

# Characteristics and influence of home literacy environment in early childhood-centered literacy orientation

Sandra Sylvia Mascarenhas<sup>1,2</sup>, Rajesh Moorakonda<sup>2,3</sup>,  
 Pratibha Agarwal<sup>4</sup>, Sok Bee Lim<sup>1,2,5</sup>, Sonoko Sensaki<sup>6</sup>,  
 Yap Seng Chong<sup>5,7,8</sup>, John Carson Allen<sup>2</sup>  
 and Lourdes Mary Daniel<sup>1,2,5</sup>

Proceedings of Singapore Healthcare  
 1–17  
 © The Author(s) 2016  
 Reprints and permissions:  
[sagepub.co.uk/journalsPermissions.nav](http://sagepub.co.uk/journalsPermissions.nav)  
 DOI: 10.1177/2010105816674738  
[psh.sagepub.com](http://psh.sagepub.com)  


## Abstract

**Background:** The home literacy environment (HLE) and joint parent–child book reading are key factors in children’s language and literacy acquisition. Child-centered literacy orientation (CCLO) refers to the child’s level of engagement in literacy events.

**Aim:** To describe the HLE and identify demographic and HLE variables associated with a poor CCLO at 12 months of age.

**Methods:** Parents of Singaporean children enrolled in the Growing Up in Singapore Towards healthy Outcomes (GUSTO;  $n = 1152$ , birth cohort 2009–2010) completed a childhood literacy questionnaire at 12 months to obtain scores on HLE (0–17) and CCLO (0–6). Logistic regression analyses were employed to identify predictors of low CCLO.

**Results:** Parents of 525 children completed the questionnaire. Mothers were the main caregivers in half the households. Mandarin was the main language (34%). Majority of the respondents had a library card that was used less than weekly, and had fewer than 10 children’s books. 18% of parents read to the child daily, of whom one-quarter read at bedtime. Amongst half of the families who had a CCLO score of 0, two-thirds had the lowest HLE scores (0–2). Correlational analyses indicated significant association between HLE with CCLO at 12 months ( $p < 0.001$ ). Non-English speaking caregivers and mothers who had only completed primary education were at high risk of a poor 12-month CCLO.

**Conclusion:** A literacy-rich home environment is associated with 12-month child-centered literacy orientation. Pediatricians and early years’ professionals may be able to promote benefits of literacy related activities to families at risk of poor child-centered literacy orientation.

## Keywords

Home literacy environment, child-centered literacy orientation, parent–child book reading

## Introduction

The home literacy environment (HLE) has been defined either as the frequency of parent–preschooler shared reading or as a multifaceted broad definition to include measures of the duration of shared picture book reading, number of picture books, joint attention, and contextual variables such as family literacy.<sup>1–3</sup> It is a key factor in language and literacy acquisition in children,<sup>4–7</sup> and a broadly defined HLE accounts for up to one third the variance in an infant’s early language comprehension.<sup>3</sup> The term “orientation to literacy” describes children’s level of interest or engagement in literacy events.<sup>8</sup> Preschool parent–child book reading, a way of engaging in early literacy orientation, is identified to be a critical factor in promoting a child’s language development, emerging literacy

<sup>1</sup>Department of Child Development, KK Women’s & Children’s Hospital, Singapore

<sup>2</sup>Duke-NUS Graduate Medical School, Singapore

<sup>3</sup>Singapore Clinical Research Institute, Singapore

<sup>4</sup>Department of Neonatology, KK Women’s and Children’s Hospital, Singapore

<sup>5</sup>Yong Loo Lin School of Medicine, Singapore

<sup>6</sup>Singapore Eye Research Institute, Singapore

<sup>7</sup>Department of Obstetrics and Gynaecology, National University Hospital, Singapore

<sup>8</sup>Singapore Institute for Clinical Sciences, Agency for Science Technology and Research (A\*STAR), Singapore

### Corresponding author:

Sandra Sylvia Mascarenhas, Department of Child Development, KK Women’s & Children’s Hospital, 100 Bukit Timah Road, 229899, Singapore.  
 Email: [sandra.sylvia.mascarenhas@kkh.com.sg](mailto:sandra.sylvia.mascarenhas@kkh.com.sg)



skills, and child–caregiver attachment, affecting the child’s cognitive and socio-emotional development.<sup>4,5,8–10</sup>

Language skills in infancy have received particular attention as they influence overall development, and in particular reading achievement.<sup>3,11–20</sup> It was shown in a longitudinal study of British and American infants to be a predictor of language and literacy outcomes at school age.<sup>19,20</sup> Effects of phonological awareness, described as the ability of the child to attend to different language sounds on early reading skills, have been well studied as being affected by early language ability, and can be acquired by exposure to alphabet boards and playing rhyming games.<sup>21,22</sup> Since the Reach out and Read (ROR) program, reading aloud to infants is identified to be crucial for building the earliest reading and language skills.<sup>18</sup> Studies of book reading have found evidence that children begin to benefit in early language and literacy skills, when regular reading begins as early as 8 months with reading routines that include sensitive and responsive, language-rich interactional routines.<sup>12</sup> Emergent literacy, a term used to describe skills and knowledge that children develop before they begin to read (alphabet knowledge, print concepts and word recognition) is associated with home literacy activities and early oral language comprehension and expression.<sup>22,23</sup> It also leads to greater school success.<sup>3,10,24,25</sup> With growing evidence of the benefits of developmentally timed interventions to support language and emergent literacy skills,<sup>6,11,12,26</sup> it is important to know what literacy activities, and at what ages, help to promote emergent language and literacy skills in infants.

Researchers have explored the influence of environmental factors including early home literacy experiences on the development of emergent literacy and language skills.<sup>14,27,28</sup> Coleman outlined the role of family capital on children’s literacy development.<sup>29,30</sup> Family capital can be differentiated into human capital, social and financial capital. Human capital refers to parental educational level, their knowledge and skills. Social networks and interaction within and between families forms the social capital and financial capital refers to family income and concrete assets. Access to family capital can lead to early literacy orientation and improved reading achievement.<sup>31,32</sup> Snow et al. and Bennett et al. examined the theoretical models of the family as educator, resilient family, and parent–school partnership on emergent literacy and language skills in children.<sup>15,33</sup> The family as an educator model includes parental reading beliefs, literacy activities, joint reading and parental education. In the resilient family model, the family functions as a protective influence against external stressors. The parent–school partnership model occurs when parents actively support schools’ efforts in promoting their child’s language and literacy achievements. Previous studies have shown that the family as an educator model was significantly associated with emergent literacy and language skills in middle income preschool and school children,<sup>16,33</sup> whereas children from families with high levels of stress, poor emotional environments, and financial stressors perform at lower levels than their counterparts from “resilient” homes.<sup>34</sup> The parent–childcare partnership model did not consistently predict literacy and language skills.<sup>15,33</sup>

Language and literacy development is also influenced by government policies. Singapore government’s bilingual policy makes it mandatory for all Singaporeans to learn two official

languages: English as the first language and a mother tongue language as the second language; Mandarin (for Chinese), Malay (for Malays) or Tamil or other Indian languages (for Indians).<sup>35</sup> The home and education sectors play a crucial role in enforcing Singapore’s linguistic structures. Yeo et al. found a moderate relationship between HLE and preschoolers’ reading skills with family literacy activities contributing more to the variance in children’s reading outcomes.<sup>36</sup> HLE contributed to Chinese children’s lexical knowledge, vocabulary, and reading ability,<sup>37</sup> while HLE in English had an impact on word reading in school-aged Malay children in Singapore.<sup>38</sup>

In summary, having identified the crucial influence of early language and literacy skills on infant development and the child’s later academic achievement, as well as the effect of HLE on language and literacy skills, this study set out to determine the role of HLE on the early literacy orientation of infants. While there are many studies on effects of HLE on literacy and language promotion in western population,<sup>4,14,29–32,35,39–42</sup> there is relatively little data on the influence of HLE on early childhood literacy orientation at 12 months of age in Singapore. Singapore is a multicultural, multi-ethnic society where families speak a wide range of languages at home. With variability in care-giving arrangements and differences in parental education levels, it is important to understand the extent that home environments are supportive of early language and literacy development. The aim of this study was to describe the HLE and identify demographic and HLE variables that predict a low early childhood literacy orientation at 12 months of age in Singapore.

## Methods

### *Data source*

This was a descriptive study involving Singaporean children enrolled in the Growing Up in Singapore Towards healthy Outcomes (GUSTO) birth cohort, which is a general population cohort. The GUSTO study recruited pregnant women aged 18 years and above, attending their first trimester antenatal dating ultrasound scan clinic at Singapore’s two major public maternity units, namely National University Hospital (NUH) and KK Women’s and Children’s Hospital (KKH) between June 2009 and September 2010.<sup>43</sup> The participants were Singapore citizens or permanent residents who were of Chinese, Malay, or Indian ethnicity with homogeneous parental ethnic background and were assessed in mid and last trimester on gestational age and fetal growth. During infancy, the babies were examined at home, at 3 weeks, 3 months, and 3-monthly thereafter until 15 months of age.<sup>43</sup> When the child turned 12 months old, parents completed a childhood literacy questionnaire that explored the HLE (Appendix A) and child’s early literacy orientation. The questionnaire was used to derive the HLE score (HLES) and Childhood Composite Literacy Orientation (CCLO) scores. Information on demographics was also collected. Of the 1152 parents recruited during pregnancy, 525 parents (45.4%) returned the questionnaire and were included in this study.

This study was approved by the institution’s ethical review boards (DSRB: B/2009/584 and CIRB: 2009/1024/E). Written informed consent was obtained from parents or legal

guardians of the subjects. The study was undertaken from December 2010 to June 2012.

### Outcome variables

The primary outcome was the CCLO score (max score 6) adapted from High et al.,<sup>44</sup> a measure of the family's ability to engage in literacy promoting activities with their child. It was derived from the composite of three component questions: (1) "What are the child's three most favorite activities?" (2) "What are the three most favorite activities the parent/caregiver does with the child?" (3a) "Does the parent/caregiver read to the child at bedtime?" (3b) "How often is the child read to?"

Questions 1 and 2 were scored 1, if the activities were related to looking at books, children's magazines, or any other literacy-related activity, otherwise the score given was 0. Question 3a was scored as 1 = Yes, 0 = No; and Question 3b was scored 1–3 based on the frequency of reading to the child, with a score of 3 if the frequency of reading was at least 6–7 times a week.

### Predictor variables

We considered demographic and HLE variables and HLES as predictors. The HLES was derived from a composite of nine questions. Each question was scored between 0 and 2. This adapted score had a maximum score of 17, with a higher score indicating a more literacy-rich home environment.<sup>4</sup> The demographic variables that were analyzed were caregiver main language, mother's education, household income, mother's age and ethnic group, mother's occupation, mother's employment status, mother's marital status, child's gender, accommodation, and main caregiver.

### Statistical analysis

Demographic and HLE variables were summarized for the entire cohort as frequency counts (%) for categorical variables, and as mean (standard deviation) and median (interquartile range) for continuous variables. In addition, demographic and HLE variables were compared statistically among CCLO score categories of 0, 1–3, and 4–6 using Fisher's exact test for categorical variables (Monte Carlo approximation for variables with  $\geq 4$  response categories). The Kruskal–Wallis test was used to analyze the continuous variables. Univariate logistic regression on the outcome CCLO = 0 versus CCLO > 0 was used to screen for potential predictors of CCLO = 0 from a list of demographic variables and the HLE score, for potential inclusion in a multiple logistic regression analysis. Variables significant at  $p < 0.20$  in the univariate analysis were included in a multiple logistic stepwise regression analysis to identify a parsimonious subset of clinically relevant variables that can characterize children at high risk for CCLO = 0. Significance levels to enter and stay in the stepwise regression were 0.20 and 0.25, respectively. Variables identified using the stepwise selection algorithm were retained as the final model. Imputation of missing values was used on a limited basis for variables exhibiting "missing-ness" of <7%. This was done to preserve complete variable profiles

in cases where missing values were few and scattered among participants. Missing values for categorical variables were randomly imputed across categories on the basis of observed response frequencies, while missing values for continuous variables were imputed using the median. There were no missing outcomes among continuous variables. In addition to analysis of binary CCLO score outcome (0, >0), polytomous logistic regression was used to predict the probability of a 12-month old child being in a ternary CCLO category of 0, 1–3, or 4–6 as a function of HLES category (0–2, 3–5, 6–17), caregiver main language, and mother's highest education. In consideration of possible interactions among the factors selected, we analyzed the data using three models: (1) a full model (3 main effects, 2-way and 3-way interactions), (2) a model with 3 main effects and 2-way interactions only, and (3) a main effect model. Final model selection was based upon comparison of Akaike information criterion values (smaller is better) and likelihood ratio tests. The statistical software SAS version 9.4 was used to perform all analyses.

## Results

Demographic characteristics are presented in Table 1(a) and (b). Parents who participated in the study had a slightly different ethnic profile to those who did not, with predominantly Chinese parents continuing in the study. Our study also had parents with higher maternal education, maternal age, household income, and who differed on occupation profile compared to non-respondents (Table 2).

Majority of the infants (51%) were males. The mean (standard deviation) age of mothers was 31.1 (5.0) years and the predominant ethnic group was Chinese (62.9%) followed by Malay (23.2%). 37% of mothers had completed university education and 59.8% were born in Singapore. 30% of mothers identified with a professional job and the majority (95%) were married and living with their husbands. The household income was less than 2000 Singapore dollars in 14% of families, while 60% of the families were living in a 4–5-bedroom public flat. The mother was the main caregiver in 51.2% of households. The main language spoken was Mandarin (34%), followed by English (30%).

Home environment characteristics are presented in Table 3.

77.9% of families reported having a library card and a third of the homes used the card more frequently than once per month. 62% had fewer than 10 children's books. The mother read to the child in 40% of households, followed by a combination of caregivers in 24%. Nearly half of the households (43%) subscribed to newspapers or magazines.

There were 256 respondents (48.8%) with a CCLO score of 0, 230 (43.8%) with a score of 1–3, while 29 (5.5%) scored between 4 and 6. 159 respondents (30.3%) had the lowest HLE score of 0–2, 223 (42.5%) a score of 3–5, and 143 (27.2%) scored between 6 and 17. There were 108 parents (21%) who reported that sharing books was one of three child's favorite activity, while 155 parents (30%) reported that sharing books was one of three favorite activities they did with their child. The child was read to daily in 94 families (18.5%), several times a week in 193 (38%), and less than once weekly in 192 families (38%).

**Table 1.** (a) Demographic characteristics. (b) Mother's age, number of children, and adults at home.**(a).**

Variable	N (%)	Variable	N (%)
Child gender (N = 525)		Mother's marital status (N = 515)	
Male	272 (51.8)	Married, living with husband	500 (95.2)
Female	253 (48.2)	Others	15 (2.9)
Adult to child ratio (N = 525)		Mother's employment status (N = 246)	
At least 1:1	460 (87.6)	Working full time	127 (24.2)
Less than 1:1	65 (12.4)	Working part time	19 (3.6)
Mother's education (N = 521)		Homemaker	98 (18.7)
Primary	21 (4.0)	Other	2 (0.4)
Secondary	305 (58.1)	Mother's occupation* (N = 514)	
University	195 (37.1)	Legislators and senior official	17 (3.2)
Mother's age when leaving full time education (N = 511)		Professional	154 (29.3)
≤16 years	68 (13.0)	Associated professionals/techs	60 (11.4)
>16 years	443 (84.4)	Clerical worker	63 (12.0)
Mother's ethnic group (N = 525)		Service worker	54 (10.3)
Chinese	330 (62.9)	Plant and machine operator	8 (1.5)
Malay	122 (23.2)	Homemaker	140 (26.7)
Indian	73 (13.9)	Student	9 (1.7)
Mother's residence (N = 521)		Unemployed	6 (1.1)
Local Mother	328 (62.5)	Others	3 (0.6)
Foreign Mother	193 (36.8)	Accommodation type (N = 521)	
Mother birth country (N = 515)		1–2 HDB flat	18 (3.4)
China	81 (15.4)	2–3 HDB flat	113 (21.5)
India	28 (5.3)	4–5 HDB flat	314 (59.8)
Malaysia	69 (13.1)	Condominium	32 (6.1)
Others	23 (4.4)	Executive flat	26 (5.0)
Singapore	314 (59.8)	Landed property	13 (2.5)
Mother's personal income (SGD) (N = 502)		Others	5 (1.0)
0–999	167 (31.8)	Main caregiver <sup>a</sup> (N = 495)	
1000–1999	113 (21.5)	Mother	269 (51.2)
2000–3999	156 (29.7)	Father	6 (1.1)
4000–5999	43 (8.2)	Grandparent	121 (23.0)
>6000	23 (4.4)	Relative	4 (0.8)
Household income (SGD) (N = 492)		Unrelated person	16 (3.0)
0–999	9 (1.7)	Childcare	17 (3.2)
1000–1999	62 (11.8)	Others	62 (11.8)
2000–3999	136 (25.9)	Caregiver's main language (N = 488)	
4000–5999	125 (23.8)	English	153 (29.1)
>6000	160 (30.5)	Mandarin	179 (34.1)
		Malay	93 (17.7)
		Tamil	29 (5.5)
		Others	34 (6.5)

SGD – Singapore dollars; HDB – Public housing managed and developed by the Housing Development Board, Singapore.

\*Parental occupation according to the Singapore Standard Occupation Classification 2015.

<sup>a</sup>The person whom the child spends majority of the day with.

**(b).**

Variable	N	Mean	Std dev	Median	Lower quartile	Upper quartile
Mother's age (years)	525	31.10	5.00	31.00	28.00	35.00
Number of children at home	525	1.89	0.97	2.00	1.00	2.00
Number of adults at home	525	2.98	1.32	2.00	2.00	4.00

In 145 families (29%), caregivers read to the child at bed time. Of these, caregivers in 28 families (19%) read to the

child 6–7 nights/week, while in 77 families (53%) the frequency was less than three nights weekly.

**Table 2.** Univariate analysis of demographic variables among those continuing in study vs non participants.

Demographic/environmental characteristics (n = 1152)	Respondents (n = 525)	Non-respondents (n = 627)	p-value #
Child gender			
Male (n = 571)	272 (48)	299 (52)	0.6712
Female (n = 517)	253 (49)	264 (51)	
Not answered (n = 64)	0	64 (100)	
Adult to child ratio			
At least 1:1 (n = 1003)	460 (46)	543 (54)	0.6596
Less than 1:1 (n = 149)	65 (44)	84 (56)	
Mother's education			
Primary (n = 70)	21 (30)	49 (70)	0.0004
Secondary (n = 697)	305 (44)	392 (56)	
University (n = 369)	195 (53)	174 (47)	
Others (n = 1)	0	1 (100)	
Not answered (n = 15)	4 (27)	11 (73)	
Mother's age when leaving full time education			
≤16 years (n = 193)	68 (35)	125 (65)	0.0019
>16 years (n = 930)	443 (48)	487 (52)	
Not answered (n = 29)	14 (48)	15 (52)	
Mother's ethnic groups			
Chinese (n = 626)	330 (53)	296 (47)	<.0001
Malay (n = 314)	122 (39)	192 (61)	
Indian (n = 211)	73 (35)	138 (65)	
Others (n = 1)	0	1 (100)	
Mother's residence			
Local mother (n = 760)	328 (43)	432 (57)	0.0114
Foreign mother (n = 377)	193 (51)	184 (49)	
Not answered (n = 15)	4 (27)	11 (73)	
Mother's birth country			
China (n = 133)	81 (61)	52 (39)	0.0001*
India (n = 85)	28 (33)	57 (67)	
Malaysia (n = 131)	69 (53)	62 (47)	
Not answered (n = 23)	10 (43)	13 (57)	
Others (n = 48)	23 (48)	25 (52)	
Singapore (n = 732)	314 (43)	418 (57)	
Parental marital status			
Divorced (n = 1)	0	1 (100)	0.0131
Married and living with husband (n = 1079)	500 (46)	579 (54)	
Married and not living with husband (n = 6)	1 (17)	5 (83)	
Not answered (n = 24)	10 (42)	14 (58)	
Single and living with baby's father (n = 16)	9 (56)	7 (44)	
Single and not living with baby's father (n = 26)	5 (19)	21 (81)	
Mother's employment status			
Working full time (n = 303)	127 (42)	176 (58)	0.3257
Working part time (n = 39)	19 (49)	20 (51)	
Homemaker (n = 215)	98 (46)	117 (54)	
Others (n = 2)	2 (100)	0	
Not answered (n = 593)	279 (47)	314 (53)	
Mother's occupation			
Legislators and senior official (n = 31)	17 (55)	14 (45)	0.0068*
Professional (n = 287)	154 (54)	133 (46)	
Associated professional /techs (n = 128)	60 (47)	68 (53)	
Clerical worker (n = 174)	63 (36)	111 (64)	
Service worker (n = 140)	54 (39)	86 (61)	
Agricultural worker (n = 1)	0	1 (100)	
Production craftsman (n = 2)	0	2 (100)	
Plant machine operator (n = 16)	8 (50)	8 (50)	
Homemaker (n = 299)	140 (47)	159 (53)	
Student (n = 17)	9 (53)	8 (47)	

(Continued)

**Table 2.** (Continued)

Demographic/environmental characteristics (n = 1152)	Respondents (n = 525)	Non-respondents (n = 627)	p-value #
Unemployed (n = 23)	6 (26)	17 (74)	
Others (n = 9)	3 (33)	6 (67)	
Not answered (n = 25)	11 (44)	14 (56)	
Accommodation type			
1–2 HDB flat (n = 52)	18 (35)	34 (65)	0.6792*
2–3 HDB flat (n = 238)	113 (47)	125 (53)	
4–5 HDB flat (n = 692)	314 (45)	378 (55)	
Condominium (n = 65)	32 (49)	33 (51)	
Executive (n = 55)	26 (47)	29 (53)	
Landed (n = 24)	13 (54)	11 (46)	
Others (n = 11)	5 (45)	6 (55)	
Not answered (n = 15)	4 (27)	11 (73)	
Mother's personal income			
0–999 (n = 366)	167 (46)	199 (54)	0.0005*
1000–1999 (n = 311)	113 (36)	198 (64)	
2000–3999 (n = 308)	156 (51)	152 (49)	
4000–5999 (n = 74)	43 (58)	31 (42)	
>6000 (n = 37)	23 (62)	14 (38)	
Not answered (n = 56)	23 (41)	33 (59)	
Household income			
0–999 (n = 29)	9 (31)	20 (69)	0.0014*
1000–1999 (n = 148)	62 (42)	86 (58)	
2000–3999 (n = 338)	136 (40)	202 (60)	
4000–5999 (n = 271)	125 (46)	146 (54)	
>6000 (n = 290)	160 (55)	130 (45)	
Not answered (n = 76)	33 (43)	43 (57)	

#p-value estimated by Fisher's exact test.

\*Monte Carlo estimation of exact p-values.

Figure 1 shows the correlation between the HLES and CCLO scores. As shown, a low HLES had a high predictive probability of a low CCLO.

Table 4 summarizes the univariate and multivariable logistic regression analyses performed to identify predictors of the outcome CCLO = 0 versus CCLO > 0. From stepwise multiple logistic regression analysis, HLES ( $p < 0.0001$ ), caregiver language ( $p < 0.0001$ ), and maternal education ( $p < 0.0091$ ) were found to be significant predictors of CCLO = 0. Using polytomous multiple logistic regression to analyze the ternary CCLO outcome (0, 1–3, 4–6), the predicted probability of a 12-month old child being in any of the CCLO categories as a function of the HLES category, caregiver main language and mother's highest education level is given in Figure 2.

Tables 5 and 6 give comparisons of the CCLO categories 0, 1–3, and 4–6 for results based on the non-imputed data. Comparisons among categorical variables for which missing values were imputed are given in Table 7, which can be compared with those of Table 5 to assess the effect of imputation.

## Discussion

We found that a literacy rich home environment highly correlates with the 12-month child-centered literacy orientation.

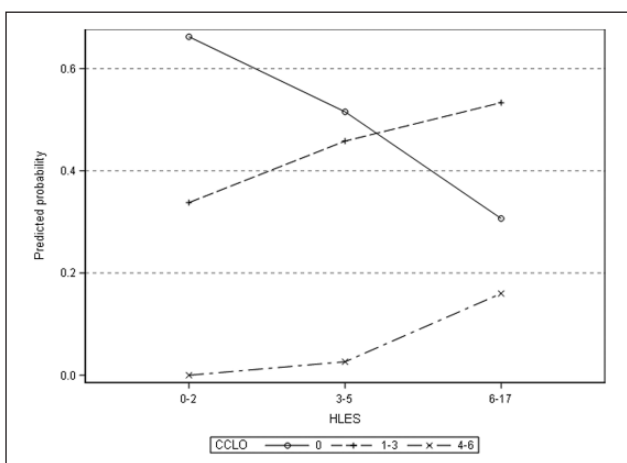
### Home literacy environment

In 30% of the families, the HLES was in the lowest (0–2) group. Even though 77% of parents reported having a library card, only 30% of the homes used it more frequently than once per month. The 2015 national literary reading and writing survey by the National Arts Council, Singapore found that only 44% of Singaporeans read one or more literary books in the year prior; 77% purchased books from a physical bookstore and that they purchased an average of seven books.<sup>45</sup> Although there was no data on borrowing library books in this study, it is possible that Singaporeans prefer to buy, rather than borrow books for their own reading. Mee and Gan,<sup>46</sup> in their study exploring home literacy practices in Singapore, also found that 80% of parents were members of a library and the majority of the children were read to by the mother, as were 40% of children in our study using materials borrowed from public libraries. The variation in library use between our study and that of Mee and Gan could be due to differences in demographics. The majority of respondents in Mee and Gan's study were young English speaking parents with an average income of between S\$2000–S\$4000 a month and majority (96%) were literate in English, 48% in Chinese, 9% in Tamil, with 45% literate in Malay.

The preference for borrowed children's materials may be a reason why most families (62%) own few children's books (<10) or it could be because parents may consider buying toys rather than books for their infant. In our study, 44% of

**Table 3.** Home literacy environment characteristics.

Variable	N (%)	Variable	N (%)
Have a library card? (N = 519)		Mother's own reading frequency (N = 522)	
No	110 (21.0)	Weekly or less	193 (36.8)
Yes	409 (77.9)	Several times a week	173 (33.0)
		Daily	156 (29.7)
Use of library card frequency (N = 342)		Father's own reading frequency (N = 514)	
Less than 1 per month	121 (23.0)	Weekly or less	282 (53.7)
Monthly	69 (13.1)	Several times a week	110 (21.0)
2–3 times per month	76 (14.5)	Daily	122 (23.2)
Weekly	76 (14.5)	Caregiver's own reading frequency (N = 383)	
Subscription to newspapers and magazines (N = 518)		Weekly or less	205 (39.0)
No	292 (55.6)	Several times a week	98 (18.7)
Yes	226 (43.0)	Daily	80 (15.2)
How many newspapers? (N = 202)		Who reads to the child (N = 420)	
0	18 (3.4)	No one	18 (3.4)
1	117 (22.3)	Mother	211 (40.2)
2	61 (11.6)	Father	9 (1.7)
3	5 (1.0)	Domestic helper	17 (3.2)
10	1 (0.2)	Grandparents	15 (2.9)
How many child magazines (N = 183)		Other family members	15 (2.9)
0	131 (25.0)	Childcare teacher	9 (1.7)
1	41 (7.8)	Combined	126 (24.0)
2	7 (1.3)		
3	3 (0.6)	Number of books at home (N = 486)	
5	1 (0.2)	Less than 10	326 (62.1)
How many non-child magazines (N = 172)		10–30	92 (17.5)
0	109 (20.8)	More than 30	68 (13.0)
1	40 (7.6)		
2	15 (2.9)		
3	4 (0.8)		
4	2 (0.4)		
5+	2 (0.4)		



**Figure 1.** Predicted probability of a 12-month old child belonging to a particular CCLO category for a given HLES category.

the parents subscribed to newspapers and magazines, whereas only 12% of parents in Mee and Gan's study were book club and magazine subscribers.

### CCLO

Almost half (48.8%) the households in this study had a CCLO score of 0 of whom two-thirds had the lowest HLE score of 0–2. This shows that children from poor HLEs are less likely to have early literacy experiences. About half the parents in this study reported reading to the child at least daily or several times weekly, while a third read to their child at bedtime.

Early onset of shared reading is found to be a good predictor of later language and literacy development, school readiness and fosters a love of reading.<sup>12,47,48</sup> In their meta-analysis of the relationship between book reading to preschoolers and emergent literacy, Bus et al. found that children who were read to at home have more advanced emergent literacy skills (effect size 0.59),<sup>1</sup> and the frequency and age of onset of reading had an impact.<sup>1,12,49</sup> Shared book reading creates an interactional context that promotes the child's reading interest and learning.<sup>9,13,50</sup> It allows the mother/caregiver to ask open-ended questions, clarify abstract language, and focus on print concepts.<sup>24</sup> Shared reading between infants and their mothers involves a greater emphasis on use of paralinguistic

**Table 4.** Summary of logistic regression analyses to identify predictors of Childhood Centered Literacy Orientation (CCLO) score = 0.

Variable	Univariate			Final model <sup>1</sup>		
	Unadjusted odds ratio (95% CI)	p-value	Omnibus p-value <sup>2</sup>	Adjusted odds ratio (95% CI)	p-value	Omnibus p-value
Child Gender						
Female vs Male	1.21 (0.86, 1.70)	0.2790				
Adult To Child Ratio						
At least 1:1 vs Less than 1:1	0.83 (0.49, 1.40)	0.4828				
Mother's age	1.00 (0.97, 1.03)	0.9882				
Mother's education			<b>&lt;0.0001</b>			<b>0.0091</b>
Primary vs university	8.51 (2.55, 28.37)	<b>0.0005</b>		6.05 (1.63, 22.50)	<b>0.0072</b>	
Secondary vs university	1.93 (1.34, 2.78)	<b>0.0004</b>		1.56 (1.02, 2.38)	<b>0.0395</b>	
Mother ethnic groups			<b>0.0231</b>			
Chinese vs Malay	1.38 (0.91, 2.09)	0.1318				
Indian vs Malay	0.70 (0.38, 1.26)	0.2314				
Mother's marital status						
No vs Yes	1.50 (0.53, 4.25)	0.4496				
Mother's employment status						
Not working vs working	0.84 (0.50, 1.39)	0.4918				
Mother's occupation*			<b>0.0311</b>			
Cat 1–2 vs Cat 9	0.58 (0.37, 0.90)	<b>0.0164</b>				
Cat 10–13 vs Cat 9	1.30 (0.48, 3.53)	0.6083				
Cat 3–8 vs Cat 9	0.98 (0.64, 1.52)	0.9373				
Accommodation type*			0.3308			
Cat 1–2,7 vs Cat 6	1.98 (0.62, 6.34)	0.2497				
Cat 3–4 vs Cat 6	1.42 (0.46, 4.40)	0.5451				
Cat 5 vs Cat 6	1.33 (0.34, 5.16)	0.6778				
Household income			<b>0.0200</b>			
0–1999 vs >6000	2.16 (1.25, 3.73)	<b>0.0061</b>				
2000–3999 vs >6000	1.75 (1.12, 2.73)	<b>0.0147</b>				
4000–5999 vs >6000	1.48 (0.94, 2.34)	0.0916				
Main caregiver			0.5523			
Parent vs unrelated	1.04 (0.66, 1.64)	0.8507				
Relative vs unrelated	1.28 (0.76, 2.16)	0.3477				
Caregiver main language			<b>&lt;0.0001</b>			<b>&lt;0.0001</b>
Mandarin vs English	4.24 (2.72, 6.61)	<b>&lt;0.0001</b>		3.96 (2.49, 6.29)	<b>&lt;0.0001</b>	
Malay vs English	2.16 (1.30, 3.60)	<b>0.0031</b>		1.52 (0.88, 2.65)	0.1367	
Tamil vs English	1.21 (0.54, 2.71)	0.6379		1.27 (0.55, 2.93)	0.5727	
HLES category			<b>&lt;0.0001</b>			<b>&lt;0.0001</b>
0–2 vs 6–17	4.38 (2.70, 7.13)	<b>&lt;0.0001</b>		3.33 (1.96, 5.67)	<b>&lt;0.0001</b>	
3–5 vs 6–17	2.39 (1.55, 3.69)	<b>&lt;0.0001</b>		2.13 (1.34, 3.38)	<b>0.0014</b>	

<sup>1</sup>Obtained using stepwise multiple logistic regression with  $p = 0.20/0.25$  to enter/stay.

<sup>2</sup>p-value for global hypothesis on variables with >2 levels.

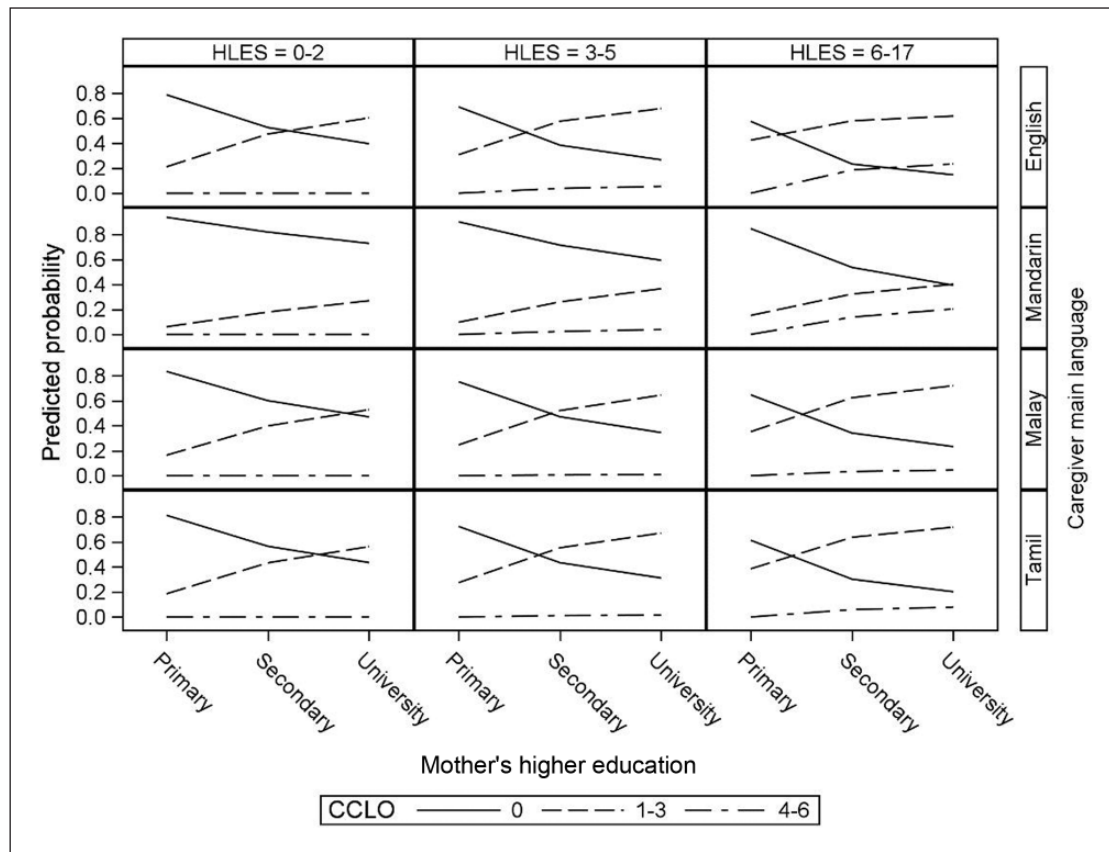
\*Mother's occupation/ occupation category: Legislators, Senior Officials – 1, Professional – 2, Associated Professionals and Technicians – 3, Clerical worker – 4, Service worker – 5, Agricultural worker – 6, Craftsman – 7, Plant and machine operators – 8, Homemaker – 9, Retired – 10, Student – 11, Unemployed – 12, Others – 13; Accommodation type/accommodation category: 1–2 HDB flat – 1, 2–3 HDB flat – 2, 4–5 HDB flat – 3, Condominium – 4, Executive – 5, Landed property – 6, Others – 7.

communication strategies as most infants at that age are likely to be in the pre-linguistic stage. Makin examined the linguistic and paralinguistic features of the interactions between 10 mother–infant dyads during book reading.<sup>13</sup> Strategies used by parents were child directed speech and exaggerations facial expression, volume, and an acute responsiveness to babies' interest in a book.<sup>13</sup> Parents who focus on interaction patterns encouraging active child participation, as much as on the process of reading, foster better language and literacy skills.<sup>13,26</sup>

While 30% of parents in Mee and Gan's study read aloud to their children daily, two thirds engaged in direct instruction

to help the child learn to read as they prioritized school achievement rather than reading for leisure.<sup>46</sup> Hence, a low CCLO score in our study could be because parents are not aware of the benefits of exposing their child to literacy related activities at an early age, and may not be concerned about literacy-related issues until the child starts formal preschool. Majid and Tan's study of reading habits of primary school children in Singapore also concurred with that view.<sup>51</sup> Parental work patterns may also limit the time to get involved in reading activities with their children and a high-quality nursery system may compensate for the time constraint.<sup>46</sup> As the





**Figure 2.** Association of HLES category, caregiver main language and mother's highest education level with predicted probability of a 12-month old child being in CLO categories 0, 1–3, 4–6 based on a polytomous multiple logistic regression model.

caregiver’s main language was non-English in among 61% of respondents in our study, this subgroup of bilingual or non-English speaking parents might not have utilized the availability of non-English books in public libraries and book stores.

High et al.,<sup>44</sup> in their study on child-centered literacy orientation found that 39% of low income families had a low early childhood literacy orientation which was a similar finding in 38% of our families with a monthly income less than S\$2000. They found that parents who were married or living together, English-speaking households, parents who themselves read books at least a few times weekly, and homes with more than 10 children’s books were significantly associated with the presence of CLO. Our study yielded similar findings to those in High et al.’s study, with regard to the influence of caregiver language, mother’s education, and HLE.

Our study went further than the study by High et al, by using a cumulative score that would determine the degree of early childhood literacy orientation, rather than the presence or lack of it. As shown in Figure 1, examining the association of a cumulative CLO score with HLES helped to identify probability of a child being in the CLO category of 0. Tracking CLO scores from infancy will help us examine the relationship between early CLO and later language and literacy outcomes.

Joint literacy activities other than shared book reading are known to correlate with later reading success.<sup>52</sup> In our study, we differentiated families based on the presence or absence of any joint literacy-related activity at 12 months, and did not differentiate based on the type of activity. Wood investigated

the type of joint parent-child literacy activities and its correlation with differences in literacy scores and found that the families that engaged in variety of joint literacy activities had higher scores on vocabulary and reading ability as compared to those who sang nursery rhymes or songs or did not participate in any literacy related activity.<sup>52</sup> We are keen to find out, if the nature of the joint-literacy activities other than book reading has an effect on the child’s literacy orientation in our cohort at 18 months. This will enable early years’ educators to give the right advice to caregivers on the range of literacy activities at routine health contacts, as part of literacy promotion.

#### Association of HLE with CLO

We found that a literacy-rich home environment had a strong association with early childhood literacy orientation ( $p < 0.001$ ) with a high predicted probability of CLO being 0 when HLES was the lowest (0–2) at 12 months of age. Schmitt et al. examined the effect of HLE on language comprehension in 50 infants after controlling for socioeconomic status and found that HLE supported receptive and expressive vocabulary in the second and third year of life.<sup>3</sup> Research has shown the benefits of book distribution programs on language and literacy. In an interventional study on providing developmentally-appropriate books and educational materials to parents of children between 12 and 38 months, High et al. found that the intervention was effective in promoting child-centered literacy activities (OR 4.7).<sup>53</sup> A similar

**Table 5.** Comparison of demographic and home literacy environment characteristics among CCLO score categories, *n* (%).

Demographic/home literacy environment characteristics ( <i>n</i> = 515)	CCLO 0 ( <i>n</i> = 256)	CCLO 1–3 ( <i>n</i> = 230)	CCLO 4–6 ( <i>n</i> = 29)	<i>p</i> -value #
Child gender				
Male ( <i>n</i> = 269)	128 (48)	124 (46)	17 (6)	0.5466
Female ( <i>n</i> = 246)	128 (52)	106 (43)	12 (5)	
Adult to child ratio				
At least 1:1 ( <i>n</i> = 453)	224 (49)	204 (45)	25 (6)	0.8350
Less than 1:1 ( <i>n</i> = 62)	32 (52)	26 (42)	4 (6)	
Mother's education				
Primary ( <i>n</i> = 20)	17 (85)	3 (15)	0 (0)	<0.0001
Secondary ( <i>n</i> = 298)	163 (55)	124 (42)	11 (4)	
University ( <i>n</i> = 193)	74 (38)	102 (53)	17 (9)	
Not answered ( <i>n</i> = 4)	2 (50)	1 (25)	1 (25)	
Mother's age when leaving full time education				
≤16 years ( <i>n</i> = 66)	44 (67)	21 (32)	1 (2)	0.0092
>16 years ( <i>n</i> = 435)	205 (47)	204 (47)	26 (6)	
Not answered ( <i>n</i> = 14)	7 (50)	5 (36)	2 (14)	
Parental ethnic group				
Chinese ( <i>n</i> = 324)	176 (54)	126 (39)	22 (7)	0.0092
Malay ( <i>n</i> = 120)	54 (45)	62 (52)	4 (3)	
Indian ( <i>n</i> = 71)	26 (37)	42 (59)	3 (4)	
Mother residence				
Local mother ( <i>n</i> = 325)	146 (45)	161 (50)	18 (6)	0.0132
Foreign mother ( <i>n</i> = 186)	108 (58)	68 (37)	10 (5)	
Not answered ( <i>n</i> = 4)	2 (50)	1 (25)	1 (25)	
Mother's birth country				
China ( <i>n</i> = 76)	52 (68)	21 (28)	3 (4)	0.0364*
India ( <i>n</i> = 27)	12 (44)	14 (52)	1 (4)	
Malaysia ( <i>n</i> = 69)	37 (54)	28 (41)	4 (6)	
Not answered ( <i>n</i> = 10)	3 (30)	5 (50)	2 (20)	
Others ( <i>n</i> = 22)	13 (59)	8 (36)	1 (5)	
Singapore ( <i>n</i> = 311)	139 (45)	154 (50)	18 (6)	
Parental marital status				
Married living with husband ( <i>n</i> = 490)	244 (50)	219 (45)	27 (6)	0.7836
Married not living with husband ( <i>n</i> = 1)	1 (100)	0 (0)	0 (0)	
Not answered ( <i>n</i> = 10)	3 (30)	5 (50)	2 (20)	
Single living with baby's father ( <i>n</i> = 9)	4 (44)	5 (56)	0 (0)	
Single not living with baby's father ( <i>n</i> = 5)	4 (80)	1 (20)	0 (0)	
Mother's employment status				
Working full time ( <i>n</i> = 125)	71 (57)	50 (40)	4 (3)	0.5264
Working part time ( <i>n</i> = 18)	8 (44)	9 (50)	1 (6)	
Homemaker ( <i>n</i> = 95)	49 (52)	41 (43)	5 (5)	
Others ( <i>n</i> = 2)	0 (0)	2 (100)	0 (0)	
Not answered ( <i>n</i> = 275)	128 (47)	128 (47)	19 (7)	
Mother's occupation				
Legislators and senior official ( <i>n</i> = 17)	6 (35)	10 (59)	1 (6)	0.4211*
Professional ( <i>n</i> = 151)	62 (41)	78 (52)	11 (7)	
Associated professional/techs ( <i>n</i> = 60)	31 (52)	28 (47)	1 (2)	
Clerical worker ( <i>n</i> = 63)	35 (56)	24 (38)	4 (6)	
Service worker ( <i>n</i> = 53)	29 (55)	21 (40)	3 (6)	
Plant or machine operator ( <i>n</i> = 8)	6 (75)	2 (25)	0 (0)	
Homemaker ( <i>n</i> = 135)	74 (55)	55 (41)	6 (4)	
Student ( <i>n</i> = 8)	4 (50)	3 (38)	1 (13)	
Unemployed ( <i>n</i> = 6)	3 (50)	3 (50)	0 (0)	
Others ( <i>n</i> = 3)	3 (100)	0 (0)	0 (0)	
Not answered ( <i>n</i> = 11)	3 (27)	6 (55)	2 (18)	
Accommodation type				
1–2 HDB flat ( <i>n</i> = 17)	13 (76)	4 (24)	0 (0)	0.0073*
2–3 HDB flat ( <i>n</i> = 110)	63 (57)	45 (41)	2 (2)	
4–5 HDB flat ( <i>n</i> = 308)	150 (49)	140 (45)	18 (6)	
Condominium ( <i>n</i> = 32)	11 (34)	15 (47)	6 (19)	

**Table 5.** (Continued)

Demographic/home literacy environment characteristics (n = 515)	CCL0 0 (n = 256)	CCL0 1–3 (n = 230)	CCL0 4–6 (n = 29)	p-value #
Executive (n = 26)	12 (46)	13 (50)	1 (4)	
Landed (n = 13)	5 (38)	8 (62)	0 (0)	
Others (n = 5)	0 (0)	4 (80)	1 (20)	
Not answered (n = 4)	2 (50)	1 (25)	1 (25)	
Mother's personal income				0.0037*
0–999 (n = 161)	89 (55)	67 (42)	5 (3)	
1000–1999 (n = 112)	63 (56)	44 (39)	5 (4)	
2000–3999 (n = 155)	72 (46)	73 (47)	10 (6)	
4000–5999 (n = 43)	11 (26)	30 (70)	2 (5)	
>6000 (n = 23)	10 (43)	9 (39)	4 (17)	
Not answered (n = 21)	11 (52)	7 (33)	3 (14)	
Household income				0.0385*
0–999 (n = 9)	5 (56)	4 (44)	0 (0)	
1000–1999 (n = 60)	38 (63)	21 (35)	1 (2)	
2000–3999 (n = 131)	70 (53)	56 (43)	5 (4)	
4000–5999 (n = 123)	61 (50)	52 (42)	10 (8)	
>6000 (n = 160)	61 (38)	87 (54)	12 (8)	
Not answered (n = 32)	21 (66)	10 (31)	1 (3)	
Main caregiver				0.4116*
Mother (n = 263)	125 (48)	119 (45)	19 (7)	
Father (n = 6)	5 (83)	1 (17)	0 (0)	
Grandparent (n = 120)	64 (53)	51 (43)	5 (4)	
Relative (n = 4)	4 (100)	0 (0)	0 (0)	
Unrelated person (n = 16)	8 (50)	7 (44)	1 (6)	
Childcare family (n = 17)	5 (29)	11 (65)	1 (6)	
Others (n = 61)	30 (49)	29 (48)	2 (3)	
Not answered (n = 28)	15 (54)	12 (43)	1 (4)	
Caregiver main language				<0.0001*
English (n = 151)	47 (31)	89 (59)	15 (10)	
Mandarin (n = 174)	118 (68)	47 (27)	9 (5)	
Malay (n = 92)	47 (51)	44 (48)	1 (1)	
Tamil (n = 29)	10 (34)	18 (62)	1 (3)	
Others (n = 33)	18 (55)	14 (42)	1 (3)	
Not answered (n = 36)	16 (44)	18 (50)	2 (6)	
Have a library card?				0.0012
No (n = 107)	70 (65)	34 (32)	3 (3)	
Yes (n = 404)	185 (46)	193 (48)	26 (6)	
Not answered (n = 4)	1 (25)	3 (75)	0 (0)	
Use of lib card frequency				0.0073*
Less than 1 per month (n = 121)	62 (51)	51 (42)	8 (7)	
Monthly (n = 69)	26 (38)	40 (58)	3 (4)	
2–3 times per month (n = 76)	27 (36)	47 (62)	2 (3)	
Weekly (n = 75)	34 (45)	30 (40)	11 (15)	
Not answered (n = 174)	107 (61)	62 (36)	5 (3)	
Subscription to newspapers and magazines				0.3793
No (n = 287)	139 (48)	135 (47)	13 (5)	
Yes (n = 223)	114 (51)	94 (42)	15 (7)	
Not answered (n = 5)	3 (60)	1 (20)	1 (20)	
How many newspapers?				0.9791
0 (n = 18)	10 (56)	8 (44)	0 (0)	
1 (n = 117)	60 (51)	50 (43)	7 (6)	
2 (n = 61)	30 (49)	27 (44)	4 (7)	
3 (n = 5)	2 (40)	3 (60)	0 (0)	
10 (n = 1)	1 (100)	0 (0)	0 (0)	
Not answered (n = 313)	153 (49)	142 (45)	18 (6)	
How many children's magazines				0.3225
0 (n = 131)	65 (50)	61 (47)	5 (4)	
1 (n = 41)	20 (49)	18 (44)	3 (7)	

(Continued)

**Table 5.** (Continued)

Demographic/home literacy environment characteristics (n = 515)	CCL0 0 (n = 256)	CCL0 1–3 (n = 230)	CCL0 4–6 (n = 29)	p-value #
2 (n = 7)	3 (43)	2 (29)	2 (29)	
3 (n = 3)	2 (67)	1 (33)	0 (0)	
5 (n = 1)	1 (100)	0 (0)	0 (0)	
Not answered (n = 332)	165 (50)	148 (45)	19 (6)	
How many non-child magazines				
0 (n = 109)	58 (53)	46 (42)	5 (5)	0.4641
1 (n = 40)	19 (48)	17 (43)	4 (10)	
2 (n = 15)	8 (53)	7 (47)	0 (0)	
3 (n = 4)	0 (0)	4 (100)	0 (0)	
4 (n = 2)	1 (50)	1 (50)	0 (0)	
5 (n = 1)	0 (0)	1 (100)	0 (0)	
10 (n = 1)	1 (100)	0 (0)	0 (0)	
Not answered (n = 343)	169 (49)	154 (45)	20 (6)	
Mother's own reading frequency				
Weekly less (n = 193)	131 (68)	61 (32)	1 (1)	<0.0001
Several times (n = 169)	70 (41)	94 (56)	5 (3)	
Daily (n = 151)	53 (35)	75 (50)	23 (15)	
Not answered (n = 2)	2 (100)	0 (0)	0 (0)	
Father's own reading frequency				
Weekly less (n = 278)	142 (51)	127 (46)	9 (3)	0.0713
Several times (n = 108)	47 (44)	52 (48)	9 (8)	
Daily (n = 119)	58 (49)	50 (42)	11 (9)	
Not answered (n = 10)	9 (90)	1 (10)	0 (0)	
Caregiver's own reading frequency				
Weekly less (n = 201)	116 (58)	81 (40)	4 (2)	0.0300
Several times (n = 95)	45 (47)	45 (47)	5 (5)	
Daily (n = 80)	32 (40)	43 (54)	5 (6)	
Not answered (n = 139)	63 (45)	61 (44)	15 (11)	
Who reads to child				
No one (n = 18)	15 (83)	3 (17)	0 (0)	0.1514*
Mother (n = 211)	94 (45)	103 (49)	14 (7)	
Father (n = 9)	3 (33)	5 (56)	1 (11)	
Domestic helper (n = 17)	7 (41)	9 (53)	1 (6)	
Grandparents (n = 15)	8 (53)	7 (47)	0 (0)	
Other family members (n = 15)	9 (60)	6 (40)	0 (0)	
Childcare teacher (n = 9)	2 (22)	6 (67)	1 (11)	
Combined (n = 126)	49 (39)	66 (52)	11 (9)	
Not answered (n = 95)	69 (73)	25 (26)	1 (1)	
HLES category				
HLES 0–2 (n = 153)	105 (69)	48 (31)	0 (0)	<0.0001
HLES 3–5 (n = 221)	111 (50)	104 (47)	6 (3)	
HLES 6–17 (n = 141)	40 (28)	78 (55)	23 (16)	

Note: Counts in 'Not answered' category were excluded from significance tests.

<sup>a</sup>Main caregiver – the person whom the child spends majority of the day with.

<sup>#</sup>Fisher's exact test p-value.

\*Monte Carlo estimate of Fisher's exact test p-value.

**Table 6.** Univariate analysis of continuous variables.

Demographic characteristics (n = 515)	CCL0 0 (n = 256)	CCL0 1–3 (n = 230)	CCL0 4–6 (n = 29)	p-value #
Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)	
Mother's age (years), 31 (27–35)	31 (27–34)	30 (27–34)	34 (29–38)	0.0439
Number of adults in home, 2 (2–4)	2 (2–4)	3 (2–4)	2 (2–3)	0.3964
Number of children in home, 2 (1–2)	2 (1–3)	2 (1–2)	1 (1–2)	0.5421

<sup>#</sup>Kruskal–Wallis p-value.

**Table 7.**† Comparison of demographic and home literacy environment characteristics among CCLO score categories, *n* (%).

Demographic/environment characteristics ( <i>n</i> = 525)	CCLO 0 ( <i>n</i> = 261)	CCLO 1–3 ( <i>n</i> = 234)	CCLO 4–6 ( <i>n</i> = 30)	<i>p</i> -value #
Mother's education				
Primary ( <i>n</i> = 21)	18 (86)	3 (14)	0 (0)	<0.0001
Secondary ( <i>n</i> = 308)	168 (55)	129 (42)	11 (4)	
University ( <i>n</i> = 196)	75 (38)	102 (52)	19 (10)	
Mother's age when leaving full time education				
≤ 16 years ( <i>n</i> = 70)	46 (66)	22 (31)	2 (3)	0.0158
> 16 years ( <i>n</i> = 455)	215 (47)	212 (47)	28 (6)	
Mother's residence				
Local mother ( <i>n</i> = 331)	150 (45)	163 (49)	18 (5)	0.0175
Foreign mother ( <i>n</i> = 194)	111 (57)	71 (37)	12 (6)	
Mother's occupation				
Legislator or senior official ( <i>n</i> = 17)	6 (35)	10 (59)	1 (6)	0.5119*
Professional ( <i>n</i> = 158)	65 (41)	80 (51)	13 (8)	
Technician or associated professional ( <i>n</i> = 61)	31 (51)	28 (46)	2 (3)	
Clerical worker ( <i>n</i> = 64)	36 (56)	24 (38)	4 (6)	
Service worker ( <i>n</i> = 55)	28 (51)	24 (44)	3 (5)	
Plant or machine operator ( <i>n</i> = 8)	6 (75)	2 (25)	0 (0)	
Homemaker ( <i>n</i> = 144)	78 (54)	60 (42)	6 (4)	
Student ( <i>n</i> = 9)	5 (56)	3 (33)	1 (11)	
Unemployed ( <i>n</i> = 6)	3 (50)	3 (50)	0 (0)	
Others ( <i>n</i> = 3)	3 (100)	0 (0)	0 (0)	
Accommodation type				
1–2 HDB flat ( <i>n</i> = 18)	14 (78)	4 (22)	0 (0)	0.0123*
2–3 HDB flat ( <i>n</i> = 114)	63 (55)	48 (42)	3 (3)	
4–5 HDB flat ( <i>n</i> = 317)	156 (49)	142 (45)	19 (6)	
Condominium ( <i>n</i> = 32)	11 (34)	15 (47)	6 (19)	
Executive ( <i>n</i> = 26)	12 (46)	13 (50)	1 (4)	
Landed ( <i>n</i> = 13)	5 (38)	8 (62)	0 (0)	
Others ( <i>n</i> = 5)	0 (0)	4 (80)	1 (20)	
Mother's personal income				
0–999 ( <i>n</i> = 174)	96 (55)	72 (41)	6 (3)	0.0113*
1000–1999 ( <i>n</i> = 118)	65 (55)	48 (41)	5 (4)	
2000–3999 ( <i>n</i> = 163)	77 (47)	75 (46)	11 (7)	
4000–5999 ( <i>n</i> = 45)	12 (27)	29 (64)	4 (9)	
>6000 ( <i>n</i> = 25)	11 (44)	10 (40)	4 (16)	
Household income				
0–999 ( <i>n</i> = 11)	6 (55)	5 (45)	0 (0)	0.1212*
1000–1999 ( <i>n</i> = 66)	40 (61)	24 (36)	2 (3)	
2000–3999 ( <i>n</i> = 145)	79 (54)	61 (42)	5 (3)	
4000–5999 ( <i>n</i> = 133)	67 (50)	56 (42)	10 (8)	
>6000 ( <i>n</i> = 170)	69 (41)	88 (52)	13 (8)	
Main caregiver				
Mother ( <i>n</i> = 286)	137 (48)	129 (45)	20 (7)	0.5390*
Father ( <i>n</i> = 6)	5 (83)	1 (17)	0 (0)	
Grandparent ( <i>n</i> = 128)	67 (52)	55 (43)	6 (5)	
Relative ( <i>n</i> = 4)	4 (100)	0 (0)	0 (0)	
Unrelated person ( <i>n</i> = 17)	9 (53)	7 (41)	1 (6)	
Childcare family ( <i>n</i> = 18)	6 (33)	11 (61)	1 (6)	
Others ( <i>n</i> = 66)	33 (50)	31 (47)	2 (3)	
Caregiver's main language				
English ( <i>n</i> = 165)	52 (32)	97 (59)	16 (10)	<0.0001*
Mandarin ( <i>n</i> = 193)	128 (66)	54 (28)	11 (6)	
Malay ( <i>n</i> = 100)	50 (50)	49 (49)	1 (1)	
Tamil ( <i>n</i> = 31)	11 (35)	19 (61)	1 (3)	
Others ( <i>n</i> = 36)	20 (56)	15 (42)	1 (3)	
Have a library card?				
No ( <i>n</i> = 111)	70 (63)	38 (34)	3 (3)	0.0054
Yes ( <i>n</i> = 414)	191 (46)	196 (47)	27 (7)	

(Continued)

**Table 7.** (Continued)

Demographic/environment characteristics (n = 525)	CCL0 (n = 261)	CCL0 1–3 (n = 234)	CCL0 4–6 (n = 30)	p-value #
Subscription to newspapers and magazines				
No (n = 296)	144 (49)	139 (47)	13 (4)	0.2188
Yes (n = 229)	117 (51)	95 (41)	17 (7)	
Mother's own reading frequency				
Weekly less (n = 194)	130 (67)	63 (32)	1 (1)	<0.0001
Several times (n = 174)	74 (43)	95 (55)	5 (3)	
Daily (n = 157)	57 (36)	76 (48)	24 (15)	
Father's own reading frequency				
Weekly less (n = 288)	149 (52)	130 (45)	9 (3)	0.0387
Several times (n = 112)	49 (44)	54 (48)	9 (8)	
Daily (n = 125)	63 (50)	50 (40)	12 (10)	
Mother's birth country				
China (n = 83)	55 (66)	24 (29)	4 (5)	0.0459*
India (n = 29)	12 (41)	16 (55)	1 (3)	
Malaysia (n = 70)	36 (51)	29 (41)	5 (7)	
Others (n = 23)	14 (61)	8 (35)	1 (4)	
Singapore (n = 320)	144 (45)	157 (49)	19 (6)	
Mother's marital status				
Married living with husband (n = 510)	252 (49)	228 (45)	30 (6)	0.7665
Married not living with husband (n = 1)	1 (100)	0 (0)	0 (0)	
Single living with baby's father (n = 9)	4 (44)	5 (56)	0 (0)	
Single not living with baby's father (n = 5)	4 (80)	1 (20)	0 (0)	

†Table 7 gives comparisons among CCL0 groups on variables for which missing values were imputed. These results can be compared with the non-imputed results in Table 5 to assess the effect of imputation.

#Fisher's exact test p-value.

\*Monte Carlo estimate of Fisher's exact test p-value.

intervention by the same authors involving 205 low income families with 5–11 month old children at baseline, found a 40% increase in CCL0 in the intervention group with higher receptive and expressive vocabulary scores in older intervention toddlers.<sup>54</sup> This shows that a CCL0 of a child in a family with less access to social and financial capital can be increased after a simple intervention of distributing children's books, thereby promoting literacy environment. Evaluations of the Reach Out and Read program in the US found that children scored higher in receptive and expressive language with mothers listing book reading as their favorite activity and reported reading frequently.<sup>55</sup> Owens and Strong studied the role of student nurses in educating pregnant mothers on the benefits of emergent literacy and described the benefits of enrolling mothers in book distribution programs soon after birth.<sup>11</sup> Simple interventions such as this to promote early literacy have shown links to greater health literacy as adults and to greater health equities.<sup>56</sup> Book distribution programs in the UK such as Book Start and Kirklees' "Babies into Books" have demonstrated the value of early book sharing and the need to educate and support caregivers in book reading activities with babies as young as 4 months.<sup>57</sup>

### Predictor variables for low CCL0

This study identified predictor variables associated with low CCL0 that would enable us to identify a high-risk group for low early childhood literacy orientation. In the multivariate

analysis, we found that caregiver language, HLES, and mother's education significantly influences the CCL0 score. The effect of caregiver language, maternal education on the predicted probability of getting a low or high CCL0 was consistent across HLES categories.

Karrass et al.,<sup>58</sup> in their study examining parental contextual factors and infant characteristics that predicted whether parents read aloud to their 8-month old infants, found family income and parenting stress as significant predictors. Dixon found home factors including caregiver language and mother tongue vocabulary predicted English vocabulary in bilingual kindergarteners when controlling for family income and mother's years of education in the multilingual context of Singapore.<sup>37</sup> While the univariate analysis in our study suggests that mother's age when leaving full-time education, parental ethnicity, mother's birth residence, parental accommodation type, parental personal income, household income and mother's reading habits were associated with a low CCL0, the multivariate analysis showed that the independent predictive value of these variables were rendered non-significant. Children from families where the caregiver's language was not English (especially Mandarin), were from homes with poor HLEs, and had mothers who had only completed primary school were more likely to belong to a high-risk CCL0 (CCL0 = 0) group. Identifying such a group will enable pediatricians and early years' professionals to focus their efforts on promoting the benefits of literacy-related activities at an early age and emphasize to caregivers that literacy promoting

activities could take place through any language. It will enable public health officials to target specific literacy interventions such as the provision of developmentally appropriate books. This has been studied by High et al.,<sup>54</sup> who found the effects of intervention stronger when parents have less education. We are unable to explain the reason for low CCLO in Mandarin speaking families and could be because of the lack of awareness that exposure to literacy activities could also happen in Mandarin.

Researchers have studied the variability in effect of HLE on language and literacy skills as a function of SES. Whilst some have shown the benefit of higher SES and more books at home on higher vocabulary and reading achievement,<sup>50,55,56,59,60,61</sup> others have shown null effects on vocabulary in first three years of life,<sup>3,16,17</sup> suggesting that the consequences of lower SES may accumulate with time. In our study, household income (which was used as a proxy for socio-economic status) did not have a predictive effect on CCLO score and could be explained by the variation in the type of joint literacy activities undertaken by families across the income group. In addition, families in Singapore with higher household income tend to have foreign domestic workers as main caregivers for majority of the day. Singapore, driven by the national policy to encourage reading in children has an excellent network of libraries, making it accessible for families to borrow, rather than buy books.

### Strengths and limitations

To our knowledge, this is one of the few studies exploring association of HLE with early childhood literacy orientation at 12 months of age in Singapore.

There was a difference in the distribution of ethnic groups between families who were recruited, and those who continued in the study and is a limitation. However, we believe that the association between HLES and CCLO does remain substantially the same. This study was also limited by the recruitment of families who attended public hospitals; therefore findings from this study cannot be generalized. Many children in Singapore are exposed to literacy activities through electronic media and this study did not examine the effect of electronic media exposure on early literacy orientation.

### Conclusion

A literacy-rich home environment has a significant association with child-centered literacy orientation at 12 months. We identified the caregiver's spoken language, HLES, and mother's education as the variables that affect the 12-month child-centered literacy orientation. This information has implications for practice, as pediatricians and early years' professionals may be able to enhance early literacy outcomes by identifying families at risk of low early childhood literacy orientation. In households where families are non-English speaking, the mothers only completed primary education, and where the HLE is poor, there is a higher risk of low child-centered literacy orientation. Further studies are needed to see how early childhood literacy orientation translates to better literacy outcomes at later ages in Singapore.

### Acknowledgements

The GUSTO study group includes Allan Sheppard, Amutha Chinnadurai, Anne Eng Neo Goh, Anne Rifkin-Graboi, Anqi Qiu, Arijit Biswas, Bee Wah Lee, Birit F.P. Broekman, Boon Long Quah, Borys Shuter, Chai Kiat Chng, Cheryl Ngo, Choon Looi Bong, Christiani Jeyakumar Henry, Cornelia Yin Ing Chee, Yam Thiam Daniel Goh, Doris Fok, Fabian Yap, George Seow Heong Yeo, Helen Chen, Hugo P S van Bever, Iliana Magiati, Inez Bik Yun Wong, Ivy Yee-Man Lau, Jeevesh Kapur, Jenny L. Richmond, Jerry Kok Yen Chan, Joanna D. Holbrook, Joshua J. Gooley, Keith M. Godfrey, Kenneth Kwek, Kok Hian Tan, Krishnamoorthy Niduvaje, Leher Singh, Lin Su, Lourdes Mary Daniel, Lynette Pei-Chi Shek, Marielle V. Fortier, Mark Hanson, Mary Foong-Fong Chong, Mary Rauff, Mei Chien Chua, Michael Meaney, Mya Thway Tint, Neerja Karnani, Ngee Lek, Oon Hoe Teoh, P. C. Wong, Peter D. Gluckman, Pratibha Agarwal, Rob M. van Dam, Salome A. Rebello, Seang-Mei Saw, Shang Chee Chong, Shirong Cai, Shu-E Soh, Sok Bee Lim, Chin-Ying Stephen Hsu, Victor Samuel Rajadurai, Walter Stunkel, Wee Meng Han, Wei Pang, Yap-Seng Chong, Yin Bun Cheung, Yiong Huak Chan, and Yung Seng Lee. The authors thank Sheryl Quek for a critical review of the manuscript.

### Declaration of conflicting interest

The authors declare that there are no conflicts of interest.

### Funding

This work was supported by the Singapore National Research Foundation under its Translational and Clinical Research (TCR) Flagship Programme and administered by the Singapore Ministry of Health's National Medical Research Council (NMRC), Singapore (grant numbers NMRC/TCR/004-NUS/2008 and NMRC/TCR/012-NUHS/2014). Additional funding is provided by the Singapore Institute for Clinical Sciences, Agency for Science Technology and Research (A\*STAR), Singapore.

### References

1. Bus AG, van Ijzendoorn MH and Pellegrini AD. Joint book reading makes for success in learning to read. A meta-analysis on intergenerational transmission of literacy. *Rev Educ Res* 1995; 65: 1–21.
2. Payne AC, Whitehurst GJ and Angell AL. The role of home literacy environment in the development of language ability in preschool children from low-income families. *Early Child Res Q* 1994; 9: 427–440.
3. Schmitt S, Simpson A and Friend M. A longitudinal assessment of the home literacy environment and early language. *Inf Child Dev* 2011; 20: 409–431.
4. Elizabeth AG and Frederick JM. The unique contributions of home literacy environment to difference in early literacy skills. *Early Child Dev Care* 1997; 127: 233–243.
5. Council on Early Childhood, High PC and Klass P. Literacy promotion: an essential component of primary care pediatric practice. *Pediatrics* 2014; 134: 404–409.
6. Whitehurst GJ, Falco FL, Lonigan CJ, et al. Accelerating language development through picture book reading. *Dev Psychol* 1988; 24: 552–559.
7. Park H. Home literacy environments and children's reading performance: a comparative study of 25 countries. *Educ Res Eval* 2008; 14: 489–505.
8. Kaderavek J and Pakulski L. Mother-child story book interactions: literacy orientation of pre-schoolers with hearing impairment. *J Early Child Literacy* 2007; 7: 49–72.

9. Tomopoulos S, Dreyer BP, Tanis-Lemonda C, et al. Books, toys, parent-child interaction, and development in young Latino children. *Ambul Pediatr* 2006; 6: 72–78.
10. Raikes H, Pan BA, Luze G, et al. Mother-child book reading in low-income families: correlates and outcomes during the first three years of life. *Child Dev* 2006; 77: 924–953.
11. Owens L and Strong G. Emerging literacy: why start at birth? *Int J Childbirth Educ* 2015; 30: 34.
12. Dickinson D, Griffith J and Golinkoff J. How reading books fosters language development around the world. *Child Dev Res* 2012; 2012: 602807.
13. Makin L. Literacy 8–12 months: what are babies learning? *Early Years* 2006; 26: 267–277.
14. Harlaar N, Hayiou-Thomas M, Dale P, et al. Why do preschool language abilities correlate with later reading? A twin study. *J Speech Lang Hear Res* 2008; 51: 688–705.
15. Snow CE, Barnes WS, Chandler J, et al. *Unfulfilled expectations: home and school influences on literacy*. Cambridge, MA: Harvard University Press, 1991.
16. Westerlund M and Lagerberg D. Expressive vocabulary in 18 month old children in relation to demographic factors, mother and child characteristics, communication style and shared reading. *Child Care Health Dev* 2008; 34: 257–266.
17. Pan B, Rowe M and Tamis-le Monda C. Measuring productive vocabulary of toddlers in low income families: concurrent and predictive validity of three sources of data. *J Child Lang* 2004; 31: 587–608.
18. Fahey C and Forman J. The journey toward literacy begins in infancy: the reach out and read innovation. *Child Educ* 2012; 88: 217–220.
19. Duff F, Reen G, Plunkett K, et al. Do infant vocabulary skills predict school age language and literacy outcomes? *J Child Psychol Psychiatry* 2015; 56: 848–856.
20. Lee J. Size matters: early vocabulary as a predictor of language and literacy competence. *Appl Psycholinguist* 2011; 32: 69–92.
21. National Institute of Child Health and Human Development. *Teaching children to read: an evidence-based assessment of the scientific literature on reading and its implications for reading instruction*. NIH Publication No. 00–4769. Bethesda, MD: Government Printing Office, 2000.
22. Whitehurst G and Lonigan C. Child development and emergent literacy. *Child Dev* 1998; 69: 848–872.
23. Edwards C. Maternal literacy practices and toddlers' emergent literacy skills. *J Early Child Literacy* 2014; 14: 53–79.
24. Roberts H, Jurgens J and Burchinal M. The role of home literacy practices in preschool children's language and emergent literacy skills. *J Speech Lang Hear Res* 2005; 48: 345–359.
25. Nord W, Lennon J and Liu B. *Home literacy activities and signs of children's emerging literacy, 1993 and 1999. Statistics in brief*. Washington, DC: US Department of Education, 2000.
26. Hargrave A and Sénéchal M. A book reading intervention with preschool children who have limited vocabularies: the benefits of regular reading and dialogic reading. *Early Child Res Q* 2000; 15: 75–90.
27. Van Hulle CA, Goldsmith HH and Lemery KS. Genetic, environmental, and gender effects on individual differences in toddler expressive language. *J Speech Lang Hear Res* 2004; 47: 904–912.
28. Sénéchal M, LeFevre J, Thomas E, et al. Differential effects of home literacy experiences on the development of oral and written language. *Read Res* 1998; 33: 96–116.
29. Coleman JS. Social capital in the creation of human capital. *Am J Sociol* 1988; 94: S95–S120.
30. Aaron PG, Joshi RM, Gooden R, et al. Diagnosis and treatment of reading disabilities based on the component model of reading. *J Learn Disabil* 2008; 41: 67–84.
31. Bradley RH and Corwyn RF. Socioeconomic status and development. *Annu Rev Psychol* 2002; 53: 371–399.
32. Brooks-Gunn J, Duncan GJ and Britto PR. Are socioeconomic gradients for children similar to those for adults? Achievement and health of children in the United States. In: Keating DP and Hertzman C (eds) *Developmental health and wealth of nations: social, biological, and educational dynamics*. New York: Guilford Press, 1999, pp.94–124.
33. Bennett KK, Weigel DJ and Martin SS. Children's acquisition of early literacy skills: examining family contributions. *Early Child Res Q* 2002; 17: 295–317.
34. Sonnesheie S, Brody G and Munsterman K. The influence of family beliefs and practices on children's early reading development. In: Baker L, Afflerbach P and Reinking D (eds) *Developing engaged readers in school and home communities*. Mahwah, NJ: Lawrence Erlbaum, 1996, pp.3–20.
35. Chua SK. Singapore's language policy and its globalized concept of bi (tri) lingualism. *Curr Issues Lang Plan* 2011; 11: 413–429.
36. Yeo LS, Ong WW and Ng CM. The home literacy environment and preschool children's reading skills and interest. *Early Educ Dev* 2014; 25: 791–814.
37. Dixon LQ. The role of home and school factors in predicting English vocabulary among bilingual kindergarten children in Singapore. *Appl Psycholinguist* 2011; 32: 141–168.
38. Li L, Zhang D, Chin CF, et al. Home literacy environment and English reading related skills among Malay children in Singapore. In: 5th redesigning pedagogy international conference, Singapore, 3–5 June 2013.
39. DeBaryshe BD. Joint picture book reading correlates of early oral language skill. *J Child Lang* 1993; 20: 455–461.
40. Rodriguez ET and Tamis-LeMonda CS. Trajectories of the home learning environment across the first 5 years: associations with children's vocabulary and literacy skills at prekindergarten. *Child Dev* 2011; 82: 1058–1075.
41. Rodriguez ET, Tamis-LeMonda CS, Spellmann ME, et al. The formative role of home literacy experiences across the first three years of life in children from low-income families. *J Appl Dev Psychol* 2009; 30: 677–694.
42. Goin R, Nordquist V and Twardosz S. Parental accounts of home-based literacy processes: contexts for infants and toddlers with developmental delays. *Early Educ Dev* 2004; 15: 187–214.
43. Soh SE, Tint MT, Gluckman PD, et al. Cohort profile: Growing Up in Singapore Towards healthy Outcomes (GUSTO) birth cohort study. *Int J Epidemiol* 2014; 43: 1401–1409.
44. High P, Hopmann M, LaGasse L, et al. Child centered literacy orientation: a form of social capital? *Pediatrics* 1999; 103: e55.
45. National Arts Council Singapore. National literary and writing survey 2015, [www.nac.gov.sg/whatwedo/support/research/National-Literary-Reading-and-Writing-Survey.html](http://www.nac.gov.sg/whatwedo/support/research/National-Literary-Reading-and-Writing-Survey.html) (2016, accessed 31 May 2016).
46. Mee CH and Gan L. Reading practices in Singapore. *Early Child Dev Care* 1998; 144: 13–20.
47. Nelson B, Dudovitz and Tumaini R. Predictors of school readiness in children without developmental delay at age 2. *Pediatrics* 2016; 138: 1–12.
48. Baker L, Mackler K, Sonnenschein S, et al. Parents' interactions with their first-grade children during storybook reading and relations with subsequent home reading activity and reading achievement. *J School Psychol* 2001; 39: 415–438.
49. Scarborough HS and Dobrich W. On the efficacy of reading to preschoolers. *Dev Rev* 1994; 14: 245–302.
50. Baker L, Scher D and Mackler K. Home and family influences on motivations for reading. *Educ Psychol* 1997; 32: 69–82.
51. Majid S and Tan V. Understanding the reading habits of children in Singapore. *J Educ Media Lib Sci* 2007; 45: 187–198.



52. Wood C. Parent-child preschool activities can affect the development of literacy skills. *J Res Read* 2002; 25: 241–258.
  53. High P, LaGasse L and Becker S. Literacy promotion in primary care pediatrics: can we make a difference? *Pediatrics* 2000; 105: 927–934.
  54. High P, Hopmann P, Lagasse L, et al. Evaluation of a clinic-based program to promote book sharing and bedtime routines among low-income urban families with young children. *Arch Paediatr Adolesc Med* 1998; 152: 459–465.
  55. Klass P, Dreezer BP and Mendelson AL. Reach out and read: literacy promotion in pediatric primary care. *Adv Pediatr* 2009; 56: 11–27.
  56. US Department of Health and Human Services. NIH health disparities strategic plan and budget, fiscal years 2009–2013, [www.nimhd.nih.gov/docs/2009-2013nih\\_health\\_disparities\\_strategic\\_plan\\_and\\_budget.pdf](http://www.nimhd.nih.gov/docs/2009-2013nih_health_disparities_strategic_plan_and_budget.pdf) (2012, accessed 31 May 2016).
  57. Hardma M and Jones L. Sharing books with babies: evaluation of an early literacy intervention. *Educ Rev* 1999; 51: 221–229.
  58. Karrass J, VanDeventer M and Braungart-Rieker J. Predicting shared parent-child book reading in infancy. *J Fam Psychol* 2003; 17: 134–146.
  59. Chiu M and McBride-Chang C. Gender, context and reading: a comparison of students in 43 countries. *Sci Stud Read* 2006; 10: 331–362.
  60. Hoff E. The specificity of environmental influence: socioeconomic status affects early vocabulary development via maternal speech. *Child Dev* 2003; 74: 1368–1378.
  61. Steensel RV. Relations between socio-cultural factors, the home literacy environment and children's literacy development in the first years of primary education. *J Res Read* 2006; 29: 367–382.
1. Does anyone at home have a library card? No = 0, If yes, = 0 = used < once /month, 1 = >once/month
  2. Does your family subscribe to newspapers/magazines? No = 0; If yes, 2 = 2 or more newspapers, 1 = 1 newspaper, and 0 = none
  3. How many adult magazines does the family subscribe to? 2 = >2 magazines, 1 = 1–2 magazines, and 0 = no adult magazines
  4. How many child magazines does the family subscribe to? 2 = more than 1 children's magazine, 1 = 1 child magazine, 0 = no children's magazines
  5. How often does mother read to herself? 2 = daily, 1 = several times a week, 0 = weekly or less
  6. How often does the father read to himself? 2 = daily, 1 = several times a week, 0 = weekly or less

(Note for items 5 and 6: If parents not caregivers, how often does the caregiver read to self? 2 = daily, 1 = several times a week, 0 = weekly or less  
If parents not caregivers then, sum total score for item 5 and 6 would be = caregiver reading score + either mother's or father's score whichever is higher)

7. How often is your child read to? 2 = daily, 1 = several times a week, 0 = weekly or less  
If no one reading to child in 12-month combined data) = 0
8. Approximately, how many books does your child own? 2 = more than 30 books, 1 = 10–30 books, 0 = <10 books
9. How many hours per week does your child watch TV? 2 = >26 hours/week, 1 = 15–26 hours /week, 0 = 14 and less hours per week

## Appendix A

### Home literacy environment score (HLES)

The HLES is a composite variable created by adding the point values of 9 questions – total score = 17: