

Health practices, behaviours and quality of life of low-income preschoolers: A community-based cross-sectional comparison study in Singapore

Shang Chee Chong^{1,2} MRCPCH, Ramkumar Aishworiya^{1,2} MRCPCH, Woon Li Seo^{1,2} MRCPCH, Yee Keow Chiong^{1,2} MRCPCH, Gerald Choon-Huat Koh^{3,4,5} MBBS, Jeremy Bingyuan Lin^{1,2} MRCPCH, Lynn Heng¹ MSc (Early Childhood Development and Education), Tahhirah Habib Mohd¹ BA (Psychology), Young Ern Saw¹ BA (Psychology), Yiong Huak Chan⁶ PhD, Jing Shi Chua⁷ BSS (Mathematics), Shefaly Shorey⁷ PhD

ABSTRACT

Introduction: Children from low-income (LI) families often suffer from poor health, with sub-optimal health practices. This cross-sectional study examined the differences in health habits and health-related quality of life (HRQoL) of LI preschool children compared to non-low-income preschool peers (PPG).

Method: Using data from the social-health Circle of Care-Health Development Screening Programme (CoC-HDSP) in Singapore, 118 LI children and 304 PPG children aged 18 months to 6 years old and their families were recruited from 13 government-funded preschools. Health practices examined included screen time habits, sleep, nutrition, dental health and the children's HRQoL using PedsQL 4.0 Generic Core Scales.

Results: Majority of the children were aged 4–6 years in kindergarten 1 and 2. There were more Malay children in the LI than the PPG (61.9% versus [vs] 29.3%, $P<0.001$). Low-income children were more likely to have lower-educated parents ($P<0.001$). The completed vaccination rate in the LI group was lower than those in PPG (84.7% vs 98.0%, $P<0.001$). More in the LI group utilised emergency services for acute illnesses ($P<0.05$). Fewer LI children had ever visited a dentist (47.4% vs 75.4%, $P<0.001$), and more LI children consumed sweetened drinks daily (33.3% vs 8.6%, $P<0.001$). The LI group reported poorer-quality sleep (48.3% vs 27.2%, $P<0.001$), though both groups exceeded the daily recommended screen viewing duration. The LI group scored higher in the social (mean 92.4 ± 12.2 vs 84.3 ± 15.3 , $P<0.001$) and emotional (mean 85.2 ± 15.1 vs 76.6 ± 17.3 , $P<0.001$) domains of the PedsQL 4.0 when compared to PPG.

Conclusion: Low-income children have poorer health practices, receive less preventive paediatric care,

and utilise more emergency services for acute illnesses. These findings are important for developing interventions that work towards improving the health of LI children.

Ann Acad Med Singap 2024;53:142-51

Keywords: health practices, low-income, paediatrics, public health, quality of life

CLINICAL IMPACT

What is New

- Children from low-income families have lower sleep quality, poorer dental health habits and less healthy diets than their peers.
- Low-income children received less preventive paediatric care and utilised more emergency than primary care services for acute illnesses.

Clinical Implications

- This study confirmed the need for attention on health needs of low-income children in Singapore.
- A deeper understanding about health practices and knowledge-practice gaps of parents of low-income children can facilitate future research directions and meaningful interventions.

The Annals is an open access journal, allowing non-commercial use under CC BY-NC-SA 4.0.

¹ Khoo Teck Puat-National University Children's Medical Institute, National University Health System, Singapore

² Department of Paediatrics, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

³ Saw Swee Hock School of Public Health, National University of Singapore, Singapore

⁴ Department of Medicine, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

⁵ Department of Medicine, National University Hospital, National University Health System, Singapore

⁶ Biostatistics Unit, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

⁷ Alice Lee Centre for Nursing Studies, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

Correspondence: Dr Shefaly Shorey, Alice Lee Centre for Nursing Studies, Yong Loo Lin School of Medicine, National University of Singapore, Level 2, Clinical Research Centre, Block MD11, 10 Medical Drive, Singapore 117597.

Email: nurssh@nus.edu.sg

INTRODUCTION

Poverty is a serious concern that has been found to bring about various adverse psychological, social and developmental outcomes.¹ Living in poverty as a child can affect an individual's life well into adulthood² due to risks including poor nutrition, poorly controlled chronic ailments and unstable environments.^{3,4} Overall, these children are often worse off than their counterparts with higher family income—in terms of health, academic achievements and psychological well-being.^{2,5-7}

Singapore has recently stepped-up efforts to give children living in poverty equal opportunities as other children by implementing early childhood interventions, which aim to promote child health and development, facilitate parent-child bonding and improve family functioning.⁸ Like in other countries, these aim to reduce health disparities. However, health services and health policies will first need a deeper understanding of priority health issues in these children, before specific recommendations can be made for such intersectoral programmes.^{9,10}

The present study is part of a larger study involving a preventive health programme called the Circle of Care-Health and Development Screening Programme (CoC-HDSP). The CoC was developed by a team of social workers from Care Corner, a social service agency in Singapore, to bring social work and parenting supports to families of low-income (LI) preschoolers. Healthcare professionals from the National University Hospital Child Development Unit and Paediatrics Department enhanced CoC to introduce health screening and education through the Health and Development Screening Programme (HDSP), with case coordination among a multidisciplinary team. This study sought to do a cross-sectional review of the baseline health habits of LI children and parental perception of their quality of life, when compared to the preschool peer group (PPG) from non-LI families.

METHOD

The health habits of low-income (LI) children in Singapore under the health intervention group (CoC-HDSP) were compared to a control group of preschool children from non-LI families at baseline.

Participants

Children receiving CoC-HDSP must be: (1) aged 18 months to 6 years; (2) attending government-funded preschools in Singapore; and (3) have a household income below SGD3000 or per capita income below SGD750. Children with complex or life-threatening medical care issues requiring

frequent hospitalisations were excluded from HDSP, as their baseline health characteristics and quality of life would differ from the general paediatric population. We did not exclude children who had common but chronic medical conditions that may require outpatient visits (e.g. eczema and asthma) as these are not uncommon within the paediatric population. Children who were PPG must be: (1) from households with higher household income and per capita income than the CoC-HDSP group; and (2) of similar age-range within same school classes as their LI peers.

Procedure

Data collection took place from November 2018 to November 2019. Thirteen preschools under the CoC programme were identified. In each preschool, there was an average of 1 to 3 classes across nursery and kindergarten levels, with 15 to 20 children per class. There are 1 to 2 classes per school at each level dedicated to the CoC programme. Children in CoC programme were invited to participate in the HDSP arm of the study. Data on health practices was taken at baseline for the LI children who opted to be in the CoC-HDSP, and these children were already receiving social and parenting supports under CoC. Non-LI children who were part of these classes were also invited to participate in the study, forming the PPG. Instead of additional health-screening services, they received basic vision screening and height and weight assessments under the national health screening exercise. Parents were asked to complete a health survey that included providing the health information of their children.

Outcome measures

To assess the health practices of the children, the following instruments were administered:

The health assessment questionnaire (HAQ).

The HAQ was developed by clinicians and the research team, and involved questions adapted from validated sleep, health habits and parenting habits questionnaires from previous studies.¹¹⁻¹³ This 57-item instrument assessed various outcomes like screen time exposure, sleep, nutrition, dental health, parenting concerns, parental high-risk behaviours (e.g. smoking) and the presence of any medical concerns or known medical conditions of the child. Information regarding the child's vaccination records and other health records in the past year were also captured.

Paediatric Quality of Life Inventory Version 4.0 (PedsQL 4.0). To measure health-related quality of life (HRQoL), the PedsQL 4.0 was used. The parent-rated proxy versions, including the

23-item parent report for young children aged 5–7 and the 21-item parent report for toddlers aged 2–4, were used. The PedsQL 4.0 has 4 generic score scales: physical functioning (8 items), emotional functioning (5 items), school functioning (5 items) and social functioning (5 items). Each item was based on a 5-point Likert scale, and scale scores were calculated by dividing the sum of item scores by the number of items. Higher scores on the PedsQL indicate better HRQoL. The PedsQL 4.0 has been reported to have high internal consistency of 0.90 for the parental proxy version.¹⁴

Data analysis

Data were analysed using the IBM Statistical Package for the Social Sciences (SPSS) software version 26 (IBM Corp, Armonk, NY, US).¹⁶ Linear regression and logistic regression, adjusting for sex, race and age range, were performed to assess the differences in numerical and binary outcomes, respectively, between the children in the intervention group and controls.

Ethical consideration

Ethics approval was obtained from the National Healthcare Group Domain Specific Review Board (2018/00629) before the commencement of this study. Written consent before the data was obtained and confidentiality was ensured. Voluntary participation was reinforced.

RESULTS

A total of 118 participants from the LI intervention group and 304 participants from the PPG were included in the analyses (see Table 1). Majority of the children were aged 4–6 years old in kindergarten 1 and 2 classes. There was a higher proportion of Malay children in LI group (61.9% versus [vs] 29.3%, $P<0.001$), and twice as many Chinese students in the PPG (54.9% vs 25.4%, $P<0.001$) (Table 1). No significant sex or age difference was observed.

In the LI group, there were more single-parent or divorced families, and parents who worked part-time or who were unemployed. Parents in the LI group, either fathers or mothers, tended to have lower levels of education and were more likely to be smokers ($P<0.001$).

General health

Despite more children (Table 3) from LI families than PPG having pre-existing conditions (e.g. asthma, eczema) ($P=0.005$), half of them had no follow-up for these conditions. A lower proportion of LI children had up-to-date vaccinations (84.7% vs 98%, $P<0.001$). Fewer of the LI visited primary care for acute medical conditions like fever and vomiting (19.5% vs 52.0%, $P<0.001$), but instead utilised emergency settings for such needs (22.9% vs 13.2%, $P<0.05$).

Table 1. Participant characteristics (low-income intervention group and preschool peer group).

Characteristics		Low-income intervention group (LI) (n=118)		Non-low-income preschool peer group (PPG) (n=304)		P value
		n	%	n	%	
Sex	Male	55	46.6	158	52.0	0.323
	Female	63	53.4	146	48.0	
Ethnicity	Chinese	30	25.4	167	54.9	<0.001
	Malay	73	61.9	89	29.3	
	Indian	7	5.9	24	7.9	
	Others	8	6.8	22	7.2	
	Unstated	0	0.0	2	0.7	
Age range (years)	<2	3	2.5	7	2.3	0.402
	2–3	16	13.6	41	13.5	
	3–4	29	24.6	69	22.7	
	4–5	36	30.5	77	25.3	
	5–6	25	21.2	95	31.3	
	>6	9	7.6	15	4.9	

Table 2. Family demographics and characteristics.

Characteristics		Low-income intervention group (LI) (n=118)		Non-low-income preschool peer group (PPG) (n=304)		P value
		n	%	n	%	
Marital status	Single	11	9.3	4	1.3	<0.001
	Married	90	76.3	292	96.0	
	Widowed	2	1.7	2	0.7	
	Divorced/separated	15	12.7	6	2.0	
Main caregiver	Mother	99	83.9	130	42.8	<0.001
	Father	11	9.3	18	5.9	
	Helper	0	0.0	5	1.6	
	Grandparents	2	1.7	25	8.2	
	Both parents	1	0.8	92	30.3	
	Others (e.g. aunts)	3	2.6	0	0.0	
	Unstated	2	1.7	34	11.2	
Employment status of caregiver	Full-time	59	50.0	206	67.8	<0.001
	Part-time	25	21.2	29	9.5	
	Not employed	34	28.8	62	20.4	
	Unstated	0	0.0	7	2.3	
Number of smokers	0	39	33.1	201	66.1	<0.001
	1	52	44.1	84	27.6	
	2 or more	25	21.2	18	5.9	
	Unstated	2	1.7	7	2.3	
Education level (mother)	Primary school or below	21	17.8	12	3.9	<0.001
	Completed secondary school	41	34.7	41	13.5	
	Completed ITE/NTE	21	17.8	27	8.9	
	Polytechnic diploma/A-level	19	16.1	55	18.1	
	Completed university	4	3.4	93	30.6	
	Postgraduate degree	0	0.0	53	17.4	
	Others	8	6.8	18	5.9	
	Unstated	4	3.4	5	1.6	
Education level (father)	Primary school or below	13	11.0	9	3.0	<0.001
	Completed secondary school	37	31.4	46	15.1	
	Completed ITE/NTE	29	24.6	51	16.8	
	Polytechnic diploma/A-level	9	7.6	68	22.4	
	Completed University	4	3.4	82	27.0	
	Postgraduate degree	0	0.0	37	12.2	
	Others	1	0.8	7	2.3	
	Unstated	25	21.2	4	1.3	

Responses under the “others” option for education level includes diplomas or degrees from other countries.

Table 3. Children's general health.

Characteristics		Low-income intervention group (LI) (n=118)		Non-low-income preschool peer group (PPG) (n=304)		P value
		n	%	n	%	
Pre-existing medical condition (common paediatric conditions, e.g. asthma, eczema)	Yes	26	22.0	33	10.9	0.005
	No	92	78.0	270	88.8	
	Parent is unsure	0	0.0	1	0.3	
Follow-up with doctor for above medical condition	Once a month or more frequent	4	15.4	1	3.0	<0.001
	Once every 3–5 months	5	19.2	6	18.2	
	Once every 6–12 months	3	11.5	14	42.4	
	Only when necessary	1	3.8	10	30.3	
	No follow-up	13	50.0	2	6.1	
Vaccinations status	Up-to-date	100	84.7	289	95.1	<0.001
	Incomplete	16	13.6	6	2.0	
	Parent is unsure	2	1.7	9	3.0	
Type of medical attendances in the past 1 year for acute illnesses (at least once in the past year)	Polyclinic	23	19.5	158	52.0	<0.001
	Children emergency	27	22.9	40	13.2	<0.05
	Hospitalisation	13	11.0	20	6.6	0.16

Only 18 participants from the LI group and 23 from the PPG indicated that their child requires follow-up for the medical condition, while remaining participants indicated that no follow-up was required.

Health awareness and practices

Dental hygiene and practices. The majority of parents from both groups recognised the importance of dental hygiene (i.e. 100% from LI and 88.8% from PPG “agreed or strongly agreed” that dental hygiene was important). Although no significant differences were found in the frequency of teeth brushing between both groups of children (61.0% LI vs 63.2% of PPG children brushed at least twice a day, $P=0.683$), parents from the PPG than the LI group were more aware of the appropriate amount of toothpaste to use (87.5% vs 40.7%, adjusted odds ratio AOR 13.6, 95% confidence interval [CI] 7.6–24.4, $P<0.001$). Significantly more children in the PPG than LI group had ever visited a dentist for check-up (75.4% vs 47.4%, AOR 3.1, 95% CI 1.9–5.2, $P<0.001$). Overall, more children in the LI group were reported to have cavities (22.0% vs 11.5%, AOR 2.1, 95% CI 1.2–3.9, $P=0.016$).

Sleep quantity. Overall, children from both groups fell short of the National Sleep

Foundation's recommended guidelines of 10–13 hours of sleep daily for preschoolers at night (Table 4), though making up for the total sleep duration recommendations with daytime naps. Children in the LI group slept significantly longer than their counterparts in the PPG at night during weekdays ($P=0.047$) and also took longer naps than children in the PPG during weekdays ($P=0.007$), and marginally shorter naps during weekends ($P=0.092$).

Sleep quality. Significantly more parents in LI than PPG expressed concerns regarding their children's sleep quality (48.3% vs 27.2%, AOR 3.9, 95% CI 2.3–6.6, $P<0.001$). The top 3 sleep problems reported by LI parents were: (1) the child needs an accompanying adult or pacifier/milk bottle to fall asleep or when the child wakes up at night (33.1%); (2) teeth grinding (13.6%); and (3) snoring (12.7%). Comparatively, sleep problems reported by the PPG parents were about sleep resistance (19.8%); and sleep latency (17.0%).

Table 4. Amount of sleep (in minutes) in low-income and preschool peer groups.

Characteristics	Low-income group (n= 118)		Non-low-income preschool peer group (n= 304)		P value ^a
	Mean (mins)	SD	Mean (mins)	SD	
Daytime sleep (weekday)	111.4	83.8	92.0	59.6	0.007
Night-time sleep (weekday)	557.4	70.0	532.3	86.3	0.047
Daytime sleep (weekend)	88.7	76.2	95.1	71.0	0.092
Night-time sleep (weekend)	573.8	98.7	557.1	97.0	0.226

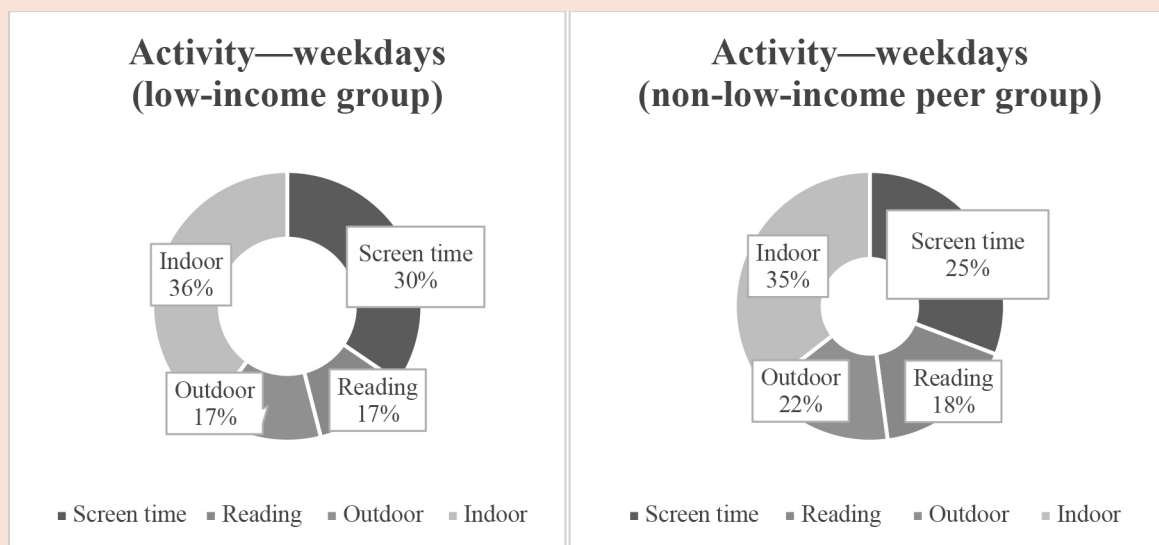
^a Adjusting for sex, ethnicity and age range

Nutrition. Significantly more parents in the LI group than in the PPG “agreed or strongly agreed” that they knew about what makes a balanced meal for their child (89.7% vs 80.1%, AOR 2.0, 95% CI 1.0–4.0, $P=0.050$) and felt they could provide a balanced meal for their child (90.6% vs 76.9%, AOR 2.5, 95% CI 1.3–5.2, $P=0.008$). However, LI families reported a higher daily consumption of sweetened drinks (33.3% vs 8.6%, AOR 4.9, 95% CI 2.7–8.9, $P<0.001$) and confectionary (41.9% vs 25.7%, AOR 1.9, 95% CI 1.2–3.1, $P=0.007$) by the children. They also consumed more processed food (12.9% vs 4.3%, AOR 2.2, 95% CI 0.98–5.1, $P=0.057$) weekly. Parents from the LI group reported more fussy eating in their children (54.2% vs 34.9%, AOR 2.0, 95% CI 1.3–3.2, $P=0.003$).

Proportion of time spent on activities. Figure 1 presents the proportion of time the children spent on various activities. During weekdays, children from the LI group spent significantly less time on outdoor physical activities (adjusted $p=0.004$) than those in the PPG. They also reported higher screen time (mean 144.1 minutes [mins]±SD 89.4mins) than the PPG (mean 124.1mins±SD 122.4mins). However, differences in screentime between both groups were not significant on both weekdays ($P=0.315$), and weekends ($P=0.209$). The proportion of supervised screen time also did not differ between both groups on weekdays ($P=0.946$) and weekends ($P=0.455$).

Health-related QoL. Interestingly, the LI group scored higher in the social (mean 92.4 ± 12.2 vs 84.3 ± 15.3 , $P<0.001$) and emotional (mean

Fig. 1. Time spent on various activities.



Indoor activities included other activities like indoor play, art and craft, writing and drawing, but excluded screen time or reading, which were measured separately.

85.2±15.1 vs 76.6±17.3, $P<0.001$) domains of the PedsQL 4.0 when compared to the PPG (Table 5). Less difference was noted for physical and school function.

DISCUSSION

Social determinants are important for child health and outcomes, with health-related behaviours and home and environmental conditions as influencing factors.¹⁵ Within the Singapore context, other studies have supported these social determinants as well—with higher socioeconomic status, healthy diets, higher physical activity, and non-smoking being related to better health.^{16,17} Our study echoes findings from other studies that poorer health practices and knowledge-practice gaps within these families have the potential to negatively impact the overall health of the children.¹⁸⁻²⁰ Compared to non-LI children, more LI children have existing medical issues, with more visits to the emergency departments for acute needs. Like other studies, this indicates that such families usually have no point-of-care other than emergency visits.²¹ Reasons for this may be related to parents waiting on acute conditions until they worsen, lack of access to primary care beyond office hours for parents on shift-work, or simply a lack of education on use of health services.

Childhood vaccinations, recognised globally as important for protection against vaccine-preventable diseases, covers 12 preventable diseases under the National Childhood Immunisation Schedule in Singapore.²² UNICEF reported a high vaccine coverage of 95% to 99% of Singaporean children for the top important preventable childhood diseases.²³ Despite many of these vaccinations being fully subsidised, vaccine coverage for LI children under this schedule is lower than the national and peer-average,

indicative of the disparity and need for action in this area.

Dental caries afflict around 40% of 3- to 6-year-old Singaporean children, and are more common among those from the lower social-economic group.²⁴ Affordability issues for fluoride toothpaste and dental health services, and difficulties accessing preventive dental services (where only selected polyclinics have paediatric services) could have contributed directly to reasons for poor dental health in our study.^{25,26} Existing literature show that oral health literacy has a direct impact on perioral health,²⁷ and attention to oral health literacy and dental care access are important factors to explore further for improving dental health, especially for the socio-economically disadvantaged.²⁸

Our study is consistent with other local studies where both income groups reflect unhealthy screen practices, which exceeded the recommended 1-hour screen-viewing duration set by the American Academy of Paediatrics for children of preschool ages.^{29,30} Lower maternal education has been found to be a risk factor for higher television viewing in infants,³¹ which is negatively associated with subsequent cognitive and language skills.³² Parental knowledge of screen viewing recommendations has been suggested as important in improving children's screen practices, including balancing sedentary screen-viewing with physical activity.³³ Assisting parents with selection of higher-quality educational content may be especially beneficial for language and cognitive development of children,³⁴ even if these parents struggle to supervise their children while on screens.

Overall, our study supports previous studies on sleep in preschool children in Singapore, with

Table 5. PedsQL 4.0 scores based on domain age group.

Domain	Low-income group (LI) (n=118)		Non-low-income group (PPG) (n=304)		P value ^a
	Mean	SD	Mean	SD	
Physical function	91.0	8.92	87.2	18.0	0.102
Emotional function	85.2	15.1	76.6	17.3	<0.001
Social function	92.4	12.2	84.3	15.3	<0.001
School function	76.7	15.1	75.9	17.7	0.907
Total scale score	86.6	9.12	81.0	13.1	0.001

^a Adjusting for sex, ethnicity and age range
Total scale score was computed based on the sum of total scores divided by the number of completed items.

both LI and PPG children still requiring naps and having shortened night-time sleep duration overall.³⁵ On weekdays, LI children had longer night-time sleep than their peers. Possibly, LI parents put their children to bed earlier to manage their household chores, while non-LI parents spend their night hours after work with the children on play or achievement-oriented activities. For parents of PPG children, the main sleep concerns were sleep resistance and sleep latency, which was similar to what was reported by Aishworiya and colleagues.¹¹ In comparison, the LI group reported issues of requiring an adult to co-sleep or a sleep-object as a top challenge—suggesting that the noisy living environments of LI families in smaller flats with poor sleep hygiene likely contributed to these practices. These children required milk bottles and pacifiers to go to bed as well, which is not exemplary of healthy sleeping habits in children aged 4 to 6. We did not capture the bedtime and wake times of the children; this would have been interesting to find out if parents in contracted shift work affect the sleep habits of the children, which can also impact wake time and school-attendance.

Consumption of sweetened beverages, confectionary and processed food by children from LI families was significantly higher than PPG children. The Singapore Longitudinal Early Development Study reported that half the children from food-insecure families were consuming sweetened beverages and sweetened and salted snacks at least thrice a week and instant noodles and fast food over twice weekly.³⁶ Frequent consumption of these food items is associated with increased cardiometabolic risk due to high concentration of refined carbohydrates, fats and sodium.³⁷ However, these processed foods, due to their longer shelf-life, form the bulk of donated food items to LI families.³⁸ Additionally, there were challenges of LI children being fussy-eaters, causing parents to have compounded struggles with managing feeding behaviour problems—which can lead to poorer nutrition. Our study also revealed a knowledge-practice gap among parents, where parental knowledge of preparing healthy and balanced meals for children was unmatched with practices of providing frequent sweetened and processed foods. Underlying reasons to be explored in future studies include the capacity of parents of these children to prepare meals (e.g. single parent, long and uncertain shift work hours) and affordability of fresh ingredients for meal preparation. Certainly, solutions include fresh food donations instead of processed foods, and providing parenting education on cultivating healthy eating habits.

This study provides interesting insights into the perceived quality of life of Singapore preschool children—which is overall very high on the PedsQL 4.0 in both groups. Surprisingly, LI parents rated their children higher on social and emotional functioning than PPG children, which was contrary to some existing literature.^{39,40} The level of support rendered by the social workers in the programme overall might have promoted a sense of social well-being and better emotional coping, as supported by other published research on LI families.⁴¹ This may highlight the potential beneficial impacts of such community interventions.

Strengths and limitations

The present study provided local, albeit regional, evidence of the health status and health practices of children from LI families in the community. It informs on priority health areas of focus, where meaningful interventive and health-promoting strategies can then be explored. It explored and revealed that socioeconomic gradients exist in health practices among young children and families.

There are limitations to this study. There is an inherent recall bias and interpretation variation in survey and questionnaire studies. It is also difficult to tease out the myriad of family and social factors that contribute to HRQoL parent-report measures. The data were limited to a group of children who were undergoing a community intervention, which may not fully represent LI children at a population level. As Singapore is a high-income country, the relative poverty in Singapore appears very differently from the absolute poverty present in other countries. Thus, access to LI families for research has been known to be notoriously difficult, especially when Singapore does not have an official poverty line.⁴² Furthermore, there was a rather large difference in sample sizes between groups, which might have affected the representativeness of the population and the study's statistical power. This was related to the difficulties of recruitment of LI families for research, and data collection was affected by the COVID-19 pandemic. Lastly, the Personal Data Protection Act prevented sharing of sensitive social data (e.g. parental incarceration, child neglect) with the study team for analysis of health outcomes in the highest-risk children.

CONCLUSION

This study allowed an understanding of the health practices among LI children and families, which potentially allows for further research and a deeper understanding of meaningful interventions. LI

families do not perceive their children's HRQoL to be worse, and different supports may impact domains of HRQoL differently. Further improving their health literacy, designing health systems to better promote preventive care, as well as working across social and community agencies to advance health equity and outcomes through holistic partnerships will be important, for existing and future intervention programmes.

Conflicts of interest

None to declare.

Funding

This study was funded by the Singapore Population Health Improvement Center (SPHERiC) seed funding grant number SPHERiC-018.

Acknowledgment

The authors would like to thank the Lien Foundation and Care Corner Singapore Ltd for the Circle of Care programme; as well as all parents, social workers from Care Corner, preschool principals and teachers from the PAP Community Foundation, Ministry of Education (MOE) Kindergartens, and Persatuan Pemudi Islam Singapura (PPIS) preschools for participating in the study.

REFERENCES

1. Chaudry A, Wimer C. Poverty is not just an indicator: the relationship between income, poverty, and child well-being. *Academic pediatrics* 2016;16:S23-9.
2. Lesner RV. The long-term effect of childhood poverty. *Journal of population economics* 2018;31:969-1004.
3. Chong WH, Choo H, Goh EC, et al. Preventive child healthcare in Singapore: A parents' well-being perspective. *Ann Acad Med Singap* 2015;44:550-3.
4. Evans GW, Kutcher R. Loosening the link between childhood poverty and adolescent smoking and obesity: The protective effects of social capital. *Psychological Science* 2011;22:3-7.
5. Bøe T, Sivertsen B, Heiervang E, et al. Socioeconomic status and child mental health: The role of parental emotional well-being and parenting practices. *Journal of abnormal child psychology* 2014;42:705-15.
6. Parker S, Greer S, Zuckerman B. Double jeopardy: the impact of poverty on early child development. *Pediatr Clin North Am* 1988;35:1227-40.
7. los Reyes-Aragon D, Jose C, Amar Amar J, et al. The care and development of children living in contexts of poverty. *Journal of Child and Family Studies* 2016;25:3637-43.
8. Seah YH. Improving Early Childhood Outcomes for Children and Families: Lessons From The KidSTART Journey. In: Ng IYH, Neo YW (Eds.) *Working with low-income families through the life course: Challenges to social services*. Singapore: National University of Singapore; 2024.
9. Black MM, Walker SP, Fernald LCH, et al. Early childhood development coming of age: science through the life course. *Lancet* 2017;389:77-90.
10. Xie H, Nah YH, Yang X, et al. Early childhood intervention: What we know and where we are headed. A review of local and international literature and implications for Singapore. NIE Working Series Paper 18. Singapore: National Institute of Education; 2021.
11. Aishworiya R, Chan P, Kiing J, et al. Sleep behaviour in a sample of preschool children in Singapore. *Ann Acad Med Singap* 2012;41:99.
12. Owens JA, Dalzell V. Use of the 'BEARS' sleep screening tool in a pediatric residents' continuity clinic: a pilot study. *Sleep medicine* 2005;6:63-9.
13. Wu XY, Han LH, Zhang JH, et al. The influence of physical activity, sedentary behavior on health-related quality of life among the general population of children and adolescents: A systematic review. *PloS one* 2017;12:e0187668.
14. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med Care* 2001;39:800-12.
15. Spencer N. The social determinants of child health. *Paediatrics and Child Health* 2018;28:138-43.
16. AshaRani P, Sin KY, Abidin E, et al. The Relationship of Socioeconomic Status to Alcohol, Smoking, and Health: a Population-Level Study of the Multiethnic Population in Singapore. *International Journal of Mental Health and Addiction* 2022;22:1-19.
17. Zhou Y-F, Song X-Y, Pan X-F, et al. Association between combined lifestyle factors and healthy ageing in Chinese adults: the Singapore Chinese Health Study. *The Journals of Gerontology: Series A* 2021;76:1796-805.
18. Garg A, Butz AM, Dworkin PH, et al. Screening for basic social needs at a medical home for low-income children. *Clinical Pediatrics* 2009;48:32-36.
19. Odgers CL, Adler NE. Challenges for low-income children in an era of increasing income inequality. *Child Development Perspectives* 2018;12:128-33.
20. de Buhr E, Tannen A. Parental health literacy and health knowledge, behaviours and outcomes in children: a cross-sectional survey. *BMC Public Health* 2020;20:1096.
21. Perry CD, Kenney GM. Preventive care for children in low-income families: how well do Medicaid and state children's health insurance programs do? *Pediatrics* 2007;120:e1393-401.
22. Ministry of Health. *Childhood Immunisation*. Singapore: Ministry of Health Singapore; 2021.
23. UNICEF. *Immunization coverage survey data*. 2022. Accessed 23 April 2023.
24. Gao XL, Hsu CY, Loh T, et al. Dental caries prevalence and distribution among preschoolers in Singapore. *Community Dent Health* 2009;26:12-7.
25. Gussy MG, Waters E, Riggs E, et al. Parental knowledge, beliefs and behaviours for oral health of toddlers residing in rural Victoria. *Australian dental journal* 2008;53:52-60.
26. Rai NK, Tiwari T. Parental factors influencing the development of early childhood caries in developing nations: a systematic review. *Frontiers in public health* 2018;6:64.
27. Baskaradoss JK. Relationship between oral health literacy and oral health status. *BMC Oral Health* 2018;18:1-6.
28. Winter J, Glaser M, Heinzl-Gutenbrunner M, et al. Association of caries increment in preschool children with nutritional and preventive variables. *Clin Oral Investig* 2015;19:1913-9.
29. Bernard JY, Padmapriya N, Chen B, et al. Predictors of screen viewing time in young Singaporean children: the GUSTO cohort. *International Journal of Behavioral Nutrition and Physical Activity* 2017;14:1-10.

30. Hill D, Ameenuddin N, Reid Chassiakos Y, et al. Media and Young Minds. *Pediatrics* 2016;138:e20162591.
31. Rideout VJ, Hamel E. The media family: Electronic media in the lives of infants, toddlers, preschoolers and their parents. San Francisco: Henry J. Kaiser Family Foundation; 2006.
32. Aishworiya R, Magiati I, Phua D, et al. Are There Bidirectional Influences Between Screen Time Exposure and Social Behavioral Traits in Young Children? *Journal of Developmental & Behavioral Pediatrics* 2022;10:1097.
33. Ebbeck M, Yim HYB, Chan Y, et al. Singaporean parents' views of their young children's access and use of technological devices. *Early Childhood Education Journal* 2016;44:127-34.
34. Wright JC, Huston AC, Murphy KC, et al. The relations of early television viewing to school readiness and vocabulary of children from low-income families: The early window project. *Child Development* 2001;72:1347-66.
35. Mindell JA, Sadeh A, Kwon R, et al. Cross-cultural differences in the sleep of preschool children. *Sleep Medicine* 2013;14:1283-89.
36. Chen X. Nutrition, Family Stress and Preschool Children's Behavior Problems. In: Singapore Longitudinal EARly Development Study (SG LEADS). Singapore: National University of Singapore; 2021.
37. Shin HJ, Cho E, Lee H-J, et al. Instant noodle intake and dietary patterns are associated with distinct cardiometabolic risk factors in Korea. *The Journal of Nutrition* 2014;144:1247-55.
38. Goh CT, Yap C. Pulling together in creative ways, to better feed food insecure Singaporeans. In: Channel News Asia. 2020. Accessed 23 April 2023.
39. Fagan J, Wildfeuer R. Low-Income Parental Risk and Engagement in Early Childhood and Child Social-Emotional Functioning in Middle Childhood. *Journal of Child and Family Studies* 2022;31:70-85.
40. Ren L, Garcia AS, Estraich JM, et al. Parent-child relationships and preschoolers' social-emotional functioning among low-income families: the moderating role of parental nativity. *Infants & Young Children* 2019;32:123-38.
41. Chan KL, Lo CKM, Ho FK, et al. Modifiable Factors for the Trajectory of Health-Related Quality of Life among Youth Growing Up in Poverty: A Prospective Cohort Study. *Int J Environ Res Public Health* 2021;18:9221.
42. Donaldson JA, Loh J, Mudaliar S, et al. Measuring poverty in Singapore: frameworks for consideration. *Social Space* 2013;58-66.