *Pediatrics*. 2019;144(6):e20190374. PubMed doi: 10.1542/peds.2019-0374
12. Lindgren Alves CR, Moreira R, Scherrer I, et al. Validity of the Survey of Wellbeing of Young Children (SWYC) to screen developmental delay in Brazilian children aged one to 65 months. *Pediatrics*. 2018;142(1_MeetingAbstract):766. doi: 10.1542/peds.142.1MA8.766
13. Hutton JS, Justice L, Huang G, Kerr A, DeWitt T, Ittenbach RF. *The Reading House*: a children's book for emergent literacy screening during well-child visits. *Pediatrics*. 2019;143(6):e20183843. PubMed
14. Hutton JS, Dudley J, Huang G, et al. Validation of *The Reading House* and association with cortical thickness. *Pediatrics*. 2021;147(3):e20201641. doi: 10.1542/peds.2020-1641
15. Bode SM, Denny S, Irwin MK, Hutton J. A primary care-based approach to improving kindergarten readiness. *Pediatrics*. 2025;155(suppl 1):e2024069159C. PubMed doi: 10.1542/peds.2024-069159C
16. Attridge MM, Heneghan JA, Akande M, Ramgopal S. Association of pediatric mortality with the Child Opportunity Index among

children presenting to the emergency department. *Acad Pediatr.* 2023;23(5):980–987. PubMed doi: 10.1016/j.acap.2023.01.006

17. Shaw DS, Mendelsohn AL, Morris PA. Reducing poverty-related disparities in child development and school readiness: the Smart Beginnings tiered prevention strategy that combines pediatric primary care with home visiting. *Clin Child Fam Psychol Rev.* 2021;24(4):669–683. PubMed doi: 10.1007/s10567-021-00366-0
18. Herring WA, Bassok D, McGinty AS, Miller LC, Wyckoff JH. Racial and socioeconomic disparities in the relationship between children's early literacy skills and third-grade outcomes: lessons from a kindergarten readiness assessment. *Educ Res.* 2022;51(7): 1–10. doi: 10.3102/0013189X221091535
19. Reach Out & Read National Office. Reading is a right. Accessed October 10th, 2024. <https://reachoutandread.org/why-we-matter/our-impact/>
20. Uthirasamy N, Reddy M, Hemler JR, et al. Reach Out and Read implementation: a scoping review. *Acad Pediatr.* 2023;23(3): 520–549. PubMed doi: 10.1016/j.acap.2022.11.012