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FOOD LABEL USAGE AND UNDERSTANDING AMONG SINGAPOREANS

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ABSTRACT

This study examines if the demographic characteristics influencing the usage of food labels and the extent to which Singaporeans read, understand and interpret food labels. Results suggest that food label reading prevalence in Singapore is high, with fat calories and sugar being read more often than other types of food label items. Healthier Choice Symbol is the most read label format in Singapore. Females are more likely to read food labels. The study also shows that, while Singaporeans positively perceived their ability to read food labels accurately, there are gaps in their perceived ability and the actual correct understanding and interpretation of food labels. The research concludes with suggestions for bridging the perceptional gaps and improving the existing food label formats.

INTRODUCTION

Obesity and overweightness among Singaporeans have been rising over the past three decades. Between 1992 and 2010, the number of adults aged 18 to 69 years who are overweight (World Health Organization, 2018) or obese (World Health Organization, 2018) have risen by 13.9%; and as of 2017, 36.5% of Singaporeans were overweight (Ministry of Health, 2011; Ministry of Health, 2018a). With that, so will the healthcare cost as there is a positive correlation between healthcare cost and Body Mass Index (BMI) (Kent et al., 2017; Nørtoft et al., 2017). The health cost for Singapore, as the result of overweight and obesity, is estimated to increase by more than 50%, between 2014 and 2025, to US $1.5 billion (World Obesity Federation, 2017b).

Overweight and obesity could be prevented through lifestyle choices, like healthy eating. Overconsumption of high-energy foods, including sugar-sweetened beverages, and poor diet quality are among the main risk factors for weight gain (Hruby et al., 2016; Lakerveld & Mackenbach, 2017). Labelling packaged foods with product information, such as nutrient contents, the amount of nutrients and ingredients may help consumers consciously choose healthier food products (Viola et al., 2016). In fact, reading food labels has been linked to reduction of weight in food label readers (Loureiro et al., 2012).

In Singapore, the Health Promotion Broad (HPB) actively encourages consumers to read food labels on packaged foods, and emphasis using the Healthier Choice Symbol (HCS) (Health Promotion Board, 2019a; Health Promotion Board, 2019c) logo to guide consumers to make healthier food purchase decisions (Health Promotion Board, 2019a). However, reading food labels may not necessarily translate to informed and healthier food choices, as consumers may interpret food label information incorrectly (Viola et al., 2016). Food labels, health (Kaur et al., 2019) and nutrition claims (Kaur et al., 2019) in particular, have been adopted by manufacturers, as a form

of marketing tool to gain competitive advantage, as the presence of such claims influence purchase intentions (Hawkes, 2004; Roe et al., 1999). As such, less healthy foods are sometimes portrayed as healthy (Nguyen et al., 2016; Colby et al., 2010). Moreover, even when consumers are reading food labels to differentiate healthy and unhealthy food choices, they do not understand the food label terminology or the Nutrition Information Panel (NIP) on the food labels (Cowbum & Stockley, 2005).

In Singapore, the food name, ingredients, product net content, food allergen labeling, country of origin, and manufacturer or importer's name and address are required by law on food labels of package food (Singapore Food Agency, 2019). However, nutritional labelling, such as Nutrition Information Panel (NIP), is voluntary (Hawkes, 2004; Health Promotion Board, 2019a). Manufacturers could choose to not to display nutrition information on food products (Singapore Food Agency, 2019). It is only required when nutritional claims are made about the products (Singapore Food Agency, 2019). In 2001, the Healthier Choice Symbol (HCS) was introduced to help consumers identify healthier products in the same food categories, under the nutritional labelling programme (Health Promotion Board, 2019c). HPB allows manufacturers to display the HCS logo on the front-of-package (FOP), if the food product meets the HPB's nutritional standard (Health Promotion Board, 2019a).

In relation to nutritional labelling, NIP is the most commonly used Back-of Package (BOP) food label format and the HCS logo is the widely used Front-of-Package (FOP) label format. The Guidance Daily Allowance (GDA) and Traffic Light Label (TLL), the other two types of FOP food label formats, are less prevalent in Singapore. However, GDA has been increasingly been adopted by manufacturers. The four nutrition label formats are shown in Figure 1.

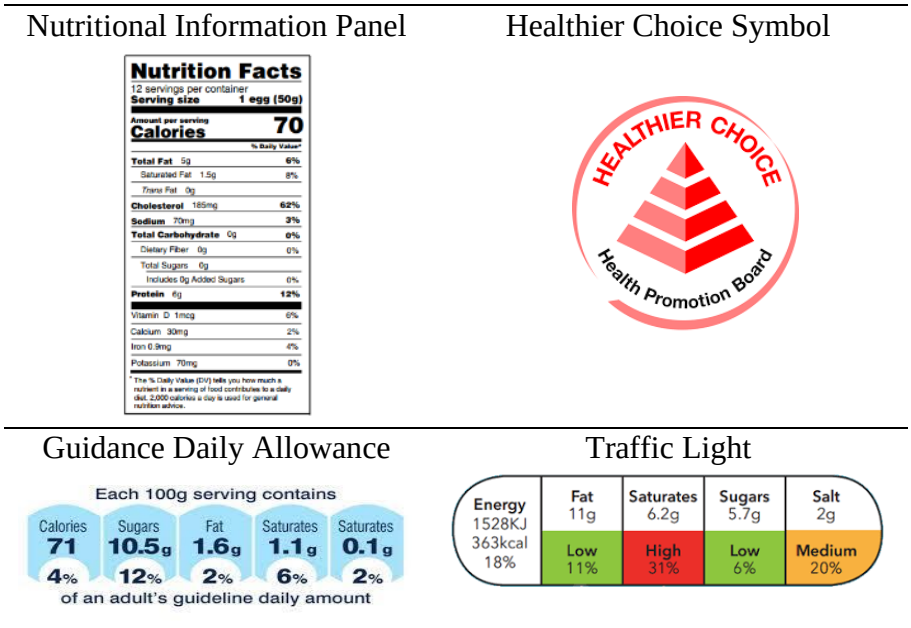

Figure 1. Major Nutrition Label Formats in Singapore

In 2014, with a growing proportion of Singaporeans eating out, the HCS programme was introduced to eating places such as full-service restaurants, fast food restaurants, hawker centers, food courts, and coffee shops, under the Healthy Dining programme (Health Promotion Board, 2018a). Similar to packaged food, there is no mandatory requirement to display nutritional information at these places. Therefore, most do not volunteer nutritional labels on their menu. Only a few restaurants, food stalls in food courts, hawker centres, and coffee shops display the HCS logo, even then only for selected food items. Others, such as fast-food restaurants, offer detailed nutrition information on their websites.

The objective of this study is to find out if Singaporeans use food labels as part of their purchase evaluation decision, to identify the characteristics of Singaporeans who uses food labels, and on Singaporeans' ability to read, understand and interpret nutrition information on the food labels accurately to purchase healthier food products. The answers to these questions will provide insights to relevant organizations to nudge consumers towards healthier food products.

METHOD

The survey method was used to collect the research data. The survey was self-administered by the respondents themselves or administered by the researcher.

The sample size was calculated using the following Cochran's formula,

$$n = \frac{Z^2 p(1-p)}{e^2} = \frac{1.96 * 0.5(1-0.5)}{e0.05^2} = 384$$

as the population size for this study was sufficiently large at 3,180,000 (Department of Statistics Singapore, 2018; Barlett et al, 2001). With n = sample size, Z = 95% confidence level, P = 50% expected proportion, and e = 5% margin of error, the optimal sample size is 384.

However, the actual sample size was 165. Although, the sample size is less than the required 384, it is still valid, as it satisfied the minimum sample size rule for Central Limit Theorem (n = 30), multiple regression (n > 50 + 8p) (where p is the number of predictors. For this study, there are nine predictors for the food label items. Hence the minimum sample size is 122 which is more than 100), and logistic regression (n > 100) (Green, 1991; Long, 1997).

The survey instrument design had four parts. Part 1 asked the respondents about the demographic information. Part 2 asked the respondents about their awareness and usage of the food labels. Part 3 asked the respondents about their understanding and interpretation of the food labels. Part 4 asked the respondents about their food label preferences at eating places.

In total, there were 27 questions. Questions 13, 15, 16, 17 and 18 were adapted from the research of Godwin et al. (2014), and questions 20,21,22 and 23 from Weiss et al. (2005). Most of the survey questions were designed as closed-ended with a Likert scale range of five or simple-dichotomy questions. Questions 10 (Asked the respondents about their height), 11 (Asked the respondents about their weight), 13a (Asked the respondents to explain their reasons for not reading food labels if they choose '*Others*'), 20-23 (Asked the respondents to interpret NIP and write the correct answers to the questions. Multiple choice answers were not used for these

questions, as the intent was to mimic real-life situations, where the respondents had to read and interpret the food labels), and 27 (Asked the respondents to explain their reasons for not using the HCS, if they choose '*Seldom*' or '*Never*') were opened-ended.

The survey instrument was pilot tested to four individuals from diverse and amended according to feedback received. It was conducted over a four-week period from 1 to 30 September 2019. A total of 168 people participated in the study. However, three of the respondents were non-Singaporeans, so only 165 were retained for the data analysis.

SPSS Statistics version 22 was used to analyse the data. The confidence level was set at 95% and the alpha at 0.05. A P-value less than 0.05 was taken to have statistical significance. The association between the demographic characteristics and reading food labels was performed using multiple logistics regression analysis, in line with prior research studies, such as Grunert et al (2010) and Ambak et al (2018). The results are presented as odds ratio (OR). The variable '*read labels when I purchase food*' was used as a dependent variable, and was recoded as a binary variable, where '*seldom*' and '*never*' were coded as 0, and '*sometimes*', '*frequently*' and '*always*' as 1. The covariates were the demographic variables. One-way analysis of variance (ANOVA) was conducted to find out if there was a significant difference in the usage of four food labels formats since the covariates were categorical variables. Multiple linear regression analysis was used to determine if there was a significant difference in the usage of fat, calories, and sugar with the other food labels items, and if there was a significant gap between the perceived correct understanding/usage food label terms and NIP, with the actual correct understanding/usage, since the variables used in these analyses were continuous. These are backed by descriptive statistics, using frequency tabulation.

The sample size for H1 was 165. The sample sizes for H2 to H5 were 128, as respondents who selected '*Seldom*' or '*Never*' to question 12 "*I read food label when I buy food products*" were not asked to indicate their usage on the food label format, usage on food label items, their understanding of food terms and understanding of NIP.

BMI was calculated using the height and weight provided by the respondents, and grouped into the BMI classification; underweight, normal, overweight or obese.

For the understanding of food label terms, respondents were asked seven questions to which they agree, disagree or indicate "*I do not know*". The responses were coded as correct or wrong/'*I do not know'*, and an overall index of food label knowledge was constructed using the formula:

$$\text{Food Label Knowledge Index} = \frac{Number\ of\ correct\ answers}{Number\ of\ food\ label\ term\ questions} \text{ X } 5$$

Similarly, for the understanding of NIP, respondents were asked four open-ended mathematical questions. The responses were coded as correct or wrong/'*I do not know'*, and an overall index of NIP knowledge was constructed using the formula:

$$\text{NIP Knowledge Index} = \frac{Number\ of\ correct\ answers}{Number\ of\ NIP\ questions}$$

Table 1. The Internal Consistency

Variable	N	%
Gender		
Female	104	63%
Male	61	37%
Race		
Chinese	125	75.8%
Malays	17	10.3%
Indians	23	13.9%
Age		
18 to 24 years old	14	8.5%
25 to 29 years old	44	26.7%
30 to 39 years old	43	26.1%
40 to 49 years old	39	23.6%
50 years old and above	25	15.2%
Marital Status		
Single/Divorced/ Widowed/Separated	79	47.9%
Married	86	52.1%
Monthly Income		
Not Disclosed	28	17.0%
No Income Earned	12	7.3%
Less than $3,501	63	38.2%
$3,501 to $5,500	12	7.3%
$5,501 to $7,500	34	20.6%
$7,501 to $10,000	10	6.1%
More than $10,001	6	3.6%
Employment Status		
Full-Time or Part-Time	143	86.7%
Self Employed	4	2.4%
Homemaker	3	1.8%
Retired	3	1.8%
Students	12	7.3%
Variable	**N**	**%**
Education Level		
Secondary/A Level/ ITE	11	6.7%
Diploma	66	40.0%
Bachelor’s Degree	63	38.2%
Postgraduate	25	15.2%
Age of Youngest Child		

Variable	N	%
No Children	110	66.7%
Child aged 0 to 6	20	12.1%
Child aged 7 to 12	14	8,5%
Child aged 13 to 17	10	6,1%
Child aged 18 years and above	11	6.7%
BMI Classification		
Underweight	7	4.2%
Normal	100	60.6%
Overweight	44	26.7%
Obese	14	8.5%

Cronbach' alpha was used to test for the internal consistency. The alpha for the test variables were over 0.80. Therefore, in line with existing literature, the internal consistency is adequate (Cronbach, 1951; Cronbach & Shavelsom, 2005).

RESULT AND DISCUSSION

H1: Demographics Characteristics and the Likelihood to Read Food Labels

H1 predicts that demographic characteristics such as females ($H1_a$), educated consumers ($H1_b$), married consumers ($H1_c$), overweight consumers ($H1_d$), Malays ($H1_e$) and households with young children ($H1_f$) are more likely to read labels, while income ($H1_g$), age ($H1_h$) and employment status ($H1_i$) do not have any bearing on the likelihood to read labels.

There was a high percentage of food label reading habit (> 60%) among all variables and sub-group, except for students (58%), retirees (33%) and those who are not earning any income (50%).

Multiple logistic regression analysis was performed to determine if any of the demographic characteristics are significantly more likely to read labels.. The percentage of explained variance is 26% (Nagelkerke R^2). Gender was significantly associated with reading labels. Females were 2.161 more likely to read labels compared with males (*OR* 2.161, *P*=0.042). Other characteristics such as race, age, education, income, age of children, employment status or BMI index have no significant differences. Therefore, the final prediction model where all the predictors are statistically significant was

$$\text{Logit}_{\text{read label}} = 0.793 + 0.771*\text{females}$$

The analysis is supportive that females are more likely to read labels, and that income, age and employment status have no bearing on likelihood to read labels. Thus, $H1_a$, $H1_g$, $H1_h$ and $H1_i$ are supported. However, the analysis does not support the Malays, educated, married consumers

and households with young children, or the overweight consumers are more likely to read labels. Hence, $H1_b$, $H1_c$, $H1_d$, $H1_e$ and $H1_f$ are not supported.

H2: Singaporeans Use the HCS Logo More than Other Food Label Formats

H2 predicts that there are significant differences in the four different types of food label format read, with HCS being read more often compared to the other food label format.

The awareness of the HCS and NIP were the same at 95.3%, while the awareness of GDA and TLL were lower at 35.2% and 33.6% respectively. The most common label format read was HCS (87.5%). This was followed by NIP (72.7%), GDA (28.9%) with TLL (16.4%) being read the least.

One-way ANOVA was conducted to determine if there were significant differences in the reading habits of food label readers for NIP, HCS, GDA and TLL. The null (H_0) and the alternative hypothesis (H_A) for the test were as follows:

1) H_0: $\mu_{HCS} = \mu_{NIP} = \mu_{GDA} = \mu_{TLL}$
2) H_A: $\mu_{HCS} > \mu_{NIP,}\ \mu_{GDA\ or}\ \mu_{TLL}$

Levene's test indicated unequal variances (F = 90.706, p = .000). Since, the assumption of homogeneity of variance was violated, the Welch F-ratio was reported. The result showed that there were significant differences in the reading habits of food label readers; F (3, 280) = 106.93, p = .000. Post hoc comparisons, using Games-Howell, showed that there are significant differences in the mean scores of all groups, except between GDA and TLL. Therefore, HCS was significantly read more often (M = .88, SD = .332) than NIP (M = .73, SD = .447), GDA (M = .29, SD = .455) or TLL (M = .16, SD = .372). Hence, H_o is rejected, and H_A is accepted. There is statistical evidence to support H2.

H3: Singaporeans Read Calories, Fats and Sugar More than Other Food Label Items

The most common items that were '*always*' or '*frequently*' read were fat (64.1%), calories (62.5%) and sugar (61.09%). This was followed by the ingredient list (55.5%), health claims (53.9%), serving size (40.6%), sodium (39.9%), and fiber (39.9%). The least read food label item was the percentage daily value (32.1%) which is also the most often 'seldom' or 'never' read label item (41.4%).

Multiple regression ANOVA was conducted to determine if there were significant differences between reading calories, fat or sugar with the other food label items. The null (H_0) and the alternative hypothesis (H_A) for the test are as follows:

1) H_0: $\mu_{fat} = \mu_{calories} = \mu_{sugar} = \mu_{sodium} = \mu_{serving\_size} = \mu_{fiber} = \mu_{ingredient\_list} = \mu_{percent\_daily\_value} = \mu_{health\_claims}$
2) H_{A1}: $\mu_{fat} > \mu_{fiber,}\ \mu_{servering\_size,}\ \mu_{fiber,}\ \mu_{ingredient\_list}\ ,\ \mu_{percent\_daily\_value\ or}\ \mu_{health\_claims,}$ and
3) H_{A2}: $\mu_{calories} > \mu_{fiber,}\ \mu_{servering\_size,}\ \mu_{fiber,}\ \mu_{ingredient\_list}\ ,\ \mu_{percent\_daily\_value\ or}\ \mu_{health\_claims,}$ and
4) H_{A3}: $\mu_{sugar,} > \mu_{fiber,}\ \mu_{servering\_size,}\ \mu_{fiber,}\ \mu_{ingredient\_list}\ ,\ \mu_{percent\_daily\_value\ or}\ \mu_{health\_claims.}$

The result indicated there was a significant difference in the different food label items read; F(9, 118) = 9.051, p=.000. As shown in Table 4.1, Fat was read more often (M = 3.73, SD = 1.048),

followed by calories (M = 3.67, SD = 1.058) and sugar (M = 3.66, SD = 1.139). The least read food label item was percent daily value (M = 2.680, SD = 1.094). Therefore, H_o is rejected, and H_{A1}, H_{A2} and H_{A3} accepted. There was statistical evidence to support H3.

H4: Singaporeans' Perceived Food Label Usage, and Actual Understanding on Food Terminology

57.8% of respondents reported that they were '*always*' or '*frequently*' confident that they know how to use food labels, and none of the respondents felt totally unconfident. However, only 38,3% of the respondents are able to obtain at least 5 correct answers while 9.4% provided all wrong answers.

The most understood food label terms were '*No Added Sugar'* (73.4%), followed by 'No Cholesterol' (71.9%). The least understood term was HCS, with only 21.9% identifying that food products with the logo may not necessarily be low in fat, sugar and calories.

To determine if there was a statistical significantly difference in Singaporeans' perception of their own ability to read and understand food label terms and their actual ability to read food label terms, multiple regression ANOVA was conducted. The null (H_0) and the alternative hypothesis (H_A) for the test were as follows:

1) H_0: $\mu_{perception} = \mu_{actual\_ability\ of\ food\ terms}$
2) H_A: $\mu_{perception} > \mu_{actual\_ability\ terms}$

The result indicated there was a statistical difference in the perception and actual ability to read food label terms; $F(2, 125)=9.157$, $p=.000$. Singaporeans' perceptions were much higher (M = 3.60, SD = .756) compared to their actual understanding (M = 3.11, SD = 1.117). Therefore, H_o is rejected. There was statistical evidence to support H4.

H5: Singaporeans' Perceived Food Label Usage, and Actual Understanding on NIP

57.8% of respondents reported that they are 'always' or 'frequently' confident on their own ability to read labels and none of the respondents felt totally unconfident. However, only 33.6% of the respondents are able to obtain at least 3 correct answers while 27.3% provided all wrong answers.

Majority of respondents were able to calculate the calories per serving consumed from the NIP (63.3%). This is followed by the amount of carbohydrates per serving (57%). The most miscalculated NIP information was tasks involving percentage daily value (26.6%) and fats (38%), where the respondents had to numerically convert the information found on the NIP and apply it to a particular scenario, to mimic real-life food label decisions faced by consumers.

To determine if there was a statistical significantly difference in Singaporeans' perception of their own ability to read and understand, and their actual ability to read NIP multiple linear regression analysis was conducted. The null (H_0) and the alternative hypothesis (H_A) for the test were as follows:

1) H_0: $\mu_{perception} = \mu_{actual\_ability\ of\ NIP}$
2) H_A: $\mu_{perception} > \mu_{actual\_ability\ of\ NIP}$

The result indicated there was a statistical difference in the perception and actual ability to read and understand NIP; $F(2, 125)=9.385$, $p=.000$. Singaporeans' perceptions were much higher ($M = 3.60$, $SD = .756$) compared to their actual understanding ($M = 2.77$, $SD = 1.1.428$). Therefore, H_o is rejected. There was statistical evidence to support H5.

Demographic Characteristics of Label Readers

Similar to other studies, label reading is prevalent in females (Nayga, 1996; Godwin et al, 2006; Grunert et al., 2010; Majid et al., 2015; Ambak et al., 2017). Compared with Godwin et al. (2006), slightly fewer females read labels (79% versus 82%), and more males read labels (69% versus 62%). The likely cause for higher reading among females could not be ascertained in this study, with their marital status, nor the number of children, which could be indicative factors (preparing meals for the family) of females reading labels (Nayga, 1996). This could suggest that other factors such as trying to lose, gain or maintain weight, as the cause of the higher tendency to read labels. Women are more likely than men to be dissatisfied with their weight (Demarest & Allen; 2000). In Singapore, 47% of the women are dissatisfied with their weight compared with men (39%) (Ho, 2019). Thus, the high reading prevalence could be attributed to their attempt to modify their diet intake by checking calories, alongside with other nutritional information to control their weight; calories was significantly read more by females compared to other read label items; but for males, other labels items were significantly read more.

Other characteristics like education and marital status which consistently are indicative of label reading did not point to the likelihood to read labels. This could be due to the large number of highly educated respondents who participated in this study; 154 out of 165 have polytechnic diploma and above. 79% of respondents who have at least a diploma and above, reads labels compared to the 63% who have secondary, A-level or ITE certificate. Therefore, the large number of highly educated Singaporeans participating in the study could have overshadowed other characteristics, except for gender. Education is a proven predictor for the likelihood to read labels in many studies (Blistein & Evans, 2006; Drichoutis et al., 2006; Christoph et al., 2018).

Reading Food Label

Singapore has one of the highest food label reading prevalence (77.6 %) compared with US (75%), Canada (52%), and European Union (47%); Only, New Zealand has a higher prevalence (82%) than Singapore (Campos et al (2010). This is likely due to the high literacy rate in Singapore (97.2%) (Department of Statistics, Singapore, 2019). With 93.3% of the respondents possessing at least a diploma and above, the high food label reading prevalence is expected, as education is one of the most consistent characteristics associated with reading labels prevalence in other studies (Blistein & Evans, 2006; Drichoutis et al., 2006; Christoph et al., 2018). Moreover, HPB actively roll-out educational program and public policies on healthy eating, and these campaigns could positively influence Singaporeans to choose healthier food options. (Health Promotion Board, 2019b). Educational campaigns like "EAT, Drink, Shop Healthy (EDSH) Challenge" (HealthHub, 2019), which offers F&B and shopping vouchers to consumers has incentivized consumers to

cultivate label reading habits (HealthHub, 2019). Qualifying foods under the challenge also include food with the HCS logo (HealthHub, 2019). For the 2018 EDSH challenge, the sign-up rate was high, an estimated 540,000 people (Ministry of Health, 2018b).

The awareness and usage of the HCS logo is higher than the other label formats. NIP also has a high awareness and usage, as HPB promotes its usage alongside with HCS Health Promotion Board (2019a). However, this study contraries with Vijaykumar et al. (2013) which suggest that the awareness of GDA and TLL was higher than HCS. It also shows that the awareness and usage of HCS is much higher than the reported awareness and usage by HPB. The likely explanation could be, since then, HPB was in the forefront to promote the HCS logo and this has positively impacted its use among Singaporeans.

In terms of reading food label items, findings are similar to Godwin et al. (2006) and Grunert et al., (2010) that fats, calories and sugar were read more. However, in Singapore, food label items were read at a higher reading frequency, as most respondents select either '*always*' or '*frequently*' compared to '*sometimes*' as was the case for Godwin et al. (2006). However, unlike Godwin et al. (2006) where health claims (18.2%) was the least read, in this study health claim (53.9%) is also one of the popular read label items at the fifth position.

Since fats, calories and sugar were significantly read more often by Singaporeans, and they contribute towards weight gain, these items should be moved to the FOP to help consumers quickly and easily identify healthier food products (Labib, 2003; Stinson et al., 2018). While, Singapore has mandated FOP labeling for sugar, for high-sugar beverages, in Oct 2019, fat and calories are not part of this FOP requirement, although fat and trans-fat in the products are considered before the products are graded (Min, 2019). There is value of having all three nutrients listed, as it leads to transparency of food information and prevent manufacturers misleading consumers with half-truth claims. This study found out that an estimated 50% of the consumers were not aware of low-fat and sugar relationship and low-sugar and fat relationship in food products, where food products with nutrient claim 'low-fat' could have higher sugar content compared to the regular version of the product and vice-versa for low-sugar. Thus, they could be making unhealthier food choices, and buying food products which they think are healthy but are not.

Understanding Food Label

This study also found that there is a perceptional gap between Singaporeans' self-reported confidence that they know how on how to read food labels, and their actual understanding of food terms and NIP. Only 10.2% (13) of Singaporeans were able to obtain correct answers to all the seven food label terminology questions, and only 15.6% (20) of Singaporeans were able to calculate correctly for all four NIP questions. Therefore, the perceptional gap, if not corrected, means that Singaporeans will continue to make unhealthier food choices.

Singaporeans misunderstanding of HCS is particularly alarming, as only 21.7% got the question correct, despite the fact that 87% of Singaporeans use HCS to make purchase decisions. This suggests that most Singaporeans who are using the HCS logo to make purchase decisions, could be interpreting the HCS wrongly. Singaporeans could view the HCS as a form of

endorsement from HPB, and thus, do not seek further details about what the HCS logo actually represents. In fact, when claims on a product is backed by a non-profit source, the credibility of the products increases in the eye of the consumers. Hence, they cast a halo effect on all the nutrient contents in the food products with the HCS logo.

When it comes to understanding NIP, Singaporeans performed badly compared with the US study. While an estimated 75% to 80% of the participants in the US study was able to perform simple calculations, only 57% to 63.3% are able to do so in this study (Persoskie et al., 2013). For the complex calculations, 60% in the US study were able to perform complex calculations, while less than 30% are able to do for in this study (Persoskie et al., 2013). However, 15.6% were able get all the answers correct, compared to the US study where less than 9% did so (Persoskie et al., 2013).

As Singapore has been consistently ranked at the top three levels in global mathematics assessment studies since 1995, the lack of mathematical skills in Singaporeans is probably not cause for the low NIP percentage (NCES, n.d). But rather the manner in which the information is presented, which could be confusing and is not intuitive. It requires some form of prior knowledge on how to use it correctly. For example, the nutrients in NIP are presented based on a single serving size, and what defines as a single serving size is not consistent across food products (Roberto & Khandpur, 2014). Similarly, for the daily percentage value which the consumers have to calculate after considering their overall diet (Roberto & Khandpur, 2014). Thus, some mental interpretation is required. Based on the type of food label items read by Singaporeans, percentage daily value and size serving were among the least read information. Alongside with the low score on NIP, this could suggest that Singaporeans would rather read information readily presented to them in food labels, than calculate them.

Singaporeans' Preferences at Eating Places

Consistent with other studies, Singaporeans want food labels, like NIP, to be made available at eating places. However, the presence of such food labels may not sway their decision to purchase unhealthy food (Parikh & Behnke, 2015). This is because, although HCS is available at selected eating places, it is not used often by Singaporeans. Mainly, because most have already decided beforehand what to order, while others associated foods without the HCS label as more delicious. NIP being a more complex food label format, the reading prevalence could be lesser.

CONCLUSION

The result of this study shows that the majority of Singaporeans read labels regularly when they purchased package food. Both HCS and NIP are often used by label readers to aid their decision-making process. However, not all food label items are read equally; fat, calories and sugar are read more often than others. Females are more likely to read labels. Results also show that there is a perceptional gap between consumers' confidence that they know how to read labels and the actual reality which shows that there is a lack of nutritional knowledge in both understanding the food terminology and NIP label.

A multi-pronged approach, by incorporating sugar, fats and calories on FOP, and at the same time extending the FOP requirement to other food categories, beyond beverages, could be considered. The extension of FOP to include other food categories will sharpen the fight against obesity and diabetes, as it might stop the marketing tactics used by manufacturers where they could substitute 'fat for sugar' and 'sugar for fat', in other food categories as the key nutrients are visible for consumers to read at a glance. This can be implemented through mandated use of the TLL food label format, which displays calories, fat and sugar at the FOP. Supplementary nutrition information in the form of TLL, alongside with the existing HCS logo, could ease the decision-making process for consumers and aid them to make healthier food choice within the food categories at a glance. The transparency of having the amount of fats, calories and sugar listed on the FOP could reduce misconceptions that HCS is always low in fats, calories and sugar but is actually a comparative logo.

As even regular food label readers have problems understanding the mathematics behind NIP, NIP format ought to be simplified and standardized. Simplification of NIP includes standardization the single serving size for the food categories, listing the each of the nutrients as high, low or medium with regards to the recommended allowance for the nutrient so that at a glance consumer are aware that the healthiness or unhealthiness of a particular nutrient in the products. Standardization includes having all manufacturers to comply to a particular NIP format so that consumers could easily conduct cross checks.

Lastly, the researchers hope that future research regarding the use of food labels can emerge with more variables affecting it. The researchers also hope that the research can become a reference for future research discussing similar topics.

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