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Obesity prevention and management: Singapore's experience

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Summary
Singapore's obesity prevalence among adult Singapore residents aged 18–69 increased from 6.9% (2004) to 10.8% (2010). Among school-going children, the prevalence of overweight and severely overweight (body weight > 120% standard weight for height) increased from 1.4% (1976) to 12.7% (2006) for primary 1 students, and 2.2% to 15.9% for primary 6 students. Fundamentally, obesity is a function of excess energy intake (food consumption) and insufficient energy expenditure (physical activity). In 2010, about 40% did not have sufficient physical activity, and about 60% consumed excess energy. For students in the mainstream schools, only a fifth consumed at least two servings of fruits and vegetables every day, and a tenth were physically active for at least 60 min on 5 or more days a week. From a public health perspective, the most powerful levers for influencing population health lie in interventions that make healthy living convenient and an unconscious choice by targeting the social and environmental context. Recognizing this, the Health Promotion Board has in recent years made a strategic shift away from just public education campaigns aimed at individual behaviours, to focus on creating a ground-up social movement to enable and empower individuals to live out a healthy lifestyle.

Background

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Since its independence in 1965, Singapore has undergone a rapid transformation. With economic progress, improvements in housing and sanitary conditions, increased availability of potable water, and the implementation of a comprehensive vaccine and disease surveillance programs, Singapore underwent an epidemiological transition from a pattern of high prevalence of infectious diseases associated with malnutrition and poor environmental sanitation to one featuring a high prevalence of chronic and degenerative diseases associated with more affluent lifestyles. Today, cancer, cardiovascular disease, and diabetes mellitus are among the top 10 diseases affecting Singaporeans, and they account for more than 60% of all deaths [1]. Obesity is a risk factor for many of these disease conditions.

In Singapore, obesity prevention and management efforts are largely coordinated by the Health Promotion Board (HPB), a statutory board under the purview of the Ministry of Health (MOH). The HPB leads national health promotion and disease prevention programs to help Singaporeans attain optimal health throughout life.

### Extent of overweight and obesity in Singapore

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The prevalence of obesity (body mass index [BMI] ≥ 30 kilograms per square meter [kg m⁻²]) among Singapore residents aged 18–69 has increased steadily from 1992 to 2010, and it currently stands at 10.8% [2]. The prevalence of obesity is higher in males (12.1%) compared with females (9.5%). Among ethnic groups, obesity is most prevalent in Malays (24.0%), followed by Indians (16.9%) and Chinese (7.9%). While Singapore's obesity rate
is lower than that in many developed countries [3], it is still a concern, as 40.1% of the population is overweight (BMI ≥ 25 kg m\(^{-2}\)) (see Table 1).

Table 1. Prevalence of overweight and obesity among Singapore residents aged 18–69 from 1992–2010

| Condition                        | 1992 | 1998 | 2004 | 2010 |
|----------------------------------|------|------|------|------|
| Overweight (BMI ≥ 25 kg m\(^{-2}\)) | 21.1%| 24.4%| 25.6%| 29.3%|
| Overweight (BMI ≥ 30 kg m\(^{-2}\)) | 5.1% | 6.0% | 6.9% | 10.8%|

Obesity starts in childhood and tends to persist in adulthood. The estimate is that approximately three-quarters of children with obesity will continue to suffer from the condition during adulthood [4]. The overweight and severely overweight prevalence in Singapore has increased over the past few decades. In 1976, the prevalence of overweight and severely overweight was 1.4% for primary 1 students, and it increased ninefold to 12.7% by 2006. This was defined as body weight more than 120% of the standard weight for height, using weight-for-height norms [5]. Similarly the overweight and severely overweight prevalence was 2.2% for primary 6 students in 1976, and it increased sevenfold to 15.9% in 30 years. The prevalence of overweight and severely overweight among schoolchildren in mainstream schools from primary to pre-university levels in 2011 was 11% based on BMI-for-age norms [6].

Energy intake through food consumption and energy expenditure through physical activity are two major factors influencing weight gain. In 2010, about 6 in 10 Singapore residents aged 18–69 consumed excess energy, and the average intake of calories and fat have increased by 10 and 20%, respectively, since 2004 [7]. These increases may be the result of an increase in meals consumed out of the home. In terms of physical activity, 4 in 10 Singapore residents aged 18–69 did not meet the recommended minimum of 30 min of moderately intense activity on 5 or more days a week in 2010 [2]. For students in the mainstream schools from primary to pre-university levels, the Students’ Health Survey 2009 found that only a fifth consumed at least two servings of fruits and vegetables every day and a tenth were physically active for at least 60 min on 5 or more days a week [8]. These findings showed that more can be done to promote healthy eating and regular physical activity among the general population in Singapore. This would require that Singapore move beyond health education at the individual level to promote health at an ecosystemic level, as obesity is not just a matter of personal choice but is also affected by environmental and social factors [9]. Singaporeans consume more high-energy and low-nutrient food partly because it is produced, priced and marketed accessibly and attractively. By the same token, the physical activity level is not as high as it should be partly because of the way society is now organized, including building designs that encourage the use of elevators rather than stairs, the widespread reliance on cars, and the overwhelming demands of studies and work, among others.

**Key obesity prevention and management strategies**

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With obesity originating early in life, the HPB has adopted a life-cycle approach to the issue. This approach is anchored on key strategies of obesity prevention and management, including health-promoting public policies and guidelines; capacity building and empowerment; ecosystemic changes to make the healthier choice the preferred choice where people live, study, work and play; and collaborative partnerships that bring together the public, the people and the private sectors of Singapore.

Development of health-promoting public policies and guidelines

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Guidelines on nutrition and physical activity for the population have been developed by the HPB to provide the public and professionals with practical information on the nutritional needs and physical activity recommendations in the different life stages. As part of the broader effort to prevent and manage childhood obesity, the HPB is developing guidelines for food advertising directed to children. Evidence shows that food marketing influences children's food preferences, purchase requests to parents, food choices and consumption patterns [10-14]. In Singapore, advertisements are guided by the Singapore Code of Advertising Practice (SCAP), which is administered by the Advertising Standards Authority of Singapore (ASAS). Whereas the SCAP currently regulates the types of advertisements that can be directed to children, there is no specific regulation of children's exposure to unhealthy food advertisements other than discouraging confectionery and snack foods as a replacement for main meals [15]. In line with the World Health Organization (WHO) recommendation of restricting food marketing to children [16], Singapore is reviewing its
standards for advertising directed to children of food and beverage products high in fat, sugar or salt. An online public consultation exercise was conducted in late 2012 to gather public feedback on the proposed strengthening of guidelines on food advertising directed to children. Responses from the public overwhelmingly supported introduction of restrictions on food advertising to children. The MOH, the HPB and the ASAS are currently working out the details of the guidelines for food advertising directed to children [17]. The HPB is also leading an expert committee to update the Clinical Practice Guidelines (CPG) for obesity, which will provide guidance to health professionals on the management of obesity in Singapore.

Shaping healthier habits among the young

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In 1992, the Ministry of Education introduced the Trim and Fit Program in Singapore's schools. The programme for students in the mainstream schools from primary to tertiary levels aimed to reduce the overall prevalence of overweight students and improve the physical fitness of students [18]. Special attention was given to students found to be overweight/obese. For instance, in schools, they were required to participate in special physical activity programmes, and messages on healthier dietary choices were reinforced. The Trim and Fit Program was successful in decreasing the overweight prevalence and improving the physical fitness levels – the overall percentage of overweight students decreased from 11.7% in 1993 to 9.5% in 2006 (based on weight-for-height norms), and the overall percentage of students who passed the physical fitness test rose from 61.5% in 1993 to 80.8% in 2006 [9]. Despite these successes, concerns about the potential stigma faced by overweight/obese students led to a review of the Trim and Fit Program in 2005. In its place, the Holistic Health Framework was formally established in 2007. The Holistic Health Framework was introduced to broaden health promotion beyond obesity and fitness management by embracing the total well-being of students and developing their intrinsic motivation to lead a healthy lifestyle [19]. The key strategies undertaken to shape healthier habits among the young include: shifting health promotion efforts upstream, building supportive health promoting environments in preschools and schools, and providing preventive health services for at-risk students.

Shifting health-promotion efforts upstream

Moving upstream is important when it comes to obesity prevention and management, as research has shown that obesity and many chronic conditions originate in the prenatal phases of life [20]. Expectant mothers who take care of their health lay an early foundation for a healthy lifestyle for their babies. The HPB has thus moved its health promotion efforts upstream with the Healthier Child, Brighter Future initiative, an early preventive health
strategy aimed to shape healthy lifestyles for the young from the time of pregnancy. The HPB has developed a tool kit in collaboration with the nine local hospitals with obstetric services to empower parents-to-be and parents to maintain healthy pregnancies and raise healthy children from the early developmental to the preschool years, thereby helping to give these children a healthy head start in life. These resource guides are also available on the HPB website [21-23]. In addition, the HPB conducts workshops and culinary training to equip parents and caregivers with knowledge and skills to positively shape the eating and physical activity practices of their children.

Building supportive health-promoting environments in preschools and schools

The Championing Efforts Resulting in Improved School Health (CHERISH) initiative, modeled after the WHO Health Promoting Schools framework, provides the backdrop against which health-promoting environments are put in place in educational settings in Singapore. The CHERISH initiative guides educational institutions on how they can design appropriate systems, processes and structures to distinguish themselves as settings that promote the health and well-being of their students and staff. The framework was also recently brought upstream to the preschools and was coined CHERISH Junior.

Healthy canteen programs at educational institutions

As part of this initiative, the HPB has developed numerous healthy canteen programs (e.g. Healthy Eating in Childcare Centres Program, Healthy Meals in Childcare Centres Program, Healthy Eating in Schools Program, Health Promoting School Canteen Program, and Healthy Canteen Program) to help educational institutions from preschool to tertiary levels develop health promoting environments that foster healthy eating, thereby allowing students and staff in these institutions to have convenient and easy access to healthier food and beverage options. One such program, the Health Promoting School Canteen (HPSC) Program for mainstream schools, requires that participating schools comply with a set of food service guidelines and serve healthy set meals. These healthy set meals incorporate the appropriate proportions of food from the four main food groups – rice and alternatives, meat and alternatives, vegetables, and fruit – thereby ensuring that when students consume meals in schools, they receive the nutrients necessary for their growth. Culinary training and individual consultations with nutritionists and professional chefs are provided for canteen vendors. The canteen vendors are advised on menu planning and are trained in healthy cooking methods. They are also taught how to prepare healthier ingredient choices, such as brown rice, and the appropriate portions of food for the students. A wide range of health education resources (such as murals, posters, and footprint floor stickers) are provided to participating schools to reinforce the messages on healthy lifestyle and obesity prevention. Outreach efforts to teachers and parents and caregivers are also undertaken so that they can complement the HPB's efforts in promoting healthy eating. An evaluation of the HPSC Program conducted among a sample of four primary schools found that it contributed to an increase in the knowledge about and consumption of fruits and vegetables among the students – the proportion of students who were aware of the daily recommended number of servings of fruit and vegetables increased from 42% in the pre-programme survey to 72% in the post-programme survey, and the proportion of students who consumed the daily recommended number of fruit and vegetables increased from 31% to 52% during that period. In view of these positive results, the HPB will be rolling out the program to more mainstream schools in a phased approach. The intention is to reach all mainstream schools by 2016.

Promotion of physical activity in preschools

To promote physical activity, the HPB has recently developed a new set of National Physical Activity Guidelines for Children and Youth. The physical activity recommendations for children aged less than 7 years are as follows: children who are capable of walking unaided should be physically active for at least 180 min spread throughout each day in safe environments, and total sedentary entertainment screen time should be limited to less than 2 h per day. The HPB is working with anchor operators of preschools to help young children in full-day child care centres to achieve 180 min of physical activity each day and those in half-day kindergartens to achieve 90 min of physical activity each day. To support preschool educators in engaging the children in physical activity, the HPB provides a resource kit with lesson plans on physical activity, physical activity break ideas, fun dance DVDs, and an educators' booklet on physical activity, among other items. In addition, the physical activity criteria in CHERISH Junior have been enhanced to assist preschools in establishing supportive health-promoting policies and environments and providing opportunities for physical activity for the children.

Promotion of physical activity in mainstream schools
In the mainstream schools, students have the opportunity to engage in physical activity through physical education (PE) lessons, sports and games in co-curricular activities (CCAs), and the Sports Education Program. In Singapore, CCAs are an integral part of the students' holistic, well-rounded education. In secondary schools, every student takes part in one CCA taken from the following options: (i) Sports and Games, (ii) Uniformed Groups, (iii) Performing Arts Groups and (iv) Clubs and Societies. Students may also participate in a second activity. In particular, students who are not involved in competitive sports (e.g. students in CCAs such as performing arts and clubs) are encouraged to take up sports and games as their second CCA. The Sports Education Programme is jointly administered by the MOE and the Singapore Sports Council (SSC) to provide students with more opportunities to learn to play one or more sports coached by specialists.

To promote a strong interest in physical activity and sports among the young, the MOE has recently increased the time in the curriculum allotted to PE in the mainstream schools (the increase will range from 0.5 to 1.5 h per week); has begun to enhance sports facilities in schools, such as building indoor sports halls; and has stepped up the recruitment of PE teachers. Schools are given until 2017 to put in place the revised PE curriculum time in view of the need to pace this with the availability of resources (facilities and manpower). The HPB complements the efforts of the MOE and the schools with educational resources that raise awareness of the importance of regular physical activity and that empower students to lead an active lifestyle.

### Providing preventive health services for at-risk students

#### Preventive health services offered by the Health Promotion Board

Students who are severely overweight are referred to the HPB's Student Health Centre for medical assessment to exclude any medical comorbidities. At the same time, individualized lifestyle counseling in nutrition and physical activity are offered to these individuals and their parents and caregivers. Interactive programs equip these students with knowledge and skills to positively reshape their eating and physical activity practices. These children are then regularly reviewed to monitor their growth and weight status.

#### Student health adviser program

In 2010, following the deliberations of an expert committee convened by the MOH to enhance the state of adolescent health in Singapore, the HPB piloted the Student Health Adviser (SHA) Program in eight secondary schools selected for their high obesity rates. The SHA Program is intended to provide a focal point for health promotion, lifestyle counseling, and early opportunistic identification of high-risk behaviours and health problems (e.g. obesity) in the school setting. The advisers deployed in the pilot program are nurses trained to manage adolescent health issues. The evaluation of the 2-year pilot SHA program yielded encouraging results. During this period, about a quarter of the severely overweight students lost weight. In addition, feedback from the students revealed that many found the initiative useful for improving their health and that they felt comfortable approaching the SHAs for help on health-related matters. About three-quarters of the school staff members also indicated that they would like to continue the SHA Program in their schools, as they had seen the above-mentioned positive impact on their students. In view of the encouraging results, the HPB will be introducing the SHA Program to more schools in phases, with priority accorded to schools identified by the MOE as having a high obesity rate to ensure optimal use of resources.

### Making healthy living more convenient and accessible

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The National Healthy Lifestyle Program (NHLP) was launched in Singapore in 1992 to focus on health promotion and disease prevention in order to address the common risk factors for chronic diseases [9]. The NHLP focused on four healthy lifestyle pillars: being physically active, eating right, not smoking, and managing stress to combat chronic diseases and their risk factors. Annual NHLP campaigns were organized, and the campaigns frequently focused on the importance and benefits of physical activity and healthy eating. From the focus of the earlier years, whereby the role of the individual in safeguarding his/her own health was emphasized, efforts have since expanded to make healthy living more convenient and accessible, and an unconscious choice through introducing changes in the social and environmental context in Singapore.

Making healthier choices accessible and affordable

With half of Singapore residents eating at hawker centres at least once a day [7], the HPB introduced the Healthier Hawker Program to encourage hawkers to prepare their signature dishes using healthier ingredients (e.g. healthier oil, reduced-sodium salt, whole-grain noodles, and brown rice). This reflects a shift in approach from recipe modification (which has met high resistance due to the cultural and ethnic value associated with hawker foods) to targeting the ingredients.

Since its launch in April 2011, the program has been extended to 12 hawker centres (10% of the centres). The HPB embraces a ground-up, whole-of-Singapore approach in this initiative. It works extensively with local grassroots organizations and the National Environment Agency (NEA) (which enforces food hygiene) to engage and secure acceptance from hawkers. The HPB also helps manufacturers develop healthier ingredients and facilitates the supply of these ingredients to hawkers at competitive prices through shared marketing and delivery services developed by leveraging on productivity schemes offered to small and medium enterprises. Participation in this program ranges from 90% to 35% of the stalls in the different hawker centres and coffee shops. In addition to direct marketing to hawker centres, the HPB works through centralized kitchens that supply volume catering and food court chains to incorporate procurement of healthier ingredients as part of their tenancy agreements. Suppliers of the healthier ingredients have reported an average 30% increase in the volume of ingredients ordered.

The HPB also collaborates with the food industry to influence the food supply. The Healthier Choice Symbol (HCS) program offers consumers an easily recognizable label that identifies foods lower in calories and fats. A multi-sectorial collaboration among the HPB, SPRING Singapore, the Singapore Food Manufacturers' Association (SFMA) and others is aimed at encouraging food manufacturers to produce healthier foods. SPRING Singapore is an agency under the Ministry of Trade and Industry responsible for helping Singapore enterprises grow and building trust in Singapore products and services. There are currently 3,000 HCS products across 75 product categories, and sales of HCS products are growing at an average rate of 5% every year. Consumption of HCS products has been associated with better diet quality. Data from a Two-Day Dietary Study by HPB in 2010 showed that individuals who consumed HCS products were half as likely to exceed the recommended intake of saturated fat (OR = 0.55; 95% CI = 0.34–0.89) and more than twice as likely to meet dietary recommendations for calcium (OR = 2.54; 95% CI = 1.21–5.34) than individuals who did not consume any HCS products, after controlling for age, gender, ethnicity, education level, monthly household income group and energy intake.

Encouraging active living anytime, anywhere

Among the commonly cited barriers to physical activity is lack of time. In 2011, the HPB developed a new set of National Physical Activity Guidelines aligned with the WHO recommendations to weave physical activity into daily living (e.g. daily commuting on foot). The Singapore Mass Rapid Transit (MRT) system has an average daily ridership of over 2 million, with 88 stations across the country [24], thus providing a strategic environment to induce more physical activity and increase energy expenditure. One tactic is to encourage the use of stairs [25]. A study conducted by
the HPB found that visual cues in MRT stations increased the mean number of people using the stairs by 49% compared with the period before the cues were put up [24]. However, after the banners were removed, the number of stair users dropped to baseline levels, suggesting a role for prompts to initiate and sustain behaviour change. In view of the results, the HPB is currently working with transport service providers to incorporate point-of-decision prompts in MRT stations to encourage the use of stairs by commuters.

There is also a growing partnership in the public sector, such as the National Parks Board (NParks) and the Singapore Sports Council (SSC), to promote physical activity in the built environment through creation of thematic walking trails and park connectors and by developing community exercise facilities.

Mobilizing a social movement

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Mobilizing communities and workplaces to influence healthy lifestyles

With 66% of the population employed in the workforce [26], workplaces are opportunistic yet effective settings to address the issue of obesity among the working population. Through its Workplace Health Promotion (WHP) program, the HPB offers grants for workplaces to invest in health promoting efforts targeted at obesity and other priority areas. Currently, 57% of the workplaces participate in WHP initiatives, and 46% of these are in obesity-related efforts. This includes working with service providers to introduce initiatives, such as iRun, which offers free weekly running sessions to the public. Professional trainers are at hand to impart tips on how to improve cardiovascular fitness through running. Fitness@Work aims to galvanize busy working adults into incorporating regular physical activity as part of their daily lives. It comprises an hour-long weekly workout session specially choreographed to suit people with different fitness levels. Sunrise in the City serves to complement HPB’s evening initiatives such as iRun and Fitness@Work by offering working adults the opportunity to partake in fun workout sessions such as yoga, brisk walking, jogging and multi-dimensional stretch in the mornings before they head to work and provide opportunities for working adults to engage in fun workout sessions near their workplaces before they start the day or after work.
In the community, the HPB has worked with local politicians and grassroots organizations to promote healthy living. Various opportunities for social bonding while being active have been developed, such as brisk walking clubs (700 island-wide), health qigong clubs (411 island-wide), dance fitness clubs (72 island-wide) and tai chi clubs (112 island-wide). These groups combined have at least 130,000 active members.

Tapping on social network and support to drive behaviours

Recognizing that social networks and support facilitate behaviour change, the HPB has developed the Interactive Diet and Activity Tracker (iDAT), an online and smart phone application that provides real-time feedback about diet and physical activity. Since its launch in November 2011, it has garnered 50,000 downloads, with 20,000 active users tracking their workouts online and interacting with other users regularly, providing high-reach, low-cost support to reduce sedentary time and increase physical activity. Plans are underway for a 6-month challenge that includes accessible weigh-in stations across the island, a virtual platform with information on community programs, and a social network community allowing users to interact. Incentives earned for participating in weigh-in and community programs and recording diet and physical activity on iDAT will help sustain interest in the longer run.

Clinical management of the obese and the severely obese

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Population-based interventions are intended to help all Singaporeans manage their weight, yet more targeted, individualized assistance is required to help those who are already overweight or obese (BMI ≥ 25) achieve a healthy weight. The HPB offers the 12-week Lose-to-Win holistic program, a safe and scientifically sound approach to weight loss. Even here social structures are leveraged to spur people towards their weight loss goals: participants are organized in groups to offer peer support, and weekly sessions are conducted at community venues within convenient reach.

The HPB also partners with four restructured hospitals to offer subsidized weight management programs for the severely obese (BMI > 37.4), who often have associated medical complications that require more intensive clinical supervision. For the morbidly obese, these hospitals may offer surgical interventions.

Forward strategies and action plan
Positioning obesity as a national priority

Obesity is a complex issue that requires the concerted efforts of many sectors beyond the health sector. This requires closer interagency public sector collaborations to support and provide resources for obesity prevention and management efforts. For example, the HPB, the MOE and the Institute of Technical Education (ITE) plan to deepen their engagement to prevent and manage obesity, especially among those in the lower socioeconomic strata (SES) of society, as the burden of obesity has been found not to be uniformly spread across the population. ITE was established as a post-secondary education institution in 1992 under MOE. ITE is a principal provider of career and technical education and key developer of national occupational skills certification and standards in Singapore. A significant connection between obesity and lower SES has been observed in Singapore. In 2009, the rate for overweight and severely overweight was 10% in primary schools and 10% in secondary schools and ranged from 6% in junior colleges and centralized institute to 23% at the ITE [27]. In addition, while the rate of overweight and severely overweight among students in the mainstream schools has remained relatively stable at approximately 10% in the past decade (2000–2009), the rate among ITE students rose from 18% in 2005 to 23% in 2009. Feedback from the ITE suggests that a significant proportion of the student population may be from the lower strata of household income, as many ITE students work part-time, some to fund their educations, some to earn extra allowance or to supplement the family income. The polarization of at-risk behaviours and less positive health conditions towards the lower and middle strata of society [28] underscores the need for equity in health promotion efforts, including targeted health promotion efforts to prevent and manage obesity among ITE students.

Beyond the public sector, the people and the private sectors need to be more aggressively engaged too. In view of this, the HPB will continue to engage the food industry to formulate healthier choices by making a business case for healthier foods to improve availability. Currently, more than 90% of all food consumed in Singapore is imported, thus the country is heavily dependent on the nutritional quality of food sold in the global market. To mitigate this, the HPB is collaborating with SPRING Singapore and the SFMA to build the local food manufacturing industry with the goal of developing healthier food products. At the same time, the potential for exporting these healthier products to a regional and even a global audience is a compelling proposition for the food industry.

The HPB will also fuel the spirit of an active citizenry through its Health Ambassador Network to inspire and support individuals in their journeys towards healthy lifestyles. Currently, the HPB has recruited about 5,000 health ambassadors who proactively share tips on healthy diets and exercise with their families, friends and neighbours. The HPB aims to grow this pool of ambassadors. This whole-of-Singapore approach will help reinforce the position of obesity as a national priority.
Incentivizing healthy behaviour changes

The HPB will launch a personalized healthy lifestyle tracking system for individuals to ascertain their lifestyles, especially in the areas of nutrition and physical activity, to achieve a healthy energy balance. Plans are underway to complement this tracking mechanism with an incentives scheme, where individuals who demonstrate efforts to adopt healthy lifestyle practices will be rewarded with a slew of incentives pegged to their personal levels of achievement. For the longer term, iDAT, the Quick Response (QR) app, health kiosks, walking trails and point-of-decision cues provide sustainable tools and interventions that can be used across various health promotion programs and by various sectors to continue to improve the health and well-being of the people in Singapore.

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None.

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