Strategies for the War on Diabetes:

A Citizens' Jury Report 2018

Foreword

On 25 November 2017, a group of 76 Singaporeans gathered together to form the first ad hoc Citizens' Jury of Singapore. Over an 8-week period, the Jury met for 4 sessions. During these sessions, the Jury heard from experts, formed and pitched ideas, and debated the merits of these ideas. In between sessions, they extensively researched, gathered on-the-ground data, and developed collaterals. This report, written by the jurors, is the summation of their efforts.

Chapter 1 - Defining the Problem

In Singapore

In a 2010 report by the National Registry of Disease Office, diabetes (type 1 and type 2 combined) accounted for 10.4% of the total disease and injury burden in Singapore, affecting 1 in 9 Singapore residents between age 18 to 69. In 1998, this figure was 1 in 11.

This increase has occurred across all ages, genders, and ethnic groups, and is expected to rise further due to our ageing population, and to more people getting screened.

Type 2 diabetes, which accounts for nearly 90% of diabetes cases in Singapore, is a metabolic disorder characterized by resistance to insulin that results in chronically high blood sugar in the body. Left untreated, the condition can result in severe complications, including heart disease, stroke, blindness, kidney failure, and poor blood flow to limbs that can lead to sores, infections, and amputations.

Today, diabetes in Singapore is higher than the world average. We also have one of the highest diabetic amputation rates, with an average of 4 lower extremity amputations daily.[1]

Globally

Worldwide, the prevalence of type 2 diabetes has soared from 30 million diagnosed cases in 1985 to about 382 million in 2014. The International Diabetes Federation estimates that by 2035, nearly 600 million people could be affected by this disease.

In 2014, an additional 316 million people globally had "pre-diabetes" (i.e., impaired glucose tolerance, impaired fasting glucose). The majority of these individuals do not exhibit symptoms and therefore elude diagnosis. However, 40% of these "pre-diabetics" end up progressing to develop full fledged diabetes within 5 to 10 years.[2]

The Trend

In the past, type 2 diabetes was referred to as "adult-onset" diabetes, and this disease was more prevalent among older people in developed economies. But its demographics are changing rapidly. Today, type 2 diabetes afflicts adolescents and even children, and its spread is more global.

Type 2 accounted for less than 3 percent of all diabetes cases in adolescents in 1990, but that share had risen to 45 percent in 2005.[3] Insulin resistance progresses faster in younger people than older people, and they also suffer earlier with more diabetes related complications such as kidney failure, blindness, and heart disease.[3]

About 80% of the growth in prevalence projected between now and 2035 is expected to be in developing economies, reflecting rapid economic growth, rising incomes, and the adoption of western lifestyles.[4] Other factors include genetic susceptibilities, socioeconomic disparities and access to healthcare.

The Costs

The United Kingdom spends around 10% of its total NHS budget on treating diabetes. The vast majority of this spending (80%) is specifically for treating the complications resulting from poorly managed diabetes.[5] These are costs that could be reduced with better management through lifestyle changes, education, and adherence to dietary, physical activity, medication, and monitoring recommendations.

The burden on healthcare systems is rising fast. It has been estimated that diabetes currently accounts for 12% of global healthcare costs, somewhere between $376 billion and $672 billion.[6]

This does not take into account the larger cost, which is the loss of economic productivity through the loss of productive life years. As this epidemic continues, it will increasingly put pressure on employers and the productivity of their companies, on healthcare system, and on government budgets.

The Complexity

The root causes of diabetes are highly complex, and include genetic, biological, sociological, economic, psychological, and environmental factors. While there have been many proposed hypotheses, the actual biochemical mechanism of developing diabetes is still unconfirmed.

Studies find that a mother with a high BMI will more likely deliver a fetus with a compromised metabolism and a resistance to insulin.[7] And the eating habits of parents are often passed on to children at an early age.[8]

There is also the "thrifty phenotype hypothesis" which states that fetal undernutrition during pregnancy is a risk factor to development of diabetes later in life.[9]

Over the last few decades, eating, activity, and lifestyle habits have changed dramatically across the globe. Throughout the vast majority of history, food insecurity and scarcity was the norm. And to obtain food, a great deal of physical labour and energy usually had to be spent.

Today, we live in an age where there is an abundance of calorie dense foods that are obtained with less physical labour, allowing a sedentary lifestyle, and a proliferation of processed foods and nutritionally deficient foods. And it is the calorie dense and nutritionally poor foods that have become very inexpensive. In the 1900, Americans spent 42% of their household income on food, compared to just 13.5% in 2003.[10]

In a Chinese study, the push toward urbanisation has reduced energy expenditure by 300 to 400 calories per day. In that same study, travelling by car or bus instead of walking or cycling reduced energy expenditure further by 200 calories.[11]

There has also been a cultural and societal shift toward seeking more comfort and less physical labour, as manual labour is viewed as menial. Celebrations are commonly centered around food, pleasure, and enjoyment. Tasty, but not necessarily nutritious, foods are often used to incentivise, punish, or coerce children. Therefore, from an early age, we have developed a psychological relationship with certain types of food, which may be unhealthy.

We also are surrounded by constant stressors, marketing advertisements, and unnatural living environments. Our ancestors were more directly connected with their environment. The environment then was also more clean, and less polluted and contaminated. Their soil was less depleted.

Today, we have more chemical pollutants and hormone disruptors in our environment. Our bacterial ecosystems have also shifted with the use of pesticides and antibiotics in farming and livestock. The environment, through epigenetic changes, may impact our susceptibility to chronic diseases. And there are still many more factors yet to be discovered.

Chapter 2 - What to Do About It

The Scope of This Report

Firstly, we need to recognise that this is a complex topic which requires a multifaceted, comprehensive, and systematic approach. No single solution will suffice. Multiple interventions will have a larger impact than any one single intervention alone.

As such, the interventions must include all stakeholders, from patients, healthcare providers, and healthcare administrators to employers, school administrators, educators, the health promotion and fitness industry, food manufacturers, food retailers, restaurant operators, the media, and the government. Together, their efforts will be more effective and create a reinforcing environment to support an individual's behavioural change, and an overall shift in the cultural and societal norms.

Because the topic of diabetes is broad and there are still many aspects that are unclear, this report is likely to evoke disagreements and controversies. Even among the jurors, there were stark disagreements. And it is likely that in the future, as more is discovered, recommendations will have to be reviewed and revised.

The Key Takeaways

Education and encouraging personal responsibility are necessary but by no means sufficient.

A mix of interventions which address conscious choices (e.g., relying on the individual to use willpower, and take responsibility and action) and subconscious choices (e.g., environmental cues, social norms, barriers/access, convenience/inconvenience, cost, presentation of information, cues from advertisement and packaging, etc.) is needed.

Additionally, in order for habits to develop and behavioural change to be sustained, the environment of the individual must be restructured. This increases the likelihood that the individual will maintain healthy behaviors since the perceived effort is minimal.

Singapore's population is also diverse in age, health knowledge, physical fitness, socioeconomic status, education, personal motivation, and health status. Thus, these interventions must address the various population segments in multifaceted ways and be deployed at all levels of society.

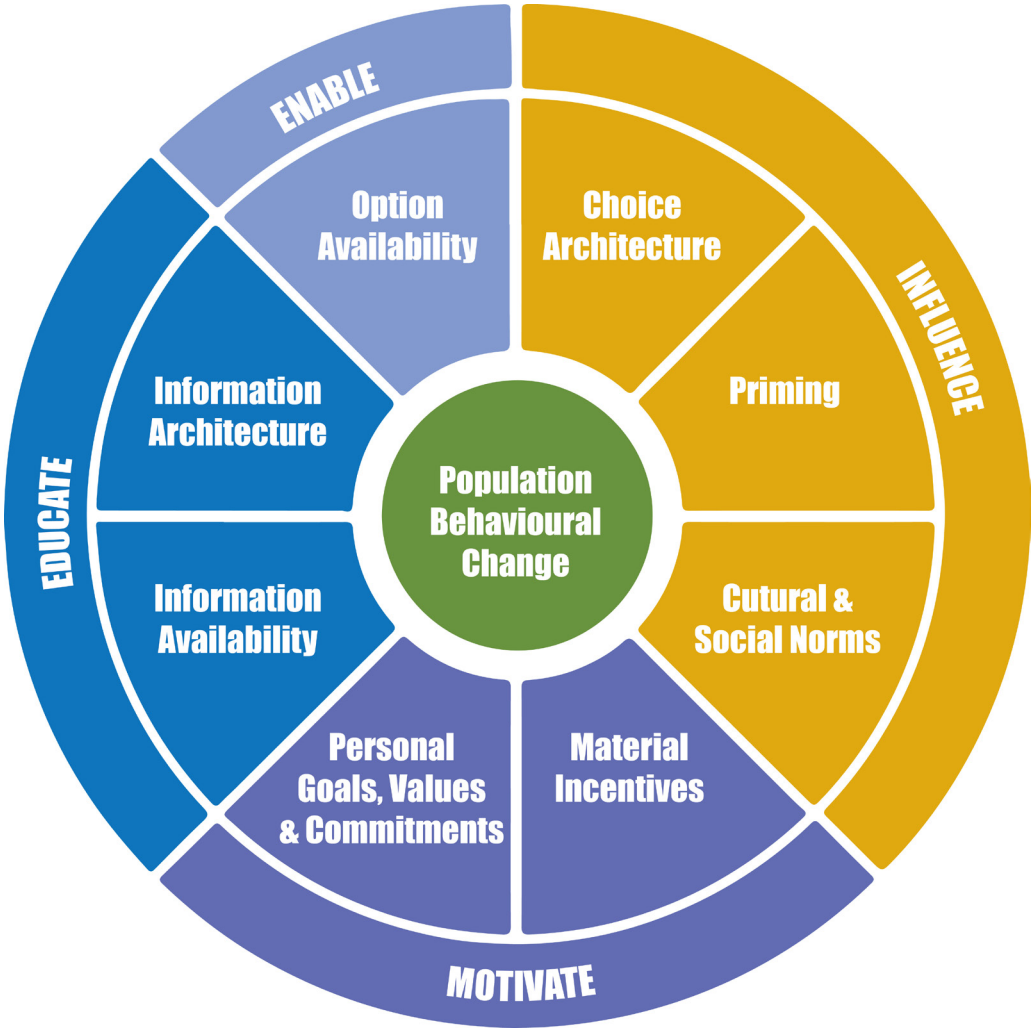
The ultimate goal is for these interventions to reset the default thinking and understanding of what it means to live a good life, and for healthier lifestyle choices to become the norm. The interventions must also be long-term, sustainable, synergistic, and self-reinforcing.

More can be done to prevent and manage diabetes, and fill the gaps within the current system.

The Framework

We adopted a framework from which to present our findings. This framework is an adaptation of various behavioural change models and closely resembles that produced by McKinsey Global Institute.[12] This framework categorises the mechanisms for behavioural change into four types: mechanisms that educate, enable, motivate, and influence.

With respect to this model, we present our findings of 11 major groups of interventions for the purpose of diabetes prevention and management. A summary overview shows how each intervention fits within the overall framework. This is followed by a more detailed discussion of each intervention.



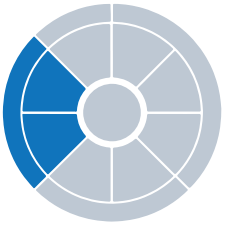
"Educate" includes whether information is made available, how it is communicated, where it is accessible, and to whom is the relevant target audience. The efficacy of messages highly depends on its delivery, which can be enhanced through thoughtful information architecture, evocative and memorable design campaigns, use of multi-sensory (e.g., colour, sound, etc.) components, and other marketing strategies. It's also crucial to understand the target audience, their pain points, their attitudes and perspectives, and their thought processes. Different groups respond differently to stimuli, so it is necessary to understand the various demographic personas and target messages accordingly.

"Enable" aims to make positive behavioural changes easy through option availability and choice architecture. Conversely, creating more obstacles and inconveniences makes bad behaviour less likely. For example, additions of covered walkways may encourage more walking. More vegetable and fruit choices in hawker stalls might encourage more consumption of these foods. Making diabetes screening easy and quick may result in more people getting screened. Conversely, limitations of ice cream flavours at Fairprice Online may result in fewer purchases. A higher tax and more banned places for smoking may result in fewer smokers.

"Motivate" attempts to encourage people consciously to make positive behavioural changes. These are often done with an individual's own values, beliefs, and drives in mind. Goal setting, making commitments, using commitment devices, financial incentives, and non-financial incentives are all examples of conscious motivation techniques.

"Influence" is the largest of the 4 mechanisms, as the recent emergence of behavioural economics highlights the irrationality of decision making and the powerful effects of subconscious priming, intrinsic beliefs, and societal pressures which nudge a person to a certain conclusion. In many instances, the individual is unaware of these influences. Choice architecture is how choices, standards, and defaults are presented. Priming exposes individuals to cues that affect judgment, perception, and decisions. Lastly, research shows that changes in social norms were at least as important as shifting individual behaviour.[13]

Description of the 11 Intervention Groups



1. Education & Awareness (for General Public)
Public outreach engagement programmes. Inclusion of the at-risk solitary, elderly, and illiterate groups through face-to-face interaction.

2. Education & Awareness (for Healthcare Provider)
ADES to assume a supervisory role over diabetic education provided by all diabetes educators.

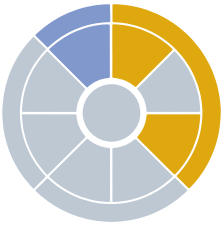
3. Education & Awareness (for Children & Schools)
Diabetes awareness campaign & curriculum for children. Re-examination of the Healthy Meals in Schools Programme and a push for wider adoption.

4. Education & Awareness (Peer-to-Peer & Community-Based)
Peer interventions to be expanded in number. Consolidation of diabetic educational and group facilitation materials, and links to support resources.

5. Labelling & Guidelines
Introduction of the "Go Green Guide", a traffic light system of labelling which foods to have more of and which to have lesser of.

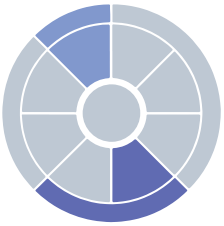
6. Advertising & Mass Media
Limits on fast food and snack food advertisements. Celebrity/mascot endorsements for healthier foods. Limits on promotions of nutritionally poor foods. Strategic counteradvertising to promote healthy foods.

7. Physical Activity and Exercise
QR code or scanner to encourage stair climbing, earning Healthpoints or travel rebates as an incentive.



8. Food Environment (at Hawker Centres & Food Courts)
More plain water, less sugary drinks campaign. Promotion of the My Healthy Plate guidelines. A "Healthy Hawker Centre" competition. Ratings & feedback to hawkers.

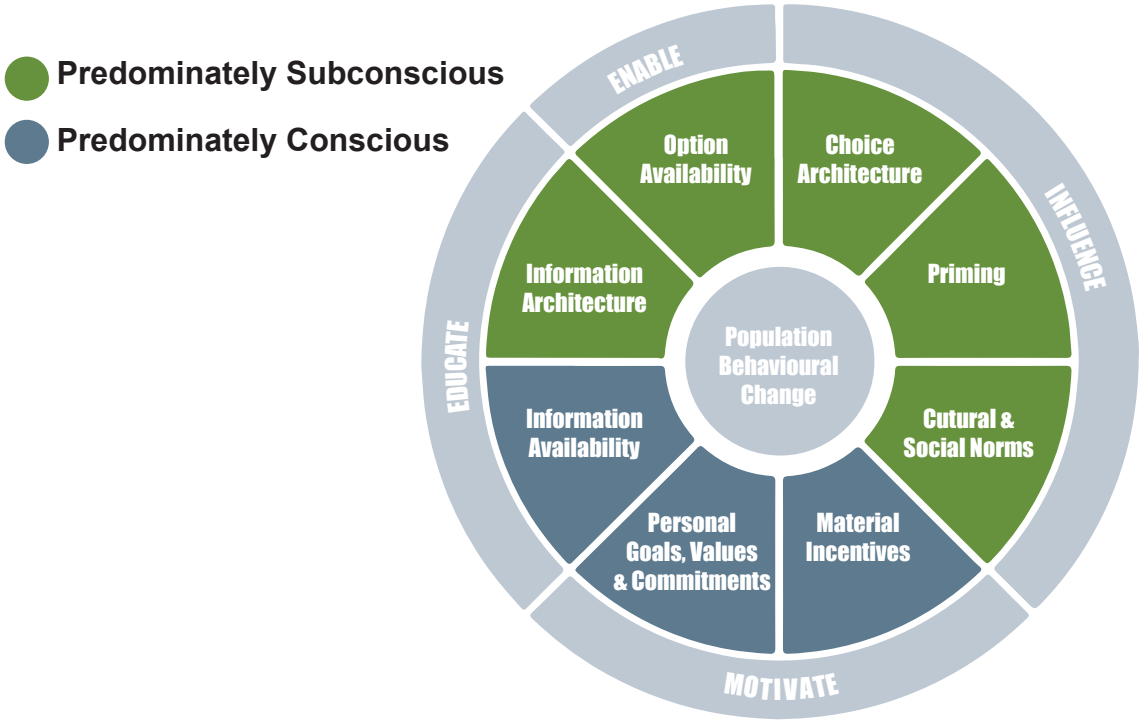
9. Food Environment (at Home)
Expand, popularise, and collaborate with existing organisations offering cooking classes. A "Healthy Food Preparation & Cooking" competition.



10. Medical Care Costs
Raise Medisave-claimable amount for CDMP to $750. A rewards system or incentive scheme on outcome-based and process-based indicators.

11. Motivationally Targetted
Communication focused Diabetic Care Clinic, with the emphasis on effective communication techniques. Adoption of a patient outcomes focused model of funding. Expand the SAC to encompass clinical communication and chronic disease counselling. Repository of all registered interventions on a central health platform like HealthHub.

The framework can also be grouped by mechanisms that are predominately conscious, where the individual must use willpower, participate or engage with an action; and subconscious, where imperceptible changes in the individual's environment steer an action.



In general, interventions that rely mostly on the individual's knowledge and willpower to make a positive lifestyle change are more resource intensive and the impact is of shorter duration. In contrast, interventions that rely on the external environment, access and availability of options, and social norms tend to be longer lasting. They also tend to be more cost effective and far-reaching, as they affect the society as a whole.

Voting

The Jury decided that ideas needed 80% endorsement to be included in this report. Those that did not meet this threshold would be moved to a "minority report" (See Appendix A). Recommendations were voted on after 5-minute pitching sessions. Some related ideas were consolidated to simplify the pitching and voting process.

The precise details as to why an idea was dismissed was not discussed as a group. Some possible reasons why certain ideas did not garner enough support include issues with the level of detail, feasibility, implementation, or supportive evidence. Some pitches were also not sufficiently clear or compelling to get enough buy-in.

Under each recommendation (or group of recommendations), the percentage of jurors who endorsed the idea is reported.

% endorsed

1. Education & Awareness (for General Public)

Background

Results from an informal survey (175 responses) conducted by Jury members identified that 60.8% of respondents would like to know more about diabetes prevention and management, if the information were easy to understand and accessible.

Although many initiatives have been implemented to combat the "War on Diabetes", the engagement level among citizens is still low. Those who choose not to participate often cite reasons such as lack of time, inconvenience, and lack of accessibility (e.g., too far to travel). Hence, our ideas centred around ways to mitigate these reasons by increasing the accessibility and convenience of education and awareness programmes.

In addition, the majority of informational leaflets and booklets on diabetes are in English. Although, many have been translated into Malay, Tamil and Mandarin, this still excludes those who are illiterate or speak only dialects. The information, thus, needs to reach this group by a different means.

Possible Solutions to Implement:

(1) **Public Outreach Programmes.** This face to face initiative is targeted at residents of HDB heartlands, and is to be held at HDB hubs, Senior Activity Centres, and Community Centres near residential neighbourhoods.

We propose the following flow of events: Upon arrival, organisers will administer a fasting, preprandial glucose test to participants. This will introduce glucometer usage skills to participants. During breakfast, participants are shown a short presentation on diabetes prevention and management. There will also be a range of educational activities stations (e.g., learn about My Healthy Plate and the National Steps Challenge™, simple exercises to do at home, healthy lifestyle planning, etc.), and information on peer and community groups. Lastly, a postprandial glucose test will be administered and interpreted. Goodie bags will only be given once all stations, including the postprandial test, have been completed. The goodie bags can contain diabetes-related information and products.

88% 

2) **Inclusion of the At-Risk Solitary, Elderly, and Illiterate Groups through Face-to-Face Interaction.** This initiative is targeted primarily at elderly Singaporeans staying in one-room flats, who may be immobile or illiterate and do not have easy access to information relating to diabetes. Currently, Lions Befriender's Befriending Services, funded by the Ministry of Social and Family Development (MSF), provides residential social and psycho-emotional support to socially isolated seniors (i.e., 65 years old and above). Meanwhile there are organisations who distribute food to this population (e.g., Lotus Light Charity Society, Willing Hearts) but give white rice, white bread, and some highly processed snack foods.

We propose incorporating more diabetic-friendly foods (e.g., mixture of white and brown rice, wholemeal bread, lower glycemic index (GI) snacks) and providing brief, simple, pictorial pamphlets on adopting healthier habits and accessing available subsidized screening. By leveraging on the trained volunteers of Befriending Services and meal distribution networks, there will be opportunities to educate residents on adopting a healthier diet face to face by using the revised meal as an example and the pamphlet as a guide.

89% 

2. Education & Awareness (for Healthcare Provider)

Background

Research on diabetes management and diabetes education is constantly and rapidly evolving, but the translation of this research into guidelines for healthcare professionals and diabetes education for non-professionals lags years behind. Additionally, the dissemination of medical guidelines into a single report has less impact on a healthcare professional's practice than having it portioned into smaller segments that can be rapidly assimilated and applied at the point of service. This concept of learning that is bite-sized and contextually provided on demand is also applicable to diabetes education for non-professionals (e.g., patients, peers, caregivers, community volunteers, etc.).

Possible Solutions to Implement:

(1) Expansion of the Responsibilities of the Association of Diabetes Educators Singapore (ADES) to assume a supervisory role over diabetes education provided by all healthcare professionals (e.g. doctors, nurses, allied health, counselors) and non-professionals.

Responsibilities would include the development of minimum standards and certification requirements. Currently, the Certified Diabetes Educator (CDE) programme is only intended for registered nurses. Additional training programmes should be developed with the aim to produce diabetes educators with different levels of expertise and proficiency (e.g., doctors to community volunteers) to cater to different sites of care (e.g., Specialty Outpatient Clinic, polyclinic, restructured hospital, community hospital, community centre, peer support meetup, etc.). Designated diabetes education training sites should be accredited and audited periodically.

In conjunction with the Endocrine and Metabolic Society of Singapore (EMSS), the ADES could contribute to the development and maintenance of publically available digital educational material including diabetes management guidelines and a core patient education curriculum, both of which would be portioned into small segments, available on demand, searchable, and reside in a central health platform.

87%

3. Education & Awareness (for Children & Schools)

Background

As dietary preferences are acquired at an early age, schools play a key role in developing good eating habits. As previously mentioned, type 2 diabetes was once associated only with the adult population. Today, this disease can affect children as young as 3 years old, as a result of poor nutritional habits.[14]

Because students spend most of their time in school, early introduction and indoctrination of a healthy lifestyle can form lifelong beneficial habits.[15] When children adopt healthier habits, they can also influence their parents. Nutrition education and healthy living in Singapore is still inadequate in its emphasis, dissemination and penetrance.

The majority of school canteens have signed on under the Healthy Meals in Schools Programme (HMSP), launched in 2011. However, there are still many that have not adopted this programme. Under the HMSP, canteens must follow strict guidelines to offer more wholesome meals than what was offered in the past. These include more fruits and vegetables, whole-grains, and lean meat (e.g. less oil and fried foods).[16] However, offering healthier food options does not guarantee their consumption. Children can still pick out and throw away the bits and pieces they do not wish to eat. Healthy habits and nutrition, therefore, needs to be explicitly taught and incorporated into the curriculum.

Possible Solutions to Implement:

(1) Awareness Campaign & Curriculum for Children, addressing what diabetes is, its postulated causes, and the impact of lifestyle (e.g., diet, exercise) so that children will be self-motivated to improve their health and parents will acknowledge that optimal health is a prerequisite to lifelong success. This awareness and understanding of diabetes would be accomplished through shifting the focus away from direct didactic teaching of diabetes, and toward infusing it into existing subjects that provide a context (e.g. in Maths - calculate the macro-nutrients, in English - research & interview diabetics, etc.), utilising role models (e.g. teachers setting an example), and experiential learning. The Japanese lunch period serves as a prime example, where food safety/hygiene, food serving, and food clean up practices are taught through participatory learning and food can be harvested from their school edible garden.[17]

100% 

(2) Re-examine the Healthy Meals in Schools Programme & Encourage Wider Adoption. As new research findings help to identify healthier food options, these could be implemented into the HMSP. Examples include the addition of new ingredients/meals (e.g., muesli), new drinks (e.g., smoothies), and high antioxidant and nutritionally dense foods.

88% 

4. Education & Awareness (Peer-to-Peer & Community-Based)

Background

To improve diabetes outcomes (e.g., HbA1c levels, amputation rates, etc.), adoption of diabetes self-care behaviours is essential. According to the self-management framework proposed by the American Association of Diabetes Educators (AADE), there are 7 self-care behaviours.[18]

Non-diabetics assume there is no social stigma associated with diabetes. In actuality, diabetics are deeply concerned with the negative social implications of having the disease, and experience its invasion into many aspects of their life, including work and relationships. Many view their diabetes self-care behaviours (e.g., diabetic diet, fingerstick glucose monitoring, insulin administration) as disgraceful, because they highlight their deviance from optimal health.[19]

There is a direct correlation between the extent of perceived stigma and the severity of psychological distress and depressive symptoms, which in turn, predict lower quality of life.[20] When diabetics themselves hold negative impressions of their illness, they tend to internalise externally perceived social stigma, which can adversely impact diabetes self-management by causing them to change their social interactions (e.g., avoidance through severely limited social participation, or highly active social participation in an attempt to conceal the disease) and adherence to treatment.[21]

Individuals (e.g. patients, caregivers, family) often have different priorities from those of healthcare practitioners[22], leading to an apprehension and reluctance to openly discuss challenges they face in managing health issues when in the presence of a healthcare professional. For some individuals, peer to peer interactions may be superior and better received. Peer support has been shown to sustain healthy behaviours through encouraging the use of new skills, helping to cope with stress, serving as liasons to health systems, and serving as triggers for health seeking behaviours. Even when there is no defined leader (e.g, peer-partner), improvements in diabetes outcomes have been demonstrated.[23] Additionally peers can provide this support cost-effectively over prolonged periods.[24]

But, peer group interventions (e.g., support groups, group counseling, group education) are implemented in a fragmented fashion rather than being part of a coordinated framework. They also lack widespread public awareness, do not utilise profiling data to improve peer compatibility and homogeneity (e.g., spoken dialect, cultural values, life stage), and lack multiple channels for self enrollment or referral.

Because of the variability of health literacy and critical content appraisal skills among individuals, reputable educational and group facilitation materials should be consolidated into a core curriculum that is available to all (see ADES proposal in Intervention Section 2). Peer support participants can draw upon this resource.

Possible Solutions to Implement:

(1) Peer Interventions (e.g., peer-leader, peer partner, etc.) Should be Expanded in Number and fulfill the key features of peer support (e.g., assistance in daily management of diabetes, helping to cope with stress, provide social and emotional support, link to clinical care and community resources, trigger health seeking behaviours, etc.).[25]

The People's Association can provide venues for diabetes support groups at Residents' Committees (RC) or Community Centers/Clubs (CC).

Peer groups that focus on education (e.g., group lecture) should have reinforcement of teaching through either text messaging, online chat, telephone calls, follow-up meetings, or home visits since this has been shown to be more effective than a standalone didactic session.[23]

100%

(2) More Effective Peer Matching Achieved Through a Central Health Platform (e.g., HealthHub) where participant registration data (e.g., peer profile), group characteristics, and data analytics are utilised to improve the homogeneity and compatibility of a collective (e.g., same patient dialect, lifestyle habits, culture, health literacy, social stressors, etc.).

A central health platform can complement the awareness and access offered by traditional face to face referral (e.g., General Practitioner clinics, Specialty Outpatient Clinics, polyclinics, peers, family, caregivers), online web address links, and paper collaterals by providing features such as self-enrollment and automated advisement of compatible groups. The key is that multiple channels should be available for referral and enrolment (see Central Repository proposal in Interventions Section 11).

83% 

(3) Consolidation of Diabetic Educational and Group Facilitation Materials and Links (e.g., web address, phone number) to support resources (e.g., local support group, online diabetic community/forums, hotline) and locating this in an online central health platform (see ADES proposal in Intervention Section 2).

Group facilitation materials should serve as a guide and should touch on the biopsychosocial aspects of diabetes management (e.g. medication adherence, lifestyle, stress management) (see SAC proposal in Interventions Section 11).

100% 

(4) Ongoing Public and Health Professional Awareness Campaigns regarding group facilitation and available support resources. This should be conducted both offline (e.g. paper collaterals, roadshows) and online (e.g. websites of public restructured hospitals, polyclinics, and Specialty Outpatient Clinics) to ensure that patients and caregivers have access to information and support at the time of diagnosis and thereafter.

82% 

5. Food Labelling & Guidelines

Background

There is a lot of confusion about which foods are healthy and which are not. Articles on diet and health are among the most popular blog topics. However, the majority of these articles are not written by knowledgeable professionals and are not peer reviewed. Even within published peer-reviewed articles, conclusions and recommendations vary or even contradict each other.

The collective information available online, from opinion pieces based on anecdotal experiences to industry-sponsored studies which might contain conflicts of interest, is challenging to navigate, resulting in information overload and exhaustion that impedes healthy decision making.

Contrast this with nutritionally poor foods, which are ubiquitous in their availability, appealing to the senses, and are promoted through easy to understand and alluring advertising. It is understandable why the the average person finds it easier to make unhealthy food choices rather than healthy food choices. Simplifying the health promotion message may help.

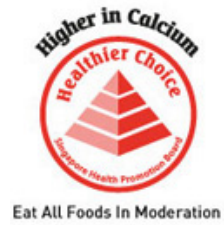
In Singapore, food labelling and guidelines can be roughly categorised into 4 general types: (1) Health Promotion Board's (HPB) Healthy Plate guideline (2) HPB's Healthier Choice Symbols (3) The Nutrition Information Panel and ingredients list, and (4) health claims & nutrient claims.

My Healthy Plate:

In 2011, the United States Department of Agriculture (USDA) implemented the "MyPlate" recommendations, which replaced the 1992 Food Pyramid. An adapted version of this guideline was subsequently created by HPB. It is known as "My Healthy Plate".

While both new guidelines are easier to understand than their predecessor, some critics believe they are still too confusing for the general public.

For example, there is no visual indication of how much oil/fat should be on the plate, no distinction between protein sources (e.g., chicken, fish, red meat), and for foods that span more than one macronutrient (e.g., legumes, pulses, and nuts), there is uncertainty regarding where these belong on the plate.



The healthy plate also does not take into account the amount of processing a food undergoes or the cooking method used. For example, if fried chicken, french fries, and coleslaw were given in a particular proportion, would that make a healthy plate?

This is important information, as the quality of dietary fats and carbohydrates consumed is more crucial than the quantity of these macronutrients for the purpose of reducing the risk of diabetes and improving glycemic control and blood lipids in diabetic patients.[26]

Healthier Choice Symbols (HCS):

The first problem with the HCS is that they resemble the now defunct Food Pyramid. Having the symbol look like a pyramid can convey the message that the Food Pyramid guidelines are still valid.

Another problem is that there are actually 6 different Healthier Choice Symbols - higher in whole grains, trans fat free, lower in saturated fat, higher in calcium, lower in sodium, and lower in sugar. Most people don't realise this, and think they are all the same. When a person sees any of these HCS, he/she may wrongly believe that the particular food item is outright healthy, rather than "healthier" than another product in the same category.[30]

The HSC is also not used on fresh foods such as meat, fruits, and vegetables. With HCS labels appearing on ice cream, soft drinks, and frozen french fries, it may mislead the public into thinking that for dessert one should opt for the "Healthier Choice" ice cream rather than fruit.

As there are different HCS labels, a food with the "lower in saturated fat" HCS might contain excess sugar. Yet the consumer might not think to check this.

The Nutrition Information Panel:

As a member nation of the UN Food and Agricultural Organization (FAO), Singapore adheres to the Codex Guidelines on Nutrition Labelling with its Nutrition Information Panel. Overall, this standard of labelling has helped to enforce a level of quality control and transparency on the side of the food manufacturers. To the public, nutrition labelling aims to inform them to make better decisions. However, many members of the public are unable to incorporate the nutritional information on the label into their decision making because they lack the skill or are illiterate.

Health Claims & Nutrient Claims:

A recent Parliament debate centered around the health claims made by infant formula manufacturers. As a marketing tool, health claims and nutrient claims can be misleading and deceptive, and yet, they can dramatically affect the popularity of a particular product.[28]

Claims such as "free," "low," "light," "reduced," "less," "high in," "good source of," "more," "fewer," and "lean" have strict rules governing their usage. But uses of other phrases that are unregulated are also a common practice, and these can sway or mislead a consumer. With infant formula marketing, such phrases include "A+", "helps reduce fussiness", "comfort proteins" and "complete nutrition of breast milk". They target parents eager for their babies to have superior immune systems, digestion, or brains. Although such claims are not supported by evidence, consumers believe these statements are relevant to their purchasing decisions rather than recognising them as marketing tactics.

Possible Solutions to Implement:

(1) Introduction of the "Go Green Guide". This easy-to-understand and user-friendly guide visually conveys to a consumer which foods to eat more of and which to have less of. This guide uses the "traffic light" system to categorise foods. Upon seeing a colour label, users will automatically get a sense of the nutritional value of the food without having to read complicated informational panels or ingredient lists.

This guide can be converted to many forms - a printed pocket guide, a placemat, a display chart or a poster. It can also be incorporated into an app, where one can search for a food and the app will display the corresponding colour. (See Figures 1 & 2)

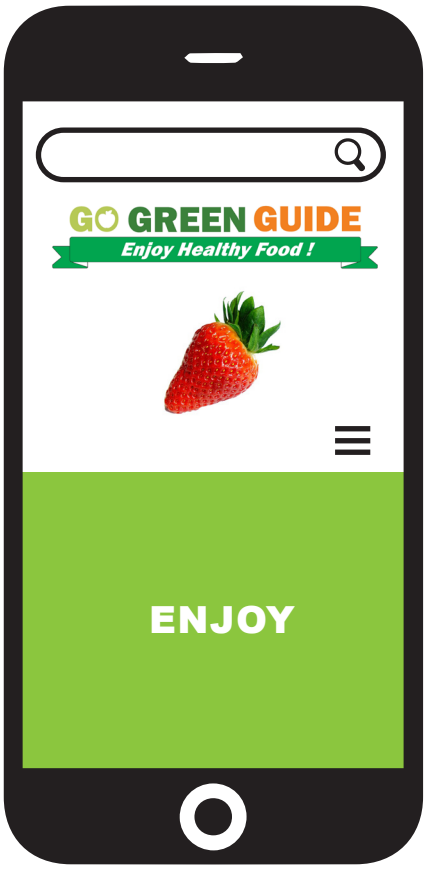


Figure 1

Figure 2

GO GREEN GUIDE

Enjoy Healthy Food !

ENJOY

VEGETABLES

Low Carb < 10g per cup
+ 1 whole

- Asparagus
- Bean Sprouts
- Bok Choy
- Broccoli
- Cabbage
- Cauliflower
- Celery+
- Chinese Radish
- Eggplant
- Garlic (3 cloves)+
- Ginger
- Green Beans
- Green Bell Peppers
- Kale
- Leeks
- Lettuce
- Mushroom
- Seaweed (kelp,wakame)
- Mustard Green
- Okra
- Onion+
- Radishes+
- Spinach
- Sweet Red Pepper
- Swiss Chard
- Tomato+
- Turnip
- Watercress
- Zucchini

FRUIT

Low Carb < 10g per cup
+ 1 whole / Slice

- Apricot +
- Avocado+
- Blackberries
- Cantaloupe+
- Cranberries
- Figs+
- Grapefruit+
- Guavas+
- Kiwifruit+
- Lemon+
- Lime+
- Passionfruit+
- Peach+
- Plum+
- Raspberries
- Starfruit+
- Strawberries
- Tangerine+

FATS

Unsaturated Fats
Olives
Extra Virgin Olive Oil
Avocado
Nuts and seeds
Expeller or cold pressed oils

Fish * such as black cod, sardines, mackeral, herring, trout, salmon, chilean seabass, red tilapia

** preferably wild caught or from well managed sustainable stocks*

YOU DECIDE

VEGETABLES

Medium Carb >10g - 20g per cup
+ 1 whole

- Artichokes+
- Beets
- Brussels sprouts
- Carrots
- Cucumber
- Collards
- Peas
- Pumpkin

High Carb > 20g per cup
+ 1 whole

- Butternut squash (22g)
- Parsnips (26g)
- Potato + (37g)
- Sweet potato+ (24g)
- Yam (37g)

FRUIT

Medium Carb > 10g - 20 g per cup
+ 1 whole / Slice

- Apples+
- Blueberries
- Bananas+
- Cherries
- Grapes
- Honeydew+
- Nectarine+
- Oranges+
- Papaya
- Peaches+
- Pears+
- Pineapple+
- Watermelon+

High Carb > 20g
+ 1 whole

- Durian (3 pieces, 32g)
- Mango+ (46g)
- Persimmon+ (21g)
- Pomegranate+ (39g)

FATS

Saturated Fats
Butter preferably grass fed
Ghee, Lard
Poultry, Grass Fed Red Meat
Eggs preferably organic
Coconut Oil, Palm Oil
Nut Butters, unsweetened

Vegetable Oils
Canola, Safflower, Sunflower, Peanut, Sesame

AVOID

REFINED CARBOHYDRATES

- White Rice
- White Flour
- White Bread and Noodles
- Waffles
- Snacks and Sweets
- Muffins
- Pastries
- Pasta
- Pancakes
- Breakfast cereals
- Bagels

Processed foods with added sugars and high fructose corn syrup

FRUIT

- Canned Fruits
- Dried/Preserved Fruits
- Fruit Juices
- Prunes
- Raisins

FATS

Trans Fats
Any hydrogenated oils, margarine and vegetable shortenings found in processed foods, such as biscuits, cookies, muffins, pastries and snacks, commercially produced baked goods, deep fried foods, fast foods

Foods labelled "Fat Free" or "Low Fat" with hidden sugars

GO GREEN GUIDE

Enjoy Healthy Food !

ENJOY

PROTEINS

Beans and Legumes
Tempeh, Tofu
Nuts and seeds
Non dairy milk
Unsweetened cocoa
Fish * such as black cod, sardines, mackeral, herring, trout, salmon, chilean seabass, red tilapia

** preferably wild caught or from well managed sustainable stocks*

DAIRY

Unsweetened non dairy preferably organic milk such as almond, macadamia, coconut

GRAINS

Whole grains such as whole rye
Quinoa
Cous cous
Rolled/Steel cut oats
Barley
Brown rice
Buckwheat

BEVERAGES

Water
Teh O & Kopi O Kosong
Green Tea
Unsweetened soya

LIFESTYLE

Regular Exercise
Sufficient Sleep
Stress Management
Eliminate/reduce sugar to <6tsp/day
Eliminate High Fructose Corn Syrup
Vitamin D
Health Education, Read Labels
Portion Control
Healthy Home Cooking

YOU DECIDE

PROTEINS

Dairy , Cottage Cheese
Greek yogurt
Eggs preferably organic
Nut Butters
Seafood including scallops, shrimp, crab
Poultry & White Meat*
Lean Grass Fed Red Meat*

** Low temperature cooking such as baking, roasting, poaching, stewing and preferably organic*

DAIRY

Milk
Greek Yogurt
Cheese

GRAINS

Corn
Whole wheat

BEVERAGES

Teh & Kopi Siu Dai
Honey (1 tsp) drink

LIFESTYLE

Use of "My Healthy Plate Lunch Box"
Vegetarian/Vegan Diet
Whole Food Plant Based Diet
Mediterranean Diet
Ketogenic Diet
Intermittent Fasting

AVOID

PROTEINS

High temperature cooked meats including

charred and processed meats
Foods which combine sugars and proteins like burgers and fries

Protein powders containing sweeteners and flavourings

DAIRY

Sweetened and artificially flavoured milk
Sweetened yogurt

GRAINS

Refined grains such as white rice

Sweetened cereals and instant oatmeal

BEVERAGES

Flavoured water
Sugar sweetened & High Energy drinks
Diet Drinks
Alcohol

LIFESTYLE

No exercise
Irregular sleep
Smoking
Alcohol (Over Comsumption)
Binge Eating
Minimal exposure to sunlight
Ignoring food labels
Frequent dining out
Poor food choices

The placement of each food in a particular category was the result of our literature review (see Appendix B). Foods in the green section are ones which you can enjoy.

Foods in the amber section are ones in which you can decide whether to include or exclude, based on your own beliefs and dietary preferences. Some foods in the amber section were placed there because of conflicting research findings. As more information develops in this field, future modifications of the guide will be necessary.

Foods in the red section are foods to avoid or to consume on rare occasions. Consuming large quantities of these foods have been found to be harmful. The government may seek to limit these items in schools and hospitals.

By labelling foods with clear and easy-to-understand labels, we can encourage healthier choices. In one case study, a simple, colour-coded system for labelling food items in a hospital cafeteria successfully encouraged the purchase of the healthier food items.[29]

The Go Green Guide also incorporates lifestyle recommendations. As part of these recommendations, we have also proposed a lunchbox that simulates the "My Healthy Plate" recommendations. This prototype lunchbox would be made of a sustainable material (e.g., stainless steel, similar to tiffin carriers), with divided sections resembling My Healthy Plate. Use of such a lunchbox would also educate the user on portion control. As one of the interventions in this report focused on home cooking and eating out less, we felt that having a lunchbox might be a good complementary approach to achieving this.

97% 

6. Advertising & Mass Media

Background

Marketing strategies aim to target our emotions, evoke social peer pressure to bring about conformity, take advantage of our reflexive reciprocity, use priming and repeated exposures to root themselves, and elicit a sense of urgency by creating a feeling of scarcity. Marketing is also used to frame an object, putting it in a better light or making it more attractive than it is otherwise.[30]

In the book "Salt Sugar Fat: How the Food Giants Hooked Us" (2014), author Michael Moss explains how food manufacturers and their team of scientists and marketing executives try to optimise the additive nature of their foods, through establishing a carefully calculated and perfected "bliss point" to "send consumers over the moon".

As standard industry practice, a food manufacturer's main objective is to make money by gaining customers and turning them into "heavy users". Nourishment and health are secondary.

Because eating habits start from a young age, children are the most targeted consumers. Just how much are children exposed to junk food advertisements? According to one study, Canadian kids are bombarded with more than 25 million junk food and drink ads online every year.[31]

Food ads on television make up 50% of all the ad time on children's shows. These ads are almost completely dominated by unhealthy food products (34% for candy and snacks, 28% for cereal, 10% for fast food, and 0% for fruits or vegetables).[28] Children who are exposed to these unhealthy food ads tend to eat 30 more calories within 15 minutes of viewing them.[32]

Kid's menus at restaurants also tend to be less healthy than choices from a "regular" menu. But through marketing techniques, many ads will frame such kid's menus as being healthier by displaying images of happy children and green pastures, endorsements by celebrities or cartoon mascots, or by something as simple as adding some garnish to the food. (See Figure 3)

Figure 3

A large part of marketing relies on emotional advertising. Studies show that people most often rely on emotions, rather than information, to make buying decisions. These emotionally targeted ads are typically directed at our basic human drives - survival, reproduction, conformity, belonging/desire to be liked, avoidance of pain, and seeking of pleasure. As such, shaming campaigns aimed to stigmatise a group can also be effective. An Australian campaign, which aimed to discourage speeding implied that men who speed lacked virility. This proved to be a highly effective message.[33]

Another effective strategy employed by many snack food and fast food brands is the use of a song, jingle, or memorable slogan in their ads and commercials. These rely on catchiness and repetition to relay their message.

As the human attention span is decreasing, many brands now use guerrilla marketing techniques, which aim to deliver messages in unconventional, creative and attention-grabbing ways. An effective example of such marketing was when Unilever stamped 2.5 million pieces of roti provided to Haj pilgrims with the phrase, "Did you wash your hands with Lifebuoy?" How, where, and when information is communicated are important dimensions in the effectiveness of implanting the message.

Possible Solutions to Implement:

(1) Limit Exposure to Fast Food and Snack Food Advertisements, especially those that are targeted to children. Increase the frequency of healthy food or physical activity ads.

(2) Consider Putting Some Restrictions on the Use of Garnish in food advertisements and menus. If the entree or meal is actually healthy, then it should speak for itself.

(3) Have Celebrity or Mascot Endorsements for Healthier Foods. In the past, the use of cartoon characters such as Popeye to promote healthier eating, increased spinach consumption by 33% during the Great Depression era in the US.[27] Today, there are ample numbers of influencers who we can tap on to promote healthy habits.

(4) Limit Promotions on or Shelf Placement of Nutritionally Poor Foods. Placing such foods at harder to reach places and not at eye level, can reduce their consumption. The centre shelf area is a prime location, and one in which food manufacturers may pay a hefty slotting fee. This section should be reserved for healthier choices. Perhaps this might encourage the healthier reformulation of some food products.

(5) Use Emotionally Targeted Counteradvertising. We have created some samples of marketing collateral that target virility (like the Australian campaign, See Figure 4), anger (See Figure 5), vanity (See Figure 6), and pain (See Figure 7). Mass spread of such counteradvertising campaigns over time can improve awareness, create the perception that healthy behaviors are more aligned with existing cultural norms, and gradually transform unhealthy cultural norms.

We have also written and performed a parody of a popular song, hoping it would send a message (made clearer through repetition), and also become an earworm. As a parody, the fair use laws of Intellectual Property apply. (See Figure 8)

In order to generate more artwork or songs, various private and public organisations and schools can hold contests and hackathons.

Figure 4 - A 2-sided hand fan where your thumb is inserted at the base

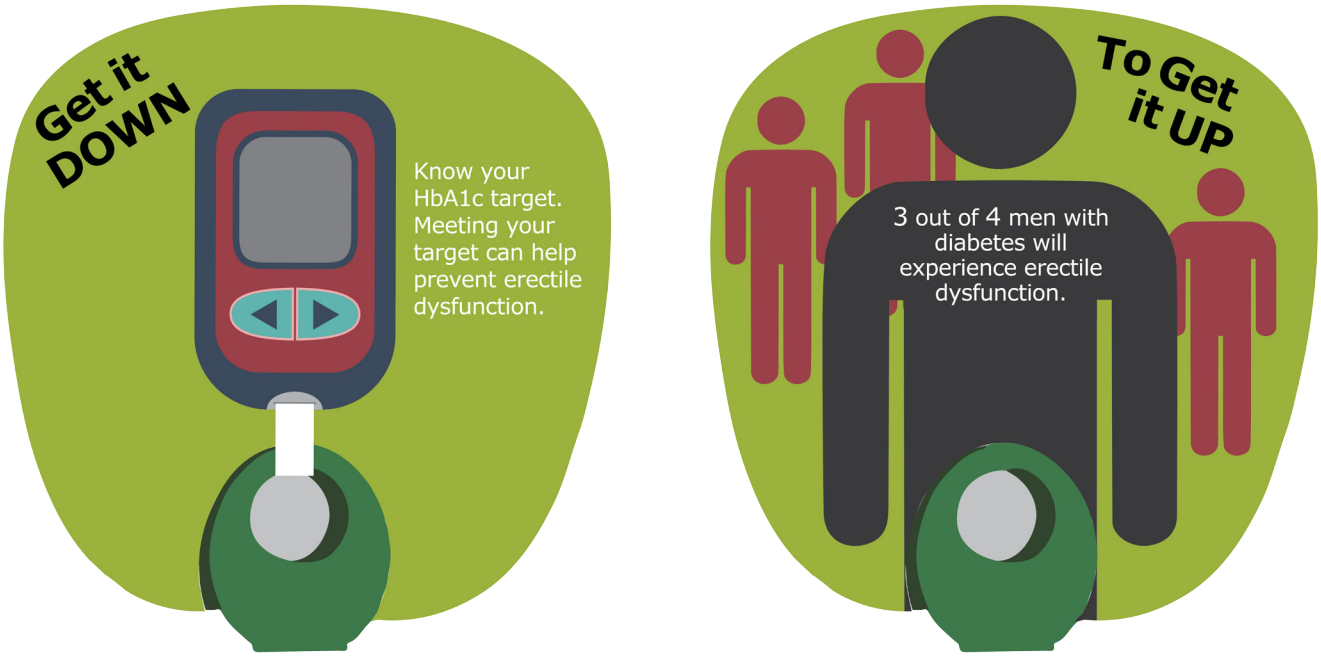


Figure 5 - An example of an evocative ad

Figure 6

Figure 7 - The Health Promotion (Cork & Dry Erase) Board

Figure 8 - A video of a sample parody with lyrics
(Download accompanying file "A Diabetes Parody.avi")

7. Physical Activity and Exercise

Background

Physical inactivity and the lack of exercise is a strong risk factor for developing chronic diseases such as obesity, hypertension, heart diseases and diabetes. On the other hand, regular exercise has also been shown to have positive effects on blood sugar control, which is important in diabetes prevention and management. Despite the importance of physical activity and exercise, self-reported data shows that about half of all Singaporeans are not exercising or moving enough (in frequency, duration, and intensity) or are sedentary.[34]

The American College of Sports Medicine recommends most adults to achieve the following (See Table 1):

Table 1

Type of Exercise	Frequency	Intensity	Time	Examples
Cardiorespiratory Exercise	≥ 5 days per week	Moderate intensity using the Rate of Perceived Exertion (RPE) scale or talk test	≥ 150 min per week	Brisk walk, jogging, swimming, cycling etc
	≥ 3 days per week	Vigorous intensity using RPE scale or talk test	≥ 75 min per week	
Resistance Exercise	2-3 days per week	Moderate intensity • 60% to 80% of 1 repetition maximum (strength) • ≤ 50% of 1 repetition maximum (muscular endurance)	Time taken to perform: • 2 to 4 sets • 8 to 12 reps (strength) or 15 to 25 reps (muscular endurance) • Rest time of 2-3 minutes between sets and exercises	Free weights, resistance machines, resistance bands involving concentric and eccentric muscle actions
Flexibility Exercises	≥ 2-3 days per week	Light intensity, at a point of stretch and minimal discomfort	• Hold each stretch for 10-30 seconds • 2-4 reps	Dynamic, static, Proprioceptive Neuromuscular Facilitation (PNF), passive etc for major muscle groups
Physical Activity (Unstructured)	Daily physical activity. Avoiding long period of sedentary time	N.A.	A goal of 10,000 steps per day. (Some adults may not need to achieve 10,000 steps daily if they are engaging in regular exercise sufficiently)	Walking, standing, stair climbing etc. Avoid prolonged sitting while watching television or desk/computer work

According to a 2016 Ministry of Health report, the number one cited reason for not exercising was "a lack of time" due to work and family commitments (36.3% of respondents). This was followed by the reasons "too old" (19.6%) and "poor health" (18.4%).[35]

As an individual transitions into adulthood, it is a common trend to see a drop in physical activity upon acquiring employment. This new lower level of physical activity often remains low for a few decades, and then starts to rise again after age 50. This phenomenon is commonly referred to as the "bathtub effect", since the curve follows the shape of a bathtub.

In the recent past, there has been a further reduction of physical activity with the proliferation of delivery services for groceries, meals, and laundry. And with ride-sharing apps, there is now less of a need to walk to an MRT Station or bus stop.

What Has Already Been Done

In 2015, HPB launched the National Steps Challenge™ to encourage Singaporeans to take 10,000 steps per day. Participants monitored their daily steps through an activity tracker, which provided instant feedback on their progress. Data has shown that 82% of the participants who were previously sedentary have increased their physical activity level after joining the Challenge.[36]

While the tracker records the number of steps a person takes, the level of exertion of these steps are not considered. For example, 2000 steps stair climbing or running is tracked in the same way as 2000 steps walking, even though the intensity is quite different.

As more research findings show greater benefits from higher intensity workouts, we felt that able-bodied adults should be encouraged to increase their level of exertion through engaging in sports, structured exercises, and stair climbing.

As HPB already has many programmes to encourage sports and group workouts, we wanted to focus our attention on stair climbing, particularly at MRT Stations were the escalators and lifts can be quite congested. This congestion unintentionally blocks access to less able-bodied persons, such as the elderly, disabled, and mothers with prams, whose only option is to use the lift.

Possible Solutions to Implement:

(1) Get Rewarded for Using the Stairs in MRT Stations. As an extension to the National Steps Challenge™, QR codes (compatible with the HPB 365 app) can be placed on the stair railings halfway up the staircase, so that people are incentivised to use the stairs instead of the escalators and lifts. Participants can earn Healthpoints by scanning this code.

If instead, this rewards programme is linked to travel rebates (as opposed to Healthpoints), a MRT card scanner can be put in the same place. Upon tapping, commuters can redeem points to earn rebates on their travel costs (similar to Travel Smart Rewards).

This intervention may ease some of the overcrowding on the escalator and lifts, while causing some congestion at the stairs. To mitigate this, sufficient QR codes or scanners need to be installed so as not to create a bottleneck at one particular scanning point.

Each approach has its tradeoffs, with MRT card scanners being more costly to implement, while QR code stickers require a smartphone and longer scanning times.

8. Food Environment (at Hawker Centres & Food Courts)

Background

In Singapore, 6 in 10 people eat 2 or more meals daily outside the home. As most of these meals are consumed at hawker centres, food courts, and coffee shops, it is essential for there to be a vast array of healthy dining options.

Despite nationwide initiatives by HPB to increase public awareness and accessibility of healthier food options at hawker centres and food courts, healthy options are still not as widespread as they could be, and only some Singaporeans are choosing to switch to "healthier options".

The jury has identified 3 contributing factors to this problem (the 3A's)

- Accessibility of healthy food options at hawker centres and food courts.
- Awareness of the different healthy food guidelines put forth by HPB
- Adoption of healthier food options by consumers and F&B establishments

According to our on-the-ground research (See Appendix C), we believe that the main obstacle for the adoption of healthy eating habits (outside the home) is the first of the 3 contributing factors - accessibility.

By "accessibility" what we mean is that there must be healthier food options (e.g., labelled with the Healthier Choice Symbol and/or meets the My Healthy Plate guidelines) available at food establishments (e.g., hawker centres, food courts, and coffee shops) within 2 kilometers from your residential estate. This also includes the accessibility of healthy beverage options, such as sugar-free drinks.

In July 2017, a Straits Times article reported that only 2,700 outlets are covered under the Healthier Dining Program (HDP) (i.e., meaning that they have at least 1 "Healthier Choice" menu item) since the programme's launch in 2014.[37]

With nearly 13,000 hawker stalls in Singapore, HDP's current adoption rate is only 20.7%. By next year, HPB aims to increase that number to 40%. As jurors, we believe that for healthy food to truly be considered "accessible" for everyday Singaporeans, more than 50% of food establishments should offer healthy options on their menu.

Some on-the-ground research findings conclude that many hawkers, particularly those who were not under a social enterprise like NTUC Food Fare or Kopitiam, were not aware of the My Healthy Plate guidelines or other HPB initiatives available to help them sell healthier menu items. Jury members also found that many of the cheaper menu items did not meet the My Healthy Plate guidelines. They also found that menu items which had the HCS label were very limited in selection.

Possible Solutions to Implement:

(1) More Plain Water, Less Sugary Drinks. We plan to kick start a citizen-led campaign (#drinkplainwater) to get Singaporeans to switch to drinking plain water during meals. This recommendation will reduce the amount of daily calories consumed, since 6 in 10 Singaporeans consume 2 or more sweetened drinks daily, which are mostly empty calories. Switching to water, which has no calories, will itself make a dramatic difference. This means that more water dispensers must be available at food establishments.

One possibility is to partner with local water firms such as Hyflux and have them sponsor the dispensers. Hyflux currently has a similar partnership with Wildlife Reserves Singapore to supply water dispensers in the zoo.

We also wish to encourage every Singaporean to bring a reusable water bottle to work and to school.

96% 

(2) Popularise the My Healthy Plate (MHP) Guidelines. More can be done on a community level to make consumers and hawkers more aware of the MHP, which may encourage more demand for healthier foods. For public outreach, HPB can set up information booths at hawker centres. These booths can also contain information on HPB schemes such as the Healthier Dining Grant and free nutritional consultations available to hawkers.

(3) A Healthy Hawker Centre Competition. In this competition, consumers can vote which hawker centre has the most number of menu options which meet the MHP guidelines. The hawker centre within the region or constituency with the highest votes will be declared the healthy hawker centre of that area. This might encourage more hawkers to offer healthier menu items.

(4) Rating Hawker Centres. Just as many public washrooms allow you to provide a cleanliness rating on an iPad, hawker centres or hawker stalls can also make use of this technology by allowing customers to provide feedback. This feedback can be in the form of a nutritional rating. This might encourage more hawkers to adopt healthier versions of their offerings.

88% 

9. Food Environment (at Home)

Background

"When I found out just how much butter and sugar go into the dish, it changed the way I looked at food forever." This is what one juror said when she, at age 19, attempted to make apple pie from scratch. Although it resembles a "healthy" dessert (after all, it has a lot of apples), the amount of additional ingredients and time required to produce the final product makes it a "special occasion" food.

In the past, these "special occasion" foods were only consumed sparingly. This is not just the case for desserts. Many "traditional" dishes were also meant to be consumed moderately. But today, they are consumed on a daily basis because they are ubiquitous, affordable, and you don't have to labour for hours making the dish.

As mentioned in the last section, 60% of Singaporeans eat 2 or more meals daily outside the home. This figure is up from 49% in 2004. This statistic is concerning because it has been found that Singaporeans who regularly eat out consume 15% more calories, and 25% more saturated fat.[38]

Furthermore, people who cook at home more often tend to have healthier overall diets.[39] These people will tend to consume fewer carbohydrates, less sugar, and less fat than those who cook less or not at all, even if they are not trying to lose weight.[40]

Therefore, we feel the need to return to a time when more meals were prepared and consumed at home. Eating together also has other beneficial effects, such as building strong family ties.

From a lack of time and a lack of food preparation skills, to the cost and abundance of choice for dining out, there are many reasons as to why eating out has become the norm today. Food sold outside the home has a wider array of cuisines, catering to a variety of tastes and appetites, and because the market is so competitive, most of the food remains affordable.

As a result, "dining out" has now become synonymous with "the Singaporean food culture". We wish to cultivate another type of food culture, one which involves wholesome home cooking. Changing the current food culture will not be easy. It will require a social movement towards healthier diets, a reminder of our past eating habits (e.g., which foods were staples and which were special occasion foods), and supportive programmes to make this shift.

Possible Solutions to Implement:

(1) Expand, Popularise, and Collaborate with existing Organisations offering Cooking Courses. While there are many cooking courses available at Community Centres and from HPB and private cooking schools, many people are simply unaware of them. These could be more publicised, or perhaps put into a central health platform (e.g., HealthHub) using an aggregator or metacrawler to compile the information that's available online. This might also encourage Community Clubs to put their cooking class schedule and cooking club meetup details online.

99% 

(2) Healthy Food Preparation & Cooking Competitions. Most food competitions are judged based on taste and presentation, and do not take into account nutritional value. We propose to hold a competition in which participants must use pre-measured ingredients to create a healthy meal. This means they cannot use an unlimited amount of oil, sugar, salt, or sauce. The meal will be judged on not just taste, but nutritional value, the ease of preparation, and the amount of ingredients used, which indirectly is an indication of cost.

We hope this will teach people how easy and fun it is to cook at home, and that cooking does not have to be so laborious or expensive.

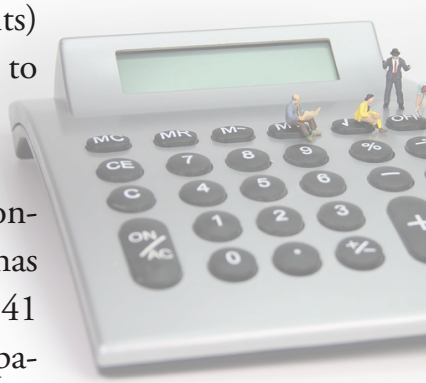
84% 

10. Medical Care Costs

Background

The Singapore Healthcare financing model has multiple layers of protection to ensure affordability of basic healthcare to Singapore citizens. The first tier is provided by government subsidies, to allow universal access to healthcare with a co-payment to promote appropriate utilisation. The second tier is provided via Medisave, a compulsory individual medical savings account, which allows Singaporeans to pay for their share of medical treatment without financial difficulty. The third tier is Medishield Life, which is a basic health insurance plan which covers large hospital bills and selected costly outpatient treatments. The last tier is Medifund, a medical endowment fund set up by the government as the ultimate safety net for needy Singaporeans with financial difficulty, which would fund the remaining bills after drawing on other means of payment.[41]

The Chronic Disease Management Programme (CDMP) was first introduced in Oct 2006 to provide support for persons with diabetes mellitus, hypertension, hyperlipidemia and stroke. Under this programme, diabetics may utilise their Medisave account or their family member's account (up to 10 accounts) and spend a maximum of $400 per account per year. Each claim is subject to a 15% co-payment in cash.[42]



Diabetics are saddled with the high economic burden of managing their chronic illness. The direct annual medical costs of type 2 diabetes in Singapore has been estimated to be SGD $2,034. In 2010, this was roughly split into $1,241 (or 61%) for inpatient services (i.e., hospitalisation), $711 (or 35%) for outpatient services, and $81 (or 4%) for Accident and Emergency (A&E) services.

Since basic inpatient hospital bills are subsidised (e.g., class B2 and C wards) and well covered for most diabetics, it is the outpatient costs that are their foremost concern. Outpatient costs come from (1) physician visits (e.g. screening for complications, medication prescribing), (2) nursing and allied health visits (e.g., foot screening, dietician visits, diabetic education), and (3) laboratory tests and medication collection.[43]

The reported figure of $711 did not include other related costs. For example, only medications directly categorised for treatment of diabetes were included in the calculation. Medications for the prevention and management of related and co-morbid diseases such as stroke, cardiovascular disease, diabetic nephropathy, diabetic neuropathy and diabetic retinopathy were not included. In a UK study, the average diabetic spent nearly twice as much on these related and co-morbid medications, than on medications specific to diabetes.[44]

Other costs not accounted for in the $711 figure were the costs of blood glucose monitors, test strips, lancets, and insulin needles. While the insulin itself may be subsidised, the syringes and lancets must be paid out of pocket. Depending on the frequency required, these costs can be quite substantial. For example, a type 2 diabetic who monitors their glucose 4 times a day for 2 days a week, the yearly cost of glucose monitoring alone is estimated to be about SGD $360 to $640 (based on current NUH Retail Pharmacy pricing).

For a type 1 diabetic, where glucose monitoring is rigorous, and insulin syringes are regularly used, the cost can be as much as 10 times more. Just syringes alone for twice daily injections is estimated to cost SGD $280 annually (based on current NUH Retail Pharmacy pricing). The cost of treatment for a type 1 diabetic, including inpatient costs, can also be much higher than for a type 2 diabetic, but we could not find any recent local data that specifically indicated how much more the amount was.

There are also no local studies on the cost of gestational diabetes. Pregnant women with gestational or type 2 diabetes are advised to do blood glucose monitoring 7 times daily, which translates to SGD $157.50 to $294 per month (based on current NUH Retail Pharmacy pricing). In addition, some women with gestational diabetes may require multiple daily insulin therapy.

Lastly, the costs of diabetes complications and comorbidities may also be substantial. Diabetes complications include nephropathy, retinopathy and neuropathy. For diabetic retinopathy, direct medical costs range from SGD $2,212 to $3595, depending on the severity.[45]

Higher out-of-pocket costs are associated with poorer outcomes and less adherence to self monitoring and self management. In a US study, a $10 increase in out-of-pocket cost resulted in a 1.9% reduction in adherence. In turn, a 10% reduction in adherence was associated with a 15% increase in per-patient hospital days.[46]

A US Study showed that 96% of diabetes patients were interested in financial incentives and that large amounts were not required to motivate behavioural change. One study showed that, in a given population, USD $258 per year could drive an average 2lb reduction in weight.[47]

In Singapore, there is an ongoing trial (TRIAD) to investigate usual care, usual care with process incentives vs usual care with outcome incentives. This study is still ongoing, however, its results might provide more direction with regards to the impact of financial incentives in diabetes care.[48]

Possible Solutions to Implement:

(1) Raise the Medisave-claimable Amount for CDMP to SGD $750 a year per account, while keeping the 15% co-payment. Allow diabetes consumables and blood glucose monitoring items to be claimed under Medisave, with the claimable amount kept within SGD $200 per year, and a 20% co-payment.

To ensure that blood glucose monitoring equipment is used appropriately, there should be safeguards in place. Healthcare professionals would be required to endorse claims for diabetes consumables.

100%

(2) A Rewards System or Incentive Scheme. Set up a rewards system to motivate diabetes patients to be more proactive and take charge of their diabetes care. This rewards system would be a tiered system whereby points are rewarded for both process-based indicators as well as outcome-based indicators. Process-based indicators could include attendance of diabetes educational talks or exercise programmes. Outcome-indicators could include improvement of HbA1c in 3-6 months or maintenance of HbA1c targets. In this system, more weight would be given to outcome-based indicators than process-based indicators.

Points could be used to claim rebate vouchers on diabetes consumables, blood glucose monitoring test strips, or even on exercise programmes or groceries. To provide a uniform platform and reach, the scheme and redemption of rebate vouchers could potentially be integrated with a central health platform (e.g., HealthHub).

96%

11. Motivationally Targeted

Background

Setting aside biological factors, successful management of diabetes is predominantly attributable to individual day-to-day self-management. According to the self-management framework proposed by the American Association of Diabetes Educators (AADE), there are 7 self-care behaviours[18], but transitioning to these behaviours requires sufficient individual motivation, acquisition of capabilities (e.g., knowledge and skills), and triggers.

Motivation is also one of the mechanisms for behavioural change in the framework adapted from McKinsey Global Institute, which incorporates several theories and models of behavioural change. It is defined as the likelihood that an individual will adopt and sustain a change in behaviour.[49] New behaviours that are perceived to be in line with one's intrinsic motivators, such as personal goals, values and commitments, are reinforced and become habits.

Unfortunately, individuals may not have insight into their intrinsic motivators and their relationship to decisions and actions. Conflicting decisions with painful tradeoffs are also common and often require guidance and support to resolve. But, patients often have different priorities from those of healthcare practitioners[22], making it difficult to provide assistance. This may in part explain why providing advice alone is often inferior to more effective communication. To further complicate matters, relevant barriers to change and the level of motivation vary among individuals and change over time. This means a set of obstacles with their paired solutions cannot be widely applied.

Empathic communication techniques, such as motivational interviewing, have been demonstrated to be effective in improving outcomes in other chronic diseases including diabetes.[50] In particular, motivational interviewing is designed to evoke the intrinsic motivation of the individual to drive behavioural change.

A critical obstacle to the implementation of motivational interviewing has been the lack of expertise. There is inadequate formal communication training among many health professionals including doctors, nurses, diabetes educators, and allied health. Existing clinical communication training is focused on gathering data and providing advice and recommendations. But, empathic communication techniques, such as motivational interviewing, require training that is resource intensive[51], and some will not be receptive to changing their communication practices.[52]

Additionally, a single communication workshop, even if it includes role play, is ineffective in changing a health professional's method of communication.[53] Although adequate communication training, supervision, and reinforcement impacts efficacy, the profession of the trainee has not shown to make a difference. It is the consistency with which the practitioner applies the techniques that matter.[52] Considering these challenges, communication training should be available to a wider audience, with the anticipation that only some will achieve competence.

The current fee-for-service model places stifling constraints on consultation times. This makes incorporation of motivational interviewing into everyday practice challenging for health practitioners. Another deterrence is the misconception that an empathic/collaborative approach takes considerably more time than a more direct approach. Unfortunately, just employing shared decision-making between the healthcare professional and the patient, is not sufficient at improving diabetes outcomes, but it does improve qualitative process of care outcomes.[54] Instead, effective counseling must be structured so that it takes into consideration the central role of an individual's motivation.[55] In fact, the way in which healthcare professionals discuss health issues with patients can have a significant impact on their motivation for behaviour change.[56]

The Diabetes Prevention Program (DPP), which achieved a 58% reduction in the incidence rate of diabetes, utilised "life coaches" that were primarily dieticians that delivered a core curriculum where half of the sessions focused on the psychological, social, and motivational challenges involved in maintaining healthy lifestyle behaviours. Additionally, these case managers tailored subsequent interventions as part of a maintenance program consisting of individual sessions, group classes, motivational campaigns, and restart opportunities.[57]

With effective implementation of empathic communication techniques, such as motivational interviewing, health practitioners will have a deep understanding of an individual's goals, values and commitments. This makes them well positioned to be resource brokers, where they thoughtfully deploy a suite of interventions tailored to the individual's needs. This is reminiscent of the "life coach" employed by the DPP.

Unfortunately, the interventions in the "War on Diabetes" are fragmented and not integrated into a centralised framework that would facilitate resource brokering by health practitioners or automated algorithms. Another consideration is the lack of a widely agreed upon set of metrics to measure the effectiveness of interventions. There is also a lack of an iterative cycle that leverages upon metrics to revise interventions.

Possible Solutions to Implement:

(1) Communication Focused Diabetic Care Clinic, with the emphasis on effective communication techniques, such as motivational interviewing. These clinics will be comprised of health professionals or health professionals in training that have been accredited by the Singapore Association for Counseling (SAC) (see below) and the Association of Diabetes Educators Singapore (ADES) (see ADES proposal in Intervention Section 2). Practitioners would not only educate and treat, but also function as chronic disease counselors (to bolster motivation and identify obstacles) and resource brokers.

These clinics should operate on a patient outcomes model rather than a strictly fee-for-service model, where considerations such as the frequency of patient visits, the duration of consultations, and caseload are secondary to whether outcomes (i.e., improvement in diet, HbA1c, blood pressure, etc.) have been achieved. This will aid empanelment and implementation of communication techniques. Additionally, they should be integrated with a central repository of patient interventions that facilitates resource brokering (see below).

Because the purpose is to supplement and not supplant the current delivery of care, these clinics would run in parallel with diabetes services offered by the Specialist Outpatient Clinics (SOC) and eventually at polyclinics and would receive referrals from these respective sites on an appointment basis. Currently, National University Hospitals (NUH) has a diabetes care program utilising motivational interviewing techniques.[58] With some modifications, this could serve as a pilot site.

Gradually, communication skills would be disseminated to other healthcare professionals at affiliate clinics near their site of care through workshops, seminars, and lectures.

87% 

(2) Adoption of a Patient Outcomes Focused Model of Funding. This would require revision of current Ministry of Health (MOH) budgeting practices, so that there is less reliance on productivity measures that use patient visit to practitioner ratios to enforce cost-effectiveness. This is an area that requires further consideration by the government.

87% 

(3) Expand the Singapore Association for Counseling (SAC) to Encompass Clinical Communication and chronic disease counselling (e.g., motivational interviewing in diabetic patients).

Responsibilities would include the development of minimum standards and certification requirements for all professionals and non-professionals that will be conducting chronic disease counselling. Additional training programmes should be developed that aim to provide communication skills that tackle the biopsychosocial aspects of diabetes education and management and that aim to produce different levels of communication expertise and proficiency (e.g., psychological counsellors to community volunteers, generic counselling skills, diabetes specific counselling, group facilitation, facilitation of behavioural change, etc.) to cater to different sites of care. Designated communication training sites should be accredited and audited periodically.

The SAC should contribute to the development of cost-effective communication approaches that utilise information technology, including technology assisted motivational interviewing (TAMI), which has already shown promise in positively impacting behavioral change.[59] Another tech solution is branching scripted dialogue employed both synchronously (i.e. during the online/offline patient interview)[60] and asynchronously.[61]

87% 

(4) Central Repository of all registered interventions that is a component of a central health platform (e.g., HealthHub). It would contain the specifics of a registered intervention, including its objectives, intervention type (e.g., peer-partner, group education, SMS reminder, digital self-education material, etc.), duration, planned follow-up, prerequisites, and target audience profile (e.g., stage of change, demographics, stage of diabetes, etc.).

This central repository should facilitate manual as well as automated algorithm based resource brokering to ensure that available resources are matched to participants that are the most likely to benefit (e.g., have sufficient motivation). It should allow multiple routes of access to the intervention (e.g., referral, self-enrollment, automated advisement).

As a prerequisite to the development of this repository, a consensus agreement must be reached on data collection practices, behavioural change assessment tools, and other performance metrics. This will enable the use of data analytics to reach conclusions regarding the relationship between the performance of interventions and participant characteristics.

84% 

11 Intervention Groups | 26 Individual Ideas

1. Education & Awareness (for General Public)
Public outreach engagement programmes. Inclusion of the at-risk solitary, elderly, and illiterate groups through face-to-face interaction.

2. Education & Awareness (for Healthcare Provider)
ADES to assume a supervisory role over diabetic education provided by all diabetes educators.

3. Education & Awareness (for Children & Schools)
Diabetes awareness campaign & curriculum for children. Re-examination of the Healthy Meals in Schools Programme and a push for wider adoption.

4. Education & Awareness (Peer-to-Peer & Community-Based)
Peer interventions to be expanded in number. Consolidation of diabetic educational and group facilitation materials, and links to support resources.

5. Labelling & Guidelines
Introduction of the “Go Green Guide”, a traffic light system of labelling which foods to have more of and which to have lesser of.

6. Advertising & Mass Media
Limits on fast food and snack food advertisements. Celebrity/mascot endorsements for healthier foods. Limits on promotions of nutritionally poor foods. Strategic counteradvertising to promote healthy foods.

7. Physical Activity and Exercise QR code or scanner to encourage stair climbing, earning Healthpoints or travel rebates as an incentive.

8. Food Environment (at Hawker Centres & Food Courts)
More plain water, less sugary drinks campaign. Promotion of the My Healthy Plate guidelines. A “Healthy Hawker Centre” competition. Ratings & feedback to hawkers.

9. Food Environment (at Home)
Expand, popularise, and collaborate with existing organisations offering cooking classes. A “Healthy Food Preparation & Cooking” competition.

10. Medical Care Costs
Raise Medisave-claimable amount for CDMP to $750. A rewards system or incentive scheme on outcome-based and process-based indicators.

11. Motivationally Targetted
Communication focused Diabetic Care Clinic, with the emphasis on effective communication techniques. Adoption of a patient outcomes focused model of funding. Expand the SAC to encompass clinical communication and chronic disease counselling. Repository of all registered interventions on a central health platform like HealthHub.

Chapter 3 - Next Steps

This report is just an attempt to develop a holistic understanding and approach to the "War on Diabetes". The research on this topic - the causes, effects, and methods of prevention and treatment - is by no means complete. As our knowledge deepens and evolves, some recommendations in this report will require modifications, while others might even be discredited.

As such, we should be prepared to engage in continuous trial and error, data collection and monitoring, and course correction to reach an understanding of which approaches are likely to be most effective. Furthermore, interventions will need to be appraised and monitored for their reach, sustainability, and cost.[62]

For some interventions to be feasible and effective, the government and many sectors of society need to act in concert. Others might not have any perceivable short-term gain. However, over the long-term, their effects become greater.

Suggested Further Research

Personas & "User Profiles" of the Singaporean population, with respect to diabetes prevention and management. Once these personas are individually categorised, we could then conduct on-the-ground interviews, name and identify key insights, obstacles and barriers, and achieve a greater understanding of how to target this population effectively.

Apply More Strategies in Choice Architecture. When asked to recall our most recent positive behavioural change, one juror said, "I have taken the same 3-in-1 coffee for years, then just last month, the store changed it to a reduced sugar version. The higher sugar one I used to buy is no longer available. I was forced to switch to this new version, but now I'm used to it." This is an example of how choice architecture can drive us to make positive changes. A popular saying among user experience (UX) designers is, "Whoever controls the menu controls the choices."[63] Something as subtle as changing a product's formulation, a product's visual prominence, the total number of products, the size of a package or plate, and even how fast or slow a product's webpage loads, can affect a person's consumption patterns.

Research How Newer Diets Specifically Affect Singaporean Diabetics. There are a wide variety of diets, including Mediterranean, DASH, Ketogenic, Vegan, Vegetarian, Low-Fat, and Low-Carb. As new findings show that the impact of the diet is greatly dependent on our genetics and epigenetics (i.e., different individuals have different optimal diets)[64], we need a deeper understanding of what might be optimal for Singaporeans, taking into account our multi-ethnic background.

<u>In Conclusion</u>

The direct cost of diabetes is substantial and rising, and the indirect cost is even greater. This includes the social, economic, and human cost.

As Jurors we came from diverse backgrounds and brought along very different perspectives, but we prevailed in producing this collective report, which is more than just a set of proposals. It is tangible proof that **Singaporeans can unite** together to ambitiously tackle the "War on Diabetes".

Although we recognise that only some of our proposals will be adopted and implemented, it is our hope that our efforts bring Singapore one step closer to ensuring that effective diabetes prevention and treatment strategies are within the reach of every Singaporean. As jurors we had a glimpse of what is possible when all stakeholders - members of the society, patients, healthcare providers, healthcare administrators, medical equipment suppliers, employers, school administrators, educators, the health promotion and fitness industry, insurers, food manufacturers, food retailers, restaurant operators, the media, and the government - work together **toward a healthier Singapore**.

Appendix A: Minority Report

The Scope

The Minority Report includes the recommendations that were proposed to the jury but did not surpass the voting threshold of 60 votes (80%). These 6 recommendations did not gain sufficient support from the majority due to drawbacks such as feasibility issues or incoherent presentation of ideas. However, there was significant support from the minority for each recommendation to warrant a dedicated report to include their views.

As Singapore evolves as a nation, these ideas may also prove more valuable in devising effective strategies to ensure a healthy and successful population.

The Recommendations

1. Raise awareness of diabetes through social/mass media (78% endorsed)

Incorporate effective educational content and campaigns on diabetes prevention and management into television dramas, radio shows, newspapers, magazines, outdoor advertising and social media channels.

Concerns: Developing the content and disseminating it through multiple media channels may result in high costs. Hiring social media influencers may backfire if they are not educated on diabetes before-hand.

Resolutions: The materials can be rolled out gradually to better ascertain the cost effectiveness of developing the content. Social media influencers can also work together with doctors and caregivers on their content.

2. Government funding for nutritious canteen food and programmes for schools (73% endorsed)

Funding from the Government is required to cover the costs of nutritious canteen food for students and sustaining school programmes that promote a healthy lifestyle over a long-term.

Concerns: There is a lack of clarity over which ministry will subsidise the project and how it will be implemented. Jurors were also concerned about higher taxes and the livelihood of canteen vendors.

Resolutions: MOH can tax unhealthy food to fund subsidies for nutritious food. For canteen vendors, they can also be reimbursed based on proof of purchase of ingredients, to ease their financial burden.

3. "Let's Walk It Forward!" Movement (63% endorsed)

A social movement that aims to motivate Singaporeans to walk more frequently through community/workplace bonding by walking with friends, family, neighbours or colleagues.

Concerns: Jurors felt there was a lack of incentives and perceived walking as not an engaging form of exercise. The implementation of technology through an app and wristband may also be too costly.

Resolutions: Games and competitions can be introduced to increase appeal, and it can possibly be integrated into the National Steps Challenge. It can also be expanded to other forms of exercise such as jogging or cycling.

4. "Healthy Zone" in hawker centres (67% endorsed)

Demarcate a "Healthy Zone" within hawker centres to increase recognition and awareness for healthy hawker food, and encourage hawkers to create and sell more healthy dishes.

Concerns: An explicit healthy zone may inadvertently suggest that stalls outside are unhealthy or less healthy, and could run counter to encouraging all hawkers to develop healthier menu options.

Resolutions: Developing healthy menu certifications which all hawkers can apply for on a voluntary basis. This may prove more effective without causing an unnecessary divide or segregation amongst hawkers.

5. MOH to set up "Lifestyle Medicine Clinics" in public hospitals (52% endorsed)

Introduce clinics which prescribe advice for lifestyle changes rather than drugs or surgery to treat chronic illnesses, with the Wholefood Plant-based Diet (WFPBD) as a first line of treatment for willing patients.

Concerns: Such clinics may see limited success as Singaporeans may find such treatments unfamiliar and may be unwilling to follow through.

Resolutions: Clinical trials, research and surveys can be conducted to better understand the benefits and demand for alternative treatment options for Singaporeans.

6. MOH to promote the WFPBD (31% endorsed)

The Government should educate the public on the health benefits of eating more fruits, vegetables, whole grains and legumes, and avoiding animal-based foods, refined grains and processed foods.

Concerns: Jurors felt that such an initiative may see limited effectiveness as most Singaporeans are not familiar with the diet and plant-based meals are not as appealing and accessible as other types of food.

Resolutions: There should be greater collaboration between the community, Government and businesses so that healthier plant-based meals can be made more appetizing and within reach for all Singaporeans.

Appendix B: References for the Go Green Guide

These articles/research papers were used to develop the "GO GREEN GUIDE":

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Appendix C: Hawker Centre Observational Survey

Methodology: Group members went to food establishments near home/work they often frequent and observed on the accessibility, awareness and acceptance of healthy food options.

Pasir Ris, Ananas @ Pasir Ris MRT	1. No 'Healthier Choice' sign on any signage 2. Economic roasted chicken rice - ~$3, substantially more rice and very little chicken, very little vegetables (more garnish than anything else) 3. Food is mostly pre-prepared, so little flexibility in asking for healthier variations other than portion control 4. No diabetic friendly options available generally, no mention of low GI, or brown rice, etc.
CBD Maxwell Food Centre	1. No 'Healthier Choice' sign on any signage 2. 2 stalls serving salads where customers can choose large amounts of vegetables. Price starts from $5 onwards 3. Nasi padan stall but, little variants for vegetables and mostly, cooked unhealthily 4. Some healthy variants available if you ask, esp for places where food is prepared immediately. (ie, Fruit juice, no sugar. Tauhuey less sugar. Siu dai drinks) 5. Plain water must be bought at > $1.50
Tampines, Hawker Centre @ Our Tampines Hub	1. 'Healthier Choice' options available at almost every stall 2. However only 1 Healthier Choice Meal (Lower in Calories) for stalls that have them 3. Lower calorie-labelled meals do not have enough vegetables and/or protein (do not meet the healthy plate guideline)
Bukit Batok East, Hawker Centre @ Seah Im Bus Interchange	1. Only 3 Healthier Choice Meal (Lower in Calories) signs available in the whole hawker centre 2. 'Healthier Choice' meals available 3. Lower calorie-labelled meals do not have enough vegetables and/or protein (do not meet the healthy plate guideline)
Jurong West, Jurong West Hawker Centre	1. No 'Healthier Choice' sign on any signage 2. "Value Meal," a compulsory menu item for all stalls to serve a meal that meets the average per meal calorie requirement is available at every stall and sold at $2.80 3. Value meals generally do not meet the My Healthy Plate guideline (heavy in carbs and not enough vegetables)
Kovan, Hawker Centre @ Kovan MRT	1. No 'Healthier Choice' sign on any signage 2. Lack of menu choices that meet the MyHealthy Plate guideline. You can meet the Healthy Plate guideline by choosing stalls that have customizable dishes (e.g., economic rice stall, yong tau foo stall) - but this requires more effort on the consumer's part to a) understand the healthy plate guideline and b) pick dishes that meet the healthy plate guideline 3. No signage to advertise that they have brown rice. So consumers do not know that the stall offers brown rice 4. Vegetarian stall is good for getting enough servings of vegetables however limited choice of protein - only have egg or deep fried tofu/taukwa

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