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Towards Simplification of Nutrition Labeling

− Use of Research Data for Secondary Analysis −

Hiromi FUJIMORI* and Chieko KOGOMORI**

* *Tokyo University of Agriculture, Department of Food Environment Economics,1-1-1 Sakuragaoka, Setagaya-ku, Tokyo 156-8502*
hf207430@nodai.ac.jp

** *Araki Commemoration Tokyo Riverside Hospital, Administration Dietitian, 8-4-4 Minamisenju, Arakawa-ku, Tokyo 116-0003*
kogomori@trshp.jp

Abstract: The adoption of a simplified nutrition label, called "a nutrition score (Nutri-score[1])", within the EU has been considered in recent years. First, we examine consumers' decision-making processes when purchasing food. Next, we examine the results of the Consumer Affairs Agency's questionnaire about how consumers attach importance to nutrition label information. Result of this, even if the percentage of correct answers to the problem of reading an energy display was low and it attached it for whether being "Liking to refer to the rate of a nutrition labeling" from the result before long.
Keywords: *Consumer understanding, Nutritional label, Nutri-Score*

1. INTRODUCTION

According to the regulation rules 1169/11 of the EU, consumers already have access to the necessary information to select food based on its nutritional value. However, consumers are often unable to completely understand these important pieces of information.

Therefore, the adoption of a simplified nutrition label, called "a nutrition score (Nutri-score[1])", within the EU has been considered in recent years. This nutrition score indicates foods' health effects by color (on a scale of A-E; A is highest and green ; E is lowest and red) and was devised as an outstanding certificate mark system to encourage consumers ' healthy food selection (Figure 1, upper right).

The score is calculated for 100 g servings, considering the amount of sugar, saturated fatty acids, sodium, energy, fiber, and protein. Food type (fruits, vegetables, legumes, nuts, etc.) also affects the score [1].

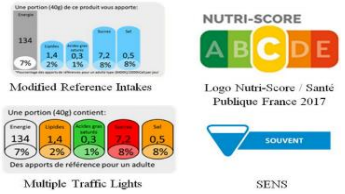

Figure 1: Nutri-Score (upper right), which is a nutrition label under consideration in the EU. Source: Egnell et al. (2018)

Nestlé uses the Nutri-Score on its food and beverages in eight EU countries: Austria, Belgium, France, Germany, Luxembourg, Portugal, Spain, and Switzerland.

Egnell et al. (2018) showed the validity of the score label based on the results of a cohort investigation using four label displays (Figure 1) containing the score label concerned [2].

However, labels often lack food additive and allergy information. Therefore, implementing a comprehensive new system requires careful planning. Moreover, the pros and cons of nutrition labeling are related to mandating and the effects, respectively.

We suggest there should be a simplified nutrition label for Japan, which is this study's subject. First, we examine consumers' decision-making processes when purchasing food. Next, we examine the results of the Consumer Affairs Agency's questionnaire about how consumers attach importance to nutrition label information.

Based on this information, the design and standard of a suitable nutrition label should be devised.

2. PREVIOUS RESEARCH ON DECISION-MAKING FRAMEWORKS

Figure 2 shows this study's conceptual model Grunert et al., 2010 [3]. In short, for nutrition labels to have any effect, consumers must be exposed to and aware of them. The effect is mediated by consumer understanding, which

in turn is be affected by their nutrition knowledge. Based on their understanding, consumers may then use the label information to make inferences about the healthiness of the product, which, together with other information (e.g., the product's taste), may affect the evaluation and eventually the purchase decision about the product. Here, we focus on the aspects of perception, understanding (conceptual and substantial), inferences (healthiness), and nutritional knowledge.

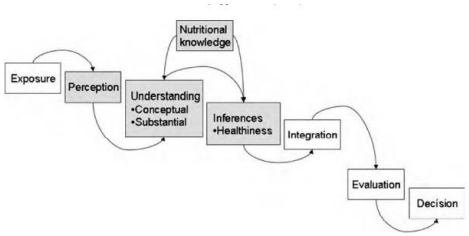

Figure 2: Conceptual framework of nutrition knowledge use and understanding of nutrition information on food labels among UK consumers. Source: Grunert et al. (2010, p.178, fig.1)

3. CORRECT UNDERSTANDING OF NUTRITIONAL LABELS

3.1. Data and participants

Our study used "Consumer Affairs Agency Public Finance Project: Consumers' Reading of Nutrition (Internet Survey) Labels" data captured from February 10-12, 2014. It aimed for 6,000 men and women (from about 1,500,000 applicable registered users) aged 20 and above nationwide. It excluded anyone with dietetic technical knowledge, such as dietitians and was stratified so that the national percentage and the census ratio were equivalent to the 2010 fiscal year, and we selected 177,180 candidates at random.

We obtained the data for this secondary analysis from the Social Science Japan Data Archive Center. We received an offer of secondary data from the Social Research and Data Archives, Institute of Social Science, and The University of Tokyo.

Gender, age, education level, household annual income, and the presence of disease (high blood pressure [HBP], diabetes [DM], hyperlipemia [HL]) were used as fundamental attributes. The item used for these was correct understanding of a nutritional information display. The observation group was 5,758, after exclusions based on whether they referred to the surface/flipside of the food label. A Mann-Whitney U test was conducted to determine the understanding of the label (energy). Although each group included both genders, their ratios were statistically significantly different ($z = -2.066$, $p = 0.0388$). Each group had HBP ($z = 3.989$, $p = 0.0001$), at a significance level of 0.05. The Pearson chi-square test was conducted on the understanding of the label. Each group included all education levels (university, high school/college, junior/primary school), and the results showed that the mean education level was statistically significantly different between the groups (Pearson chi-square = 43.1741, Pr = 0.000), as was age (Pearson chi-square = 72.3189, Pr = 0.000).

Each group's household annual income level was evaluated (Pearson chi-square = 0.1283, Pr = 0.938). Each group had DM ($z = 1.179$, $p = 0.2384$) and HL ($z = 0.889$, $p = 0.3740$) at values not below the significance level of 0.05; therefore, we failed to reject the null hypothesis.

Figure 3: Nutritional information display (flipside)

3.2. Correct carbohydrate understanding

Q: Please choose the item representing carbohydrate nutritional information.

A: (1) non-fibrous-carbohydrates, (2) non-fibrous-carbohydrates ＋dietary fiber, (3) non-fibrous-carbohydrates＋collagen, and (4) not applicable

Although the correct answer is (2) "non-fibrous-carbohydrates + dietary fiber", across all education levels, only23-24% had correct answers. (Pearson chi-square = 20.9441, Pr = 0.002). In addition, although carbohydrates consist of non-fibrous-carbohydrates + dietary fibers, they are part of the "non-fibrous-carbohydrates" restrictions currently praised as an effective dieting method. Active intake of "Dietary fiber" is recommended for constipation dissolution. Accodingly, the composition of "non-fibrous -carbohydrates" ***restrictions*** + "dietary fiber" ***recommend-dations*** seems contrary and may confuse consumers.

Table 1: Participants' nutrition basic knowledge (non-fibrous carbohydrates + dietary fiber) by education level

	carbohydrates				
Education Level	1	2	3	4	Total
Universty	1,551 63.18	566 23.05	65 2.65	273 11.12	2,455 100.00
highschool/college	1,897 60.32	758 24.10	63 2.00	427 13.58	3,145 100.00
juniorhigh/juniorsc..	81 52.94	36 23.53	6 3.92	30 19.61	153 100.00
Total	3,529 61.34	1,360 23.64	134 2.33	730 12.69	5,753 100.00

3-3. Reading investigation of energy rates

Q: What does "11%" in the "energy" column mean?

A: (1) If one serving of this food is eaten, I can take in 11% of the energy required per day.

(2) If one serving is eaten, I can take in 11% of the energy required per meal.

(3) If one serving is eaten, I can take in 11% of the energy recommended for the between-meal snack per day.

(4) 11% of this food is energy.

(5) None applied.

3.3.1. Understanding energy by rate and label display reference

The correct answer to the problem about reading an energy display is (1)"If one serving of this food is eaten, I can take in 11% of the energy required per day". Only 2,297 persons answered correctly (39.89%), and 1,032 persons who answered it said "I referred to the display about the nutrition written to the front of food, and chose it", and referred to it ("I always refer to it" and "I am referring to it") (45.05%).

3.4. Understanding of sodium chloride equivalents

栄養成分表示 1本(200ml)当たり	
エネルギー	100kcal
たんぱく質	3g
脂質	0g
炭水化物	20g
ナトリウム	1000mg

Figure 5: Nutritional information display shown by reading investigation of sodium chloride equivalent. ※The switch from the sodium display to the display of the amount salt equivalent was completed in March 2020.

Q: How much "sodium chloride equivalent" is there per unit?

A: (1) 1.0 g (2) 1.5 g (3) 2.0 g (4) 2.5 g and (5) none applied

We analyzed the reading results of an investigation of "sodium chloride equivalent". Although the correct answer is (4) 2.5g, across all education levels, only 20% gave correct answers in Table 3 (Pearson chi-square = 50.7419, Pr = 0.000).

Table 3: Frequency table of correct understanding of "sodium equivalent" by education level

	Salt intake					
Education Level	1	2	3	4	5	Total
Universty	1,176 47.90	693 28.23	307 12.51	238 9.69	41 1.67	2,455 100.00
highschool/college	1,781 56.63	795 25.28	302 9.60	228 7.25	39 1.24	3,145 100.00
juniorhigh/juniorsc..	81 52.94	36 23.53	18 11.76	13 8.50	5 3.27	153 100.00
Total	3,038 52.81	1,524 26.49	627 10.90	479 8.33	85 1.48	5,753 100.00

Furthermore, participants with hypertension (who were diagnosed with HBP or were identified by a medical institution or examination in the past year) assumed that salt intake would affect them.Only 7.07% of consumers with hypertension (indicated by 1 in HBP column) answered correctly (4), showing that they lacked basic knowledge of sodium chloride equivalents.

According to the Ministry of Health, Labour and Welfare (Japan), the annual estimate of medical bills related to HBP in Japan is 1,790,300 million yen[3]. Of this, 207,700 million yen was outpatient costs. These rates indicate the necessity of a simplified label display to make information about salt ingestion accessible for those with lifestyle-related diseases.

4. EXAMPLE OF NESTLE JAPAN

At Nestlé Japan [4], the rate (%) of a nutrient's quantity per serving is provided for lipids, saturated fatty acids, sugars, and sodium chloride equivalents relevant to an increased risk rise for a lifestyle -related disease , and these have already been displayed intelligibly (Figure 6).

In addition to the conventional calories, the rate of these ingredients (lipids, saturated fatty acids, sugars, sodium chloride equivalents) is expressed on the package backing, and the ingestion standard per day is clear at a glance.

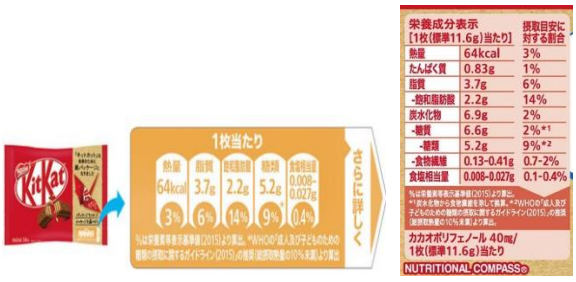

Figure 6: Nutrition label on Nestlé Japan packaging (Left: top of packaging; Right: flipside). Source: Nestlé the nutrition-information display on a product package

Nutrition (calorie) guide display has iconified the

quantity per serving of a nutrient, and the rate based on ingestion standards . ex) Energy 64k cal of 1sheet, 3% of the daily energy intake standard.

Moreover, the nutritional information can be accessed using the QR code on the package. If a one-serving display based on total daily consumption, like Nestle's, is adopted[4], this display will be more intuitive for consumers.

5. REGULATIONS AND SIMPLIFICATION

Due to the Food Labelling Act in Japan, revision is performed in order to provide information about (Act No. 70) food intelligibly for consumers by establishing trusted labeling and ensuring reliability, providing appropriate information on food labeling, and strictly managing related laws[5]. However, consumers are largely unable to understand this information.

Although Ben-Shahar and Schneider (2014) are known for simplifying complex information, about easy use they said "Unfortunately, simplification is a complex business, not readily mastered. And simplification is in tension with the full disclosure principle"[5].

According to this research and the examples from Nestlé, we think that the addition of the + and -- content and attaching a smiley face score, such as 😊, will be an effective evaluation level display.

In the Nutri-Score A-E scale, displays are expected to allow consumers to judge a level at a glance, including consumers with color-related visual impairment. We believe the face scale will work similarly. For example, if a product contains less than 0% saturated fatty acids, it would display a smiling face 😊, 0%-x% a serious look 😐, and above x% a tearful face😢, etc. In any case, the criterion are not yet established, and the appropriate laws must be developed.

6. CONCLUSION

In this research, we examined simplified nutrition labeling systems and evaluated the results of the Consumer Affairs Agency questionnaire about understanding nutrition labels.

The reply was divided in half, even if the percentage of correct answers to the problem of reading an energy display was low and it attached it for whether being "Liking to refer to the rate of a nutrition labeling" from the result before long.

There is nothing on the level that the display by a rate cannot necessarily be recommended under the present circumstances. In order to create a nutrition label suitable for consumers' understanding and needs, after being based on a regulation rule or a scientific argument, we would like to deepen research about the ingredients labels to display the appropriate information required to help foster correct understanding.

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NOTES

1. Nutri-Score's Front of Pack (FOP) label system derives from the FSAm-NPS. (FSi: score of food/beverage i, Ei: energy intake from food/beverage i, n: number of food/beverage consumed):

$$\text{FSAm} - \text{NPS DI} = \frac{\sum_{i=1}^{n}(\text{FS}_i\text{E}_i)}{\sum_{i=1}^{n}\text{E}_i}$$

Higher FSAm-NPS DI therefore reflects lower nutritional quality in foods consumed. For more details on FSAm-NPS and FSAm-NPS DI calculations, please see Dietary Index; FSAm-NPS, Nutrient Profiling System of the British Food Standards Agency.

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