



**2022 ACTIVE HEALTHY KIDS  
SINGAPORE REPORT CARD  
ON PHYSICAL ACTIVITY FOR  
CHILDREN AND  
ADOLESCENTS**

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**SAW SWEE HOCK SCHOOL OF  
PUBLIC HEALTH**

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## ACKNOWLEDGEMENTS

The authors would like to thank the following individuals for their contributions to the 2022 Singapore Report Card: Aaron Sim (Health Promotion Board), Jing Song (Sport Singapore), Amir Mohamed (Sport Singapore), Pamela Marique (Sport Singapore).

This work is supported by the Ministry of Education, Singapore, under its Academic Research Fund Tier 1 [Grant number: A-0002049-00-00].

## CITATION

Recommended citation: Tay Z, Chen BZ, Kui KY, Padmapriya N, Choong MFF, Müller AM, Lee EL, Troy E, Müller-Riemenschneider F. Active Healthy Kids Singapore Report Card on physical activity for children and adolescents (Long format), 2022. Available at: <https://blog.nus.edu.sg/sphpanda/research-projects/mapping-environmental-determinants/AHKGA-singapore-report-card/>

## INTRODUCTION

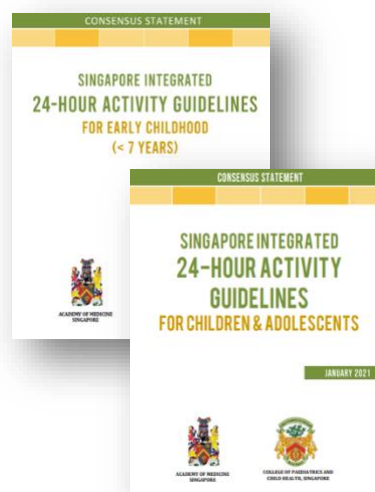
Physical activity (PA) promotion in children and adolescents is important because PA has been shown to improve overall health, including physical and mental wellbeing<sup>1,2</sup>. Promotion of PA in children and adolescents can cultivate good lifestyle habits at a young age, which can lead to better health during childhood, adolescence and in later adulthood. Research in Singapore has shown that children tended to shift towards less active and more sedentary lifestyles as they age<sup>3</sup>. Findings from the same study also demonstrated that longer screen viewing time in young children is associated with longer sedentary time and shorter time engaged in PA in later childhood<sup>4</sup>.

In the recent years, PA promotion has received increasing attention among policymakers in Singapore. Specific to children and adolescents, three new national guidelines were developed; the *Singapore Integrated 24-Hour Activity Guidelines (2021)* which provided recommendations for children and adolescents using a holistic approach to integrate all types of activity within a 24-hour period<sup>5</sup> and the *Singapore Physical Activity Guidelines (SPAG 2022)* which included recommendations for different population segments<sup>6</sup>.

Along with having up-to-date guidelines for the promotion of PA, it is also important to understand the landscape of PA among children and adolescents in Singapore. As such, this is the first national Report Card which synthesizes the available local evidence and examines PA and its indicators from multiple levels of influence in children and adolescents (6 to 18 years) in Singapore. This Report Card highlights gaps in the current evidence and points towards opportunities for the improvement of national PA surveillance and promotion in this population. It also facilitates international comparisons and contributes to global efforts towards promoting PA.

### Singapore Integrated 24-Hour Activity Guidelines for children and adolescents (7 to 18 years) (2021) and for early childhood (<7 years) (2022)<sup>5</sup>

Endorsed by the College of Paediatrics and Child Health of the Academy of Medicine and supported by the Health Promotion Board (HPB).



### Singapore Physical Activity Guidelines 2022<sup>6</sup>

Developed by HPB and Sport Singapore (SportSG), the guidelines provide the general population and subpopulations with evidence-based recommendations for PA, sedentary behavior, and sleep habits, including preschool children (0 to 6 years old) and school children and adolescents (7 to 17 years old).



## SINGAPORE PHYSICAL ACTIVITY GUIDELINES FOR SCHOOL CHILDREN & YOUTHS (7 - 17 YEARS)

School children and youths can engage in physical activity through many different settings and not only through recreation and leisure, such as home, in school, and in community settings. They should meet all recommendations for physical activity, sedentary behaviour and sleep habits to reap health benefits associated with regular physical activity and reduced sedentary behaviour.

### MOVE WITH PLAY & GROW

**RECOMMENDATIONS**

**PLAY FOR 60 & MIX IT UP / Physical Activity**  
 Accumulate an average of **60 minutes in moderate- to vigorous-intensity aerobic activity per day across the week.**  
 \*Every minute of vigorous-intensity activity can generally be considered as two minutes' worth of moderate-intensity activity.  
 A variety of **vigorous-intensity aerobic activities, muscle- and bone-strengthening exercises** should be incorporated **at least 3 days a week** to promote the development of movement skills.

**PLAY MORE / Sedentary Behaviour**  
 Limit the amount of time spent being sedentary, particularly recreational screen time, by **engaging in activities of any intensity, including those of light-intensity.**

**SLEEP WELL / Quality Sleep**  
 7-13 years: **9 to 12 hours**  
 14-17 years: **8 to 10 hours**

**TIPS**

- Incorporate active travel into the weekly routine, such as walking or cycling to school.
- Explore a variety of activities to help school children and youths develop active hobbies or interests.
- Visit outdoor playgrounds for your child to engage in social play and interact with others while being active.
- Stand up while studying or take movement breaks in between study sessions.
- Consider joining a sports team/club/organisation to experience physical activity in a social setting, which helps school children and youths stay motivated.

**EXERCISE INTENSITY**

**Light**  
 Can talk in full sentences and sing

**Moderate**  
 Can talk in phrases or short sentences but cannot sing

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## SINGAPORE PHYSICAL ACTIVITY GUIDELINES FOR PRESCHOOL CHILDREN (0 - 6 YEARS)

Preschool children should meet all recommendations for physical activity, sedentary behaviour and sleep habits to reap health benefits associated with regular physical activity and reduced sedentary behaviour.

### MOVE WITH FUN & GROW

**RECOMMENDATIONS**

0-2 YEARS:		
SEDENTARY TIME	PHYSICAL ACTIVITY	QUALITY SLEEP
<b>START PLAYING</b> Limit the amount of time spent being sedentary, with recreational screen time not recommended.  Instead, engage in imaginative play and storytelling activities.	<b>PLAY MORE</b> 0-1 years Encourage interactive floor-based activities for a minimum of 30-minutes a day.  1-2 years Spend at least 180 minutes doing a variety of physical activities of any intensity, spread throughout the day.  Aim for daily outdoor play.	<b>SLEEP WELL</b> 0-3 months: 14 to 17 hours 4-11 months: 12 to 15 hours 1-2 years: 11 to 14 hours
3-6 YEARS:		
SEDENTARY TIME	PHYSICAL ACTIVITY	QUALITY SLEEP
<b>START PLAYING</b> Limit the amount of time spent being sedentary, keeping recreational screen time to less than an hour a day.	<b>PLAY MORE</b> Spend at least 180 minutes doing a variety of physical activities, of which at least 60 minutes should be moderate- to vigorous-intensity activity, spread throughout the day.	<b>SLEEP WELL</b> 3-4 years: 10 to 13 hours 5-6 years: 9 to 13 hours

**TIPS**

- Create a home environment that encourages movement and exploration.
- Introduce activity-based games. E.g. Animal movements, dance activity.
- Encourage a wide variety of movements like running, jumping, catching, throwing, and kicking, in different environments, to build Fundamental Movement Skills (FMS).
- Visit outdoor playgrounds for your child to engage in social play and interact with others while being active.
- Establish a consistent bedtime routine to help your child develop good habits.

**EXERCISE INTENSITY**

**Light**  
 Can talk in full sentences and sing

**Moderate**  
 Can talk in phrases or short sentences but cannot sing

**Vigorous**  
 Have difficulty talking

18

Figure 1 Images of SPAG 2022 for children and adolescents (0 to 17 years)<sup>6</sup>

## SINGAPORE REPORT CARD AND ITS AIMS

This Report Card is an evidence-based assessment of PA among children and adolescents aged up to 18 years in Singapore. It synthesizes available and up to date, published and unpublished evidence across PA and its diverse indicators related to individual behaviors, settings and sources of influence, and strategies and investments (Figure 2).

The Singapore Report Card is part of a global initiative led by a non-profit organization, Active Healthy Kids Global Alliance (AHKGA), to promote healthier lifestyles among children and adolescents through the encouragement and facilitation of opportunities for PA. By developing the Singapore Report Card, we hope to:

1. provide stakeholders, such as parents and educators, with evidence-based information on key PA indicators of children and adolescents in Singapore; and
2. underscore limitations and gaps in the available evidence related to PA among children and adolescents in Singapore.

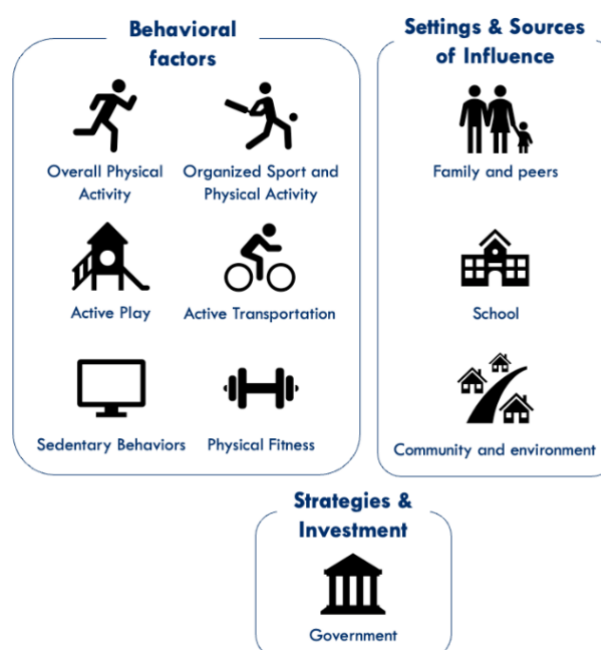


Figure 2 10 indicators under Global Matrix 4.0

## COVID-19 PANDEMIC

The COVID-19 pandemic was a major source of disruption globally, bringing about changes to the overall PA landscape in children and adolescents. As the data sources used in the grading were from pre-Covid period, (July 2010 to July 2020) we did not examine the impact of Covid-19 on the PA levels, as well as health and wellbeing of children and adolescents in this report.

## METHODOLOGY AND DATA SOURCES

The AHKGA systematic development process was adopted for developing this Singapore Report Card. This Report Card covers 10 core indicators (Figure 2): overall physical activity, organized sport and physical activity, active play, active transportation, sedentary behaviors, physical fitness, family and peers, school, community and environment, and government.

A data source was identified if it met all the following criteria:

- (1) children and adolescents aged 0-18 years in Singapore;
- (2) contained information of at least one of the 10 core indicators; and
- (3) relevant data collected and released between July 2010 to July 2020.

Typically, data for children aged 5 years and below are not included in the analysis. However, as there might be mention of whole data source(s) that contains data for older children (i.e., 6 to 18 years) in the studies for younger children (i.e., 0 to 5 years), a wider age range (i.e., 0 to 18 years) was applied during the search for data source. A total of 36 published studies or reports pertinent to 10 core indicators were identified. However, only data synthesized from national surveys or large-scale longitudinal studies were eventually selected and used for grade assignment in the 2022 Report Card.

#### *Student Health Survey (SHS)<sup>7</sup>*

Since 2006, the national SHS was conducted once every 3 years to track health behaviors among students aged 13 to 17 years old (i.e., secondary school students) managed by HPB. The latest SHS dataset was obtained in 2015. However, the dataset was not publicly available and the RWG was not able to obtain the data due to technical challenges. Only the aggregated data on percentage of school-going adolescents who accumulated at least 60 minutes of moderate-to-vigorous intensity physical activity (MVPA) per day on average from 2015 SHS was available, and the data was used to grade 'Overall Physical Activity'<sup>7</sup>.

#### *National Sports Participation Survey (NSPS)<sup>8</sup>*

This is a national survey conducted and managed by SportSG, with a focus on sport participation and sport culture in Singapore. It is conducted yearly since 2015. Face to face interviews were conducted among Singapore and permanent residents aged 13 years old and above from randomly sampled households provided by the Department of Statistics, Singapore. The 2020 NSPS dataset, collected between January 2020 to December 2020, was identified as the latest dataset through the communication with the SportSG representative. Using the 2020 NSPS, aggregated data on regular participation in sport or PA at least once a week from 13 to 19 years old was obtained and used to grade 'Organized Sport and Physical Activity'.

#### *Growing Up in Singapore Towards healthy Outcomes (GUSTO) Cohort study<sup>9,10</sup>*

The GUSTO study examines how conditions in pregnancy and early childhood influence the health and development of women and children. It is an ongoing large-scale and longitudinal birth cohort in Singapore, with 1247 pregnant women recruited in 2009 to 2010 and a total of 1171 singleton births were followed up. As the cohort progresses, survey questionnaires were administered by proxy to the parents/caregivers of children at different time points. With the large sample size and wider representation of age groups, survey data collected by proxy from 5.5 years old and 8 years old were used to grade the indicators.

**Table 1. Showing a description of the available main data sources and the respective indicator(s) they provided data for.**

Indicator	Benchmark(s)	Data source	Coverage	Managed by	Measures	Target population
<b>Overall Physical Activity</b>	<p><b>Selected:</b> % of children and adolescents who meet the Global Recommendations on Physical Activity for Health, which recommend that children and adolescents accumulate at least 60 min of moderate- to vigorous-intensity physical activity per day on average.</p> <p><b>Others:</b> % of children and youth meeting the guidelines on at least 4 d a week (when an average cannot be estimated).</p>	SHS7	2015 (survey conducted every 3 years since 2006)	HPB	National survey	13 – 17 years
		GUSTO cohort		GUSTO study team	Caregiver reported physical activity questionnaire	8 years
<b>Organized Sport and Physical Activity</b>	<p><b>Selected:</b> % of children and adolescents who participate in organized sport and/or physical activity programs.</p> <p><b>Others:</b> None.</p>	NSPS	2020 (survey conducted every 5 years since 1987)	SportSG	National survey	13 years – 19 years
		GUSTO cohort		GUSTO study team	Caregiver reported physical activity questionnaire	8 years
<b>Active Play</b>	<p><b>Selected:</b> % of children and adolescents who engage in unstructured/unorganized active play at any intensity for more than 2 h a day.</p> <p><b>Others:</b> % of children and youth who report being outdoors for more than 2 h a day.</p>	GUSTO cohort		GUSTO study team	Caregiver reported physical activity questionnaire	8 years



<b>Active Transportation</b>	<p><b>Selected:</b> % of children and adolescents who use active transportation to get to and from places (eg, school, park, mall, friend's house).</p> <p><b>Others:</b> None.</p>	GUSTO cohort		GUSTO study team	Caregiver reported physical activity questionnaire	8 years
<b>Sedentary Behaviors</b>	<p><b>Selected:</b> % of children and adolescents who meet the Canadian Sedentary Behavior Guidelines (5- to 17-y-olds: no more than 2 h of recreational screen time per day). Note: The Guidelines currently provide a time limit recommendation for screen-related pursuits, but not for non-screen-related pursuits.</p> <p><b>Others:</b> None.</p>	GUSTO cohort		GUSTO study team	Caregiver reported physical activity questionnaire	8 years
<b>Physical Fitness</b>	<p><b>Selected:</b> None.</p> <p><b>Others:</b> Average percentile achieved on certain physical fitness indicators based on the normative values published by Tomkinson et al.<sup>11</sup></p>	Unable to locate evidence on the speed of last completed stage with nationally representative data				

<b>Family and Peers</b>	<p><b>Selected:</b> % of family members (e.g., parents, guardians) who facilitate physical activity and sport opportunities for their children (e.g., volunteering, coaching, driving, paying for membership fees and equipment).</p> <p><b>Others:</b> % of parents who meet the Global Recommendations on Physical Activity for Health, which recommend that adults accumulate at least 150 min of moderate-intensity aerobic physical activity throughout the week or do at least 75 min of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity physical activity. % of family members (e.g., parents, guardians) who are physically active with their kids.</p> <p>% of children and youth with friends and peers who encourage and support them to be physically active.</p> <p>% of children and youth who encourage and support their friends and peers to be physically active.</p>	GUSTO cohort		GUSTO study team	Caregiver reported physical activity questionnaire	8 years
<b>School</b>	<p><b>Selected:</b> None.</p> <p><b>Others:</b> % of children and youth with friends and peers who encourage and support them to be physically active. % of children and youth who encourage and support their friends and peers to be physically active.</p> <p>% of schools where the majority (<math>\geq 80\%</math>) of students are taught by a PE specialist.</p>	Unable to obtain descriptive evidence specific to the indicators mentioned				

	<p>% of schools where the majority (<math>\geq 80\%</math>) of students are offered the mandated amount of PE (for the given state/territory/region/country).</p> <p>% of schools that offer physical activity opportunities (excluding PE) to the majority (<math>&gt; 80\%</math>) of their students.</p> <p>% of parents who report their children and youth have access to physical activity opportunities at school in addition to PE classes.</p> <p>% of schools with students who have regular access to facilities and equipment that support physical activity (e.g., gymnasium, outdoor playgrounds, sporting fields, multipurpose space for physical activity, equipment in good condition).</p>					
<p><b>Community and Environment</b></p>	<p><b>Selected:</b> % of children or parents who report having facilities, programs, parks, and playgrounds available to them in their community.</p> <p>% of children or parents who report living in a safe neighborhood where they can be physically active.</p> <p><b>Others:</b> % of children or parents who perceive their community is doing a good job at promoting physical activity (e.g., variety, location, cost, quality).</p> <p>% of communities that report they have policies promoting physical activity.</p>	<p>GUSTO cohort</p>		<p>GUSTO study team</p>	<p>Caregiver reported physical activity questionnaire</p>	<p>5.5 and 8 years</p>

	<p>% of communities that report they have infrastructure (e.g., sidewalks, trails, paths, bike lanes) specifically geared toward promoting physical activity.</p> <p>% of children or parents who report having well-maintained facilities, parks, and playgrounds in their community that are safe to use.</p>					
<p><b>Government</b></p>	<p><b>Selected:</b> Evidence of leadership and commitment in providing physical activity opportunities for all children and adolescents.</p> <p>Demonstrated progress through the key stages of public policy making (i.e., policy agenda, policy formation, policy implementation, policy evaluation and decisions about the future).</p> <p><b>Others:</b> Allocated funds and resources for the implementation of physical activity promotion strategies and initiatives for all children and adolescents.</p> <p>HEPA PAT v2 and the scoring rubric published by Ward et al<sup>12</sup>.</p>	<p>News media and email communication</p>				

**GRADING SCHEME AND SUMMARY OF THE INDICATORS AND SCORES**

Letter grades were assigned to the 10 indicators, according to pre-defined benchmarks and grading rubric in the Global Matrix 4.0. The grade for each indicator is based on the percentage of children and adolescents meeting a defined benchmark.

A+	94% - 100%	We are succeeding with a <b>large majority</b> of children and adolescents
A	87% - 93%	
A-	80% - 86%	
B+	74% - 79%	We are succeeding with <b>well over half</b> of children and adolescents
B	67% - 73%	
B-	60% - 66%	
C+	54% - 59%	We are succeeding with <b>about half</b> of children and adolescents
C	47% - 53%	
C-	40% - 46%	
D+	34% - 39%	We are succeeding with <b>less than half</b> of children and adolescents
D	27% - 33%	
D-	20% - 26%	
F	<20%	We are succeeding with <b>very few</b> children and adolescents
INC		Incomplete – insufficient or inadequate information to assign a grade

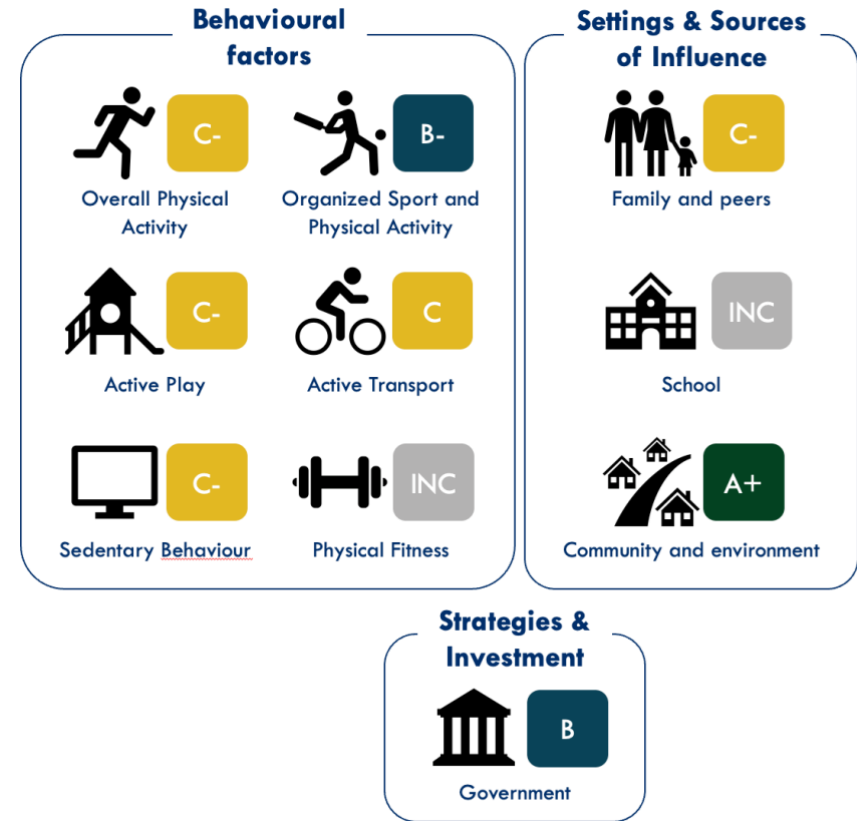


Figure 2 Grading rubric and summary of grades for indicators

## INDICATORS

### Overall Physical Activity

PA plays an important role in physical and mental wellbeing in both present and future. Evidence suggests that adolescents who are active have better cardiometabolic health, as well as cardiorespiratory and muscular fitness<sup>7, 12</sup>. However, low PA levels during childhood are associated with reduced motor skill development and increased risk of chronic diseases such as diabetes and coronary heart disease<sup>7, 13</sup>. Furthermore, higher level of PA is associated with improved cognitive function, greater cognitive flexibility, better brain health and working memory among children and adolescents<sup>7, 13, 14</sup>.



### BENCHMARK(S) USED

- % of children and adolescents who accumulate 60 minutes or more of MVPA per day on average.

### KEY FINDINGS

- **Questionnaire or survey data**
  - 23.7% of school-going adolescents aged 13-17 years engaged in sufficient PA, according to international recommendations of 60 minutes or more of daily MVPA, based on self-reported data from school-based surveys in 2015<sup>7</sup>.
  - From the GUSTO cohort study survey data, 65% of 8 years old children in the study met the international recommendation.
  - Hence, the simple average is 44.4%.

### CONTRIBUTING FACTORS AND DISPARITIES

- **Differences by gender**
  - Based on the GUSTO cohort, 63.3% the 8-year-old girls and 66.3% of the 8-year-old boys are engaged in sufficient PA by proxy report.
  - At age 13-17 years, insufficient PA was more common among school-going adolescent girls (83.1%) compared to school-going adolescent boys (69.7%), based on self-reported data from nationally representative school-based surveys (Student Health Surveys) in 2015<sup>7</sup>.
  - There is a 6.2% increase in the difference in prevalence of insufficient PA between school-going adolescent boys and girls aged 11-17 years from 2001 (77.7% boys, 84.9% girls) to 2015 (69.7% boys, 83.1% girls), based on self-reported data from school-based surveys in 2015<sup>7</sup>.
- **Differences by ethnicity**
  - Based on the GUSTO cohort, 62.0% of Chinese, 67.0% of Malay, and 71.0% of Indian were engaged in sufficient PA by proxy report at 8 years old.

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#### LIMITATIONS/RESEARCH GAPS

- Lack of representative data for key population subgroups by age (12 years and below), ethnicity and gender among children and adolescents in Singapore.
- Mostly self-reported data which may not be as accurate as accelerometer data in capturing PA.

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#### RECOMMENDATIONS

- Frequent surveillance data is needed to assess overall physical activity engagement in Singaporean children and adolescents, particularly for primary school children.
- Nationwide intervention strategies to increase PA at school may be an efficient way in improving overall PA for children, particularly for secondary school-going children.
- Community wide education campaigns or activities may help increase public awareness of the PA guidelines and the importance of PA in children and adolescents.
- Current guidelines recommend MVPA on a daily basis, however, most of current evidence or data reflect the accumulated 60 minutes of MVPA daily on average over a period of several days. Further research to explore the optimal combination of frequency and duration of PA is needed.

## Organized Sport Participation

Organized Sport is defined as PA which involves rules, formal practice, and competitions, providing children and adolescents with opportunities to accumulate PA. Participation in organized sport promotes PA, which decreases the risk of childhood and adulthood obesity and improves overall physical wellbeing<sup>15</sup>. It is also associated with better metabolic profiles and increased muscular strength, by improving PA participation in children<sup>10</sup>. Organized sport plays a role in promoting mental wellbeing in children and adolescents. Organized sport participation leads to an increase in PA, resulting in reduced risk of depression and improved self-esteem in children<sup>6</sup>. Organized sport participation is also reported to be correlated with reduced odds of psychological distress among senior high school students<sup>16</sup>. Such evidence emphasizes the importance of children and adolescents in Singapore to participate in organized sport regularly.



### BENCHMARK(S) USED

- % of children and adolescents who participate in organized sport and/or PA programs.

### KEY FINDINGS

- **Questionnaire or survey data**
  - Based on the 2020 NSPS, 75% of children aged 13 to 19 reported to participate in organized sport at least once a week.
  - 52% of 8-year-old children in the GUSTO cohort study were involved in organized sport activity during the week by proxy report.
  - Hence, the simple average is 63.5%.

### CONTRIBUTING FACTORS AND DISPARITIES

- **Differences by gender**
  - Based on the GUSTO cohort, 50.6% of the 8-year-old girls and 52.3% of the 8-year-old boys are involved in organized sport activity during the week by proxy report.
  - Male teenagers aged 13-19 years had 7% more sport participation compared to female teenagers aged 13-19, based on computer-assisted personal interview data from a smaller-scale "Sports Index" study conducted in between NSPS years by SportSG<sup>8</sup>.
- **Differences by ethnicity**
  - Based on the GUSTO cohort, 62.0% of Chinese, 29.0% of Malay, and 50.0% of Indian are involved in organized sport activity during the week by proxy report at 8 years old.

### LIMITATIONS/RESEARCH GAPS

- Lack of representative data for key population subgroups by age (12 years and below), ethnicity and gender among children and adolescents in Singapore.



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**RECOMMENDATIONS:**

- Frequent surveillance data is needed to assess organized sport levels in Singaporean children and adolescents, particularly for primary school children.
- Parents and teachers should encourage children and adolescents to attend extracurricular organized sport.
- Relevant stakeholders should increase opportunities for organized sport outside of school and ensure that children and adolescents have equitable access to sport.

## Active Play

In this report, active play is defined as any activity which constitutes unstructured and free play. When children are involved in active play, they are normally moving at an intensity that is above sedentary levels, often without supervision and guidance of adults. Active play is vital for physical health for children and adolescents as it provides them with opportunities to accumulate PA<sup>17</sup>. In addition, active play aids in improving executive functions in young children<sup>18</sup>, cognitive and emotional development in children and adolescents<sup>17</sup>. Overall, the evidence highlights the importance for children and adolescents to engage in active play.



### BENCHMARK(S) USED

- % of children and adolescents who engage in unstructured/unorganized active play at any intensity for more than 2 h a day.

### KEY FINDINGS

- **Questionnaire or survey data**
  - In the GUSTO cohort study, 44.4% of 8-year-old children spend an average of more than 2 hours per day in indoor and/or outdoor active play.

### CONTRIBUTING FACTORS AND DISPARITIES

- **Differences by gender**
  - Based on the GUSTO cohort, 44.7% of the 8-year-old girls and 44.2% of the 8-year-old boys spend an average of more than 2 hours per day in indoor and/or outdoor active play by proxy report.
- **Differences by ethnicity**
  - Based on the GUSTO cohort, 46.6% of Chinese, 45.0% of Malay, and 35.8% of Indian spend an average of more than 2 hours per day in indoor and/or outdoor active play by proxy report at 8 years old.

### LIMITATIONS/RESEARCH GAPS:

- Lack of representative data for key population subgroups by age, ethnicity and gender investigating active play among children and adolescents in Singapore.

### RECOMMENDATIONS

- Frequent surveillance data are needed to assess active play in children and adolescents across the country.
- Future studies are necessary to enhance the understanding of active play in children and adolescents, including its frequency, intensity, duration, and context.
- In creating opportunities for outdoor play, relevant stakeholders should consider the high population density, hot and humid weather in Singapore.

## Active Transportation

Active transportation is defined as commuting solely by walking or cycling, or by walking or cycling in combination with motorized modes of travel. Data reported that active transport provides greatest opportunities for adolescents living in both urban and suburb areas to accumulate PA. In fact, active transport to school can provide a substantial portion of children's PA and is correlated with higher levels of energy expenditure<sup>19</sup>. As active transport contributes to overall PA in children and adolescents, it was reported to have the same physical and mental benefits as PA. Therefore, it is recommended that children and adolescents in Singapore commute via active transport, which would increase PA levels.



### BENCHMARK(S) USED

- % of children and adolescents who use active transportation to get to and from places (e.g., school, park, mall, friend's house).

### KEY FINDINGS

- **Questionnaire or survey data**
  - In the GUSTO study, 48% of 8-year-old children spend  $\geq 50\%$  of total transport duration in active transportation.

### CONTRIBUTING FACTORS AND DISPARITIES

- **Differences by gender**
  - Based on the GUSTO cohort, 50.6% of the 8-year-old girls and 45.6% of the 8-year-old boys spend  $\geq 50\%$  of total transport duration in active transportation by proxy report.
- **Differences by ethnicity**
  - Based on the GUSTO cohort, 47.0% of Chinese, 50.0% of Malay, and 48.0% of Indian spend  $\geq 50\%$  of total transport duration in active transportation by proxy report at 8 years old.

### LIMITATIONS/RESEARCH GAPS

- Lack of representative data for key population subgroups by age, ethnicity and gender investigating active transportation in children and adolescents in Singapore.
- Available data involving active transportation focuses on school trip rather than active transportation to destinations such as parks and recreation facilities.

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## RECOMMENDATIONS

- Frequent surveillance data is needed to explore the duration of active transportation in Singaporean children and adolescents.
- Improving public awareness via community wide education campaigns or activities may help promote active transportation in children and adolescents.
- Encouraging active travel to destinations in addition to school may provide additional health benefits of children and adolescents, given that most children attend schools close to home.

## Sedentary Behaviors

Sedentary behavior (SB) is defined as any waking behavior characterized by low energy expenditure ( $\leq 1.5$  metabolic equivalents), while in a sitting, reclining, or lying posture. SB can be further classified into screen-based SB (e.g., TV-viewing) and non-screen-based SB (e.g., reading). Research suggests that increasing sedentary behavior is associated with poorer physical and mental health in children and adolescents, and different forms of sedentary behavior could impact on health differently<sup>16</sup>. Greater durations of screen viewing were reported to be associated with increased risk of cardiometabolic risk and reduced physical fitness and psychosocial health children and adolescents<sup>16</sup>. Although sedentary behaviors are not entirely avoidable, these findings support restrictions of sedentary behavior time, particularly screen viewing time.



### BENCHMARK(S) USED

- % of children and adolescents who engage in no more than 2 h of recreational screen time per day.

### KEY FINDINGS

- **Questionnaire or survey data**
  - In the GUSTO cohort study, 41% of 8-year-old children engage in less than 2 h of recreational screen time per day by proxy report.

### CONTRIBUTING FACTORS AND DISPARITIES

- **Differences by gender**
  - Based on the GUSTO cohort, 46.8% of the 8-year-old girls and 36.1% of the 8-year-old boys meet the recommendation of less than 2 h per day of screen viewing time by proxy report.
- **Differences by ethnicity**
  - Based on the GUSTO cohort, 48.0% of Chinese, and 27.0% of Malay, 38.0% of Indian meet the recommendation of less than 2 h per day of screen viewing time by proxy report at 8 years old.

### LIMITATIONS/RESEARCH GAPS

- Lack of representative data for key population subgroups by age, ethnicity and gender on screen viewing time, as well as on non-screen-based sedentary behaviors, which is needed to better understand their independent contributions to sedentary behavior.

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## RECOMMENDATIONS

- Frequent surveillance data is needed to assess sedentary behavior in Singaporean children and adolescents.
- More research on non-screen-based sedentary behaviors is needed to better understand their independent contributions to sedentary behaviors.
- Efforts from both schools and home are needed to limit sedentary behaviors in children and adolescents.
- Increasing awareness of parents, health professionals, and adolescent of the negative health outcomes associated with excessive sedentary behaviors, especially screen-based sedentary behaviors, is essential.

## Physical Fitness

Physical fitness is defined as the ability to carry out daily tasks with vigor and alertness, without undue fatigue. Physical fitness includes several different components such as cardiorespiratory fitness/endurance (aerobic fitness), skeletal muscle fitness/endurance, flexibility and balance<sup>19</sup>. Physical fitness is an early predictor of current and future physical wellbeing. For instance, higher physical fitness is associated with lower risk of cardiovascular disease and overall health in preschool children and later in adulthood<sup>20,21</sup>. Research also shows that physical fitness is important for mental wellbeing. For instance, cardiorespiratory fitness was reported to be inversely associated with psychological difficulties in adolescents<sup>22</sup>. Greater cardiovascular fitness is also reported to induce greater cerebral blood flow, leading to better cognitive abilities and better academic performance in children<sup>23</sup>. Children and adolescents participating in regular PA are more likely to have higher levels of physical fitness<sup>23,25</sup>. For example, 30 minutes or more of daily MVPA is associated with increased fitness and better metabolic health in obese children and adolescents<sup>26</sup>. Overall, the research evidence on physical fitness highlights the need for children to engage in PA to improve physical fitness.



### BENCHMARK(S) USED

- None used.

### KEY FINDINGS

- Unable to locate nationally representative data or data from large-scale observational studies to match the benchmark under the indicator.

### CONTRIBUTING FACTORS AND DISPARITIES

- Unable to locate relevant evidence.

### LIMITATIONS/RESEARCH GAPS

- Lack of representative studies investigating physical fitness levels in children and adolescents in Singapore.

### RECOMMENDATIONS

- Frequent surveillance data is needed to assess physical fitness levels among children and adolescents in Singapore.

## Family And Peers

Family and peers play an important role in influencing PA levels in children and adolescents. The family is the setting where children are first exposed to PA, and which continues to have a strong influence throughout childhood. Family influences include the home physical environment, parental support (e.g., encouragement in sport), co-participation and role modelling<sup>27</sup>. Home environment provides resources and opportunities for PA in children and adolescents<sup>28</sup>. There is also evidence that parental support is related to school-aged children's perceptions, which in turn are positively associated with children's engagement in PA<sup>29</sup>. Parental co-participation also promotes PA in children, as the involvement of family and peers in the PA of children and adolescents was reported to be associated with a higher level of MVPA in Chinese high school students<sup>30</sup>. Furthermore, parents influence children and adolescents through their role modelling, as parental PA levels was shown to be associated with children PA levels<sup>27</sup>. Overall, the research evidence underscores the need for family and peers to promote PA in children and adolescents.



### BENCHMARK(S) USED

- % of family members (e.g., parents, guardians) who facilitate PA and sport opportunities for their children.

### KEY FINDINGS

- **Questionnaire or survey data**
  - In the GUSTO cohort study, 55% of parents or caregivers encouraged their 8-year-old child to play outside when the weather is suitable, and 29% of parents or caregivers were physically active with or in front of their child.
  - Hence, the simple average is 42%.

### CONTRIBUTING FACTORS AND DISPARITIES

- **Differences by gender**
  - Based on the GUSTO cohort, 52.2% and 57.5% of the parent/caregivers of 8-year-old girls and 8-year-old boys respectively encouraged their child to play outside when the weather is suitable. 31.1% and 26.8% of the parent/caregivers of 8-year-old girls and 8-year-old boys respectively were physically active with or in front of their child.
- **Differences by ethnicity**
  - Based on the GUSTO cohort, 54.0%, 48.0% and 71.0% of the parent/caregivers of 8-year-old Chinese, Malay, and Indian respectively encouraged their child to play outside when the weather is suitable. 22.0%, 29.0% and 53.0% of the parent/caregivers of 8-year-old Chinese, Malay and Indian respectively were physically active with or in front of their child.



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#### LIMITATIONS/RESEARCH GAPS

- Lack of representative studies investigating family and peer influence on PA in children and adolescents in Singapore.

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#### RECOMMENDATIONS

- Frequent surveillance data, as well as quantifiable data is warranted to assess the association between family and peer support with both children and adolescent participation in sport to better understand the parental and peer influences on their PA levels.
- Raising parents' awareness of children health benefits associated with family support and involvement in children's PA may help increase PA in children and adolescents.
- Factors influencing family support in children's PA should be assessed to better inform subsequent intervention efforts.

## School

Majority of Singaporean children would have experienced pre-school by age six even though it is not compulsory<sup>31</sup>. Research in Singapore shows that children spend an average of 10 hours in preschool during school days<sup>32</sup>. Generally, the primary and secondary schools in Singapore approximates 6 hours of curriculum per day, excluding co-curricular activities. Schools are an effective setting to educate children and adolescents on PA through physical education (PE) classes conducted by specialist teachers and provide opportunities for PA through co-curricular sport activities<sup>33,34</sup>. Schools also provide sport facilities (e.g., basketball courts, indoor gym) and equipment (e.g., basketball, tennis rackets) for PA<sup>33</sup>. As such, school environments are correlated with the PA levels of children and adolescents<sup>33,34</sup>. Overall, the research evidence emphasizes the need for a school environment that is conducive to and promotes PA in children and adolescents.



### BENCHMARK(S) USED

- None used.

### KEY FINDINGS

- Unable to locate nationally representative or quantifiable data to match the benchmarks under the indicator.
- However, qualitative evidence includes news reports detailing that the “Ministry of Education (MOE) said that by 2017, all schools would have implemented the one-hour increase in PE curriculum time to two hours per week”<sup>35</sup>. An official PE Syllabus for primary, secondary and pre-university levels also exists<sup>36</sup>. In 2016, the NurtureSG taskforce, a multi-government agency taskforce, was formed to strengthen health promotion in schools and institutes of higher learning and to increase opportunities for PA. In June 2017, recommendations made by the taskforce were consolidated into an action plan report. In July 2017, an MOE press release mentioned that these recommendations were progressively rolled out across pre-schools, schools, and Institutes of Higher Learning, albeit with no quantitative substantiation<sup>15,37</sup>.

### CONTRIBUTING FACTORS AND DISPARITIES

- Unable to locate relevant evidence.

### LIMITATIONS/RESEARCH GAPS

- Lack of quantitative evidence or representative studies investigating schools’ influence on PA in children and adolescents in Singapore.

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## RECOMMENDATIONS

- Frequent surveillance data, as well as quantifiable data is warranted to assess PA policies and organizational factors (e.g., availability of infrastructure) in the school environment among Singaporean children and adolescents.
- Future studies to continuously evaluate classes and sport programs is crucial to ensure that quality PE curriculum is provided for all students.

## Community And Environment

Community and environment settings (e.g., sport clubs, park, playground) play an important role in influencing PA in children and adolescents as policies, infrastructure, facilities, and safe neighborhoods represents promise for PA promoting effects in children and adolescents. Community and environment were reported to explain the differences in PA among countries and regions<sup>38</sup>. Overall, the research evidence highlights the need for community and environments that are conducive to and promote PA in children and adolescents.



### BENCHMARK(S) USED

- % of children or parents who report having facilities, programs, parks, and playgrounds available to them in their community.
- % of children or parents who report living in a safe neighborhood where they can be physically active.

### KEY FINDINGS

- **Questionnaire or survey data**
  - In the GUSTO cohort study, 99.8% of 5.5-year-old parents and 97% of 8-year-old parents reported the presence of neighborhood open areas, park, playground, swimming pool, gym, or sport activities club. 88.5% of 5.5-year-old parents perceived the neighborhood environment to be safe for children's PA. The simple average across these three data points is 95.1%.

### CONTRIBUTING FACTORS AND DISPARITIES

- Unable to locate relevant evidence.

### LIMITATIONS/RESEARCH GAPS

- Current evidence is heavily based on self-reported perceptions of the environment. Objective measures are needed for better reflection on the built environment features.
- More evaluations are needed to translate the research on built environment into policy making and urban planning.

### RECOMMENDATIONS

- Frequent surveillance data, as well as quantifiable data is warranted to explore the effect of policies and/or organizational factors (e.g., infrastructure, accountability for policy implementation) in the community and built environment on physical activity and health of children and adolescents.
- Consistently and objectively measured data on features of community and built environment associated with physical activity is needed.
- Additional efforts and strategies are needed to ensure that infrastructure and sport facilities could translate into higher levels of PA in children and adolescents.

## Government

The government plays a crucial role in promoting PA levels in children and adolescents. The government can encourage children and adolescents to be more physically active through policies, strategies, and initiatives, thereby influencing the built environment, norms and perceptions<sup>39</sup>. The government can also allocate more funds towards PA promotion<sup>39</sup>. Overall, the research evidence emphasizes the importance of governments in creating opportunities for PA for children and adolescents.



### BENCHMARK(S) USED

- Evidence of leadership and commitment in providing PA opportunities for all children and adolescents.
- Demonstrated progress through the key stages of public policy making (i.e., policy agenda, policy formation, policy implementation, policy evaluation and decisions about the future).

### KEY FINDINGS

- It is challenging to assign a grade for this indicator due to a lack of a definitive benchmark and lack of more definitive evidence.
- Overall, it is evident that HPB, SportSG, and the Ministry of Education (MOE) are actively providing resources to promote PA among children and adolescents in Singapore. The statutory boards, SportSG and HPB, are funded annually by the Ministry of Culture, Community and Adolescents and the Ministry of Health.
- A multi-agency government taskforce, NurtureSG, was set up in 2016 to promote health among children and adolescent<sup>14</sup>.
- The built environment in Singapore is generally supportive of PA.

### CONTRIBUTING FACTORS AND DISPARITIES

- Unable to locate relevant evidence.

### LIMITATIONS/RESEARCH GAPS

- It is unclear if there are existing coordination with other stakeholders (such as private sector and civil society) to promote PA in young children and adolescents.
- While it is evident that the HPB, SportSG, and MOE are actively providing resources to promote PA among children and adolescents in Singapore, their implementation and effectiveness remains largely unknown.

### RECOMMENDATIONS

- Some evidence suggests that Singapore government agencies have provided opportunities, allocated funds and resources to promote PA in children and adolescents. However, continuous monitoring and evaluation of the effectiveness of such implementation are needed.
- To better implement PA-related policy and programme, efforts from multiple parties (e.g., government agencies, academia, education professionals and parents) are necessary.

## CONCLUSION

Along with 56 countries, the Global Matrix 4.0 was applied in this first comprehensive evaluation of the physical activity landscape among children and adolescents in Singapore.

Overall, Singapore has fared well in organizing the built environment to support PA among the young. There is also evidence for governmental support in supplying resources for efforts in PA promotion. A clear example is the recently released National Physical Activity Guidelines in recognition of the diverse benefits of an active lifestyle. However, the behavioral indicators for PA were not optimal. As such, implementing nationwide intervention strategies, particularly with multiple parties (e.g., government agencies, academia, education professionals and parents), is important to improve overall physical activity, active play, active transportation, sedentary behavior, and parental and peer support for the target population. Rigorous evaluation of existing PA related programs is also crucial to guide the development and implementation of more effective health promotion strategies.

While most of the indicators were assigned a grade in this report card, comprehensive and representative data were often limited or absent. As such, additional efforts are required to strengthen both the frequency and quality of surveillance efforts for the PA indicators across children and adolescents. This also allows for continuous monitoring of relevant outcomes. Transparent reporting of relevant information, as well as increased accessibility to national surveillance reports would also be valuable. However, if transparent reporting of information is difficult, policies to lower the access barrier to government data for research entities should be considered to improve surveillance and public health promotion efforts.

## APPENDIX

## TABLE SUMMARIZING NUMBER OF STUDIES FOR EACH INDICATOR

**Table 2. Showing number of available studies for each indicator.**

	Indicators	Number of existing studies/reports			
		All	<6 years	6-18 years	Both
1	Overall Physical Activity	5	2	3	-
2	Organized Sport Participation	2	1	1	-
3	Active Play	1	1	-	-
4	Active Transportation	1	1	-	-
5	Sedentary Behaviors/Screen Viewing	12	8	4	-
6	Physical Fitness	1	1	-	-
7	Family and Peers	2	2	-	-
8	Community and Environment	3	1	-	2
9	School	1	1	-	-
10	Government	4	-	1	3

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