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How do consumer characteristics influence responses to nutritional warnings?

¿Cómo influyen las características de los consumidores en su respuesta a las advertencias nutricionales?

Gastón Ares^{1*}. <https://orcid.org/0000-0002-0565-8835>
 Lucía Antúnez¹. <https://orcid.org/0000-0003-2497-6609>
 Vanesa Gugliucci². <https://orcid.org/0000-0001-6486-0622>
 María Rosa Curutchet³. <https://orcid.org/0000-0003-1211-7604>
 Luis Galicia⁴. <https://orcid.org/0000-0003-4003-6561>
 Ximena Moratorio⁴. <https://orcid.org/0000-0002-4403-9113>
 Ana Giménez¹. <https://orcid.org/0000-0002-2625-5226>
 Isabel Bove⁵. <https://orcid.org/0000-0001-9107-5355>

1. Sensometrics & Consumer Science, Instituto Polo Tecnológico de Pando, Facultad de Química, Universidad de la República.

By Pass de Rutas 8 y 101 s/n. CP 91000. Pando, Canelones, Uruguay.

2. Espacio Interdisciplinario, Universidad de la República. Montevideo, Uruguay.

3. Observatorio de Seguridad Alimentaria y Nutricional, Instituto Nacional de Alimentación. Montevideo, Uruguay.

4. Ministerio de Salud Pública. Montevideo, Uruguay.

5. UNICEF Uruguay. Montevideo, Uruguay.

*Corresponding author: Gastón Ares.

Sensometrics & Consumer Science, Instituto Polo Tecnológico de Pando,

Facultad de Química, Universidad de la República.

By Pass de Rutas 8 y 101 s/n. CP 91000. Pando, Canelones, Uruguay.

Email: gares@fq.edu.uy

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ABSTRACT

The aim of the present work was to explore the influence of consumer characteristics on purchase decisions when facing products with nutritional warnings a few days after their implementation in Uruguay. A non-probabilistic sample of 917 participants was obtained using an advertisement on social media. Participants were asked if they had seen the warning signs when making their food purchases and if they had seen the warnings on any product they intended to buy. Participants who answered affirmately ($n=616$) were asked about their purchase decision by answering the question "What have you done with the product?" using the following response options: 'I purchased it anyway', 'I purchased a similar product with fewer excess signs', 'I purchased a similar product without excess signs', 'I didn't purchase the product or any similar one'. Univariate and multivariate multinomial logistic regression models were used to explore the influence of individual variables on participants' likelihood of having taken different decisions when facing a product with warnings. Results showed that participants older than 55 years were more likely to react to the warnings by purchasing a similar product with fewer warnings or by not purchasing any product. Likelihood of modifying purchase decisions due to the inclusion of the warnings was associated with a frequent consumption of natural and minimally processed foods and a low consumption frequency of ultra-processed products. These results provide insights to target efforts to promote the use of nutritional warnings in decision making.

Keywords: Food labelling; Health communication; Public policy.

RESUMEN

El objetivo del presente trabajo fue explorar la influencia de características de los consumidores en sus decisiones de compra al enfrentar productos con advertencias nutricionales, unos días después de su implementación en Uruguay. Se obtuvo una muestra no probabilística de 917 participantes utilizando redes sociales. Se les preguntó a los participantes si habían visto las advertencias en un producto que tenían la intención de comprar. A los participantes que respondieron afirmativamente (n= 616) se les pidió qué indicarn qué habían hecho con el producto, utilizando las siguientes opciones de respuesta: 'Lo compré igual', 'Compré un producto similar con menos símbolos de exceso', 'Compré un producto similar sin símbolos de exceso' y 'No compré el producto ni tampoco otro similar. Los datos se analizaron utilizaron modelos de regresión multinomial univariados y multivariados. Los participantes mayores de 55 años presentaron una mayor probabilidad de reaccionar a las advertencias no comprando el producto. La probabilidad de modificar la decisión de compra debido a las advertencias estuvo asociada con una mayor frecuencia de consumo de alimentos naturales y mínimamente procesados y una menor frecuencia de consumo de productos ultra-procesados. Los resultados del presente trabajo sugieren que los esfuerzos para promover el uso de las advertencias en la toma de decisiones deben estar focalizados en los ciudadanos con el mayor consumo de productos ultra-procesados.

Palabras clave: Comunicación en salud; Etiquetado de alimentos; Política pública.

INTRODUCTION

Front-of-pack (FOP) nutrition labelling is part of a set of comprehensive policy actions that are being implemented worldwide to reduce the negative impact of unhealthy diets^{1,2}. Nutritional warnings are one of several FOP nutrition labelling schemes that have been proposed worldwide³. They are text-based signs highlighting excessive content of nutrients associated with non-communicable disease⁴. This FOP nutrition labelling scheme is gaining popularity in the region of the Americas; and has been already implemented in Chile, Mexico, Peru and Uruguay⁴. A growing body of experimental evidence suggests that nutritional warnings hold potential to encourage more healthful food choices^{5,6}. However, information about the effectiveness of warnings after their implementation in the marketplace is still limited^{7,8,9,10}.

Citizens are expected to differ in the importance they attach to nutritional information for making their food purchase decisions¹¹. Recent studies conducted in Chile and Uruguay have shown that approximately 50% of the consumers report that the warnings encouraged changes in their purchase decisions^{7,9}. The identification of segments of the population with different likelihood of modifying their food choices after the implementation of nutritional warnings can contribute to the development of targeted communication campaigns to stimulate healthy eating^{12,13}. Such campaigns are expected to be more accepted by the target population and have been found to effectively encourage behavioral changes¹⁴.

Drawing from research on back-of-package nutrition labelling, reaction towards the warnings is expected to be modulated by socio-demographic, attitudinal and behavioral characteristics. Studies have shown that females, older and highly educated citizens are more likely to use nutrient declarations^{13,15,16}. In addition, health consciousness, interest in healthy eating and nutrition knowledge have been found to be positively associated with the use of nutrient declarations^{13,15,17}. However, information on the socio-demographic and behavioral characteristics of consumers

that mediate reaction towards nutritional warnings after their implementation in the marketplace is not available yet.

Study context and objective

In August 2018, a presidential decree approved the implementation of nutritional warnings in Uruguay¹⁸. According to the decree, packaged products added with sugar, fat and/or sodium should feature nutritional warnings on the front of the package if the content of sugar, fat, saturated fat and sodium exceed the thresholds established by the Ministry of Public Health¹⁸. The graphical design of the warnings corresponds to black octagons with a white border, featuring the expression "Excess", followed by the corresponding nutrient in white font. The decree granted the food industry an 18-months period to adapt to the new regulation, which entered into force on March 1st, 2020.

A few days after the implementation of the warnings⁷, 77% of consumers had seen products featuring warnings across a wide range of food categories. Although no communication campaign raising awareness of nutritional warnings had been implemented, increased understanding of nutritional information and high self-reported use was observed⁷. However, on March 13th, 2020, a new decree granted an additional adaptation period to the food industry¹⁹.

The objective of the present work was to explore the influence of consumer characteristics on purchase decisions when facing products with nutritional warnings, a few days after the implementation of the policy in Uruguay. The study involves a re-analysis of the data included in Ares et al.⁷, who reported consumer awareness and use of nutritional warnings at the aggregate level. Only data from participants recruited after the implementation of nutritional warnings between March 10th and March 25th, 2020, were considered.

MATERIALS AND METHODS

The study protocol was approved by the Ethics Committee of the School of Chemistry of Universidad de la República (Uruguay). In the following sections, the main

characteristics of the study are described. Full details of the study are provided in Ares et al⁷.

Participants

A non-probabilistic sample of 917 participants was obtained using an advertisement on Facebook and Instagram. The advertisement included the text "Participate in our new study and enter a raffle to win a gift card. We want to know your opinion", drawings of food packages and the University logo. The sample was diverse in terms of age (18 to 80 years old), gender (66% female) and socio-demographic characteristics. Participants were given the chance of entering a raffle to win a gift card worth 70 US dollars.

Questionnaire

Interested participants clicked on the link provided in the advertisement and were re-directed to the online questionnaire, hosted on Compusense Cloud (Compusense Inc., Canada). Participants were explained that the study aimed at exploring how Uruguayan citizens interpret food labels. They provided informed consent to participate in the study using an online form.

Participants were first presented with a series of food labels and were asked to answer questions related to their nutritional composition. Then, they were provided with the following information about the Uruguayan FOP nutrition labelling regulation: "In August 2018, Uruguay approved a decree establishing that packaged foods with excessive content of sugar, fat and sodium should feature symbols like those shown in the Figure", accompanied by the graphical representation of the warnings. After two questions about awareness and acceptance of nutritional warnings, participants were asked if they had seen the warnings on any product they intended to buy. Participants who answered affirmately were asked about their purchase decision by answering the question "What have you done with the product?" using the following response options: 'I purchased it anyway', 'I purchased a similar product with fewer excess signs', 'I purchased a similar product without excess signs', 'I didn't purchase the product or any similar one'. The response options intended to capture the two expected effects of nutritional warnings: substitution and category abandonment effects¹¹. A similar question was used in a previous study, conducted before the approval of the regulation to explore how Uruguayan citizens perceive nutritional warnings²⁰.

Consumption frequency of 15 food categories was assessed by asking participants to indicate the number of days they had consumed them during the previous week, using a 5-point scale ('I didn't consume it', '1 day', '2 to 3 days', '4 to 6 days', 'Everyday'). The food categories were adapted from an official Uruguayan survey²¹ and included natural and minimally processed foods (fruits; pulses; potatoes and sweet potatoes; vegetables (excluding potatoes and sweet potatoes); meat; fish), and ultra-processed products (crackers; cold cuts and charcuterie; frozen ready-to-eat

meals; savoury snacks; sweetened beverages; instant foods (puree, soups and Bouillon cubes); cookies; alfajores and pastry; candy and sweets). Finally, participants were asked a series of socio-demographic questions. Socio-economic status was estimated using a standard methodology in Uruguay, which classifies people in three socio-economic groups (low, medium and high socio-economic status) based on a score calculated using the following variables: place of residence, number of people in the household, presence of children under 10 years old in the household, number of income earners in the household, number of people with University degree in the household, number of number of cars, domestic workers performing services in the household²². Participants were also requested to indicate their self-reported weight and height, as well as if they had any of the following health conditions: high blood pressure, high cholesterol level, diabetes and cardiovascular diseases.

Data analysis

The present research focused on self-reported use of the warnings. Only data from participants who reported having seen nutritional warnings on a product they intended to buy (n= 616) were considered.

Consumption frequency data were transformed into a continuous scale ('I didn't consume it'= 0, '1 day'= 1, '2 to 3 days'= 2.5, '4 to 6 days'= 5, 'Everyday'= 7). Based on the recommendations of the Uruguayan dietary guidelines²³, the average consumption frequency of natural or minimally processed foods and ultra-processed products were calculated for each participant.

Self-reported weight and height were used to calculate weight-status based on body mass index. Participants were classified as underweight, normal weight, overweight or obesity according to the criteria of the World Health Organization²⁴. Considering that only 9 participants (1%) were classified as underweight, this category was merged with normal weight for the purpose of data analysis.

Three types of responses to the warnings were estimated: product substitution (purchasing a similar product with fewer or no warnings), category abandonment (not purchasing any product) and no response (purchasing the product anyway). Univariate and multivariate multinomial logistic regression models were used considering the likelihood of having taken different decisions when facing a product with nutritional warnings as dependent variable (purchased the product anyway, purchased a similar product with fewer or no warnings, did not purchase the product). First, separate univariate multinomial logistic regressions were run on each of the following independent variables separately: gender (male/female), age range (18-25/26-35/36-45/46-55/older than 55 y), educational level (primary education/secondary education/tertiary education), presence of children under 10 years old in the household (yes/no), socio-economic level (low/medium/high), weight status based on self-reported weight and height (normal weight or underweight/overweight/obesity), self-reported high blood pressure (yes/

no), self-reported high cholesterol (yes/no), self-reported diabetes (yes/no), consumption frequency of natural or minimally processed foods and consumption frequency of ultra-processed products. Successively, a multinomial logistic regression model was fitted including only the variables that were found to be significant ($p \leq 0.05$, Wald chi-square test for model effects) in the univariate regressions in order to take into account potential correlations between variables. Results were presented as odds ratios with 95% confidence intervals.

RESULTS

The socio-demographic characteristics of participants who reported having seen the warnings on a product they intended to buy ($n = 616$) are shown in table 1. When asked about their purchase decisions, 42% of the participants stated that they did not take the warnings into account (they bought the product anyway), 40% of the participants reported product substitution effects (purchasing a similar product with fewer or no warnings), whereas 18% of the participants reported not having purchased the product or other similar product (category abandonment effects).

Initially, univariate multinomial logistic regression analyses were run to explore the influence of individual characteristics on likelihood of reporting having taken different decisions when facing a product with nutritional warnings. Results showed that only four variables had a significant effect: gender, age, consumption frequency of natural and minimally processed foods and consumption frequency of ultra-processed products (Table 2). Meanwhile, educational level, socio-economic level, children under 10 years old in the household, weight status, self-reported high blood pressure, self-reported high cholesterol and self-reported diabetes were found to be non-significant (data not shown). A multivariate multinomial logistic regression model was run including only the four variables that had a significant effect ($p < 0.05$).

As shown in table 3, the likelihood of purchasing a product with fewer or no warnings rather than not taking the warnings into account was significantly larger for participants with a higher consumption frequency of natural and minimally processed foods and a lower consumption of ultra-processed products. A unit increase in the average consumption frequency of natural products was associated with a 30% increase in the likelihood of purchasing a product with fewer or no warnings, whereas a unit increase in the average consumption frequency of ultra-processed products was associated with a 25% reduction (Table 3).

Finally, likelihood of not purchasing any product when facing nutritional warnings was significantly larger for participants aged between 26 and 35 years old and for those older than 55. As shown in table 3, a unit increase in the average consumption frequency of ultra-processed products was associated with a 45% decrease in the likelihood of reacting to the warnings by not purchasing any product.

Table 1. Socio-demographic characteristics of participants who reported having seen nutritional warnings on a product they intended to buy ($n = 616$).

Characteristic	Percentage of participants (%)
Gender	
Female	65
Male	35
Age	
18-25	17
26-35	26
36-45	29
46-55	13
Older than 55	15
Educational level	
Primary school	15
Secondary school	44
Tertiary education	40
Socio-economic status	
Low	14
Medium	48
High	38
Children under 10 years old in the household	
No	33
Yes	67
Weight status based on self-reported weight and height	
Normal weight or underweight	39
Overweight	39
Obesity	22
Percentage of participants who self-reported different health conditions	
High blood pressure	15
High cholesterol	14
Diabetes	8

DISCUSSION

The present study aimed at exploring the influence of individual characteristics on the likelihood of taking different purchase decisions when facing products with warnings, a few days after their implementation in Uruguay. Considering that the study was conducted before the implementation of any official communication campaign, results enable

Table 2. Results of the univariate multinomial logistic regression models exploring the influence of individual characteristics on participant likelihood of making different decisions when facing a product with nutritional warnings.

Characteristic	Odds ratio (95% confidence interval)	
	Purchasing a similar product with fewer or no warnings	Not purchasing any product
Gender		
Male	1.04 (0.72-1.49)	0.55 (0.33-0.91)*
Age		
26-35	1.36 (0.79-2.32)	2.27 (1.03-4.97)*
36-45	0.79 (0.47-1.33)	1.32 (0.60-2.88)
46-55	1.83 (0.97-3.44)	1.62 (0.61-4.29)
Older than 55	1.86 (0.95-3.62)	6.72 (2.90-15.57)*
Educational level		
Secondary school	0.84 (0.50-1.40)	1.59 (0.73-3.02)
Tertiary education	0.68 (0.41-1.14)	1.12 (0.54-2.30)
Socio-economic status		
Low	1.21 (0.70-2.10)	1.03 (0.51-1.99)
Medium	1.01 (0.70-1.50)	0.73 (0.45-1.17)
Children under 10 years old in the household		
Yes	0.90 (0.62-1.30)	0.99 (0.62-1.59)
Weight status		
Overweight	1.27 (0.85-1.91)	1.45 (0.87-2.41)
Obesity	1.07 (0.69-1.67)	0.99 (0.55-1.76)
Self reported high blood pressure		
Yes	1.48 (0.90-2.42)	1.41 (0.76-2.62)
Self-reported high cholesterol		
Yes	0.80 (0.48-1.33)	0.92 (0.49-1.72)
Self-reported diabetes		
Yes	1.69 (0.80-3.56)	1.76 (0.72-4.30)
Consumption frequency of natural or minimally processed foods	1.30 (1.13-1.50)*	1.19 (0.99-1.42)
Consumption frequency of ultra-processed products	0.76 (0.64-0.91)*	0.54 (0.40-0.71)*

Notes: The reference category in the model was purchasing the product with warnings anyway. The reference levels for the variables were: Gender (Female), Age (18-25 years old), Educational level (primary school), Socio-economic status (High), Children under 10 years old in the household (Yes), Weight status (Normal weight or underweight), Self-reported high blood pressure (No), Self-reported high cholesterol (No), Self-reported diabetes (No). Significant odd-ratios are highlighted with * and bold characters.

Table 3. Results of the multivariate multinomial logistic regression model exploring the influence of individual characteristics on participants' likelihood of taking different decisions when facing a product with nutritional warnings.

Variable	Odds ratio (95% confidence interval)	
	Purchasing a similar product with fewer or no warnings	Not purchasing any product
Gender		
Male	1.15 (0.78-1.68)	0.67 (0.39-1.14)
Age		
26-35	1.41 (0.82-2.45)	2.29 (1.03-5.10)*
36-45	0.81 (0.47-1.39)	1.25 (0.56-2.78)
46-55	1.75 (0.92-3.30)	1.51 (0.56-4.07)
Older than 55	1.94 (0.98-3.85)	6.60 (2.79-15.60)*
Consumption frequency of natural or minimally processed foods	1.30 (1.13-1.50) *	1.20 (0.99-1.45)
Consumption frequency of ultra-processed products	0.75 (0.62-0.90) *	0.55 (0.41-0.73)*

Notes: The reference category in the model was purchasing the product with warnings anyway. The reference levels for the variables were: Gender (Female), Age (18-25 years old). Significant odd-ratios are highlighted with * and bold characters.

the identification of participants who were spontaneously motivated to modify their food purchase decisions when seeing the warnings on the packages.

Results from the present work showed that age significantly influenced participants' reaction towards nutritional warnings. Compared to the youngest participants, participants older than 55 years were more likely to react to the warnings by not purchasing any product. The percentage of participants providing this last response was 37% for participants older than 55 compared to 18% for the whole sample. Older adults usually report higher concerns over their health-related vulnerabilities and tend to be more motivated to avoid potential negative health outcomes compared to young adults²⁵. However, older consumers have been reported to have more difficulties at finding and understanding nutrient declarations^{26,27}, suggesting that this segment of the population may particularly benefit for the implementation of nutritional warnings.

Interestingly, the likelihood of not purchasing any product when facing nutritional warnings was also significantly larger for participants between 26 and 35 years old. This suggests the potential of nutritional warnings to encourage changes in the eating habits of this age group, which could be related to an increased interest in dietary change. Further research

is needed to obtain an in-depth understanding of the effect of age on reactions to nutritional warnings.

Educational level and socio-economic status did not have a significant effect on self-reported reaction to nutritional warnings. This result can be explained by the salience and easiness to understand nutritional warnings^{10,11,28}. Previous studies have reported that people who attained higher levels of education are more likely to look for nutrition labelling²⁶. Thus, results from the present work suggest that nutritional warnings may contribute to reduce the inequities generated by the complexity of nutrient declarations²⁹.

Females have been reported to be more health conscious and to more frequently use nutrition labelling compared to males^{3,15,26,30}. In the present work, the effect of gender was only significant in the univariate model but not in the multivariate model, suggesting that its effect could be attributed to the correlation of gender with one or more of the variables with a significant effect. In particular, males and females showed a significantly average consumption frequency of ultra-processed products (1.2 vs 0.9, $p=0.0003$), which significantly influenced how consumers reacted to the warnings.

Consumption frequency of natural and minimally processed foods and ultra-processed products had a

significant effect on how participants reacted to the warnings. Consumption frequency of natural foods was associated with an increased likelihood of reporting having modified purchase decisions when facing a product with warnings, whereas consumption frequency of ultra-processed products was associated with a reduction in the likelihood of changing purchase decisions. This result suggests that reaction towards the warnings may be mediated by diet quality: participants with the lowest diet quality may be the least influenced by the warnings. This agrees with the fact that consumer accounts have identified health interest as the main motivator for taking the warnings into account for making purchase decisions, both before¹¹ and after their implementation⁹. In addition, these results are aligned with the positive association between nutritional label usage and diet healthiness^{13,17,26}.

Results from the present work suggest that efforts to promote the use of nutritional warnings in decision making should be targeted at citizens with the least healthy diets. Particularly, those who frequently consume ultra-processed products. Communication campaigns stressing the negative health consequences of excessive intake of sugar, fat and sodium (loss-frame) and the positive effects of avoiding consumption of products with excessive content of such nutrients (gain-frame) could encourage citizens to take nutritional warnings into account for making their food related decisions. The inclusion of both types of messages has the potential to influence the behavior of citizens with different regulatory focus, i.e. prevention or promotion orientation²⁵. Considering that consensus on the effect of message framing on eating behavior change has not been reached yet³¹, further research on the topic is needed to design effective communication campaigns to encourage the use of nutritional warnings.

In closing, the limitations of the study should be acknowledged. First of all, the present research relied on self-reported measures of use of nutritional warnings for making purchase decisions. Secondly, the present research assessed consumers' reaction to nutritional warnings without taking into account the specific product categories they had intended to purchase. Finally, at the time of the study not all products were complying with the regulation due to the additional extension granted to the food industry to include warnings on food packages.

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