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Determinants of Food Label Use among Supermarket Shoppers: A Singaporean Perspective

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ABSTRACT

Objective: Examining factors influencing food label use among Singapore's supermarket shoppers using the Theory of Planned Behavior.

Design: A point-of-purchase survey among general shoppers in 2 supermarkets.

Setting: Singapore, a country whose population is exposed to a wide range of food labeling formats because of the import-dependent nature of the food industry.

Participants: A total of 200 shoppers (Chinese [75.5%], Malays [8.5%], and Indians [7.0%]) participated in the survey.

Main Outcome Measures: Independent variables composed of attitudes and subjective norms (both 5-point Likert); perceived behavioral control and diet-health concern (both 5-point semantic differential); and knowledge (18-item index). Dependent variables were intention to use food labels (5-point differential scale) and actual use of food labels (19-item index).

Analysis: Data were analyzed using descriptive statistics, mean analysis, and multivariate linear regression.

Results: Low levels of knowledge and health literacy were found. Attitudes, subjective norms, and behavioral control differed significantly by age and ethnicity. Subjective norms and diet-health concern were significant predictors of intention to use food labels.

Conclusions and Implications: Lack of knowledge but positive attitudes toward food labels make Singapore's consumers vulnerable to misusing or being misled by food label information. Demographic differences demonstrate the need to develop targeted educational interventions and enhance awareness of and ability to use food labels.

Key Words: food label, Asia, behavior, Theory of Planned Behavior (*J Nutr Educ Behav.* 2013;45:204–212.)

INTRODUCTION

In the past 2 decades, countries in the Asia-Pacific region, especially Singapore, have experienced considerable economic growth.¹ However, an increase in per capita income has led to a greater desire for convenience, willingness to experiment, and less time for home preparation of meals. Thus, dietary behaviors have shifted toward an increased consumption of processed and packaged food.² Concurrently, the region has experienced a rise in lifestyle-related and/or diet- and weight-related chronic health conditions such as obesity and diabe-

tes, among others.^{3–5} As the public health community attempts to devise effective educational strategies to address this situation, food labels have emerged as legitimate candidates. Some researchers suggest that food labels influence diet and health outcomes by shaping food-related attitudes and choices,^{6–8} whereas others view this relationship as uncertain.^{9,10}

In a world in which people grapple with busy lifestyles and reduced attention spans, food labels help marketers to quickly share information, communicate a product's healthfulness, and generate consumer confidence in

a product's quality.¹¹ Food labels bridge the health information gap between producers and consumers and are designed to aid in consumers' dietary choices.^{12,13} In Europe, researchers found surprising consistency in consumers' interest in nutritional information and obtaining this information from food labels.¹⁴ In the United States (US),¹⁵ a vast majority of shoppers reported using nutrition labels "sometimes" or "always," while in New Zealand,¹⁶ label use among shoppers was found to be moderate to high.

In contrast, controversies surrounding misleading information and claims have adversely affected consumer attitudes toward food labels.¹⁷ Researchers now find that consumers' actual use of food labels might be lower than their reported use.^{18,19} As a result, there is a growing lack of trust in, and skepticism about, food labels among the public.²⁰

These conflicting trends challenge nutrition educators and public health authorities who encourage the public to use food labels as a means to make

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food choices that align with their dietary composition and health needs. In order to understand how food label marketing influences dietary choices or health outcomes, it is important to begin by identifying the factors that influence the use of food labels. This research set out to examine whether psychosocial factors related to food label use differ by demographic segments and theoretical drivers of intention to use food labels. Although researchers in the West have conducted some examinations of such issues,²¹⁻²³ similar inquiries in the East, particularly Singapore, are scant.

The Singaporean Food Labeling Context

Singapore, an island city-state that is home to approximately 5 million people, represents a microcosm of Asia, with a dominant blend of Chinese, Malays, and Indians. However, the country's rapid economic prosperity foreshadows the lack of local agricultural produce, which leads to food consumption being dependent on imported food. This pattern exposes Singapore's consumers to packaged food that arrives from different continents with a range of food labeling formats.

Current Singapore food regulations require all pre-packaged food products for sale in Singapore to be labeled according to specified local requirements.²⁴ General labeling requirements include product name, ingredient list, allergen labeling, quantity, drained weight, name of the country of origin, as well as the name and address of manufacturer, packer, or local vendor. All these items must be printed in English, in letters not less than 1.5 mm in height. The food labeling regulations also permit the use of a nutrition information panel—which has been shown to influence consumers' assessments of packaged food²⁵—to enable the listing of energy and nutrients contained in the food. All food for sale in Singapore, including products that are imported into the country, must be labeled according to this format. With regard to front-of-package labeling that intends to serve as an indicator of the product's healthiness, international systems such as Guidance Daily Amount and traffic lights²⁶

are eschewed in Singapore. Instead, food products are allowed to carry the Health Promotion Board (HPB) Healthier Choice Symbol.²⁷

Singapore's consumers also encounter logos/seals besides the Healthier Choice Symbol—a practice generally not allowed. Notwithstanding this general prohibition, some specific logos or seals issued by authorities recognized by the regulatory agency are permitted. Some examples include logos of the Singapore Heart Foundation,²⁸ Superbrands,²⁹ and *halal* (commonly meat products) certifications.³⁰ Such third-party seals are potentially extrinsic cues to consumer choices, as early studies have shown that consumers tend to attribute more meaning to seals than is true.³¹

Determinants of Food Label Use

According to Drichoutis and colleagues,²¹ food label use is influenced by factors at various levels, ranging from demographic to attitudinal and product related. Scientific evidence remains inconclusive toward influence of demographic factors on food label use. Although some studies have reported that food label use decreases with age,^{22,32} other studies have demonstrated the reverse.^{33,34} Furthermore, individuals with higher education are more likely to read nutrition labels and peruse ingredient lists, as opposed to those with lower education, who tend to read only the former.^{35,36}

Prior nutritional knowledge can increase food label use by enhancing its perceived benefits²¹ or by increasing motivation to seek more health information.³⁷ A person's attitude shapes food label use in concert with a range of different factors. For instance, consumers who perceive food labels as “too hard to understand,” “too small to read,” and an activity that “takes too much time” are discouraged to use them.³⁸ Recent reports have identified a lack of trust and growing skepticism about information displayed in food labels²⁰ and a low perception of importance of food label information³⁹ as possible barriers to use. Other research has found that higher perceived benefits of food label use (in terms of its usefulness and ability to facilitate food choices) can influence greater use of food labels.⁴⁰

Theoretical Framework

The theoretical framework that informed the present study was the Theory of Planned Behavior (TPB).⁴¹ According to this theory, behavioral intention can be explained by (1) attitudes (beliefs about the likely consequences of behavior); (2) subjective norms (“social pressure to perform or not perform the behavior”);⁴¹ and (3) perceived behavioral control (beliefs about internal and external barriers that may hinder the behavior to be performed). This study extended the application of TPB in food label use research by focusing on 2 elements that have been largely ignored in previous studies: subjective norms and diet-health concern (DHC), a construct outside the original TPB model.

First, in previous research, pathways between subjective norms and diet- and health-related behaviors have been shown to exist.^{42,43} Given that food label use has been shown to influence such behaviors, it is important to understand the role of subjective norms in shaping the use of food labels. A simple illustration is that of a woman using food labels because she perceives that her husband would like for her to be more health conscious and lose weight. Then, food label use is generally stimulated in settings such as supermarkets, where consumer behavior may be shaped by a process of negotiation with one's social identity. For instance, a person might use food labels to “come across” as being a discerning consumer or a health-conscious one.

The second element pertains to DHC. In the past decade, researchers have noted how concerns about one's own health vis-à-vis one's diet and feelings about linkages between diet and disease can potentially shape use of food labels.⁴⁴ These findings are tested by exploring whether DHC adds to the predictive ability of TPB in explaining intention to use food labels. In sum, this study examined the demographic and attitudinal drivers of food label use among Singapore's supermarket shoppers. The intent was to quantitatively investigate public awareness of, and attitudes toward, food labels among Singapore's supermarket shoppers. Such an assessment helps to determine whether psychosocial factors related to food label use

varies according to gender, ethnicity, and age. In doing so, this study addressed theoretical gaps by examining the relevance of the TPB and the extent that DHC adds to the predictive power of TPB.

METHODS

The study team conducted point-of-purchase surveys among shoppers in 2 supermarkets in Singapore. Point-of-purchase survey is the preferred methodology for food labeling studies,⁴⁵ as this strategy enables researchers to capture consumers' insights during their shopping experiences, thereby lowering the possibility of overreporting of food label use. Settings catering to different socioeconomic groups were chosen (National Trade Union Congress [NTUC], Fairprice Extra [discount grocery store], and NTUC Fairprice Finest [high-end grocery store]) to account for economic diversity in the study

sample.⁴⁶ Data collection began after obtaining necessary permissions from store managers. Convenience sampling was used to collect data from all respondents who agreed to participate, within a 1-week period in March 2010. Two trained research assistants solicited general shoppers to participate in the 15- to 20-minute survey and, when the shoppers agreed to participate, described the study objective to them. Only participants aged 18 years or older with English proficiency were included. Shopping vouchers for 10 Singapore dollars (US equivalent \$8.00) were offered. Participants received a self-administered, 36-item, English-language questionnaire with color pictures for easier understanding. Nanyang Technological University's Institutional Review Board had not been established when data were collected. However, the study team obtained approval from the HPB and followed international ethical proto-

cols such as seeking subject consent and ensuring data confidentiality.

Before implementing the final survey, the research team piloted the questionnaire with 10 graduate students to test for comprehensibility and length. Minor amendments were subsequently made.

Measures

The knowledge index (Table 1) was partially adapted from previous studies and was composed of 4 informational categories that frequently feature in food labels: percent daily value; percent nutrient composition; natural and/or fresh claims; and "organic" food products. Health literacy⁴⁵ was operationalized as an individual's ability to understand and use information from the nutrition information panel.⁴⁵ Attitudes, adapted from a previous study,⁴⁵ reflected beliefs about the usefulness, accuracy, and truthfulness of food

Table 1. Singapore Shoppers' Knowledge about Food Labels, Food Claims, and Organic Food, and Their Ability to Interpret Food Label Information (n = 199)

Knowledge of Food Label Information	% Incorrect	% Correct
Which of the following calorie requirements is the % daily value based on?	78.5	21.5
If a food could be considered as a good source of a nutrient, the food should contain at least what percentage of that nutrient?	75.5	24.5
<i>A natural claim means...</i>		
One/some of the ingredients is/are natural.	41.5	58.5
All the ingredients are natural.	48.5	51.5
No additives have been added.	59.5	40.5
No preservatives have been added.	58.5	41.5
Food with a natural or fresh claim is less processed than food without such claims.	84.0	15.5
Natural or fresh claim on food products means that food has not been excessively extracted.	76.0	23.0
Natural or fresh claim on food products means that the food has not been significantly modified from its natural state.	79.5	19.5
Natural or fresh food is healthier than food without such claims.	80.5	18.5
Foods with fresh or natural claim has lesser risk of being polluted than food without such claims.	67.5	31.0
<i>Organic food is...</i>		
Food free of artificial food additives.	85.5	14.0
Food that is minimally processed.	60.0	38.5
Food with fresh/natural claim.	43.5	56.0
Organic food tastes better than nonorganic food.	55.5	44.0
Organic food has longer shelf life.	48.0	51.0
Organic food has more health-related benefits than nonorganic food.	84.5	15.0
Organic food has less risk of being polluted than nonorganic food.	82.5	17.5
Health Literacy		
<i>Based on the nutrition information in Product 1...</i>		
How many grams of sugar are there in 2 servings of this product?	57.5	42.0
How many grams of fat are there in 50% of this pack?	44.5	55.5
How many servings are there in this product?	33.5	66.5
Is this product high in fat?	63.5	36.5

labels. Subjective norm items were participants' social or normative pressures, or relevant others' beliefs that he or she should or should not use food labels. Perceived behavioral control was the perceived ease of understanding different food label elements. These variables were measured on 5-point Likert scales. Items pertaining to DHC reflected the perceived importance of healthful eating.⁴⁰ Intention to read/use food labels was adapted from a previous study and measured through a 5-point semantic differential scale.⁴⁵ Overall food label use was measured through an index of respondents' use of 19 different elements in food labels.

Analysis

Data were manually entered, managed, and analyzed with SPSS software (version 17, SPSS Inc, Chicago, IL, 2008). Factor analysis with Varimax rotation was first performed on all survey questions to identify factors and loadings of individual items, followed by reliability testing of constructs. Final items and reliability scores are available in the [Supplementary Data](#) online.

The analytical approach was composed of 4 stages. In stage 1, normality of distribution of key variables was assessed using P-P plots and skewness. Stage 2 used univariate statistics (simple frequencies) to generate a profile of respondents and overall scores for variables of interest. Knowledge scores were calculated as a summation of correct responses. In stage 3, knowledge, TPB constructs, DHC, and food label use were compared between demographic groups such as sex (independent *t* tests), age, and ethnicity (both age and ethnicity 1-way ANOVA). Tukey post hoc tests were used to compare between groups. Stage 4 used multivariate linear regression to examine relationships between independent variables (TPB constructs and DHC), and dependent variables (intention to use food labels and actual food label use). To ensure parsimony, independent variables that failed to meet statistical significance were excluded from the models.

None of the demographic variables demonstrated significant correlations with intention to use or actual food label use, and they were excluded.

Statistical significance for all tests was determined at the $P < .05$ level. A single case with several missing values was found and excluded from analysis.

RESULTS

Sample Description

Of the 199 shoppers who participated in the present survey, 75.5% were

Table 2. Sociodemographic Description and General Food Label Awareness of Survey Respondents (n = 199)

Variable	%
Sex	
Male	36.5
Female	63.5
Race	
Chinese	75.5
Malay	8.5
Indian	7.0
Caucasian	9.0
Age, y	
10–19	16.0
20–29	32.5
30–39	22.0
40–49	18.5
≥ 50	11.0
Education	
Primary school/secondary school	35.0
Junior college/polytechnic diploma/advanced diploma	27.0
Bachelor or post-bachelor degree	37.5
Income, \$	
≤ 1,000	18.6
1,001–3,000	25.1
3,001–5,000	16.6
5,001–7,000	8.0
> 7,000	6.0
Declined to answer	25.6
General awareness of food labels	
Heard of traffic lights ^a	17.5
Heard of Guidance Daily Amount	24.0
Heard of Health Promotion Board (or Healthier Choice symbol)	9.2
Heard of third-party seals	
Singapore Heart Foundation	78.0
Islamic Association	93.0
Superbrands	74.0

Summary Scores of Key Variables (Maximum Score)	Mean ^b (SD)	Median ^c (25th–75th Percentiles)
Knowledge (18)	–	5 (4–8)
Attitude (5)	3.78 (0.72)	–
Subjective norms (5)	3.35 (0.75)	–
Perceived behavioral control (5)	3.70 (0.63)	–
Diet-health concern (5)	–	4.09 (3.72–4.55)
Intention to use food labels (5)	3.34 (0.79)	–
Food label use (19)	–	13 (10–16)

^aThe traffic lights system is used in the United Kingdom and indicates the levels of sugars, fat, saturated fat, and salt. Red means high in content; Amber, medium in content; Green, low in content. Other countries may use a different interpretation (Red: Never consume; Amber: consume once in a while; Green: consume anytime). Generally, green indicates healthiest and red indicates least healthy; ^bNormally distributed; ^cNot normally distributed.

Demographic Factors and Attitudes toward Food Label Use

The gender analysis shows minimal differences in psychosocial factors among male and female respondents. Female participants had a significantly higher level of DHC as opposed to male respondents ($t = -2.18$, $P = .03$; Table 3).

Comparisons by age showed significant overall results in attitude, subjective norm, and food label use. Within these constructs, participants who were 40-49 years old demonstrated significantly higher positive attitudes ($F = 3.74$, $P = .01$) and perception of subjective norms ($F = 5.10$, $P = .001$) in comparison to 20- to 29-year-old participants ($P = .01$ and $P < .001$, respectively) and 30- to 39-year-old participants (subjective norms, $P = .01$). No significant between-group differences in food label use were detected (Table 4).

Analysis by ethnicity showed significant overall differences across all psychosocial factors. Malays had significantly higher positive attitudes ($F = 7.07$, $P < .001$) toward food labels as compared to Chinese ($P < .001$) and Caucasian ($P = .01$) respondents. Similarly, perceived subjective norms ($F = 3.99$, $P = .01$) related to food label use were significantly higher among Malays compared to Chinese ($P = .01$) and Indian ($P = .02$) respondents. Malays also found food labels significantly easier to use (perceived behavioral control; $F = 3.53$, $P = .02$) when compared to Chinese respondents ($P = .02$). Indian respondents' diet-health concern ($F = 4.10$, $P = .01$) was highest among

Table 3. Factors Related to Food Label Use by Sex, Mean Score (SD)

Variable (Maximum Score)	Male (n = 73)	Female (n = 126)
Knowledge (18)	6.81 (0.42)	5.50 (0.24)
Attitude (5)	3.75 (0.61)	3.73 (0.62)
Subjective norm (5)	3.38 (0.73)	3.33 (0.42)
Perceived behavioral control (5)	3.68 (0.60)	3.71 (0.65)
Diet-health concern (5)*	3.95 (0.75)	4.14 (0.56)
Food label use (19)	13.21 (0.50)	12.75 (0.38)

*Statistically significant at $P \leq .05$.

Note: Means comparison was carried out using independent t tests.

Chinese, followed by 8.5% Malays and 7.0% Indians, reflecting the country's ethnic composition (Chinese: 74.0%; Malays: 13.0%; Indians: 9.2%).⁴⁷ The majority of respondents were female (63.5%). Most respondents (32.5%) were 20-29 years old, 22.0% were 30-39 years old, and 18.5% were 40-49 years old. Nearly 38% of respondents had completed a bachelor's degree or higher.

Awareness of and Attitudes toward Food Labels

As expected, most respondents had heard of neither the Guidance Daily Amount nor the traffic light labeling systems. More than 90% of the respondents were aware of third-party seals by the HPB. Overall scores of key variables suggested low knowledge (median = 5) and positive attitudes toward food labels (mean = 3.73, SD = 0.61). Respondents perceived that people important to them would like them to read food labels (mean = 3.35, SD = 0.75) and believed that they are capable of using

food labels (mean = 3.70, SD = 0.63). In addition, survey respondents expressed a high level of concern about their diet (median = 4.09), and many frequently used food labels (median = 13; Table 2).

Knowledge of Nutrition and Food Label Information

Knowledge of calorie requirements and nutrient content was low, and less than a quarter of the sample correctly responded. Fewer than 25% of respondents correctly answered 4 questions on natural and fresh claims, and fewer than half correctly responded to 3 other questions in this category. Fewer than 20% respondents correctly answered 3 questions on organic food. Based on food label information that was provided, correct calculations on sugar content and fat content were performed by 42.0% and 36.5% of the respondents, respectively. More respondents were able to correctly calculate fat content (55.5%) and serving size (66.5%; Table 1).

Table 4. Age-based Differences in Psychosocial Factors Related to Food Label Use, and Actual Use of Food Labels, Mean Score (SD)

Variable (Maximum Score)	10-19 (a; n = 31)	20-29 (b; n = 65)	30-39 (c; n = 44)	40-49 (d; n = 37)	50+ (e; n = 31)	P
Knowledge (18)	6.06 (2.29)	5.98 (2.36)	6.11 (2.81)	5.35 (3.11)	6.63 (4.08)	.64
Attitude (5)	3.88 (0.57)	3.60 ^d (0.62)	3.66 ^d (0.60)	4.02 ^{b,c} (0.60)	3.64 (0.53)	.01
Subjective norm (5)	3.24 (0.76)	3.21 ^d (0.75)	3.27 ^d (0.63)	3.82 ^{b,c} (0.60)	3.39 (0.79)	.00
Behavioral control (5)	3.73 (0.76)	3.73 (0.58)	3.49 (0.57)	3.78 (0.72)	3.84 (0.60)	.14
Diet-health concern (5)	4.01 (0.74)	4.09 (0.58)	4.04 (0.55)	4.28 (0.56)	3.98 (0.63)	.29
Food label use (19)	11.68 (4.07)	13.75 (4.01)	11.61 (4.74)	13.91 (4.03)	13.14 (4.14)	.02

Note: Statistical test: 1-way ANOVA with $P < .05$ and Tukey post-hoc for between-group differences. Between-group differences: each age group has been assigned a letter, eg, 10-19 year olds were assigned the letter a. Superscripted letters within rows indicate a statistically significant difference (at $P \leq .05$) with the respective age group.

Table 5. Ethnic Differences in Psychosocial Factors Related to Food Label Use, and Actual Use of Food Labels, Mean Score (SD)

Variable (Maximum Score)	Chinese (a; n = 149)	Malay (b; n = 17)	Indian (c; n = 14)	Caucasian (d; n = 18)	P
Knowledge (18)	6.06 (2.80)	5.18 (3.20)	5.43 (4.15)	6.50 (4.64)	.55
Attitude (5)	3.66 ^b (0.60)	4.32 ^{a,d} (0.65)	3.91 (0.51)	3.70 ^b (0.50)	.00
Subjective norm (5)	3.32 ^b (0.73)	3.92 ^{a,c} (0.64)	3.16 ^b (0.65)	3.35 (0.69)	.01
Behavioral control (5)	3.62 ^b (0.63)	4.08 ^a (0.67)	3.81 (0.42)	3.87 (0.61)	.02
Diet-health concern (5)	4.03 ^c (0.59)	4.36 (0.49)	4.50 ^a (0.51)	4.01 (0.73)	.01
Food label use (19)	12.87 (4.14)	14.58 (3.73)	12.42 (3.57)	12.11 (5.60)	.33

Note: Statistical test: 1-way ANOVA with $P < .05$ and Tukey post-hoc for between-group differences. Between-group differences: each ethnic group has been assigned a letter, eg, Chinese was assigned the letter a. Superscripted letters indicate a statistically significant difference (at $P \leq .05$) with the respective ethnic group.

the 4 groups and significantly higher than that of Chinese respondents ($P = .02$; Table 5).

Predicting Intention to Use Food Labels with TPB and DHC

The regression model with TPB constructs alone explained 18% of the variance of intention to use food labels ($P < .001$). Attitudes, subjective norms, and perceived behavioral control made significant contributions to this model, with β weights of .21, .20, and .14, respectively. Diet-health concern proved to be a significant additional predictor ($\beta = .26$) and significantly enhanced the predictive ability of the model to 24% ($P < .001$). Intention to use food labels ($\beta = .38$), predicted 14% of the variance in actual food label use ($P < .001$; Tables 6 and 7).

DISCUSSION

This study found high-food label use among Singapore's shoppers, positive

attitudes and DHC, but low levels of knowledge and health literacy. Most notable was the low level of knowledge pertaining to nutritional content, natural/fresh claims, and organic food. Although scholars have previously highlighted a similar need to improve nutrition knowledge,⁴⁸ the issue needs to be considered in conjunction with low health literacy levels and high use of food labels. Low knowledge of frequently used informational and marketing strategies in food labels and incorrect interpretation of numerical information presented in food labels are issues that expose individuals to 2 potential vulnerabilities. First, low nutritional knowledge can potentially prevent individuals from using food labels, as they might be unable to understand its educational benefits. Then, miscalculating numerical information in food labels (Table 2) could adversely influence their dietary choices, and thereby health outcomes. This argument is anchored on evidence about the influence of food labels on diet-

related behavioral factors.⁷ As previously shown, consumers prefer food claims for their succinct communication and may care less about seeking health information beyond such claims.⁴⁹

Industry should be urged to engage nutritionists to participate in product development and promote consumers' food label knowledge.

The conundrum highlighted by these findings—high food label use but limited health literacy skills—extends to countries beyond Singapore. Indeed, a study among immigrants in the former Soviet Union showed that although 55% of respondents always/often used a food label, only 32% had good label-reading skills and struggled with numerical information.⁵⁰ The fact that food labels are an increasingly common source of nutritional information,⁵¹ with demonstrated effects on dietary choices despite consumers' inadequate comprehension of information contained therein,^{52,53} is cause for concern.

Demographic Analysis

The gender-based analysis revealed significantly greater DHC among females. A possible explanation for this trend emerges from correlated studies in nutritional behavior,⁵⁴ which suggest that women are less satisfied with their weight and are more prone to exercise restraint in

Table 6. Theory of Planned Behavior Constructs and Diet-Health Concern as Predictors of Intention to Use Food Labels (n = 199)

Predictors	Model 1 $R^2 = 0.18$ ($P < .001$)				Model 2 $R^2 = 0.24$ ($P < .001$)			
	Intercept	SE	β	P	Intercept	SE	β	P
Constant	0.92	0.40	.02	—	−0.24	0.48	—	.62
Attitudes	0.27	0.10	.21	.01	0.19	0.10	.15	.05
Subjective norms	0.22	0.08	.20	.01	0.24	0.08	.22	< .01
Behavioral control	0.18	0.09	.14	.04	0.19	0.09	.15	.03
Diet-health concern	—	—	—	—	0.34	0.09	.26	< .001

SE indicates standard error.

Note: Significance at $P < .05$. Linear regression model was used.

eating. Other research links these traits with issues such as body image consciousness⁵⁵ and gender objectification.⁵⁶

However, new contributions to understanding of food label use in the East emerged from the demographic analyses that help to identify new audience segments for future communication interventions. For instance, positive attitudes toward food labels were found to be highest among those who were 40-49 years old. This age segment could be an effective link to reach both younger (adolescents, young adults) as well as older (geriatric) populations for disseminating health messages. In terms of ethnicity, positive attitudes toward food labels were found to be highest among Malaysian respondents. Nutrition educators could launch their efforts by targeting Malays and use members of this group as catalysts to communicate with others in their social networks. Other researchers have focused on exploring linkages between ethnicity and food label use and examined ethnic differences in terms of ability to use specific elements such as the nutrition information panel to find notable differences.⁵⁷ This study shed new light on this dimension by focusing on ethnic differences in *psychosocial factors* related to use of food labels.

Theoretical Implications

The findings confirmed insights from previous research that demonstrate the significance of core TPB constructs—attitudes, subjective norms, and behavioral control—in predicting behavioral intention across a range of health behaviors. In terms of relative

Tailoring programs that focus on basic nutrition principles and yield healthier eating behaviors is needed to enhance nutrition knowledge.

importance, however, behavioral control ($\beta = .22$) proved a stronger predictor than attitudes ($\beta = .15$) and subjective norms ($\beta = .15$). This finding is consistent with a study by Blanchard and colleagues,⁵⁸ in which the TPB was used to predict fruit and vegetable consumption ($\beta = .59$ and $\beta = .16$ for behavioral control and attitudes, respectively). Attitudes could be stronger predictors of intention in other areas such as adoption of plant-based diets.⁵⁹ Subjective norms, as demonstrated by Zoellner and colleagues,⁶⁰ have traditionally proved to be weak predictors of intention,⁶¹ which could change when the behavior involves situations of a distinctly social nature such as a family meal ($\beta = .62$).⁶² The fact that different TPB constructs assume different levels of importance based on the health behavior in question is known. This study demonstrates that expanding its application using constructs specific to the problem in question might bolster the TPB's applicability.

In addition, it is important to recognize the contribution of subjective norms and DHC in predicting intention to use food labels. Food label use in public places such as supermarkets involves a certain sociological dynamic that needs to be increasingly considered by researchers in light of an increasingly health- and image-conscious popu-

lace cognizant of weight loss and obesity issues.

The main limitation of this study is that behavioral intention predicted only 14% of the variance in actual use of food labels. The unexplained variance indicated the presence of more factors acting on the data that need to be investigated in future research. The low R^2 could also be a function of the cross-sectional design of this study. Scientists have previously pointed out that an experimental study with random subject assignments increases the predictive strength of intentions relative to a control condition.⁶¹ The generalizability of findings from this study is limited by a convenience sample, limited sample size, and exclusion of non-English-speaking participants because of the English-language questionnaire. The representativeness of the sampling distribution to the ethnic composition of Singapore's population, and the proven efficiency of shop-intercept surveys in food label research, partially mitigate these limitations.

Practical Implications

It is important for practitioners to incorporate demographic and cultural considerations into the design of educational interventions. A deeper understanding of the role of subjective norms in food label use can inform nutrition education and counseling modules by helping to identify those social actors who could influence normative beliefs among their clients and subsequently using such actors to re-

Involvement of multiple stakeholders public-private partnership in implementing nutrition education programs focusing on food label use is needed.

inforce educational messages. Future research could expand the scale of the present study and further delve into the new theoretical consideration of subjective norms highlighted here. In addition, there is also a need

Table 7. Intention to Use Food labels as a Predictor of Total Food Label Use (n = 199)				
Model 1 $R^2 = 0.14$ ($P < .001$)				
Predictor	Intercept	SE	β	P
Constant	6.12	1.23	—	< .001
Behavioral intention	2.03	0.36	.38	< .001
SE indicates standard error.				
Note: Significance at $P < .05$. Linear regression model was used.				

to extend food labeling studies beyond shoppers to end users of food products, for example, children and adolescents. Interdisciplinary research between communication researchers and nutrition educators could engender an integrative approach to further understand the links between food label use and psychosocial factors that shape dietary choices.

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SUPPLEMENTARY DATA

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.jneb.2012.09.001>.

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