



Diabetes Population in Singapore and Government Regulations on Sugar Levels

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Abstract. The rising prevalence of diabetes in Singapore poses a significant public health challenge, demanding significant public health measurements and comprehensive government intervention. The global diabetes trend, as reported by the International Diabetes Federation, indicates an increase from 537 million cases in 2021 to an estimated 700 million by 2045. In Singapore, approximately 14.5% of the adult population was diagnosed with diabetes in 2021, driven by an aging population, sedentary lifestyles, and high consumption of sugary drinks. In response, the Singaporean government has introduced various policies to regulate sugar content in beverages and promote healthier dietary choices. Key initiatives include public education campaigns, the "War on Diabetes," early detection programs, and the implementation of the Nutri-Grade policy, which mandates clear labeling of sugar and fat content in prepackaged beverages. These efforts aim to reduce sugar intake, thereby mitigating obesity and diabetes risks. The success of these policies highlights the importance of regulatory interventions in addressing public health challenges and sets a precedent for other nations facing similar issues.

Keywords: Singapore Diabetes Prevalence, Nutri-Grade Policy, and Sugar Regulations.

1 INTRODUCTION

1.1 What is Diabetes?

Diabetes is an ongoing disorder that has mainly two classification methods. While the one type of diabetes often emerges during early adulthood with results of the immune system's attack on the pancreatic islet cells, resulting in insufficient or total insulin output and a lifelong reliance on insulin for treatment, Type 2 diabetes is relatively wider-spread, accounting for 90–95 percent of all diabetes occurrences. This kind often develops in maturity, although as obesity rates in children and adolescents rise, the age of start of type 2 diabetes is rapidly reducing. The main determinants influencing the onset of Type 2 diabetes include insulin resistance and inadequate insulin production, frequently linked to being overweight, unhealthy eating patterns, and a sedentary lifestyle. The main indications of diabetes include frequent urination, intense thirst, constant hunger, weight loss, fatigue, and impaired vision. Improperly

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controlled diabetes can lead to notable consequences encompassing cardiovascular disease, stroke, kidney dysfunction, blindness, and nerve damage. Ensuring the prevention and effective management of diabetes is of utmost importance in sustaining public health [1].

1.2 Global Diabetes Population Trend

The global incidence of diabetes is consistently rising. There are approximately 537 million diabetes patients in 2021. The approximation is expected to increase to almost 700 million by the end of 2045[2]. This phenomenon has a substantial effect on personal well-being and imposes a substantial strain on public healthcare systems and economies worldwide. Factors contributing to the global diabetes population increase include population aging, increasing urbanization, changing dietary patterns, and physical inactivity. Considering these factors, government health agencies worldwide are developing public health measurements and regulations to slow down the increase in the diabetes population [2].

1.3 Diabetes in Singapore

Diabetes has emerged as a significant health issue in Singapore. Singapore has one of the most elevated prevalence rates of diabetes globally, with around 14.5% of its adult population affected, according to the International Diabetes Federation (IDF) in 2021[2]. The rise in diabetes incidence in Singapore is influenced by factors such as an aging population, sedentary lifestyles, and dietary choices, namely the excessive intake of sugary beverages. In response to this issue, the Singapore Government has enacted several rules to control the sugar levels in beverages as a component of its comprehensive approach to address diabetes [3].

1.4 Research Purpose

The purpose of this research is to examine the increasing prevalence of diabetes in Singapore and evaluate the effectiveness of government regulations on sugar levels in addressing this public health crisis. By analyzing the relationship between dietary habits, particularly sugar consumption, and the incidence of diabetes, this study aims to provide insights into the impact of public health policies such as the Nutri-Grade labeling system. Additionally, the research seeks to identify potential areas for improvement in current strategies to better manage and prevent diabetes, ultimately contributing to the development of more effective public health interventions [4].

2 DEMOGRAPHIC DISTRIBUTION IN SINGAPORE

2.1 Demographic Distribution

Singapore's population distribution significantly influences its culinary landscape. The interplay between Chinese, Malays, Indians, and expatriates has created a rich and diverse food culture, essential to Singapore's identity. These cultural influences have profoundly impacted Singaporeans' eating habits, emphasizing health, community, and diversity [5].

Based on the most recent figures, the Chinese community in Singapore is the largest ethnic group, making up around 74.3% of the resident population [5]. The Malays, at about 13.5%, are the second-largest ethnic group, while the Indians make up about 9.0% as the third-largest ethnic group in Singapore. Each ethnic group brings its own culinary traditions, creating a diverse and harmonious culinary landscape [5]. Being the majority, the Chinese community has a dominant influence on food habits in Singapore. Traditional Chinese cuisine includes Hainanese chicken rice, fried kuey teow, and dim sum. These dishes are popular among the Chinese and have also been embraced by other ethnic groups, creating a shared culinary identity. The Chinese diet emphasizes balance and often incorporates the philosophy of Traditional Chinese Medicine (TCM), which promotes the consumption of foods that contribute to health and well-being [5].

The Malay community has significantly impacted the local gastronomic landscape with its colorful dishes. Staple foods like coconut milk rice, satay, and rendang are popular among all communities. Singapore's Malay cuisine is heavily influenced by coconut milk, spices, and herbs, reflecting the traditional Malay predilection for richly flavored and aromatic dishes. The shared nature of Malay dining, often among family and friends, has influenced the value Singaporeans place on food for broad social connections and shared dining experiences. The Indian cuisine in Singapore is also very diversified, ranging from the rich and creamy dishes of North India to the spicy flavors of South India. Popular dishes include biryani, ginger rice, and various curries. The Indian influence also extends to vegetarianism, and due to the dietary habits of many Indians, especially Hindu believers, vegetarian options have become commonplace in Singapore, catering to a wide range of dietary preferences [5].

Singaporeans' high sugar intake has caught the attention of public health departments. According to the Health Promotion Board (HPB), Singaporeans' sugar intake is generally high, especially regarding beverages and sweets [6]. Sweetened beverages such as pearl milk tea are particularly popular among young people, while traditional desserts such as pastries, sticky rice with coconut milk, and various types of sweetened water are also popular among all ethnic groups [6]. To address this, the government has launched awareness campaigns to reduce sugar intake, encourage people to choose low-sugar or sugar-free beverages, and label the sugar content on food packages to help consumers make healthier choices [6]. From a cultural perspective, Singapore's eating habits, influenced by various ethnic traditions, emphasize the enjoyment of food in a social setting. Hawker centers offer a diverse range of foods in a single location and symbolize a communal dining culture. These centers provide

affordable and tasty meals and serve as social hubs that bring together people from different backgrounds, reflecting Singapore's multicultural spirit. The government is also influencing eating habits through public health campaigns aimed at promoting healthy eating. Campaigns such as the "Healthy Choice Mark" and the Reduced Sugar and Salt Intake campaign are part of a broader effort to address health problems such as diabetes and heart disease, which are quite prevalent among the population [6].

2.2 Comparative Case Study: Japan

Often considered one of the healthiest diets in the world, the traditional Japanese diet is characterized by low sugar and an emphasis on fresh, seasonal ingredients [7]. The Japanese people's long-life expectancy, low obesity rates, and low incidence of chronic illnesses including diabetes and cardiovascular disease are largely attributed to this diet [7]. Traditional Japanese desserts, known as wagashi, usually use natural sweeteners such as fruit and red bean paste rather than refined sugar. Additionally, Japanese people typically consume smaller portions of sweets compared to Western diets. This moderation of sugar extends to beverages; green tea is a common drink, rich in antioxidants, and is often consumed unsweetened [7].

To further check the correlation between diet habits and diabetes, the following data analysis has shown a clear opposite trend when running the comparative analysis of the rate of the adult population (aged 20-79 years) relative to the total population in Japan and Singapore [1] (Figure 1).

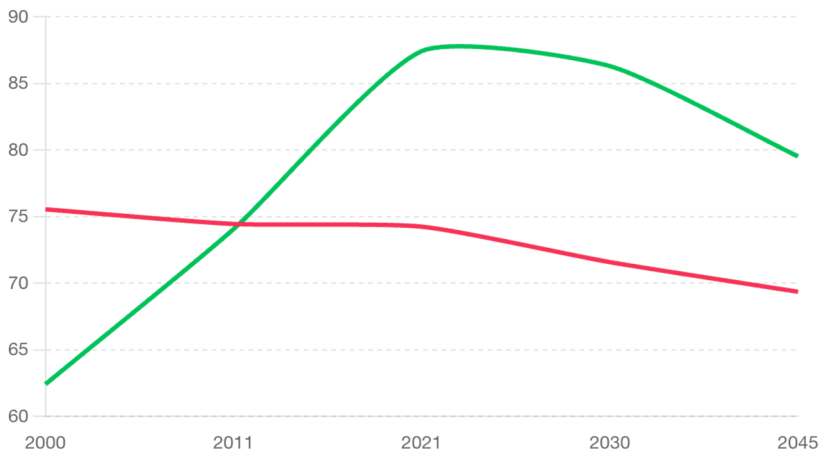


Fig. 1. Rate of Adult Population (20-79 Years) Relative to Total Population in Japan and Singapore (Singapore: Green; Japan: Red) (Photo credit: Original)

Japan: The rate of the adult population shows a steady increase, reflecting an aging population. By 2045, a significant portion of the total population is projected to be adults aged 20-79.

Singapore: The rate shows a rising trend, particularly between 2000 and 2021, then stabilizes. This suggests a relatively younger population compared to Japan, with a steady proportion of adults aged 20-79 over time.

3 PUBLIC HEALTH MEASUREMENTS ON DIABETES IN SINGAPORE

3.1 Dietary Habits and Sugar Consumption

Dietary choices play a significant effect in the onset of diabetes, and excessive sugar consumption is a substantial risk factor [9]. Sugar-sweetened beverages are an essential component of sugar in people's diets, and they are linked with a higher likelihood of developing obesity and Type 2 diabetes [9]. Studies have demonstrated that consistent ingestion of sugar-sweetened beverages results in a rise in body mass, insulin resistance, and other metabolic abnormalities that raise the risk of diabetes [9]. Public health officials in Singapore regard the excessive intake of sugar-sweetened beverages as a crucial contributing factor to the diabetes epidemic in the country. Public health initiatives targeting sugar intake are critical in addressing the diabetes epidemic and further spikes in the diabetes population in Singapore [10]. By reducing the intake of added sugars, the risk of diabetes and other related health concerns could be reduced [10]. Public awareness campaigns, educational programs, and regulatory measures such as the Healthy Choice Symbol (HCS) and Nutri-Grade labeling are part of a comprehensive campaign aimed at decreasing sugar consumption and encouraging healthy eating habits [11].

3.2 War on Diabetes

In 2016, Singapore's Health Administration introduced the "War on Diabetes" initiative, marking the beginning of an ambitious and comprehensive public health campaign [12]. The program addresses the growing diabetes epidemic through public education, early detection, and better disease management [12]. This national effort underscores the urgency of the need for a collective response to stem the rise of diabetes, which poses significant health and economic challenges [12]. The strategic plan focuses on several key areas, starting with increasing public awareness [12]. MOH has launched extensive public education campaigns to inform citizens about the risks of diabetes and the importance of maintaining a healthy lifestyle [13]. These campaigns emphasize dietary modifications, regular physical activity, and smoking cessation [13]. Public service announcements, community events, and partnerships with schools and workplaces are some ways these messages are disseminated [13].

Early-stage detection and implementation of preventive measures are crucial [14]. MOH has introduced various screening programs for early detection of diabetes and pre-diabetic conditions [14]. Regular health screenings are especially promoted for adults with risk factors such as obesity and a family history of diabetes [14]. These

early detections can significantly reduce the progression to full-blown diabetes and its associated complications [14].

Advanced management of diabetes is another focus area [15]. MOH has improved the accessibility and quality of diabetes care [15]. The government has expanded the Chronic Disease Management Program (CDMP) to subsidize the treatment of diabetes and other chronic diseases [15]. This initiative ensures that more people have access to affordable healthcare services, including counseling, medication, and necessary testing [15]. The primary health care network was also strengthened to provide integrated and patient-centered care to improve disease management outcomes [15]. Additionally, in partnership with the Institute for Policy Studies (IPS), the Singaporean government designed the Citizens' Jury Against Diabetes program, which involves all citizens in the policy formulation process [15]. Participants are tasked with making community-based recommendations to improve diabetes prevention and management [15]. This effort not only employs community insights but also cultivates a feeling of connection and shared responsibility among citizens [15].

Technological advances play an important role in the fight against diabetes [16]. MOH utilizes digital health solutions to enhance diabetes care [16]. Telemedicine services, mobile health applications, and remote monitoring equipment empower individuals to efficiently manage their medical condition [16]. These technologies facilitate effective and ongoing communication amongst patients and their healthcare providers to ensure consistent monitoring and prompt intervention [16]. The government invests in diabetes research to discover new treatments and improve existing ones [16]. Collaboration with academic institutions and private sector partners plays an important role in advancing diabetes research [16]. These efforts aim to develop innovative solutions that can be translated into practical applications for the benefit of patients [16].

Singapore has shown a strong and comprehensive response to the major public health problem of diabetes [17]. Through public education, preventive measures, improved care, community involvement, technology integration, supportive policies, and ongoing research, Singapore has made progress in tackling diabetes [17]. The success of this program relies on the collective efforts of the government, healthcare providers, communities, and individuals [17]. Singapore aspires to alleviate the impact of diabetes and enhance the well-being of its inhabitants by promoting a culture that prioritizes health and wellbeing [17].

3.3 Nutri-Grade Policy

The Nutri-Grade policy implemented by the Singapore Ministry of Health (MOH) requires prepackaged beverages sold in Singapore to display a color-coded grade label indicating their sugar and fat content [3]. The grading system ranges from "A" (the healthiest) to "D" (the least healthy) and is color-coded to provide quick and clear information to consumers [3]. The policy encompasses all non-alcoholic beverages, encompassing ready-to-drink (RTD) beverages, fruit juices, dairy products, as well as syrups and powders that are combined into beverages [3]. The primary goal is to decrease the intake of high-sugar beverages, thereby mitigating the likelihood of obesity

and diabetes among the population of Singapore [3]. The policy aims to minimize the intake of sugary drinks by requiring clearer nutritional labeling and introducing specific regulations on sugar and fat content [3].

Implementing the Nutri-Grade policy increases costs for the beverage industry [9]. Companies will have to invest in new labeling systems, adjust their marketing strategies, and possibly incur the costs of product formulation adjustments [9]. These costs can be considerable, especially for smaller companies with limited resources [9]. However, these investments are critical to maintaining long-term competitiveness in an increasingly health-driven marketplace [9]. Beverage manufacturers are now incentivized to reduce sugar and fat content to achieve higher Nutri-Grade ratings [9]. This has led to significant innovation within the industry, as companies invest in research and development to create healthier alternatives without sacrificing taste [9]. Major brands are aggressively adjusting their product formulations to avoid "C" and "D" grades, which may scare away health-conscious consumers [9]. Products that receive an "A" or "B" grade may be more aggressively marketed to highlight their health benefits [9]. Conversely, lower-rated beverages may face reduced shelf space and promotional opportunities, resulting in lower sales [9]. This shift requires a strategic change in the positioning of products in the marketplace, with a greater emphasis on health and wellness [9].

As consumers become more aware of the health implications of their beverage choices, demand for healthier options is likely to increase [9]. This shift could result in healthier products commanding higher prices, benefiting companies that successfully adapt to the new regulations [9]. Conversely, brands that fail to adjust may see sales and market share decline [9].

The Nutri-Grade policy is an important initiative in Singapore to promote healthier lifestyles and address diet-related health issues [3]. Its impact on the beverage industry is multifaceted, driving formulation adjustments, influencing marketing strategies, and changing market dynamics [3]. While the policy imposes a cost on companies, it also provides opportunities for innovation and alignment with consumer health trends [3]. Economically, the initiative promises long-term benefits by encouraging healthy behavior and possibly cutting healthcare costs [3]. With the program now fully implemented, its efficacy could serve as a paradigm for other initiatives globally, underscoring the significance of regulatory interventions in advancing public health [3].

4 CONCLUSION

An analysis of diabetes trends and sugar content regulations and policies in Singapore underscores the significant public health impact of government measures. The implementation of HCS (Healthier Choice Symbol) and Nutri-Grade labeling has effectively decreased the intake of beverages that contain sugar, which in turn has helped slow the growth of diabetes prevalence. These findings highlight the importance of regulatory interventions in addressing public health challenges and provide valuable insights for policymakers aiming to combat diabetes and other lifestyle-related diseases. Singapore's successful implementation of sugar regulations sets an example for other

countries facing similar public health issues. Continual inspection and assessment of these procedures are crucial to guarantee their long-term efficacy and pinpoint areas for enhancement.

Future research should focus on exploring other factors that influence the prevalence of diabetes, such as physical activity levels and other dietary habits, to develop comprehensive diabetes prevention and management strategies. By closely examining Singapore's experience in adapting public health policies, especially targeting diabetes, to local contexts, countries worldwide facing similar public health concerns can take meaningful steps to reduce the burden of diabetes and other non-communicable diseases (NCDs). This will require the collaborative efforts of governments, industry, healthcare providers, and communities to work together to promote healthier lifestyles and improve public health outcomes.

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