BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-035591
Article Type:	Original research
Date Submitted by the Author:	07-Nov-2019
Complete List of Authors:	Yun, Young Ho; Seoul National University College of Medicine Sim, Jin Ah; Seoul National University College of Medicine Kim, Yaeji ; Friedrich-Alexander-Universität Erlangen-Nürnberg Lee, Sujee ; University of Wisconsin Madison Kim, Kyoung-Nam; Seoul National University Hospital
Keywords:	PUBLIC HEALTH, HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Original Research

Consumers' consciousness of health-friendly products and services and its association with sociodemographic characteristics and health status: a cross-sectional survey of the Korean general population

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[**]Jin Ah Sim received a scholarship from the BK21-plus education program

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ABSTRACT

Objectives: To identify consumers' consciousness of health-friendly products and services (consumer reaction, purchase intention, and willingness to pay more) and its association with sociodemographic characteristics and multi-dimensional health status.

Methods: From March to May, we administered questionnaires to 1,200 individuals from the general Korean population asking about their perception of health-friendly labels, and if they would purchase such labeled products (foods, pharmaceuticals, etc.) and services (purifying water, preventing air pollution, etc.) at extra cost.

Results: The participants placed a high value on the importance of mental, social, spiritual, and physical health factors in terms of the company's products and services with a score of about 8 out of 10 (range, 7.74-8.33). Most respondents (72.4%) said they were interested in adopting health-friendly labels. When a health-friendly label is introduced (such as one by the Business for Social Responsiveness), 65.1% of the respondents said they intended to purchase the product or service, while 6.8% said they did not, and 75.0% said they were willing to pay extra for the health-friendly product or service. Multivariate logistic regression models showed urban residence, high education level, and good social health to be significantly associated with positive attitudes toward health-friendly labels. People with high income, no religion, or normal weight were more likely to say they intend to purchase products and services with health-friendly labels. They also had a more positive attitude toward paying more for such products and services, as did people with good spiritual health. **Conclusion:** This study provides data that illustrate the importance of health-friendly products and services to the general population and companies.

Keywords: consciousness for health; health-friendly activities; health-friendly products and services; health status

Article Summary

Strengths and limitations of the study

- There is an increasing awareness of the importance of social and environmental factors on health as well as consumers' health, the responsibility of both the government and the private sector are of importance.
- Consumers nowadays are interested in what a company cares about their health and wellness, few studies have investigated the companys' health-friendly management activities on health.
- Therefore, we proposed here the concept of "health-friendly management", aimed to understand consumers' perception of health-friendly labels and their purchase behavior of health-friendly labelled products and services, then, tried to identify associated factors.

INTRODUCTION

In 1948, the World Health Organization (WHO) Constitution defined health as "a state of complete physical, social, and mental well-being and not merely the absence of disease or infirmity". In recent years, health has been viewed as having four aspects—body, mind, social, and spiritual. Health is determined somewhat by genetics and medical care, but mostly by behavior and social conditions. Health care policy, however, does not accommodate that observation.[1] In the U.S., for example, approximately 95% of the health budget goes to medical care services, while only 5% is allocated to population-based approaches for health improvement.[2]

There is an increasing awareness of the importance of social and environmental factors on health and that health is the responsibility of both the government and the private sector. [3] Although current health policy focuses mainly on the role of the government, companies can play an important role in building a framework of health ecosystems.[3] Just as companies can influence the health of employees and customers, they can address corporate social responsibility (CSR). Usually, however, CSR efforts focus on philanthropy and are undertaken largely to meet legal requirements or avoid penalties [4]. But CSR can have a more strategic role by using the company's core systems to create business and express social value by addressing the issue of population health.[3 5] According to Porter and Kramer, "The concept of shared values can be defined as policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions of the communities in which it operates." [5 6] Some companies, such as PepsiCo,[7] Qualcomm Incorporated,[8] Walmart,[9] and General Electric,[5] found new business opportunities that could prevent or solve specific health challenges.[3] Overall, a few companies outside the food, beverage, and agriculture industries are trying to improve customers' health and wellness.[3] Many sustainability and corporate responsibility programs are 'less bad' rather than 'good'.[4]

According to Business for Social Responsibility, consumers nowadays are interested in what a company cares about their health and wellness, health-friendly product and service.[3] For example, consumers can easily accept to buy innovative functional foods with health effects and increasing interest in health might drive a growth in demand for functional health foods with radical innovations.[10] For other example, a famous examples is the announcement Walmart made at the White House, together with then-First Lady Michelle Obama, that the company would open 300 stores to serve the U.S. Department of Agriculture's designated food desert areas to provide easy access to fresh, affordable, and nutritious food so as to foster healthier communities.[9] There is a significant stream of research covering health labelling and its impact on consumer choice.[11-13] For example, frequent users of nutrition labels were less likely to consume unhealthy indicator foods [12]

Some studies of consumer purchase decision models indicate that consumer purchase intentions greatly depend on health and price consciousness and on a health label and are uneven across different market segments and cultures.[14-17]. Although some studies have investigated the perception and purchase of organic products and eco labels, few have investigated the same concept on health.[16 18-20] Thus, in this study, we aimed to understand consumer perception of health-friendly labels and their purchasing behavior of health-friendly labelled products and services, and to identify associated factors.

We propose here the concept of "health-friendly management", which refers to the promotion of various healthful components, or the avoidance of harmful components, whether they affect the physical, mental, social, or spiritual aspects of health.

To eliminate factors that may impair health, it is necessary for health-friendly products and services to meet safety regulations through quality control of raw materials, minimization of harmful elements, or the improvement of mental, social, and spiritual health. Health-friendly management, thus, deals with health-friendly products and services as a corporate responsibility.

From our literature review, we hypothesized that consumer's demographic characteristics such as education and income, and their health status might influence their attitude toward health-friendly products and services (consumer reaction, purchase intention, and willingness to pay more).[16 17 19-26]

METHODS

Participants and procedures

Data were collected from a broader general Korean population targeted in the survey. Firstly, the survey was conducted with the general population aged 20-70 years and residing across 17 major cities and local districts from March to May 2018. In each major city and local district, all participants were recruited taking the age and sex strata by region into account and applying probability proportion-to-size sampling in accordance with the 2016 Korean census. We used a probability-proportional-to-size technique for sample selection to to select a representative national sample, particularly when the sample groups differ in size. [27] Among 4000 eligible persons, 1,200 people (30% response rate) of them responded to the self-reported questionnaire in the presence of the interviewer, who could provide further explanation on the study. This method is widely used trained research assistants administered a semi-structured, self-reported questionnaire. The World Research Co., Ltd., (Seoul, Korea) conducted the survey. All recruiters provided informed consent.

Ethics approval was obtained from the Institutional Review Board of the Seoul National University for the participants' self-reported questionnaire (IRB No. 1804-024-934). All participants provided oral informed consent.

Patient and public involvement

This research was conducted because our investigations found that there is increasing importance on consumers' health, evidence about 'consumer-friendly health activity' was lacking within our communities. The research objectives and study design of this study were formulated in consultation with a World Research Co., Ltd., specialized in surveys in among the general population. It was not appropriate or possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

Measurement

The survey items were formulated on the basis of published studies [28-31]. Accordingly, these 3 items were generated: (1) How would you feel about companies when you see their health-friendly labeled products or services? The participants could respond with one of the following: "They are trustworthy", "They care about consumers' health", "The cost is high", or "No special feeling". (2) Would you prefer the health-friendly labeled products and services to others not so labeled? (5-point Likert scale with 1, not at all; 2, a little; 3, moderate; 4, quite a bit; 5, very much.) (3) Would you be willing to pay more for the health-friendly labeled product or service? If so, how much more compared with the label-free product price?" (1, no more; 2, less than 5%; 3, 5%~10%; 4, 11%~15%; 5, 16%~20%; 6, more than 21%). To measure the impact of different aspects of health status on health-friendly consciousness, we assessed the respondents' health on the basis of a holistic point of view.[32] The items measuring physical, mental, social, and spiritual health status were applied as follows: "Physical health is the state of having normal physical strength, without diseases and injuries. What do you think about your physical health status?" "Mental health is the state of being mentally stable, being able to overcome stress. What do you think about your mental health status?" "Social health is the state of having good social

relationships, carrying out one's work properly. What do you think about your social health status?" "Spiritual health is the state of adding meaning to life through volunteering, religious experiences, and meditation. What do you think about your spiritual health status?" In addition, we measured general health status with the following question: "Considering your physical, mental, social, and spiritual health status, what do you think about your health status in general?" All the items used a 5-point Likert scale with "Excellent", "Very Good", "Good", "Poor", and "Bad".

In addition, the respondents were asked which subscales of each health aspect they considered important for the pursuit of a company's health-friendly products or services. They were given the subscales of four health aspects (5 subscales each), and asked to rate the importance of each on a scale of 0 to 10. The respondents' sociodemographic and health information we collected included age, sex, residence, religion, marital status, education, monthly income, job status, body mass index (BMI), comorbidities, and smoking experience.

Statistical analysis

Using descriptive statistics for the sociodemographic variables, we calculated the mean ± SD scores of the importance of the impact of the 4 health factors (physical, mental, social, and spiritual) for corporations that made health-friendly products or services. To test the reliability of the the variables of health-friendly activities, we estimated Cronbach's α, which is a measure of internal consistency of patient responses. Then we performed univariate analyses to measure sociodemographic correlates for each aspect of health consciousness (consumer reaction, purchase intention, and willingness to pay more). The sociodemographic factors that were determined to be significant in univariate analysis were used to examine the association between the sociodemographic variables those of more positive health consciousness. The

sociodemographic variables were included in univariate analyses based on the literature reviews [16 17 19-26] and screening potentially element associated with the health consciousness.

We also compared the proportions of health consciousness using a chi-squared test to evaluate the impact of five categories of health status (physical, mental, social, spiritual, and general health). In all analyses, we determined two-sided *P*-values and considered a *P*-value less than 0.05 to be significant. In final model, we used the factors that were determined to be significant in univariate analyses to examine the association between the sociodemographic variables, health status, and those of more positive health consciousness. We conducted three multiple regression analyses using the hierarchical/stepwise method to identify independent factors with statistical significance. We conducted a univariate analysis with the aim of screening potentially existing elements to learn from existing data and draw implications. Therefore, univariate analysis was not a meaningful thing in itself, but a step to build a model for the final multivariate analysis. As a result, the final multivariate analysis results were meaningful and the researchers evaluated it. We also performed a sensitivity analysis by further calibrating the age-square along with the age variable in the multivariate analysis, confirming that most results were maintained. In the case of Income variables, obtained and analyzed in a categorical manner, without logarithmic conversion of income variables, there are no problems caused by extreme values. We considered $P < 0.05$ as statistically significant and reported results as the odds ratio (OR) with a 95% CI. We used SAS, version 9.3 software (SAS Institute, Cary, NC, USA) for all analyses.

RESULTS

Sociodemographic characteristics of the participants

Table 1 shows sociodemographic characteristics of the 1,200 survey participants. The mean age ± SD of the study participants was 46.97 ± 14.18 years.

Factors that are important for the health-friendly activities of companies to affect consumers' four aspect of health

The respondents evaluated the mental, social, spiritual, and physical health factors incorporated into products or services highly. Table 2 shows the scores for the various aspects of the four factors. All values on the variables of the health-friendly activities showed a high reliability with good internal consistency.

Acceptance of health-friendly label and intent to purchase its products or services

Most respondents (72.4%) said they were interested in adopting the health-friendly label, evaluating the companies' health-friendly activities in various areas. In detail, 36.5% of the respondents believed that the companies thought about consumers' health, and 35.9% felt that they could believe the label claims and purchase the products or services. When a health-friendly label is introduced by a company, 65.1% of the respondents said they intended to purchase the product/service, 6.8% said they did not, and 75.1% said that they were willing to pay more for it (Figure 1).

Association of demographic characteristics and health status with health-friendly label, intent to purchase its product/services, and willing to pay extra price, univariate logistic analysis

Tables 3 and 4 show the association of demographic characteristics and health status with consciousness of health-friendly products and services, intent to purchase the product or services, and willingness to pay a higher price for them. As for the domain of consumer reaction, 5 demographic variables (young age, place of residence, religion, education, higher BMI) and 2 types of health status (good mental health and social health) were statistically significant.

Significantly related to the domain of purchase intention were social health status as well as the demographic factors of age, religion, education, monthly income, and BMI. In addition, significantly associated with additional payment intention were the demographic factors of younger age, education, monthly income, and BMI, as were physical, mental, spiritual, and general health status.

Multivariate logistic regression models for factors associated with health-friendly labels, intent to purchase its product or services, and willingness to pay for the higher price

Multivariate logistic regression models show that the consumers residing in urban areas, highly educated, and having good social health status showed a more positive reaction to health-friendly labels. Respondents with a higher income level, normal BMI, and no religion were more likely to express an intention to purchase products and services with a health-friendly label, whereas no health status was significantly associated with that intent. In addition, factors such as higher education, higher income level, normal BMI, and good spiritual health were associated with having a more positive attitude toward paying extra for products and services with health-friendly labels (Table 5). Significant correlations in some univariate analyzes such as age, physical, mental and general health status have lost significance in multivariate analysis, which may be due to correlation and confounding between variables.

DISCUSSION

This study provides a better understanding of the importance to consumers of products or services that provide physical, mental, social, and spiritual health. In addition, this study suggests the need for a health-friendly certification mark or label recognized by the general population. Our findings suggest that consumers are demanding health-friendly products and services and are willing to pay the extra cost involved.

Companies' marketing activities can play a significant role in raising the public awareness of health [3]. Business for Social Responsibility, a global nonprofit organization working to build "a just and sustainable world," confirmed that member companies support the idea that they can strengthen the health and wellness of their customers and the public. About 90% of the companies agree that they can help strengthen the health of their consumers, while about 75% agree that they can help strengthen public health.[3] Shared value models may represent the next evolution of capitalism.[6] In the U.S., for example, Kaiser Permanente partnered with Home Box Office, the National Institutes of Health, the Centers for Disease Control and Prevention, the Institute of Medicine, and the Michael & Susan Dell Foundation and launched public health campaigns addressing the obesity epidemic.[33] Moreover, companies can partner with local governments to encourage healthy lifestyles or habits. For the National Salt Reduction Initiative, for instance, more than 100 state and local health authorities and national health organizations partnered with many companies to reduce the amount of sodium in packaged and restaurant foods (https://www1.nyc.gov/site/doh/health/health-topics/national-salt-reduction-initiative.page#national-salt-reduction-initiative).

Although our findings showed that consumers with a high-education level or who lived in an urban area had a more positive attitude towards health-friendly labels, that non-religious, high-income, or normal-weight consumers had intentions to purchase products and services with a health-friendly label, and that people with high-education level, high-income, or normal-weight had a positive attitude toward paying more for products and services with a health-friendly label, other studies had inconsistent findings between demographic characteristics and purchase intention toward green products.[19 21] Our finding that consumers with good health status would be cautious about products and services with a health-friendly label and expressed willingness to pay more for them are consistent with the finding that health consciousness is an important factor that influences the purchase of organic foods.[16 17 22 23] Our results seem to be consistent with the

finding that eco-label and the value of green products had the strongest positive influence on green product purchase intention and were associated with the willingness to pay more for environmentally certified products, the eco-label, or the energy-label.[20 21 24-26]

These studies imply that most consumers perceive the health-friendly label as important when purchasing products or services. Emphasizing the health-friendly label of products or services accredited by reputable organizations would help to build reliability and awareness among consumers, but the products and services would be more expensive than conventional products and services,[20 21] and that could negatively influence purchasing. Thus, managers are challenged with the need to produce high quality products and services at affordable prices.[20]

To integrate health-friendliness into its value chain and culture, companies can start by meeting social needs through products or services that serve the unserved or underserved.[5 6 15] It can motivate employees to strengthen the health of their customers through daily actions and business decisions. Companies can use key performance indicators and report them in their sustainability report in a comprehensive and transparent way.[3]

Many companies, however, would struggle when trying to integrate a health and wellness agenda into their value chain. Many CEOs cite a lack of recognition from the financial market as a barrier to achieving their sustainability goals [34]. But it is necessary to focus not only on preventive and holistic health, but also on return on investment. Stakeholders from managers, employees, investors, consumers, community organizations, and government should form a consensus that companies should try to contribute to consumer and public health through a mission that goes beyond mere profit. “The purpose of business is to serve society, through the provision of safe, high quality products and services that enhance our well-being, without eroding our ecological and community life-support systems ultimately.” [4] The government also should consider ways to assist these companies through tax breaks or their health insurance premium cuts.[3]

Although the scope of this study is so broad that cover all products and services and health also very broadly defined across 4 different domains, consumers think that corporate products or services have very important impact on not only their physical health, but also mental, social and spiritual health and there was no difference in importance among the 4 different domains of health. It might be crucial to develop measure to evaluate the health-friendly activities of corporates across 4 different domains of health in an objective and reasonable manner and to apply "health-friendly label" to the products and services of corporates.

This study had some limitations. The first is that it was conducted in Korea and the findings might not apply to other populations. Second, since this is a cross-sectional study, we could not attribute causality between attitudes toward health-friendly labels and intent to purchase health-friendly products or services. Further studies are needed to examine the associations. Third, almost all respondents would automatically agree with the questions in our survey and we did not address the gap between attitudes and behavior. Four, our hypothesis that consumer's demographic characteristics might influence their attitude toward health-friendly products and services have the limitation of study design. Especially educated people tend to give socially desired responses in surveys, i.e. to say that they would prefer health-friendly products and be willing to pay more for them. Therefore, Discrete Choice Modeling (Choice-Based Conjoint analysis) would be more suitable method to find out the preferences of features and products to simulate market and create optimal products. Finally, it is also a limitation that the respondents' use of health-friendly products or knowledge of such products was not asked at all in the survey although these factors might explain the attitudes towards the products. Further studies are needed to examine the associations of the consumers' use of health-friendly products or knowledge of the products with attitude toward health-friendly products and services.

Acknowledgements

The corresponding author YH Yun and co-author JA Sim thank BK21 plus program through the National Research Foundation (NRF) for financial support.

Author Contributions: YH Yun participated in the design of the study, provided financial supports and study materials, collected and assembly the data, interpret the analyses and also participated in the sequence alignment and drafted the manuscript. JA Sim participated in its design and coordination, conducted data analyses and also participated in the sequence alignment and drafted the manuscript. YJ Kim, SJ Lee and KN KIM participated in the design of the study and performed the statistical analysis and helped to draft the manuscript.

Data sharing statement: No additional data available

Ethics approval and consent to participate

The Institutional Review Board (IRB) at Seoul National University Hospital approved the study protocol, and all participants provided informed consent. All participants from each of the Seoul National University Hospital provided written informed consent.

Funding: This work was supported by a Seoul National University Research Grant in 2016 (800-20170241).

Potential Financial Conflicts of Interest: None disclosed

Availability of data and materilas: None

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Table 1. Sociodemographic Characteristics of Participants

Variable		N = 1,200	%
Sex	Male	592	49.3
	Female	608	50.7
Age, years	20-29	194	16.2
	30-39	212	17.7
	40-49	249	20.8
	50-59	239	19.9
	≥60	306	25.5
Religion	Protestantism	213	17.8
	Buddhism	178	14.8
	Catholic	98	8.2
	No religion	709	59.1
	Other	2	0.2
Marriage	Married	884	73.7
	Widowed	34	2.8
	Divorced/separated	17	1.4
	Single	265	22.1
Education	Elementary school graduate	27	2.3
	Middle school graduate	92	7.7
	High school graduate	537	44.8
	College degree or higher	539	44.9
	Non-schooled	5	0.4
Residence	Metropolitan	543	45.3
	Urban	592	49.3
	Rural	65	5.4
Monthly income, KRW (1000 KRW = 0.9 USD)	≤ 1,000,000	30	2.5
	1,000,000~1,999,999	89	7.4
	2,000,000~2,999,999	188	15.6
	3,000,000~3,999,999	344	28.7
	≥4999,999	543	45.3
Job status	Own Business	291	24.3
	Employed	549	45.8
	Unemployed	342	28.5
	Retired	18	1.5
BMI	<18.5	41	3.4
	18.5-23.49	686	57.4
	23.5-24.99	245	20.5
	≥25	224	18.7

Table 2. Mean and standard deviation (SD) of the company's health-friendly activities that have a significant impact on consumers' health

Item	Mean	SD
Company's health-friendly activities that have an important impact on consumers' physical health		
Reflecting physical health status during product / service development / improvement	7.71	1.33
Reflecting the enhancement of physical health activities when developing / improving products / services	7.76	1.35
Quality control for raw materials	8.02	1.43
Minimization of harmful elements of production / service process	8.03	1.39
Active compensation for health related accidents	7.95	1.37
Company's health-friendly activities that have an important impact on consumers' mental health		
Reflecting mental health status during product / service development / improvement	7.78	1.29
Reflecting the promotion of mental health activities when developing / improving products / services	7.80	1.33
Customer Friendly service	7.94	1.34
Actively coping with customer complaints	8.02	1.27
Building confidence in corporation made products / services	8.06	1.25
Company's health-friendly activities that have an important impact on consumers' social health		
Reflecting social health status during product / service development / improvement	7.74	1.20
Reflecting on social health activities promotion when developing / improving products / services	7.75	1.34
Building constant relationship with customers	7.83	1.39
Respecting customers without discrimination	7.95	1.31
Contribution to improvement of family / relationship with others	7.83	1.21
Company's health-friendly activities that have an important impact on consumers' spiritual health		
Reflecting spiritual health status during product / service development / improvement	7.61	1.36
Reflecting on spiritual health activities promotion when developing / improving products / services	7.66	1.37
Whether products / services respect person as a human being	7.83	1.39
Whether products /services make person feel worthy and valuable	7.84	1.34
Whether products / services help improve life satisfaction	7.80	1.29

Abbreviation: SD, Standard Deviation

Table 3. Univariate analysis of correlation of participants' consciousness of company's health-friendly activities with demographic and health behaviors (*$p < 0.05$)

Predictors	n (%)	Consumer Reaction			Purchase Intention			Additional Payment Intention		
		Negative Response	Positive Response	*p*-value	Negative Response	Positive Response	*p*-value	Negative Response	Positive Response	*p*-value
Age, years										
20-59	894(74.5)	**231(25.8)**	**663(74.2)**	**0.006***	**292(32.7)**	**602(67.3)**	**0.004***	**198(22.1)**	**696(77.9)**	**<0.001***
≥60	306(25.5)	**104(34.0)**	**202(66.0)**		**128(41.8)**	**176(58.2)**		**101(33.0)**	**205(67.0)**	
Sex										
Male	592(49.3)	159(26.9)	433(73.1)	0.42	212(35.8)	380(64.2)	0.561	146(24.7)	446(75.3)	0.841
Female	608(50.7)	176(28.9)	432(71.1)		208(34.2)	400(65.8)		153(25.2)	455(74.8)	
Residence										
Rural/suburban	657(54.8)	**209(31.8)**	**448(68.2)**	**0.001***	228(34.7)	429(65.3)	0.813	177(26.9)	480(73.1)	0.075
Urban	543(45.3)	**126(23.2)**	**417(76.8)**		192(35.4)	351(64.6)		122(22.5)	421(77.5)	
Religion										
None	711(59.3)	**182(25.6)**	**529(74.4)**	**0.031***	218(30.7)	493(69.3)	<0.001*	175(24.6)	536(75.4)	0.769
Yes	489(40.8)	**153(31.35)**	**336(68.7)**		202(41.3)	287(58.7)		124(25.4)	365(74.6)	
Marriage										
Not married	316(26.3)	87(27.5)	229(72.5)	0.859	117(37.0)	199(63.0)	0.379	78(24.7)	239(75.3)	0.911
Married	884(73.7)	248(28.1)	636(71.9)		303(34.3)	581(65.7)		221(25.0)	663(75.0)	
Education										
≤ High school graduate	**661(55.1)**	**204(30.9)**	**457(69.1)**	**0.012***	**259(39.2)**	**402(60.8)**	**0.001***	**193(29.2)**	**468(70.8)**	**<0.001***
College graduate	**539(44.9)**	**131(24.3)**	**408(75.7)**		**161(29.9)**	**378(70.1)**		**106(19.7)**	**433(80.3)**	
Monthly Income, KRW (1000 KRW = 0.9 USD)										
<3,000	307(25.6)	**97(31.6)**	**210(68.4)**	**0.096**	**136(44.3)**	**171(55.7)**	**<0.001**	**101(32.9)**	**206(67.1)**	**<0.001**
≥3,000	893(74.4)	**238(26.7)**	**655(73.3)**		**284(31.8)**	**609(68.2)**		**198(22.2)**	**695(77.8)**	
Employed										
Yes	840(70.0)	235(28.0)	605(72.0)	0.944	292(34.8)	548(65.2)	0.792	205(24.4)	635(75.6)	0.531
No	360(30.0)	100(27.8)	260(72.2)		128(35.6)	232(64.4)		94(26.1)	266(73.9)	
Overweight (BMI)										
<23.5	727(60.6)	**188(25.9)**	**539(74.1)**	**0.049**	**230(31.6)**	**497(68.4)**	**0.002**	**154(21.2)**	**573(78.8)**	**<0.001**
≥23.5	473(39.4)	**147(31.1)**	**326(68.9)**		**190(40.2)**	**283(59.8)**		**145(30.7)**	**328(69.3)**	

Table 4. **Univariate analysis of correlation of participants' consciousness of health-friendly product/services with health status** (*$p < 0.05$)

Predictors	N (%)	Consumer Reaction			Purchase Intention			Additional Payment Intention		
		Negative Response	Positive Response	p-value	Negative Response	Positive Response	p-value	Negative Response	Positive Response	p-value
Physical health status										
Poor	221(18.4)	66(29.9)	155(70.1)	0.475	78(35.3)	143(64.7)	0.919	**67(30.3)**	**154(69.7)**	**0.04****
≥good	979(81.6)	269(27.5)	710(72.5)		342(34.9)	637(65.1)		**232(23.7)**	**747(76.3)**	
Mental Health Status										
Poor	121(10.1)	**44(36.4)**	**77(63.6)**	**0.029***	46(38.0)	75(62.0)	0.463	**40(33.1)**	**81(66.9)**	**0.029****
≥good	1079(89.9)	**291(27.0)**	**788(73.0)**		374(34.7)	705(65.3)		**259(24.0)**	**820(76.0)**	
Social Health Status										
Poor	**83(6.9)**	**35(42.2)**	**48(57.8)**	**0.003***	**40(48.2)**	**43(51.8)**	**0.009***	**27(32.5)**	**56(67.5)**	**0.096***
≥good	**1117(93.1)**	**300(26.9)**	**817(73.1)**		**380(34.0)**	**737(66.0)**		**272(24.4)**	**845(76.5)**	
Spiritual Health Status										
Poor	112(9.3)	38(33.9)	74(66.1)	0.136	46(41.1)	66(58.9)	0.157	**45(40.2)**	**67(59.8)**	**<0.001****
≥good	1088(90.7)	297(27.3)	791(72.7)		374(34.4)	714(65.6)		**254(23.3)**	**834(76.7)**	
General Health Status										
Poor	90(7.5)	32(35.6)	58(64.4)	0.093	34(37.8)	56(62.2)	0.566	**36(40.0)**	**54(60.0)**	**0.001***
≥good	1110(92.5)	303(27.3)	807(72.7)		386(34.8)	724(65.2)		**263(23.7)**	**847(76.3)**	

Table 5. Multivariate analyses* of participants' consciousness of health-friendly product/services with sociodemographic variables and health status

Predictor	n (%)	Positive Consumer Reaction aOR* (95% CI)	Positive Purchase Intention aOR* (95% CI)	Positive Additional Payment Intention aOR* (95% CI)
Age				
≥60	894(74.5)			
20-59	306(25.5)	NS	NS	NS
Residence				
Rural/suburban	657(54.8)	1		
Urban	543(45.3)	1.54(1.19-2.00)	-	-
Religion				
None	711(59.3)		1	
Yes	489(40.8)	NS	0.66(0.51-0.84)	-
Education				
≤ High school graduate	661(55.1)	1		1
College graduate	539(44.9)	1.30(1.00-1.69)	NS	1.41(1.06-1.87)
Monthly Income, KRW (1000 KRW = 0.9 USD)				
<3,000	345(28.7)		1	1
≥3,000	855(71.3)	-	1.46(1.11-1.93)	1.42(1.05-1.92)
BMI				
≥23.5	966(76.6)		1	1
<23.5	281(23.4)	NS	1.34(1.04-1.72)	1.42(1.08-1.86)
Physical health status				
Poor	221(18.4)			
≥good	979(81.6)	-	-	NS
Mental health status				
Poor	121(10.1)			
≥good	1079(89.9)	NS	-	NS
Social Health Status				
Poor	83(6.9)	1		
≥good	1117(93.1)	1.79(1.13-2.85)	NS	-
Spiritual health status				
Poor	112(9.3)			1
≥good	1088(90.7)	-	-	1.90(1.26-2.86)
General health status				
Poor	90(7.5)			
≥good	1110(92.5)	-	-	NS

Abbreviations: aOR, adjusted odds ratio; Ref, reference; NS, Non-significant

* Multiple logistic regression analysis including variables identified as independent predictors that showed statistical significance in univariate analysis of correlates of needs for tailored health management program

[a] The backward-selected multiple logistic regression model identified with sl entry = 0.05 and sl stay = 0.05

[b] Variables that were significantly correlated with a health behavior in the univariate cross-tabulations but not significant in the multivariate analysis are presented as NS; variables not significant in univariate analysis are not included in the model and are presented as '-'.

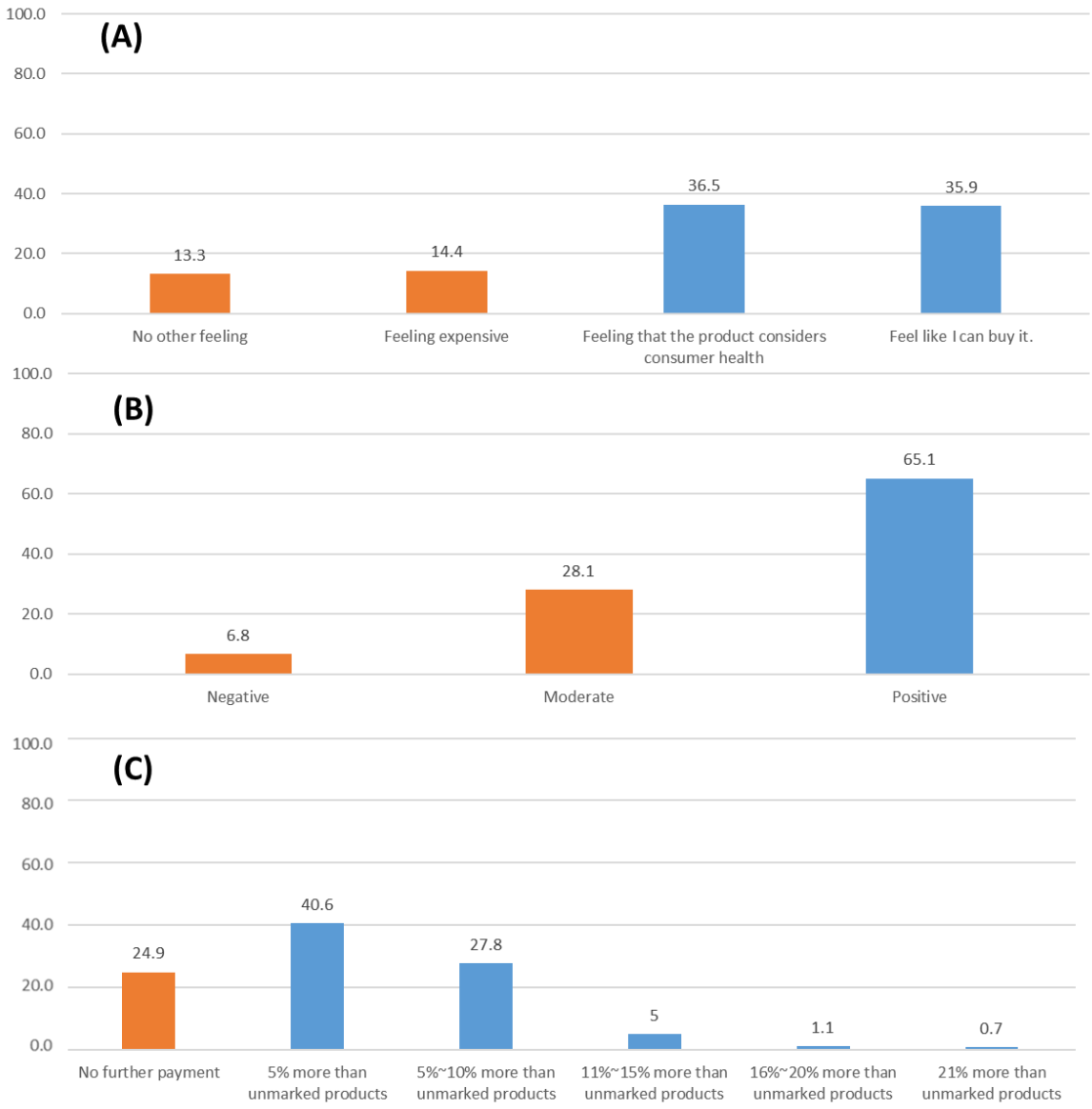

Figure 1. Proportions about participants' idea about Friendly Index Marked Products
(A)Consumer Reaction about Health Friendly Corporation
(B)Purchase Intention for Health Friendly Index Marked Products
(C)Additional Payment Intention for Health Friendly Index Marked Products

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	ItemNo	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **(We changed the title and abstract indicating the study design with a commonly used term in the title or the abstract)**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **(See Abstract)**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **(page 4)**
Objectives	3	State specific objectives, including any prespecified hypotheses **(page 5)**
Methods		
Study design	4	Present key elements of study design early in the paper **(page 6, Participants and procedures)**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **(page 6, Participants and procedures)**
Participants	6	Give the eligibility criteria, and the sources and methods of selection of participants **(page 6, Participants and procedures)**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **(page 7, Measurements)**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **(page 7, measurements)**
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at **(page 6, Participants and procedures)**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen

		and why **(page 7, measurements)**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **(page 8, 9)**
		(*b*) Describe any methods used to examine subgroups and interactions **(page 8, 9)**
		(*c*) Explain how missing data were addressed **(NA)**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy **(page 8)**
		(*e*) Describe any sensitivity analyses **(NA)**
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **(page 9)**
		(b) Give reasons for non-participation at each stage **(NA)**
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **(page 10)**
		(b) Indicate number of participants with missing data for each variable of interest **(NA)**
Outcome data	15*	Report numbers of outcome events or summary measures **(page 9-19)**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **(page 10, 11)**
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **(page 11)**
Discussion		
Key results	18	Summarise key results with reference to study objectives **(page 11)**

Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **(page 13)**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **(page 11-13)**
Generalisability	21	Discuss the generalisability (external validity) of the study results **(page 15)**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based. **(page 15)**

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article.

BMJ Open

Consumers' consciousness of health-friendly products and services and its association with sociodemographic characteristics and health status: a cross-sectional survey of the South Korean population

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-035591.R1
Article Type:	Original research
Date Submitted by the Author:	15-Apr-2020
Complete List of Authors:	Yun, Young Ho; Seoul National University College of Medicine Sim, Jin Ah; Seoul National University College of Medicine Kim, Yaeji ; Friedrich-Alexander-Universität Erlangen-Nürnberg Lee, Sujee ; University of Wisconsin Madison Kim, Kyoung-Nam; Seoul National University Hospital
Primary Subject Heading:	Public health
Secondary Subject Heading:	Public health
Keywords:	PUBLIC HEALTH, HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Original Research

Consumers' consciousness of health-friendly products and services and its association with sociodemographic characteristics and health status: a cross-sectional survey of the South Korean population

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**Jin Ah Sim received a scholarship from the BK21-plus education program

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ABSTRACT

Objectives: To identify consumers' consciousness of health-friendly products and services (consumer reaction, purchase intention, and willingness to pay more) and its association with sociodemographic characteristics and multi-dimensional health status.

Methods: From March to May 2018, we administered questionnaires to 1,200 individuals from the general Korean population asking about their perception of health-friendly labels, and if they would purchase such labeled products (foods, pharmaceuticals, etc.) and services (purifying water, preventing air pollution, etc.) at extra cost.

Results: The participants placed a high value on the importance of mental, social, spiritual, and physical health factors in terms of the company's products and services with a score of about 8 out of 10 (range, 7.74-8.33). Most respondents (72.4%) said they were interested in adopting health-friendly labels. When a health-friendly label is introduced (such as one by the Business for Social Responsiveness), 65.1% of the respondents said they intended to purchase the product or service, while 6.8% said they did not, and 75.0% said they were willing to pay extra for the health-friendly product or service. Multivariate logistic regression models showed urban residence, high education level, and good social health to be significantly associated with positive attitudes toward health-friendly labels. People with high income, no religion, or normal weight were more likely to say they intend to purchase products and services with health-friendly labels. They also had a more positive attitude toward paying more for such products and services, as did people with good spiritual health.

Conclusion: This study provides data that illustrate the importance of health-friendly products and services to the general population and companies.

Keywords: consciousness for health; health-friendly activities; health-friendly products and services; health status

Article Summary

Strengths and limitations of the study

- Consumers nowadays are interested in whether a company cares about consumers' health and wellness. Given such an increasing consensus, we proposed the concept of health-friendly management and, thereby, aimed to better understand consumers' perception of health-friendly labels and their purchase behaviour of health-friendly labelled products and services.
- We propose here the concept of "health-friendly management", which refers to the promotion of various healthful components, or the avoidance of harmful components, whether they affect the physical, mental, social, or spiritual aspects of health.
- However, since the current study is based on cross-sectional data, we could not conclude the causality between one's attitude towards health-friendly labels and the intent to purchase health-friendly products or services.

INTRODUCTION

In 1948, the World Health Organization (WHO) Constitution defined health as "a state of complete physical, social, and mental well-being and not merely the absence of disease or infirmity". In recent years, health has been viewed as having four aspects—body, mind, social, and spiritual.[1] Health is determined somewhat by genetics and medical care, but mostly by behavior and social conditions. Health care policy, however, does not accommodate that observation.[2] In the U.S., for example, approximately 95% of the health budget goes to medical care services, while only 5% is allocated to population-based approaches for health improvement.[3]

There is an increasing awareness of the importance of social and environmental factors on health and that health is the responsibility of both the government and the private sector. [4] Although current health policy focuses mainly on the role of the government, companies can play an important role in building a framework of health ecosystems.[4] Just as companies can influence the health of employees and customers, they can address corporate social responsibility (CSR). Usually, however, CSR efforts focus on philanthropy and are undertaken largely to meet legal requirements or avoid penalties [5]. But CSR can have a more strategic role by using the company's core systems to create business and express social value by addressing the issue of population health.[4,6] According to Porter and Kramer, "The concept of shared values can be defined as policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions of the communities in which it operates." [6,7] Some companies, such as PepsiCo,[8] Qualcomm Incorporated,[9] Walmart,[10] and General Electric,[6] found new business opportunities that could prevent or solve specific health challenges.[4] Overall, a few companies outside the food, beverage, and agriculture industries are trying to improve customers' health and wellness.[4] Many sustainability and corporate responsibility programs are 'less bad' rather than 'good'.[5]

According to Business for Social Responsibility, consumers nowadays are interested in what a company cares about their health and wellness, health-friendly product and service.[4] For example, consumers can easily accept to buy innovative functional foods with health effects and increasing interest in health might drive a growth in demand for functional health foods with radical innovations.[11] A famous example is the announcement Walmart made at the White House together with then-First Lady Michelle Obama. Walmart company would open 300 stores to serve the U.S. Department of Agriculture's designated food desert areas to provide easy access to fresh, affordable, and nutritious food to foster healthier communities.[10] There is a significant stream of research covering health labelling and its impact on consumer choice.[12-14] For example, frequent users of nutrition labels were less likely to consume unhealthy indicator foods [13]

Some studies of consumer purchase decision models indicate that consumer purchase intentions greatly depend on health and price consciousness and on a health label and are uneven across different market segments and cultures.[15-18]. Although some studies have investigated the perception and purchase of organic products and eco labels, few have investigated the same concept on health.[17,19-21] Earlier studies have shown that consumer's sociodemographic characteristics[20,22], such as age, sex, education, and income, and their health status influenced their attitude towards health-friendly products and services (consumer reaction, purchase intention, and willingness to pay more).[17,18,20-27] Thus, in this study, we aimed to understand consumer perception of health-friendly labels and their purchasing behavior of health-friendly labelled products and services, and to identify associated factors.

We propose here the concept of "health-friendly management", which refers to the promotion of various healthful components, or the avoidance of harmful components, whether they affect the physical, mental, social, or spiritual aspects of health.

To eliminate factors that may impair health, it is necessary for health-friendly products and services to meet safety regulations through quality control of raw materials, minimization of

harmful elements, or the improvement of mental, social, and spiritual health. Health-friendly management, thus, deals with health-friendly products and services as a corporate responsibility. From our literature review, we hypothesized that consumer's demographic characteristics such as education and income, and their health status might influence their attitude toward health-friendly products and services (consumer reaction, purchase intention, and willingness to pay more).[17,18,20-27] (Figure 1)

METHODS

Patient and public involvement

Data were collected from a broader general Korean population targeted in the survey. Firstly, the survey was conducted with the general population aged 20-70 years and residing across 17 major cities and local districts from March to May 2018. In each major city and local district, all participants were recruited taking the age and sex strata by region into account and applying probability proportion-to-size sampling in accordance with the 2016 Korean census. We used a probability-proportional-to-size technique for sample selection to to select a representative national sample, particularly when the sample groups differ in size. [28] Among 4000 eligible persons, 1,200 people (30% response rate) of them responded to the self-reported questionnaire in the presence of the interviewer, who could provide further explanation on the study. This method is widely used trained research assistants administered a semi-structured, self-reported questionnaire. The World Research Co., Ltd., (Seoul, Korea) conducted the survey. All recruiters provided informed consent.

Ethics approval was obtained from the Institutional Review Board of the Seoul National University for the participants' self-reported questionnaire. All participants provided oral informed consent.

Measurement

The survey items were formulated on the basis of published studies [29-32]. Accordingly, these 3 items were generated: (1) How would you feel about companies when you see their health-friendly labeled products or services?[28] The participants could respond with one of the following: "They are trustworthy", "They care about consumers' health", "The cost is high", or "No special feeling". (2) Would you prefer the health-friendly labeled products or services to others not so labeled? [28 31] (5-point Likert scale with 1, not at all; 2, a little; 3, moderate; 4, quite a bit; 5, very much.) (3) Would you be willing to pay more for the health-friendly labeled product or service? If so, how much more compared with the label-free product price?" [29-31] (1, no more; 2, less than 5%; 3, 5%~10%; 4, 11%~15%; 5, 16%~20%; 6, more than 21%). (Figure 2) To measure the impact of different aspects of health status on health-friendly consciousness, we assessed the respondents' health on the basis of a holistic point of view.[1] The items measuring physical, mental, social, and spiritual health status were applied as follows (0 = not at all helpful, 10 = very helpful): "Physical health is the state of having normal physical strength, without diseases and injuries. What do you think about your physical health status?" "Mental health is the state of being mentally stable, being able to overcome stress. What do you think about your mental health status?" "Social health is the state of having good social relationships, carrying out one's work properly. What do you think about your social health status?" "Spiritual health is the state of adding meaning to life through volunteering, religious experiences, and meditation. What do you think about your spiritual health status?" In addition, we measured general health status with the following question: "Considering your physical, mental, social, and spiritual health status, what do you think about your health status in general?" All the items used a 5-point Likert scale with "Excellent", "Very Good", "Good", "Poor", and "Bad".

In addition, the respondents were asked which subscales of each health aspect they considered important for the pursuit of a company's health-friendly products or services. They were given the subscales of four health aspects (5 subscales each), and asked to rate the importance of each

on a scale of 0 to 10. The respondents' sociodemographic and health information we collected included age, sex, residence, religion, marital status, education, monthly income, job status, body mass index (BMI), comorbidities, and smoking experience.

Statistical analysis

Using descriptive statistics for the sociodemographic variables, we calculated the mean ± SD scores of the importance of the impact of the 4 health factors (physical, mental, social, and spiritual) for corporations that made health-friendly products or services. To test the reliability of the the variables of health-friendly activities, we estimated Cronbach's α, which is a measure of internal consistency of patient responses. Then we performed univariate analyses to measure sociodemographic correlates for each aspect of health consciousness (consumer reaction, purchase intention, and willingness to pay more). For the sociodemographic factors significantly associated in univariate analysis, we performed multiple regression analyses to examine the independent association with more positive health consciousness. The sociodemographic variables were included in univariate analyses based on the literature reviews [17,18,20-27] and screening potentially element associated with the health consciousness. We also compared the proportions of health consciousness using a chi-squared test to evaluate the impact of five categories of health status (physical, mental, social, spiritual, and general health). In all analyses, we determined two-sided *P*-values and considered a *P*-value less than 0.05 to be significant. In final model, we used the factors that were determined to be significant in univariate analyses to examine the association between the sociodemographic variables, health status, and those of more positive health consciousness. We conducted three multiple regression analyses using the hierarchical/stepwise method for factors significantly associated in univariate analysis to identify the independent and best predicted variables for participants' consciousness of health-friendly product/services. We used this analytical approach because of concerns of multicollinearity. We conducted a univariate

analysis with the aim of screening potentially existing elements to learn from existing data and draw implications. Therefore, univariate analysis was not a meaningful thing in itself, but a step to build a model for the final multivariate analysis. As a result, the final multivariate analysis results were meaningful and the researchers evaluated it. We also performed a sensitivity analysis by further calibrating the age-square along with the age variable in the multivariate analysis, confirming that most results were maintained. In the case of Income variables, obtained and analyzed in a categorical manner, without logarithmic conversion of income variables, there are no problems caused by extreme values. We considered $P < 0.05$ as statistically significant and reported results as the odds ratio (OR) with a 95% CI. We used SAS, version 9.3 software (SAS Institute, Cary, NC, USA) for all analyses.

RESULTS

Sociodemographic characteristics of the participants

Table 1 shows sociodemographic characteristics of the 1,200 survey participants. The mean age ± SD of the study participants was 46.97 ± 14.18 years.

Factors that are important for the health-friendly activities of companies to affect consumers' four aspect of health

The respondents evaluated the mental, social, spiritual, and physical health factors incorporated into products or services highly. Table 2 shows the scores for the various aspects of the four factors. All values of the variables of the health-friendly activities showed high reliability, with good internal consistency (Cronbach's α range, 0.89 to 0.91).

Acceptance of health-friendly label and intent to purchase its products or services

Most respondents (72.4%) said they were interested in adopting the health-friendly label, evaluating the companies' health-friendly activities in various areas. In detail, 36.5% of the

respondents believed that the companies thought about consumers' health, and 35.9% felt that they could believe the label claims and purchase the products or services. When a health-friendly label is introduced by a company, 65.1% of the respondents said they intended to purchase the product/service, 6.8% said they did not, and 75.1% said that they were willing to pay more for it (Figure 2).

Association of demographic characteristics and health status with health-friendly label, intent to purchase its product/services, and willing to pay extra price, univariate logistic analysis

Tables 3 and 4 show the association of demographic characteristics and health status with consciousness of health-friendly products and services, intent to purchase the product or services, and willingness to pay a higher price for them. As for the domain of consumer reaction, 5 demographic variables (young age, place of residence, religion, education, higher BMI) and 2 types of health status (good mental health and social health) were statistically significant.

Significantly related to the domain of purchase intention were social health status as well as the demographic factors of age, religion, education, monthly income, and BMI. In addition, significantly associated with additional payment intention were the demographic factors of younger age, education, monthly income, and BMI, as were physical, mental, spiritual, and general health status.

Multivariate logistic regression models for factors associated with health-friendly labels, intent to purchase its product or services, and willingness to pay for the higher price

Multivariate logistic regression models show that the consumers residing in urban areas, highly educated, and having good social health status showed a more positive reaction to health-friendly labels. Respondents with a higher income level, normal BMI, and no religion were more likely to express an intention to purchase products and services with a health-friendly label, whereas no

health status was significantly associated with that intent. In addition, factors such as higher education, higher income level, normal BMI, and good spiritual health were associated with having a more positive attitude toward paying extra for products and services with health-friendly labels (Table 5). Significant correlations in some univariate analyzes such as age, physical, mental and general health status have lost significance in multivariate analysis, which may be due to correlation and confounding between variables.

DISCUSSION

This study provides a better understanding of the importance to consumers of products or services that provide physical, mental, social, and spiritual health. In addition, this study suggests the need for a health-friendly certification mark or label recognized by the general population. Our findings suggest that consumers are demanding health-friendly products and services and are willing to pay the extra cost involved.

Companies' marketing activities can play a significant role in raising the public awareness of health [4]. Business for Social Responsibility, a global nonprofit organization working to build "a just and sustainable world," confirmed that member companies support the idea that they can strengthen the health and wellness of their customers and the public. About 90% of the companies agree that they can help strengthen the health of their consumers, while about 75% agree that they can help strengthen public health.[4] Shared value models may represent the next evolution of capitalism.[7] In the U.S., for example, Kaiser Permanente partnered with Home Box Office, the National Institutes of Health, the Centers for Disease Control and Prevention, the Institute of Medicine, and the Michael & Susan Dell Foundation and launched public health campaigns addressing the obesity epidemic.[33] Moreover, companies can partner with local governments to encourage healthy lifestyles or habits. For the National Salt Reduction Initiative,

for instance, more than 100 state and local health authorities and national health organizations partnered with many companies to reduce the amount of sodium in packaged and restaurant foods (https://www1.nyc.gov/site/doh/health/health-topics/national-salt-reduction-initiative.page#national-salt-reduction-initiative).

Our findings showed that consumers with higher education or who lived in an urban area had a more favourable attitude towards health-friendly labels and that non-religious, high-income, or normal-weight consumers had intentions to purchase products and services with health-friendly labels. This study showed that people with higher education, high income, or normal weight had a positive attitude towards paying more for products and services with health-friendly labels. However, other studies had inconsistent findings between demographic characteristics and purchase intention towards green products.[20,22] Our finding that consumers with good health status would be cautious about products and services with a health-friendly label and expressed willingness to pay more for them are consistent with the finding that health consciousness is an important factor that influences the purchase of organic foods.[17,18,23,24] Our results seem to be consistent with the finding that eco-label and the value of green products had the strongest positive influence on green product purchase intention and were associated with the willingness to pay more for environmentally certified products, the eco-label, or the energy-label.[21,22,25-27]

These studies imply that most consumers perceive the health-friendly label as important when purchasing products or services. Emphasizing the health-friendly label of products or services accredited by reputable organizations would help to build reliability and awareness among consumers, but the products and services would be more expensive than conventional products and services,[21,22] and that could negatively influence purchasing. Thus, managers are challenged with the need to produce high quality products and services at affordable prices.[21]

To integrate health-friendliness into its value chain and culture, companies can start by meeting social needs through products or services that serve the unserved or underserved.[6,7,16] It

can motivate employees to strengthen the health of their customers through daily actions and business decisions. Companies can use key performance indicators and report them in their sustainability report in a comprehensive and transparent way.[4]

Many companies, however, would struggle when trying to integrate a health and wellness agenda into their value chain. Many CEOs cite a lack of recognition from the financial market as a barrier to achieving their sustainability goals [34]. But it is necessary to focus not only on preventive and holistic health, but also on return on investment. Stakeholders from managers, employees, investors, consumers, community organizations, and government should form a consensus that companies should try to contribute to consumer and public health through a mission that goes beyond mere profit. "The purpose of business is to serve society, through the provision of safe, high quality products and services that enhance our well-being, without eroding our ecological and community life-support systems ultimately." [5] The government also should consider ways to assist these companies through tax breaks or their health insurance premium cuts.[4]

Although the scope of this study is so broad that cover all products and services and health also very broadly defined across 4 different domains, consumers think that corporate products or services have very important impact on not only their physical health, but also mental, social and spiritual health and there was no difference in importance among the 4 different domains of health. It might be crucial to develop measure to evaluate the health-friendly activities of corporates across 4 different domains of health in an objective and reasonable manner and to apply "health-friendly label" to the products and services of corporates.

This study had some limitations. The first is that it was conducted in Korea and the findings might not apply to other populations. Second, in the present study, we applied probability proportion-to-size sampling taking into account the age and sex strata with the 2016 Korean census. Although we could not perform inverse probability weighting techniques due to lack of information of non-

responder and, therefore, a concern of selection bias remains as you indicated, the sociodemographic characteristics of the study participants included in the present study (n = 1,200) were similar to the those of the Korean population with regard to age (20–29 years: 16.2%, 30–39 years: 17.7%, 40–49 years: 20.8%, 50–59 years: 19.9%, ≥60 years: 25.5% in the present study; 20–29 years: 15.9%, 30–39 years: 16.4%, 40–49 years: 19.6%, 50–59 years: 20.2%, ≥60 years: 27.9% in the Korean population) and sex (male: 49.3%, female: 50.7% in the present study; male: 49.9%, female: 50.1% in the Korean population, suggesting low possibility of selection bias and confirming representative sampling. Third, since this is a cross-sectional study, we could not attribute causality between attitudes toward health-friendly labels and intent to purchase health-friendly products or services. Further studies are needed to examine the associations. Fourth, almost all respondents would automatically agree with the questions in our survey and we did not address the gap between attitudes and behavior. Fifth, our hypothesis that consumer's demographic characteristics might influence their attitude toward health-friendly products and services have the limitation of study design. Especially educated people tend to give socially desired responses in surveys, i.e. to say that they would prefer health-friendly products and be willing to pay more for them. Therefore, Discrete Choice Modeling (Choice-Based Conjoint analysis) would be more suitable method to find out the preferences of features and products to simulate market and create optimal products. Sixth, We did not treat the questions of trustworthiness and care about consumer health as separate questions. Therefore, it is hard to interpret how one feels about companies when seeing health-friendly products or services. Seventh, we arbitrarily used the categories to assess willingness to pay more and did not test other categories. It would be helpful to see how sensitive the results are to the use of other categories in further studies. Finally, it is also a limitation that the respondents' use of health-friendly products or knowledge of such products was not asked at all in the survey although these factors might explain the attitudes towards the products. Further studies

are needed to examine the associations of the consumers' use of health-friendly products or knowledge of the products with attitude toward health-friendly products and services.

Acknowledgements

The corresponding author YH Yun and co-author JA Sim thank BK21 plus program through the National Research Foundation (NRF) for financial support.

Author Contributions: YH Yun participated in the design of the study, provided financial supports and study materials, collected and assembly the data, interpret the analyses and also participated in the sequence alignment and drafted the manuscript. JA Sim participated in its design and coordination, conducted data analyses and also participated in the sequence alignment and drafted the manuscript. YJ Kim, SJ Lee and KN KIM participated in the design of the study and performed the statistical analysis and helped to draft the manuscript.

Data sharing statement: No additional data available

Ethics approval and consent to participate

The Institutional Review Board (IRB) at Seoul National University Hospital approved the study protocol, and all participants provided informed consent. All participants from each of the Seoul National University Hospital provided written informed consent.

Funding: This work was supported by a Seoul National University Research Grant in 2016 (800-20170241).

Potential Financial Conflicts of Interest: None disclosed

Availability of data and materilas: None

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Table 1. Sociodemographic Characteristics of Participants

Variable		Study participants		Korea population [a]
		N = 1,200	%	%
Sex	Male	592	49.3	49.9
	Female	608	50.7	50.1
Age, years	20-29	194	16.2	15.9
	30-39	212	17.7	16.4
	40-49	249	20.8	19.6
	50-59	239	19.9	20.2
	≥60	306	25.5	27.9
Religion	Protestantism	213	17.8	19.7
	Buddhism	178	14.8	15.5
	Catholic	98	8.2	7.9
	No religion	709	59.1	56.1
	Other	2	0.2	0.8
Marriage	Married	884	73.7	55.8
	Widowed	34	2.8	3.5
	Divorced/separated	17	1.4	1.9
	Single	265	22.1	38.6
Education	Non-schooled	5	0.4	12.0
	Elementary school graduate	27	2.3	
	Middle school graduate	92	7.7	
	High school graduate	537	44.8	39.0
	College degree or higher	539	44.9	48.0
	Metropolitan	543	45.3	91.8
Residence	Urban	592	49.3	
	Rural	65	5.4	8.2
	≤ 1,000,000	30	2.5	6.2
Monthly income, KRW	1,000,000~1,999,999	89	7.4	15.2
(1000 KRW = 0.9	2,000,000~2,999,999	188	15.6	18.9
USD)	3,000,000~3,999,999	344	28.7	17.7
	≥4999,999	543	45.3	42.2
	Own Business	291	24.3	21.0
Job status	Employed	549	45.8	39.7
	Unemployed	342	28.5	39.3
	Retired	18	1.5	
	<18.5	41	3.4	3.6
BMI	18.5-23.49	686	57.4	58.1
	23.5-24.99	245	20.5	
	≥25	224	18.7	38.3

[a] Data for the Korean population (2013–2019) was obtained from Statistics Korea.

Table 2. Mean and standard deviation (SD) of the company's health-friendly activities that have a significant impact on consumers' health (0 = not at all helpful, 10 = very helpful)

Item	Mean	SD
Company's health-friendly activities that have an important impact on consumers' physical health (Cronbach's α=0.89)		
Reflecting physical health status during product / service development / improvement	7.71	1.33
Reflecting the enhancement of physical health activities when developing / improving products / services	7.76	1.35
Quality control for raw materials	8.02	1.43
Minimization of harmful elements of production / service process	8.03	1.39
Active compensation for health related accidents	7.95	1.37
Company's health-friendly activities that have an important impact on consumers' mental health (Cronbach's α=0.90)		
Reflecting mental health status during product / service development / improvement	7.78	1.29
Reflecting the promotion of mental health activities when developing / improving products / services	7.80	1.33
Customer Friendly service	7.94	1.34
Actively coping with customer complaints	8.02	1.27
Building confidence in corporation made products / services	8.06	1.25
Company's health-friendly activities that have an important impact on consumers' social health (Cronbach's α=0.91)		
Reflecting social health status during product / service development / improvement	7.74	1.20
Reflecting on social health activities promotion when developing / improving products / services	7.75	1.34
Building constant relationship with customers	7.83	1.39
Respecting customers without discrimination	7.95	1.31
Contribution to improvement of family / relationship with others	7.83	1.21
Company's health-friendly activities that have an important impact on consumers' spiritual health (Cronbach's α=0.91)		
Reflecting spiritual health status during product / service development / improvement	7.61	1.36
Reflecting on spiritual health activities promotion when developing / improving products / services	7.66	1.37
Whether products / services respect person as a human being	7.83	1.39
Whether products /services make person feel worthy and valuable	7.84	1.34
Whether products / services help improve life satisfaction	7.80	1.29

Abbreviation: SD, Standard Deviation

Table 3. Univariate analysis of correlation of participants' consciousness of company's health-friendly activities with demographic and health behaviors

Predictors	n (%)	Consumer Reaction			Purchase Intention			Additional Payment Intention		
		Negative Response	Positive Response	*p*-value	Negative Response	Positive Response	*p*-value	Negative Response	Positive Response	*p*-value
Age, years										
20-59	894(74.5)	231(25.8)	663(74.2)	0.006	292(32.7)	602(67.3)	0.004	198(22.1)	696(77.9)	<0.001
≥60	306(25.5)	104(34.0)	202(66.0)		128(41.8)	176(58.2)		101(33.0)	205(67.0)	
Sex										
Male	592(49.3)	159(26.9)	433(73.1)	0.42	212(35.8)	380(64.2)	0.561	146(24.7)	446(75.3)	0.841
Female	608(50.7)	176(28.9)	432(71.1)		208(34.2)	400(65.8)		153(25.2)	455(74.8)	
Residence										
Rural/suburban	657(54.8)	209(31.8)	448(68.2)	0.001	228(34.7)	429(65.3)	0.813	177(26.9)	480(73.1)	0.075
Urban	543(45.3)	126(23.2)	417(76.8)		192(35.4)	351(64.6)		122(22.5)	421(77.5)	
Religion										
None	711(59.3)	182(25.6)	529(74.4)	0.031	218(30.7)	493(69.3)	<0.001	175(24.6)	536(75.4)	0.769
Yes	489(40.8)	153(31.35)	336(68.7)		202(41.3)	287(58.7)		124(25.4)	365(74.6)	
Marriage										
Not married	316(26.3)	87(27.5)	229(72.5)	0.859	117(37.0)	199(63.0)	0.379	78(24.7)	239(75.3)	0.911
Married	884(73.7)	248(28.1)	636(71.9)		303(34.3)	581(65.7)		221(25.0)	663(75.0)	
Education										
≤ High school graduate	661(55.1)	204(30.9)	457(69.1)	0.012	259(39.2)	402(60.8)	0.001	193(29.2)	468(70.8)	<0.001
College graduate	539(44.9)	131(24.3)	408(75.7)		161(29.9)	378(70.1)		106(19.7)	433(80.3)	
Monthly Income, KRW (1000 KRW = 0.9 USD)										
<3,000	307(25.6)	97(31.6)	210(68.4)	0.096	136(44.3)	171(55.7)	<0.001	101(32.9)	206(67.1)	<0.001
≥3,000	893(74.4)	238(26.7)	655(73.3)		284(31.8)	609(68.2)		198(22.2)	695(77.8)	
Employed										
Yes	840(70.0)	235(28.0)	605(72.0)	0.944	292(34.8)	548(65.2)	0.792	205(24.4)	635(75.6)	0.531
No	360(30.0)	100(27.8)	260(72.2)		128(35.6)	232(64.4)		94(26.1)	266(73.9)	
Overweight (BMI)										
<23.5	727(60.6)	188(25.9)	539(74.1)	0.049	230(31.6)	497(68.4)	0.002	154(21.2)	573(78.8)	<0.001
≥23.5	473(39.4)	147(31.1)	326(68.9)		190(40.2)	283(59.8)		145(30.7)	328(69.3)	

Table 4. Univariate analysis of correlation of participants' consciousness of health-friendly product/services with health status

Predictors	N (%)	Consumer Reaction		p-value	Purchase Intention		p-value	Additional Payment Intention		p-value
		Negative Response	Positive Response		Negative Response	Positive Response		Negative Response	Positive Response	
Physical health status										
Poor	221(18.4)	66(29.9)	155(70.1)	0.475	78(35.3)	143(64.7)	0.919	67(30.3)	154(69.7)	0.04
≥good	979(81.6)	269(27.5)	710(72.5)		342(34.9)	637(65.1)		232(23.7)	747(76.3)	
Mental Health Status										
Poor	121(10.1)	44(36.4)	77(63.6)	0.029	46(38.0)	75(62.0)	0.463	40(33.1)	81(66.9)	0.029
≥good	1079(89.9)	291(27.0)	788(73.0)		374(34.7)	705(65.3)		259(24.0)	820(76.0)	
Social Health Status										
Poor	83(6.9)	35(42.2)	48(57.8)	0.003	40(48.2)	43(51.8)	0.009	27(32.5)	56(67.5)	0.096
≥good	1117(93.1)	300(26.9)	817(73.1)		380(34.0)	737(66.0)		272(24.4)	845(76.5)	
Spiritual Health Status										
Poor	112(9.3)	38(33.9)	74(66.1)	0.136	46(41.1)	66(58.9)	0.157	45(40.2)	67(59.8)	<0.001
≥good	1088(90.7)	297(27.3)	791(72.7)		374(34.4)	714(65.6)		254(23.3)	834(76.7)	
General Health Status										
Poor	90(7.5)	32(35.6)	58(64.4)	0.093	34(37.8)	56(62.2)	0.566	36(40.0)	54(60.0)	0.001
≥good	1110(92.5)	303(27.3)	807(72.7)		386(34.8)	724(65.2)		263(23.7)	847(76.3)	

Table 5. Multivariate analyses* of participants' consciousness of health-friendly product/services with sociodemographic variables and health status

Predictor	n (%)	Positive Consumer Reaction aOR* (95% CI)	Positive Purchase Intention aOR* (95% CI)	Positive Additional Payment Intention aOR* (95% CI)
Age				
≥60	894(74.5)			
20-59	306(25.5)	NS	NS	NS
Residence				
Rural/suburban	657(54.8)	1		
Urban	543(45.3)	1.54(1.19-2.00)	-	-
Religion				
None	711(59.3)		1	
Yes	489(40.8)	NS	0.66(0.51-0.84)	-
Education				
≤ High school graduate	661(55.1)	1		1
College graduate	539(44.9)	1.30(1.00-1.69)	NS	1.41(1.06-1.87)
Monthly Income, KRW (1000 KRW = 0.9 USD)				
<3,000	345(28.7)		1	1
≥3,000	855(71.3)	-	1.46(1.11-1.93)	1.42(1.05-1.92)
BMI				
≥23.5	966(76.6)		1	1
<23.5	281(23.4)	NS	1.34(1.04-1.72)	1.42(1.08-1.86)
Physical health status				
Poor	221(18.4)			
≥good	979(81.6)	-	-	NS
Mental health status				
Poor	121(10.1)			
≥good	1079(89.9)	NS	-	NS
Social Health Status				
Poor	83(6.9)	1		
≥good	1117(93.1)	1.79(1.13-2.85)	NS	-
Spiritual health status				
Poor	112(9.3)			1
≥good	1088(90.7)	-	-	1.90(1.26-2.86)
General health status				
Poor	90(7.5)			
≥good	1110(92.5)	-	-	NS

Abbreviations: aOR, adjusted odds ratio; Ref, reference; NS, Non-significant

* Multiple logistic regression analysis including variables identified as independent predictors that showed statistical significance in univariate analysis of correlates of needs for tailored health management program

[a] The backward-selected multiple logistic regression model identified with sl entry = 0.05 and sl stay = 0.05

[b] Variables that were significantly correlated with a health behavior in the univariate cross-tabulations but not significant in the multivariate analysis are presented as NS; variables not significant in univariate analysis are not included in the model and are presented as '-'.

Figure 1. The conceptual model for how demographic and health behaviors and health status are related to consciousness of health-friendly products and services

Figure 2. Proportions about participants' idea about health-friendly labeled products or services

(A) Consumer reaction about health-friendly labeled products or services

(B) Purchase intention for health-friendly labeled products or services

(C) Willing to pay more for the health-friendly labeled product or service

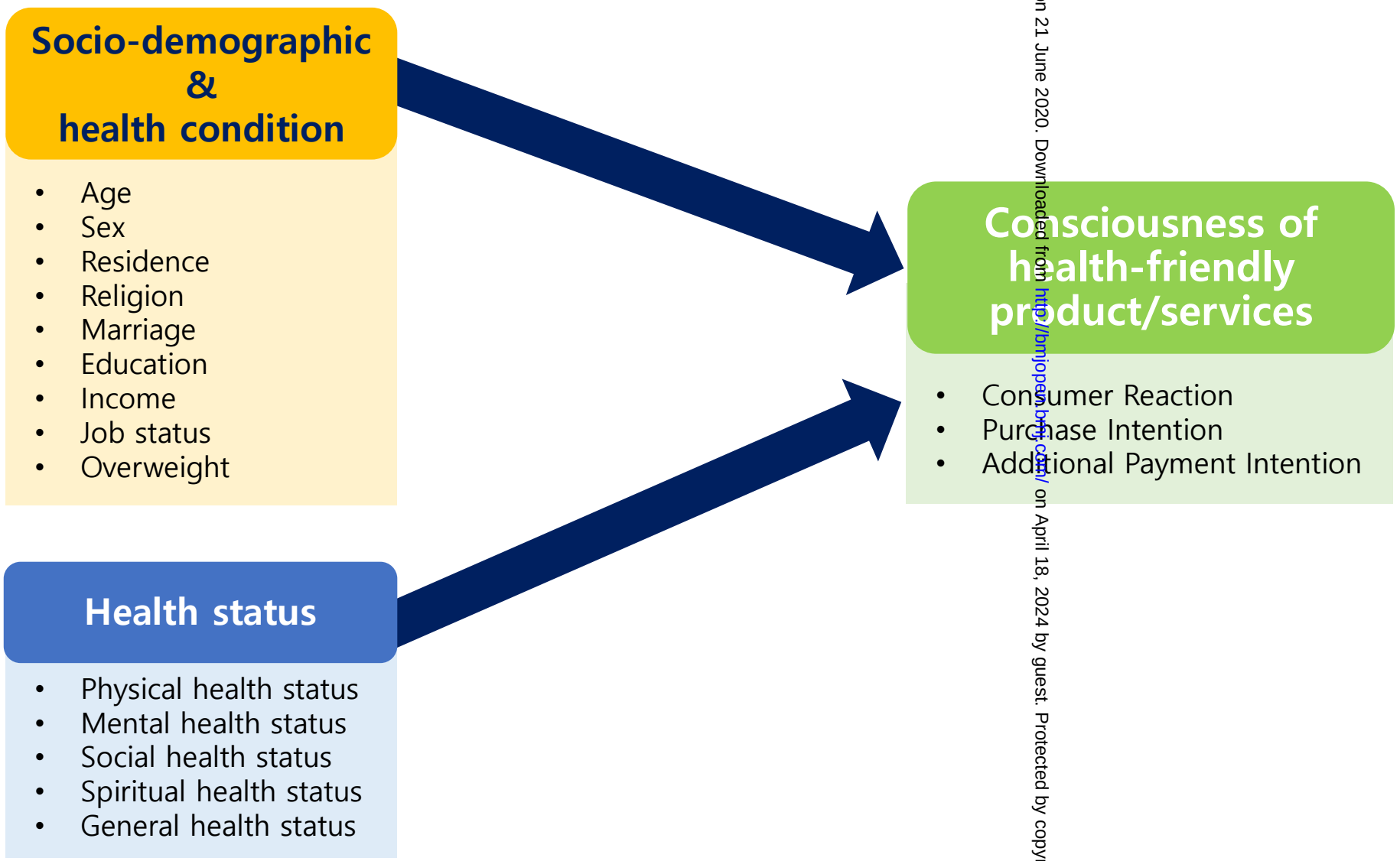

Figure 1. The conceptual model for how demographic and health behaviors and health status are related to consciousness of health-friendly products and services

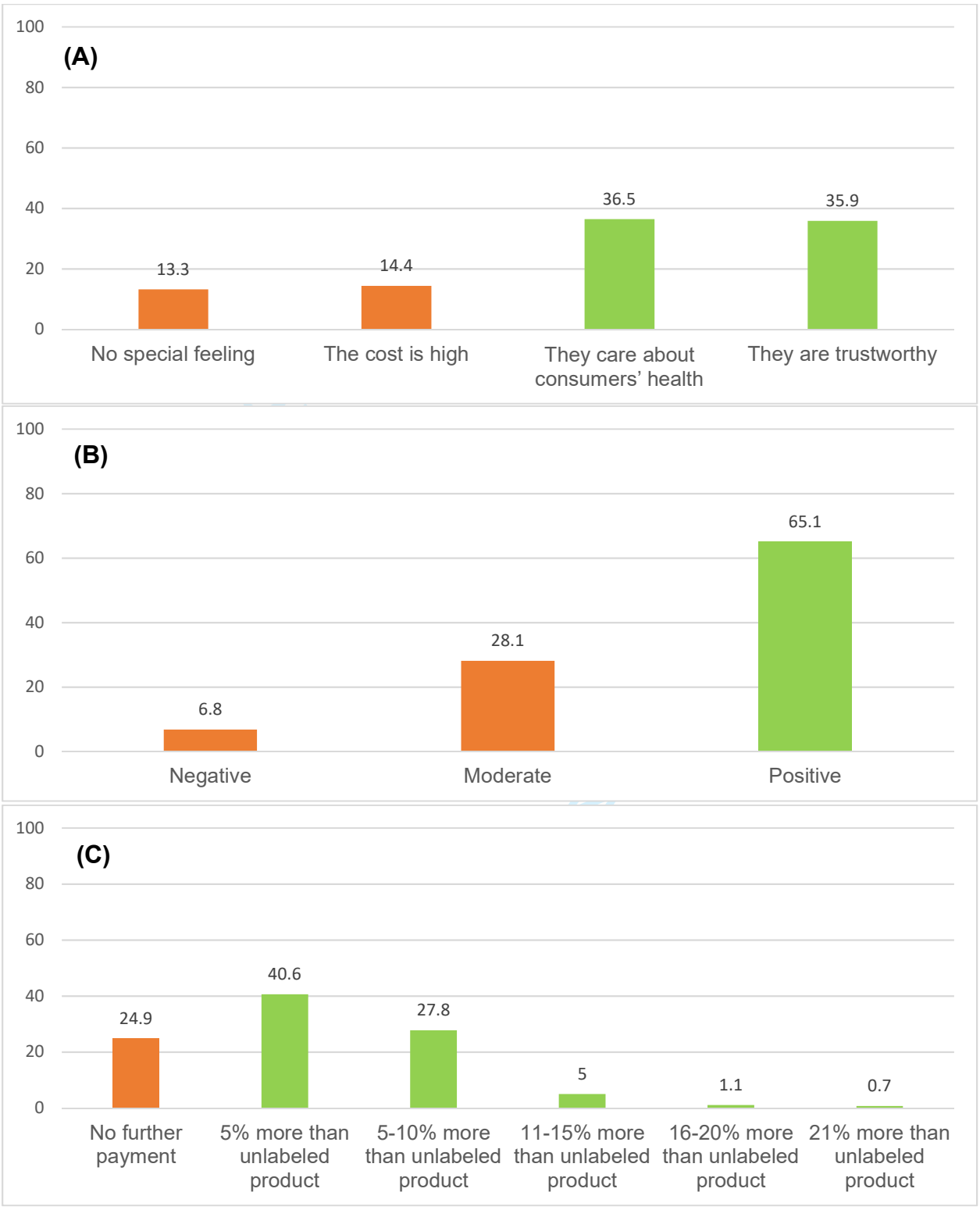

Figure 2. Proportions about participants' idea about health-friendly labeled products or services

(A) Consumer reaction about health-friendly labeled products or services

(B) Purchase intention for health-friendly labeled products or services

(C) Willing to pay more for the health-friendly labeled product or service

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	ItemNo	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **(We changed the title and abstract indicating the study design with a commonly used term in the title or the abstract)**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **(See Abstract)**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **(page 4)**
Objectives	3	State specific objectives, including any prespecified hypotheses **(page 6)**
Methods		
Study design	4	Present key elements of study design early in the paper **(page 6, Participants and procedures)**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **(page 6, Participants and procedures)**
Participants	6	Give the eligibility criteria, and the sources and methods of selection of participants **(page 6, Participants and procedures)**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **(page 7, Measurements)**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **(page 7, measurements)**
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at **(page 6, Participants and procedures)**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen

		and why **(page 7, measurements)**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **(page 8, 9)**
		(*b*) Describe any methods used to examine subgroups and interactions **(page 8, 9)**
		(*c*) Explain how missing data were addressed **(NA)**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy **(page 8)**
		(*e*) Describe any sensitivity analyses **(NA)**
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **(page 9)**
		(b) Give reasons for non-participation at each stage **(NA)**
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **(page 9, 10)**
		(b) Indicate number of participants with missing data for each variable of interest **(NA)**
Outcome data	15*	Report numbers of outcome events or summary measures **(page 9-11)**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **(page 10, 11)**
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **(page 11)**
Discussion		
Key results	18	Summarise key results with reference to study objectives **(page 11)**

Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **(page 13-15)**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **(page 11-13)**
Generalisability	21	Discuss the generalisability (external validity) of the study results **(page 13-14)**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based. **(page 16)**

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article.

BMJ Open

Consumers' consciousness of health-friendly products and services and its association with sociodemographic characteristics and health status: a cross-sectional survey of the South Korean population

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-035591.R2
Article Type:	Original research
Date Submitted by the Author:	07-May-2020
Complete List of Authors:	Yun, Young Ho; Seoul National University College of Medicine Sim, Jin Ah; Seoul National University College of Medicine Kim, Yaeji ; Friedrich-Alexander-Universität Erlangen-Nürnberg Lee, Sujee ; University of Wisconsin Madison Kim, Kyoung-Nam; Seoul National University Hospital
Primary Subject Heading:	Public health
Secondary Subject Heading:	Public health
Keywords:	PUBLIC HEALTH, HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Original Research

Consumers' consciousness of health-friendly products and services and its association with sociodemographic characteristics and health status: a cross-sectional survey of the South Korean population

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**Jin Ah Sim received a scholarship from the BK21-plus education program

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ABSTRACT

Objectives: To identify consumers' consciousness of health-friendly products and services (consumer reaction, purchase intention, and willingness to pay more) and its association with sociodemographic characteristics and multi-dimensional health status.

Methods: From March to May 2018, we administered questionnaires to 1,200 individuals from the general Korean population asking about their perception of health-friendly labels, and if they would purchase such labeled products (foods, pharmaceuticals, etc.) and services (purifying water, preventing air pollution, etc.) at extra cost.

Results: The participants placed a high value on the importance of mental, social, spiritual, and physical health factors in terms of the company's products and services with a score of about 8 out of 10 (range, 7.74-8.33). Most respondents (72.4%) said they were interested in adopting health-friendly labels. When a health-friendly label is introduced (such as one by the Business for Social Responsiveness), 65.1% of the respondents said they intended to purchase the product or service, while 6.8% said they did not, and 75.0% said they were willing to pay extra for the health-friendly product or service. Multivariate logistic regression models showed urban residence, high education level, and good social health to be significantly associated with positive attitudes toward health-friendly labels. People with high income, no religion, or normal weight were more likely to say they intend to purchase products and services with health-friendly labels. They also had a more positive attitude toward paying more for such products and services, as did people with good spiritual health.

Conclusion: This study provides data that illustrate the importance of health-friendly products and services to the general population and companies.

Keywords: consciousness for health; health-friendly activities; health-friendly products and services; health status

Article Summary

Strengths and limitations of the study

- Consumers nowadays are interested in whether a company cares about consumers' health and wellness. Given such an increasing consensus, we proposed the concept of health-friendly management and, thereby, aimed to better understand consumers' perception of health-friendly labels and their purchase behaviour of health-friendly labelled products and services.
- We propose here the concept of "health-friendly management", which refers to the promotion of various healthful components, or the avoidance of harmful components, whether they affect the physical, mental, social, or spiritual aspects of health.
- However, since the current study is based on cross-sectional data, we could not conclude the causality between one's attitude towards health-friendly labels and the intent to purchase health-friendly products or services.

INTRODUCTION

In 1948, the World Health Organization (WHO) Constitution defined health as "a state of complete physical, social, and mental well-being and not merely the absence of disease or infirmity". In recent years, health has been viewed as having four aspects—body, mind, social, and spiritual.[1] Health is determined somewhat by genetics and medical care, but mostly by behavior and social conditions. Health care policy, however, does not accommodate that observation.[2] In the U.S., for example, approximately 95% of the health budget goes to medical care services, while only 5% is allocated to population-based approaches for health improvement.[3]

There is an increasing awareness of the importance of social and environmental factors on health and that health is the responsibility of both the government and the private sector. [4] Although current health policy focuses mainly on the role of the government, companies can play an important role in building a framework of health ecosystems.[4] Just as companies can influence the health of employees and customers, they can address corporate social responsibility (CSR). Usually, however, CSR efforts focus on philanthropy and are undertaken largely to meet legal requirements or avoid penalties [5]. But CSR can have a more strategic role by using the company's core systems to create business and express social value by addressing the issue of population health.[4,6] According to Porter and Kramer, "The concept of shared values can be defined as policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions of the communities in which it operates." [6,7] Some companies, such as PepsiCo,[8] Qualcomm Incorporated,[9] Walmart,[10] and General Electric,[6] found new business opportunities that could prevent or solve specific health challenges.[4] Overall, a few companies outside the food, beverage, and agriculture industries are trying to improve customers' health and wellness.[4] Many sustainability and corporate responsibility programs are 'less bad' rather than 'good'.[5]

According to Business for Social Responsibility, consumers nowadays are interested in what a company cares about their health and wellness, health-friendly product and service.[4] For example, consumers can easily accept to buy innovative functional foods with health effects and increasing interest in health might drive a growth in demand for functional health foods with radical innovations.[11] A famous example is the announcement Walmart made at the White House together with then-First Lady Michelle Obama. Walmart company would open 300 stores to serve the U.S. Department of Agriculture's designated food desert areas to provide easy access to fresh, affordable, and nutritious food to foster healthier communities.[10] There is a significant stream of research covering health labelling and its impact on consumer choice.[12-14] For example, frequent users of nutrition labels were less likely to consume unhealthy indicator foods [13]

Some studies of consumer purchase decision models indicate that consumer purchase intentions greatly depend on health and price consciousness and on a health label and are uneven across different market segments and cultures.[15-18]. Although some studies have investigated the perception and purchase of organic products and eco labels, few have investigated the same concept on health.[17,19-21] Earlier studies have shown that consumer's sociodemographic characteristics[20,22], such as age, sex, education, and income, and their health status influenced their attitude towards health-friendly products and services (consumer reaction, purchase intention, and willingness to pay more).[17,18,20-27] Thus, in this study, we aimed to understand consumer perception of health-friendly labels and their purchasing behavior of health-friendly labelled products and services, and to identify associated factors.

We propose here the concept of "health-friendly management", which refers to the promotion of various healthful components, or the avoidance of harmful components, whether they affect the physical, mental, social, or spiritual aspects of health.

To eliminate factors that may impair health, it is necessary for health-friendly products and services to meet safety regulations through quality control of raw materials, minimization of

harmful elements, or the improvement of mental, social, and spiritual health. Health-friendly management, thus, deals with health-friendly products and services as a corporate responsibility. From our literature review, we hypothesized that consumer's demographic characteristics such as education and income, and their health status might influence their attitude toward health-friendly products and services (consumer reaction, purchase intention, and willingness to pay more).[17,18,20-27] (Figure 1)

METHODS

Patient and public involvement

Data were collected from a broader general Korean population targeted in the survey. Firstly, the survey was conducted with the general population aged 20-70 years and residing across 17 major cities and local districts from March to May 2018. In each major city and local district, all participants were recruited taking the age and sex strata by region into account and applying probability proportion-to-size sampling in accordance with the 2016 Korean census. We used a probability-proportional-to-size technique for sample selection to to select a representative national sample, particularly when the sample groups differ in size. [28] Among 4000 eligible persons, 1,200 people (30% response rate) of them responded to the self-reported questionnaire in the presence of the interviewer, who could provide further explanation on the study. This method is widely used trained research assistants administered a semi-structured, self-reported questionnaire. The World Research Co., Ltd., (Seoul, Korea) conducted the survey. All recruiters provided informed consent.

Ethics approval was obtained from the Institutional Review Board of the Seoul National University for the participants' self-reported questionnaire. All participants provided oral informed consent.

Measurement

The survey items were formulated on the basis of published studies [29-32]. Accordingly, these 3 items were generated: (1) How would you feel about companies when you see their health-friendly labeled products or services?[28] The participants could respond with one of the following: "They are trustworthy", "They care about consumers' health", "The cost is high", or "No special feeling". (2) Would you prefer the health-friendly labeled products or services to others not so labeled? [28 31] (5-point Likert scale with 1, not at all; 2, a little; 3, moderate; 4, quite a bit; 5, very much.) (3) Would you be willing to pay more for the health-friendly labeled product or service? If so, how much more compared with the label-free product price?" [29-31] (1, no more; 2, less than 5%; 3, 5%~10%; 4, 11%~15%; 5, 16%~20%; 6, more than 21%). (Figure 2) To measure the impact of different aspects of health status on health-friendly consciousness, we assessed the respondents' health on the basis of a holistic point of view.[1] The items measuring physical, mental, social, and spiritual health status were applied as follows (0 = not at all helpful, 10 = very helpful): "Physical health is the state of having normal physical strength, without diseases and injuries. What do you think about your physical health status?" "Mental health is the state of being mentally stable, being able to overcome stress. What do you think about your mental health status?" "Social health is the state of having good social relationships, carrying out one's work properly. What do you think about your social health status?" "Spiritual health is the state of adding meaning to life through volunteering, religious experiences, and meditation. What do you think about your spiritual health status?" In addition, we measured general health status with the following question: "Considering your physical, mental, social, and spiritual health status, what do you think about your health status in general?" All the items used a 5-point Likert scale with "Excellent", "Very Good", "Good", "Poor", and "Bad".

In addition, the respondents were asked which subscales of each health aspect they considered important for the pursuit of a company's health-friendly products or services. They were given the subscales of four health aspects (5 subscales each), and asked to rate the importance of each

on a scale of 0 to 10. The respondents' sociodemographic and health information we collected included age, sex, residence, religion, marital status, education, monthly income, job status, body mass index (BMI), comorbidities, and smoking experience.

Statistical analysis

Using descriptive statistics for the sociodemographic variables, we calculated the mean ± SD scores of the importance of the impact of the 4 health factors (physical, mental, social, and spiritual) for corporations that made health-friendly products or services. To test the reliability of the the variables of health-friendly activities, we estimated Cronbach's α, which is a measure of internal consistency of patient responses. Then we performed univariate analyses to measure sociodemographic correlates for each aspect of health consciousness (consumer reaction, purchase intention, and willingness to pay more). For the sociodemographic factors significantly associated in univariate analysis, we performed multiple regression analyses to examine the independent association with more positive health consciousness. The sociodemographic variables were included in univariate analyses based on the literature reviews [17,18,20-27] and screening potentially element associated with the health consciousness. We also compared the proportions of health consciousness using a chi-squared test to evaluate the impact of five categories of health status (physical, mental, social, spiritual, and general health). In all analyses, we determined two-sided *P*-values and considered a *P*-value less than 0.05 to be significant. In final model, we used the factors that were determined to be significant in univariate analyses to examine the association between the sociodemographic variables, health status, and those of more positive health consciousness. We conducted three multiple regression analyses using the hierarchical/stepwise method for factors significantly associated in univariate analysis to identify the independent and best predicted variables for participants' consciousness of health-friendly product/services. We used this analytical approach because of concerns of multicollinearity. We conducted a univariate

analysis with the aim of screening potentially existing elements to learn from existing data and draw implications. Therefore, univariate analysis was not a meaningful thing in itself, but a step to build a model for the final multivariate analysis. As a result, the final multivariate analysis results were meaningful and the researchers evaluated it. We also performed a sensitivity analysis by further calibrating the age-square along with the age variable in the multivariate analysis, confirming that most results were maintained. In the case of Income variables, obtained and analyzed in a categorical manner, without logarithmic conversion of income variables, there are no problems caused by extreme values. We considered $P < 0.05$ as statistically significant and reported results as the odds ratio (OR) with a 95% CI. We used SAS, version 9.3 software (SAS Institute, Cary, NC, USA) for all analyses.

RESULTS

Sociodemographic characteristics of the participants

Table 1 shows sociodemographic characteristics of the 1,200 survey participants. The mean age ± SD of the study participants was 46.97 ± 14.18 years.

Factors that are important for the health-friendly activities of companies to affect consumers' four aspect of health

The respondents evaluated the mental, social, spiritual, and physical health factors incorporated into products or services highly. Table 2 shows the scores for the various aspects of the four factors. All values of the variables of the health-friendly activities showed high reliability, with good internal consistency (Cronbach's α range, 0.89 to 0.91).

Acceptance of health-friendly label and intent to purchase its products or services

Most respondents (72.4%) said they were interested in adopting the health-friendly label, evaluating the companies' health-friendly activities in various areas. In detail, 36.5% of the

respondents believed that the companies thought about consumers' health, and 35.9% felt that they could believe the label claims and purchase the products or services. When a health-friendly label is introduced by a company, 65.1% of the respondents said they intended to purchase the product/service, 6.8% said they did not, and 75.1% said that they were willing to pay more for it (Figure 2).

Association of demographic characteristics and health status with health-friendly label, intent to purchase its product/services, and willing to pay extra price, univariate logistic analysis

Tables 3 and 4 show the association of demographic characteristics and health status with consciousness of health-friendly products and services, intent to purchase the product or services, and willingness to pay a higher price for them. As for the domain of consumer reaction, 5 demographic variables (young age, place of residence, religion, education, higher BMI) and 2 types of health status (good mental health and social health) were statistically significant.

Significantly related to the domain of purchase intention were social health status as well as the demographic factors of age, religion, education, monthly income, and BMI. In addition, significantly associated with additional payment intention were the demographic factors of younger age, education, monthly income, and BMI, as were physical, mental, spiritual, and general health status.

Multivariate logistic regression models for factors associated with health-friendly labels, intent to purchase its product or services, and willingness to pay for the higher price

Multivariate logistic regression models show that the consumers residing in urban areas, highly educated, and having good social health status showed a more positive reaction to health-friendly labels. Respondents with a higher income level, normal BMI, and no religion were more likely to express an intention to purchase products and services with a health-friendly label, whereas no

health status was significantly associated with that intent. In addition, factors such as higher education, higher income level, normal BMI, and good spiritual health were associated with having a more positive attitude toward paying extra for products and services with health-friendly labels (Table 5). Significant correlations in some univariate analyzes such as age, physical, mental and general health status have lost significance in multivariate analysis, which may be due to correlation and confounding between variables.

DISCUSSION

This study provides a better understanding of the importance to consumers of products or services that provide physical, mental, social, and spiritual health. In addition, this study suggests the need for a health-friendly certification mark or label recognized by the general population. Our findings suggest that consumers are demanding health-friendly products and services and are willing to pay the extra cost involved.

Companies' marketing activities can play a significant role in raising the public awareness of health [4]. Business for Social Responsibility, a global nonprofit organization working to build "a just and sustainable world," confirmed that member companies support the idea that they can strengthen the health and wellness of their customers and the public. About 90% of the companies agree that they can help strengthen the health of their consumers, while about 75% agree that they can help strengthen public health.[4] Shared value models may represent the next evolution of capitalism.[7] In the U.S., for example, Kaiser Permanente partnered with Home Box Office, the National Institutes of Health, the Centers for Disease Control and Prevention, the Institute of Medicine, and the Michael & Susan Dell Foundation and launched public health campaigns addressing the obesity epidemic.[33] Moreover, companies can partner with local governments to encourage healthy lifestyles or habits. For the National Salt Reduction Initiative,

for instance, more than 100 state and local health authorities and national health organizations partnered with many companies to reduce the amount of sodium in packaged and restaurant foods (https://www1.nyc.gov/site/doh/health/health-topics/national-salt-reduction-initiative.page#national-salt-reduction-initiative).

Our findings showed that consumers with higher education or who lived in an urban area had a more favourable attitude towards health-friendly labels and that non-religious, high-income, or normal-weight consumers had intentions to purchase products and services with health-friendly labels. This study showed that people with higher education, high income, or normal weight had a positive attitude towards paying more for products and services with health-friendly labels. However, other studies had inconsistent findings between demographic characteristics and purchase intention towards green products.[20,22] Our finding that consumers with good health status would be cautious about products and services with a health-friendly label and expressed willingness to pay more for them are consistent with the finding that health consciousness is an important factor that influences the purchase of organic foods.[17,18,23,24] Our results seem to be consistent with the finding that eco-label and the value of green products had the strongest positive influence on green product purchase intention and were associated with the willingness to pay more for environmentally certified products, the eco-label, or the energy-label.[21,22,25-27]

These studies imply that most consumers perceive the health-friendly label as important when purchasing products or services. Emphasizing the health-friendly label of products or services accredited by reputable organizations would help to build reliability and awareness among consumers, but the products and services would be more expensive than conventional products and services,[21,22] and that could negatively influence purchasing. Thus, managers are challenged with the need to produce high quality products and services at affordable prices.[21]

To integrate health-friendliness into its value chain and culture, companies can start by meeting social needs through products or services that serve the unserved or underserved.[6,7,16] It

can motivate employees to strengthen the health of their customers through daily actions and business decisions. Companies can use key performance indicators and report them in their sustainability report in a comprehensive and transparent way.[4]

Many companies, however, would struggle when trying to integrate a health and wellness agenda into their value chain. Many CEOs cite a lack of recognition from the financial market as a barrier to achieving their sustainability goals [34]. But it is necessary to focus not only on preventive and holistic health, but also on return on investment. Stakeholders from managers, employees, investors, consumers, community organizations, and government should form a consensus that companies should try to contribute to consumer and public health through a mission that goes beyond mere profit. "The purpose of business is to serve society, through the provision of safe, high quality products and services that enhance our well-being, without eroding our ecological and community life-support systems ultimately." [5] The government also should consider ways to assist these companies through tax breaks or their health insurance premium cuts.[4]

Although the scope of this study is so broad that cover all products and services and health also very broadly defined across 4 different domains, consumers think that corporate products or services have very important impact on not only their physical health, but also mental, social and spiritual health and there was no difference in importance among the 4 different domains of health. It might be crucial to develop measure to evaluate the health-friendly activities of corporates across 4 different domains of health in an objective and reasonable manner and to apply "health-friendly label" to the products and services of corporates.

This study had some limitations. The first is that it was conducted in Korea and the findings might not apply to other populations. Second, in the present study, we applied probability proportion-to-size sampling taking into account the age and sex strata with the 2016 Korean census. Although we could not perform inverse probability weighting techniques due to lack of information of non-

responder and, therefore, a concern of selection bias remains, the sociodemographic characteristics of the study participants included in the present study (n = 1,200) were similar to the those of the Korean population with regard to age (20–29 years: 16.2%, 30–39 years: 17.7%, 40–49 years: 20.8%, 50–59 years: 19.9%, ≥60 years: 25.5% in the present study; 20–29 years: 15.9%, 30–39 years: 16.4%, 40–49 years: 19.6%, 50–59 years: 20.2%, ≥60 years: 27.9% in the Korean population) and sex (male: 49.3%, female: 50.7% in the present study; male: 49.9%, female: 50.1% in the Korean population, suggesting low possibility of selection bias and confirming representative sampling. Third, the response rates of the subjects were low, so the results might not be generalizable. Fourth, since this is a cross-sectional study, we could not attribute causality between attitudes toward health-friendly labels and intent to purchase health-friendly products or services. Further studies are needed to examine the associations. Fifth, almost all respondents would automatically agree with the questions in our survey and we did not address the gap between attitudes and behavior. Sixth, our hypothesis that consumer's demographic characteristics might influence their attitude toward health-friendly products and services have the limitation of study design. Especially educated people tend to give socially desired responses in surveys, i.e. to say that they would prefer health-friendly products and be willing to pay more for them. Therefore, Discrete Choice Modeling (Choice-Based Conjoint analysis) would be more suitable method to find out the preferences of features and products to simulate market and create optimal products. Seventh, we did not treat the questions of trustworthiness and care about consumer health as separate questions. Therefore, it is hard to interpret how one feels about companies when seeing health-friendly products or services. Eight, we arbitrarily used the categories to assess willingness to pay more and did not test other categories. It would be helpful to see how sensitive the results are to the use of other categories in further studies. Finally, it is also a limitation that the respondents' use of health-friendly products or knowledge of such products was not asked at all in the survey although these factors might explain the attitudes towards the products. Further studies are needed

to examine the associations of the consumers' use of health-friendly products or knowledge of the products with attitude toward health-friendly products and services.

Acknowledgements

The corresponding author YH Yun and co-author JA Sim thank BK21 plus program through the National Research Foundation (NRF) for financial support.

Author Contributions: YH Yun participated in the design of the study, provided financial supports and study materials, collected and assembly the data, interpret the analyses and also participated in the sequence alignment and drafted the manuscript. JA Sim participated in its design and coordination, conducted data analyses and also participated in the sequence alignment and drafted the manuscript. YJ Kim, SJ Lee and KN KIM participated in the design of the study and performed the statistical analysis and helped to draft the manuscript.

Data sharing statement: No additional data available

Ethics approval and consent to participate

The Institutional Review Board (IRB) at Seoul National University Hospital approved the study protocol, and all participants provided informed consent. All participants from each of the Seoul National University Hospital provided written informed consent.

Funding: This work was supported by a Seoul National University Research Grant in 2016 (800-20170241).

Potential Financial Conflicts of Interest: None disclosed

Availability of data and materilas: None

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Table 1. Sociodemographic Characteristics of Participants

Variable		Study participants		Korea population [a]
		N = 1,200	%	%
Sex	Male	592	49.3	49.9
	Female	608	50.7	50.1
Age, years	20-29	194	16.2	15.9
	30-39	212	17.7	16.4
	40-49	249	20.8	19.6
	50-59	239	19.9	20.2
	≥60	306	25.5	27.9
Religion	Protestantism	213	17.8	19.7
	Buddhism	178	14.8	15.5
	Catholic	98	8.2	7.9
	No religion	709	59.1	56.1
	Other	2	0.2	0.8
Marriage	Married	884	73.7	55.8
	Widowed	34	2.8	3.5
	Divorced/separated	17	1.4	1.9
	Single	265	22.1	38.6
Education	Non-schooled	5	0.4	12.0
	Elementary school graduate	27	2.3	
	Middle school graduate	92	7.7	
	High school graduate	537	44.8	39.0
	College degree or higher	539	44.9	48.0
	Metropolitan	543	45.3	91.8
Residence	Urban	592	49.3	
	Rural	65	5.4	8.2
	≤ 1,000,000	30	2.5	6.2
Monthly income, KRW	1,000,000~1,999,999	89	7.4	15.2
(1000 KRW = 0.9	2,000,000~2,999,999	188	15.6	18.9
USD)	3,000,000~3,999,999	344	28.7	17.7
	≥4999,999	543	45.3	42.2
	Own Business	291	24.3	21.0
Job status	Employed	549	45.8	39.7
	Unemployed	342	28.5	39.3
	Retired	18	1.5	
	<18.5	41	3.4	3.6
BMI	18.5-23.49	686	57.4	58.1
	23.5-24.99	245	20.5	
	≥25	224	18.7	38.3

[a] Data for the Korean population (2013–2019) was obtained from Statistics Korea.

Table 2. Mean and standard deviation (SD) of the company's health-friendly activities that have a significant impact on consumers' health (0 = not at all helpful, 10 = very helpful)

Item	Mean	SD
Company's health-friendly activities that have an important impact on consumers' physical health (Cronbach's α=0.89)		
Reflecting physical health status during product / service development / improvement	7.71	1.33
Reflecting the enhancement of physical health activities when developing / improving products / services	7.76	1.35
Quality control for raw materials	8.02	1.43
Minimization of harmful elements of production / service process	8.03	1.39
Active compensation for health related accidents	7.95	1.37
Company's health-friendly activities that have an important impact on consumers' mental health (Cronbach's α=0.90)		
Reflecting mental health status during product / service development / improvement	7.78	1.29
Reflecting the promotion of mental health activities when developing / improving products / services	7.80	1.33
Customer Friendly service	7.94	1.34
Actively coping with customer complaints	8.02	1.27
Building confidence in corporation made products / services	8.06	1.25
Company's health-friendly activities that have an important impact on consumers' social health (Cronbach's α=0.91)		
Reflecting social health status during product / service development / improvement	7.74	1.20
Reflecting on social health activities promotion when developing / improving products / services	7.75	1.34
Building constant relationship with customers	7.83	1.39
Respecting customers without discrimination	7.95	1.31
Contribution to improvement of family / relationship with others	7.83	1.21
Company's health-friendly activities that have an important impact on consumers' spiritual health (Cronbach's α=0.91)		
Reflecting spiritual health status during product / service development / improvement	7.61	1.36
Reflecting on spiritual health activities promotion when developing / improving products / services	7.66	1.37
Whether products / services respect person as a human being	7.83	1.39
Whether products /services make person feel worthy and valuable	7.84	1.34
Whether products / services help improve life satisfaction	7.80	1.29

Abbreviation: SD, Standard Deviation

Table 3. Univariate analysis of correlation of participants' consciousness of company's health-friendly activities with demographic and health behaviors

Predictors	n (%)	Consumer Reaction			Purchase Intention			Additional Payment Intention		
		Negative Response	Positive Response	*p*-value	Negative Response	Positive Response	*p*-value	Negative Response	Positive Response	*p*-value
Age, years										
20-59	894(74.5)	**231(25.8)**	**663(74.2)**	**0.006***	**292(32.7)**	**602(67.3)**	**0.004***	**198(22.1)**	**696(77.9)**	**<0.001***
≥60	306(25.5)	**104(34.0)**	**202(66.0)**		**128(41.8)**	**176(58.2)**		**101(33.0)**	**205(67.0)**	
Sex										
Male	592(49.3)	159(26.9)	433(73.1)	0.42	212(35.8)	380(64.2)	0.561	146(24.7)	446(75.3)	0.841
Female	608(50.7)	176(28.9)	432(71.1)		208(34.2)	400(65.8)		153(25.2)	455(74.8)	
Residence										
Rural/suburban	657(54.8)	**209(31.8)**	**448(68.2)**	**0.001***	228(34.7)	429(65.3)	0.813	177(26.9)	480(73.1)	0.075
Urban	543(45.3)	**126(23.2)**	**417(76.8)**		192(35.4)	351(64.6)		122(22.5)	421(77.5)	
Religion										
None	711(59.3)	**182(25.6)**	**529(74.4)**	**0.031***	**218(30.7)**	**493(69.3)**	**<0.001***	175(24.6)	536(75.4)	0.769
Yes	489(40.8)	**153(31.35)**	**336(68.7)**		**202(41.3)**	**287(58.7)**		124(25.4)	365(74.6)	
Marriage										
Not married	316(26.3)	87(27.5)	229(72.5)	0.859	117(37.0)	199(63.0)	0.379	78(24.7)	239(75.3)	0.911
Married	884(73.7)	248(28.1)	636(71.9)		303(34.3)	581(65.7)		221(25.0)	663(75.0)	
Education										
≤ High school graduate	**661(55.1)**	**204(30.9)**	**457(69.1)**	**0.012***	**259(39.2)**	**402(60.8)**	**0.001***	**193(29.2)**	**468(70.8)**	**<0.001***
College graduate	**539(44.9)**	**131(24.3)**	**408(75.7)**		**161(29.9)**	**378(70.1)**		**106(19.7)**	**433(80.3)**	
Monthly Income, KRW (1000 KRW = 0.9 USD)										
<3,000	307(25.6)	97(31.6)	210(68.4)	0.096	**136(44.3)**	**171(55.7)**	**<0.001***	**101(32.9)**	**206(67.1)**	**<0.001***
≥3,000	893(74.4)	238(26.7)	655(73.3)		**284(31.8)**	**609(68.2)**		**198(22.2)**	**695(77.8)**	
Employed										
Yes	840(70.0)	235(28.0)	605(72.0)	0.944	292(34.8)	548(65.2)	0.792	205(24.4)	635(75.6)	0.531
No	360(30.0)	100(27.8)	260(72.2)		128(35.6)	232(64.4)		94(26.1)	266(73.9)	
Overweight (BMI)										
<23.5	727(60.6)	**188(25.9)**	**539(74.1)**	**0.049***	**230(31.6)**	**497(68.4)**	**0.002***	**154(21.2)**	**573(78.8)**	**<0.001***
≥23.5	473(39.4)	**147(31.1)**	**326(68.9)**		**190(40.2)**	**283(59.8)**		**145(30.7)**	**328(69.3)**	

* Significant correlation results (*P < 0.05)* were highlighted as bold.

Table 4. Univariate analysis of correlation of participants' consciousness of health-friendly product/services with health status

Predictors	N (%)	Consumer Reaction			Purchase Intention			Additional Payment Intention		
		Negative Response	Positive Response	p-value	Negative Response	Positive Response	p-value	Negative Response	Positive Response	p-value
Physical health status										
Poor	221(18.4)	66(29.9)	155(70.1)	0.475	78(35.3)	143(64.7)	0.919	**67(30.3)**	**154(69.7)**	**0.04***
≥good	979(81.6)	269(27.5)	710(72.5)		342(34.9)	637(65.1)		**232(23.7)**	**747(76.3)**	
Mental Health Status										
Poor	121(10.1)	**44(36.4)**	**77(63.6)**	**0.029***	46(38.0)	75(62.0)	0.463	**40(33.1)**	**81(66.9)**	**0.029***
≥good	1079(89.9)	**291(27.0)**	**788(73.0)**		374(34.7)	705(65.3)		**259(24.0)**	**820(76.0)**	
Social Health Status										
Poor	**83(6.9)**	**35(42.2)**	**48(57.8)**	**0.003***	**40(48.2)**	**43(51.8)**	**0.009***	27(32.5)	56(67.5)	0.096
≥good	**1117(93.1)**	**300(26.9)**	**817(73.1)**		**380(34.0)**	**737(66.0)**		272(24.4)	845(76.5)	
Spiritual Health Status										
Poor	112(9.3)	38(33.9)	74(66.1)	0.136	46(41.1)	66(58.9)	0.157	**45(40.2)**	**67(59.8)**	**<0.001***
≥good	1088(90.7)	297(27.3)	791(72.7)		374(34.4)	714(65.6)		**254(23.3)**	**834(76.7)**	
General Health Status										
Poor	90(7.5)	32(35.6)	58(64.4)	0.093	34(37.8)	56(62.2)	0.566	**36(40.0)**	**54(60.0)**	**0.001***
≥good	1110(92.5)	303(27.3)	807(72.7)		386(34.8)	724(65.2)		**263(23.7)**	**847(76.3)**	

* Significant correlation results ($P < 0.05$) were highlighted as bold.

Table 5. Multivariate analyses* of participants' consciousness of health-friendly product/services with sociodemographic variables and health status

Predictor	n (%)	Positive Consumer Reaction aOR* (95% CI)	Positive Purchase Intention aOR* (95% CI)	Positive Additional Payment Intention aOR* (95% CI)
Age				
≥60	894(74.5)			
20-59	306(25.5)	NS	NS	NS
Residence				
Rural/suburban	657(54.8)	1		
Urban	543(45.3)	1.54(1.19-2.00)	-	-
Religion				
None	711(59.3)		1	
Yes	489(40.8)	NS	0.66(0.51-0.84)	-
Education				
≤ High school graduate	661(55.1)	1		1
College graduate	539(44.9)	1.30(1.00-1.69)	NS	1.41(1.06-1.87)
Monthly Income, KRW (1000 KRW = 0.9 USD)				
<3,000	345(28.7)		1	1
≥3,000	855(71.3)	-	1.46(1.11-1.93)	1.42(1.05-1.92)
BMI				
≥23.5	966(76.6)		1	1
<23.5	281(23.4)	NS	1.34(1.04-1.72)	1.42(1.08-1.86)
Physical health status				
Poor	221(18.4)			
≥good	979(81.6)	-	-	NS
Mental health status				
Poor	121(10.1)			
≥good	1079(89.9)	NS	-	NS
Social Health Status				
Poor	83(6.9)	1		
≥good	1117(93.1)	1.79(1.13-2.85)	NS	-
Spiritual health status				
Poor	112(9.3)			1
≥good	1088(90.7)	-	-	1.90(1.26-2.86)
General health status				
Poor	90(7.5)			
≥good	1110(92.5)	-	-	NS

Abbreviations: aOR, adjusted odds ratio; Ref, reference; NS, Non-significant

* Multiple logistic regression analysis including variables identified as independent predictors that showed statistical significance in univariate analysis of correlates of needs for tailored health management program

[a] The backward-selected multiple logistic regression model identified with sl entry = 0.05 and sl stay = 0.05

[b] Variables that were significantly correlated with a health behavior in the univariate cross-tabulations but not significant in the multivariate analysis are presented as NS; variables not significant in univariate analysis are not included in the model and are presented as '-'.

Figure 1. The conceptual model for how demographic and health behaviors and health status are related to consciousness of health-friendly products and services

Figure 2. Proportions about participants' idea about health-friendly labeled products or services

(A) Consumer reaction about health-friendly labeled products or services

(B) Purchase intention for health-friendly labeled products or services

(C) Willing to pay more for the health-friendly labeled product or service

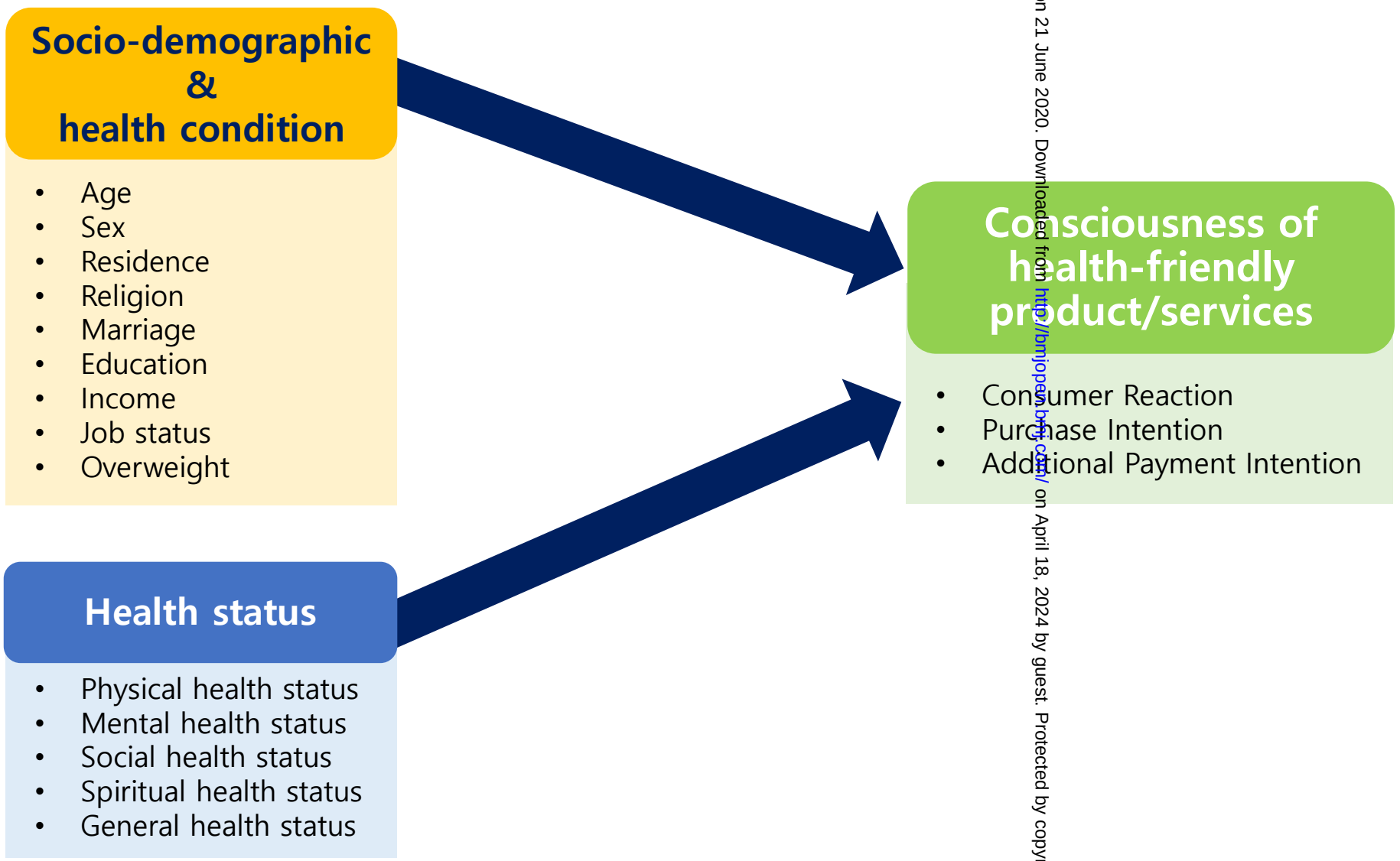

Figure 1. The conceptual model for how demographic and health behaviors and health status are related to consciousness of health-friendly products and services

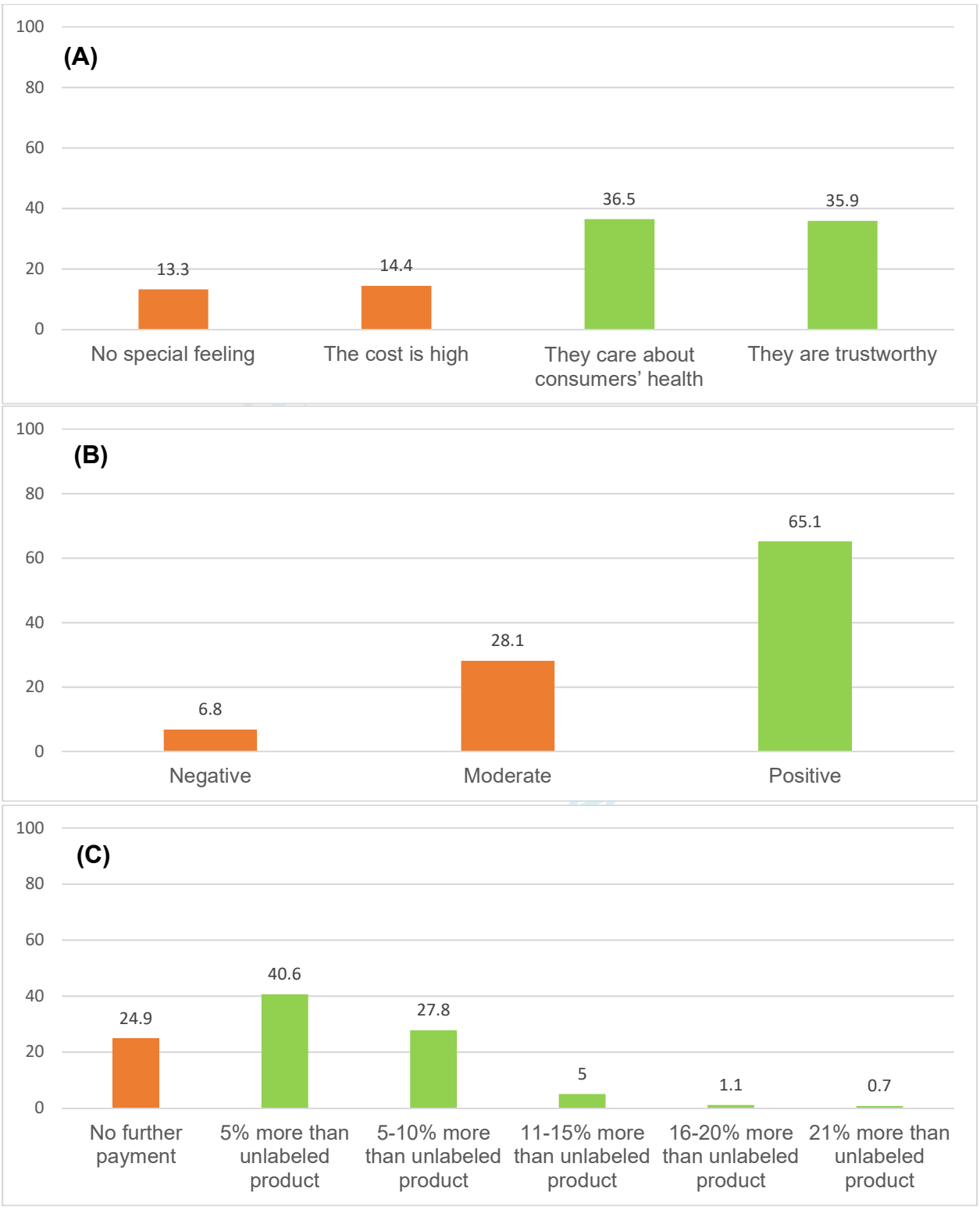

Figure 2. Proportions about participants' idea about health-friendly labeled products or services

(A) Consumer reaction about health-friendly labeled products or services

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(C) Willing to pay more for the health-friendly labeled product or service

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	ItemNo	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **(We changed the title and abstract indicating the study design with a commonly used term in the title or the abstract)**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **(See Abstract)**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **(page 4)**
Objectives	3	State specific objectives, including any prespecified hypotheses **(page 6)**
Methods		
Study design	4	Present key elements of study design early in the paper **(page 6, Participants and procedures)**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **(page 6, Participants and procedures)**
Participants	6	Give the eligibility criteria, and the sources and methods of selection of participants **(page 6, Participants and procedures)**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **(page 7, Measurements)**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **(page 7, measurements)**
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at **(page 6, Participants and procedures)**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen

		and why **(page 7, measurements)**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **(page 8, 9)**
		(*b*) Describe any methods used to examine subgroups and interactions **(page 8, 9)**
		(*c*) Explain how missing data were addressed **(NA)**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy **(page 8)**
		(*e*) Describe any sensitivity analyses **(NA)**
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **(page 9)**
		(b) Give reasons for non-participation at each stage **(NA)**
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **(page 9, 10)**
		(b) Indicate number of participants with missing data for each variable of interest **(NA)**
Outcome data	15*	Report numbers of outcome events or summary measures **(page 9-11)**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **(page 10, 11)**
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **(page 11)**
Discussion		
Key results	18	Summarise key results with reference to study objectives **(page 11)**

Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **(page 13-15)**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **(page 11-13)**
Generalisability	21	Discuss the generalisability (external validity) of the study results **(page 13-14)**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based. **(page 16)**

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article.