Development of a scale of use, comprehension and attitudes in relation to nutrition labels in Spanish

David Flores-Villalba, D Adm Sc,[1] Edgardo Arturo Ayala-Gaytán, D Econ,[1]
Claudia María Quintanilla-Domínguez, D Mktg.[1]

Abstract

Objective. To describe the development of a reliable and valid measure of attitudes toward, and use and comprehension of nutritional labels in Spanish speaking countries. **Materials and methods.** The dimensions encompassed in this instrument are attitudes, comprehension and use, combining self-reports and objective measures of nutrition knowledge. Content validity, item analysis, repeat and internal reliability, and convergent and divergent validity were assessed in a pooled sample of 185 individuals. **Results.** Cronbach alpha coefficients (above 0.9) exhibit internal consistency. Exploratory and confirmatory factor analyses of the scale show good properties for convergent and divergent validity. **Conclusion.** The final 25-item scale is a valid and reliable measure of use, comprehension and attitude towards nutrition labels for Spanish speaking populations.

Keywords: nutrition labeling; scale/development; validity and reliability

Resumen

Objetivo. Describir el desarrollo de una medida confiable y válida de las actitudes, uso y comprensión de etiquetas nutricionales en poblaciones de habla hispana. **Material y métodos.** Las dimensiones abarcadas en este instrumento son las actitudes, la comprensión y el uso, combinando medidas subjetivas y objetivas acerca del conocimiento sobre nutrición. Se evaluó la validez del contenido, el análisis de los ítems, la repetición y confiabilidad interna y la validez convergente y divergente en una muestra de 185 individuos. **Resultados.** Los coeficientes alfa de Cronbach (mayores a 0.9) presentan consistencia interna, mientras que el factor de análisis confirmatorio y exploratorio muestra que la escala tiene validez convergente y divergente. **Conclusiones.** El instrumento final de 25 ítems es una medida válida y confiable de uso, comprensión y actitud hacia las etiquetas nutricionales diseñada para las poblaciones de habla hispana.

Palabras clave: etiquetado de alimentos; escala/desarrollo; confiabilidad y validez

(1) EGADE Business School, Instituto Tecnológico y de Estudios Superiores de Monterrey. Garza García, Nuevo León, México.

Nutrition labels on packaged food products have been introduced in many countries to help consumers improve their diet. As a health policy tool, nutrition labels provide the key nutrition information that consumers need in order to make informed food choices. Nutrition labelling is currently mandatory in Mexico and most countries in Latin America. A back-of-pack nutrition information panel declares the content of energy and the amount of protein, carbohydrate, sugars, fat, saturated fat, dietetic fibre, sodium per serving or per 100 g/100ml of food, vitamins and minerals.[1] According to the Ensanut Survey (2016), in Mexico only 40% of the population read the nutritional labels, and almost 45% reported that they found them difficult to understand,[2] whereas De la Cruz-Góngora, and colleagues[3] estimate that 17% use nutritional labels to make decisions, but 49% do not understand them, and only 1% can provide correct answers to a simple nutrition label comprehension test.

However, the evidence of a positive link between label use and dietary outcomes is ambiguous. Some studies have found an association between nutrition label use and healthier diets.[4] In contrast Drichoutis, Lazardis and Nayga,[5] based on data from the 2005-2006 National Health and Nutrition Examination Survey, concluded that nutritional label use has no effect on the body mass index (BMI), while Variyam and Cawley[6] found that the BMI of users of nutrition labels dropped significantly after the introduction of the 1990 Nutrition Labelling and Education Act. Studies of the impact of nutrition labels on food purchases by consumers have also produced conflicting results.[7]

One possible cause of the weak relationship between nutrition labels and dietary outcomes is the lack of robust measures of how consumers use and comprehend nutrition labels.[8,9] Thus, accurate assessments of nutrition-related dimensions and dietary behaviour relationships requires valid and reliable measures.[10]

On the other hand, most of what we know about how consumers use nutrition labels comes, disproportionately, from high-income Western countries, with the majority of studies originating in the United States, Canada and the United Kingdom. Therefore, it is unclear to what extent the findings of these studies apply to jurisdictions with different legal and cultural contexts.[4] Studies in the context of Spanish speaking populations are scarce, with the exception of studies on nutrition literacy and healthy food choices among Latinos,[11,12] Mexicans,[3,13] and Spaniards.[14-16]

Nutrition labels are a health policy tool; as such, they are bound by legal considerations unique to every country. Although nutrition information displays and dietary recommendations are similar across countries, specific instruments may need adapting to account for differences in labels and consumers' diet patterns.[17] In addition, because of cultural variations in eating habits and population-specific dietary recommendations, instruments developed in other countries may not necessarily be valid for the Spanish speaking population. Given the alarming prevalence of overweight and obesity, especially in countries like Mexico,[18-21] it is urgent to conduct more context-specific research on nutritional label use, employing appropriate and specific measures. This study helps to fill this gap by developing and validating a measure of consumer attitudes, use, and comprehension of back-of-pack nutrition labels of products by Spanish speaking adult consumers.

Materials and methods

Study design

Several studies were combined in order to build, test and validate the nutritional label scale we propose in this paper. In-depth interviews were conducted with both consumers (6) and experts (3) in qualitative research on uses and attitudes. A sample of 185 adults and undergraduate students answered the questionnaires that allow us to validate the scale. All studies were conducted in northeastern Mexico (Nuevo León, Coahuila, and Tamaulipas) during the fall of 2016. All the studies were approved by the Research and Ethics Committee of *Hospital Metropolitano* in Monterrey, Mexico (Protocol 17/723).

Identification of dimensions

Previous studies on nutrition labels have developed items to measure such constructs as perception of labels,[22] attitudes towards labels,[23,24] motivation to process label information,[25] label comprehension,[23,26-31] label knowledge,[32] and behavioral intention and change.[33] In addition, several studies have developed items that measure self-reported reading of labels[22,24,30,33,34] and perceived understanding of labels.[23,26,27]

The review of the extant literature and a pilot qualitative inquiry conducted in the northeastern states of Mexico during 2016 suggested three important dimensions of the use of food labels by consumers. The first dimension is related to the consumers' cognitive and affective evaluations of labels; we broadly refer to this dimension as "attitude towards labels". The second dimension corresponds to the behavior related to utilization of nutrition labels by the consumers; we name this dimension "use of nutrition labels". The third dimension involves the consumers' ability to interpret and apply the information provided by nutrition

labels; we refer to this dimension as "comprehension of nutrition labels".

Following the literature, the attitude towards labels was operationalized in terms of interest, importance, value, and preference.[4,35] Interest refers to the appeal that nutrition labels hold for consumers. Importance is related to the relevance which consumers assign to nutrition labels as sources of nutritional information. Value represents the utility that consumers derive from the information contained in nutrition labels. Finally, preference refers to the extent to which consumers would rather have a product with a nutrition label compared to one that does not have a label.

Comprehension refers to whether respondents interpret the information on the label correctly.[31] Nutrition label comprehension was operationalized as consumers' performance in nutrition label related tasks. Levy, Fein & Schucker[28] define four basic label tasks regarding labels: comparing two products in order to find differences in nutrient levels, judging whether or not a nutrient claim is true, assessing the dietary implications of consuming a product, and estimating the contribution of a product to recommended daily intake levels.[36] A fifth task –nutrition judgment, *i.e.* determining if consumers evaluate whether a product contains high or low levels of a particular nutrient– was also considered.[26]

Research suggests that consumer use is limited to looking at label information, with little further processing.[37] Therefore, nutrition label use was operationalized as reading the nutrition label.

Qualitative phase

We developed the items for the nutrition label use scale based on a qualitative inquiry and the review of the extant literature on nutrition label use. For the exploratory, qualitative phase, we conducted in-depth interviews with a purposive sample[38] of six adults in order to examine how consumers use nutrition labels. The sample was balanced between lay consumers and nutrition experts. All the studies were approved by the Research and Ethics Committee of Hospital Metropolitano in Monterrey, Mexico (Protocol 17/723).

In addition, we examined previous studies that had included items to measure related dimensions and selected and adapted relevant items. Since all of the previous studies that we reviewed were published in English, items were back-translated into Spanish.[39,40] Finally, we constructed items to represent the conceptual domains described in the previous section. Special care was taken to avoid ambiguous, negatively phrased, double-barreled, and excessively technical questions,[41,42] keeping 53 items at this stage.

In order to test content validity, a panel of three nutrition experts conducted a review of the 53 items. Experts rated each item on relevance, appropriateness, and clarity, using a seven-point Likert-type scale anchored by 'completely disagree/completely agree'.[43] In addition, space for comments was provided next to each item. Quantitative ratings and qualitative evaluations of each item were analysed. As a result of this expert evaluation, the item pool was reduced to 33.

Quantitative phase

Using the pool of 33 items, we constructed the preliminary instrument in three main sections. The first section measured attitude towards nutrition labels using 13 items with seven-point Likert-type scales with 'totally disagree/totally agree' anchors. The second section measured nutrition label use and included seven items with seven-point Likert-type scales anchored by 'never/always.' The third section included 13 multiple-choice items with a single correct answer; these measured the comprehension of nutrition label information by using nutrition tasks that required consumers to interpret and apply—*i.e.* to show understanding of— nutrition label data. A 'don't know' category was included in the response choice set in order to discourage guessing.[41] Finally, a number of demographic questions were included in the questionnaire with the purpose of classifying the respondents.

Finally, a pre-test was undertaken with 10 subjects in a paper based version, and 6 more in a computer-administered version, using a probing technique to gain information from the respondents in regard to the questionnaire items.[44] Readability was also assessed with the Flesch Reading Ease Score formula.[45] According to this test, no further changes were necessary, and the readability obtained 76.4 out of 100 points, which indicates that the items were easy to read.

An online questionnaire was distributed to two samples. The first sample consisted of 125 adults, and the second, of 65 undergraduate students from a large university in northeastern Mexico.

Respondents from the second sample were informed that they would be required to complete a similar questionnaire five days later. 57 participants completed and submitted the questionnaire at this later time. The two repeated measures data from this second sample were used to assess the temporal stability of the measure.

An ANOVA revealed that there were no significant differences in the ratings of attitudes [$F_{(1, 142)} = 3.02$, $p = .08$], use [$F_{(1,142)} = 2.30$, $p = .13$], and comprehension assessment [$F_{(1, 142)} = .15$, $p = .69$] between adults and

students; therefore, the data were pooled. 52% of the final sample were female; 70% of these were aged 18 to 29 years, and 51% had college or higher education.

Results

The properties of the scales used to measure the attitudes and use section (interval scales) were substantially different from those utilized for the comprehension section (dichotomic items); therefore, their results were analysed separately.

An exploratory factor analysis conducted with the entire set of attitude and usage items resulted in a two-factor structure that explained 71.60% of total variance. Table I shows the items loadings for these two factors.

Internal consistency was evaluated using Cronbach alpha coefficients, resulting in an alpha of 0.943 for the attitude items, and 0.918 for the usage items; these coefficients are indicative of a very good internal consistency of these measures.

The longitudinal stability of the measure was evaluated through a test-retest procedure using data from the student subsample. Subjects answered the retest questionnaire five days after they had answered the initial questionnaire. The test-retest correlation coefficients were significant for the three dimensions —attitude ($r = .837$), usage ($r = .858$), and comprehension ($r = .602$)—, suggesting good temporal stability of the measures (figure 1).

We also employed confirmatory factor analysis to test convergent and divergent validity. Using the three criteria established by Fornell and Larcker,[46] we calculated R^2, average variance extracted (AVE), and construct reliability (CR) measures. As shown in table II, the AVE and CR coefficients are above 0.5 and 0.7, respectively. Therefore, we conclude that the attitude and use dimensions have convergent validity.

The divergent validity for attitude and use was calculated using Anderson's and Gerbing's criteria.[47] The tests show that both dimensions represent different constructs ($\chi^2=22.6$, $p=0.000$). Divergent validity was also tested through the ad-hoc criterion. The squared correlation coefficient between attitude and use was 0.603, which is smaller than the 0.660 AVE coefficient of the usage construct. Thus, it can be concluded that these dimensions have divergent validity.

Regarding comprehension, the item difficulty index (p), or the proportion of respondents who answered the item correctly, was used to assess difficulty.[48] The

Table I
FACTOR LOADINGS OF THE NUTRITIONAL
LABELS ITEMS FOR THE POOLED SAMPLE OF ADULTS AND STUDENTS

	Scale	Attitude	Use
ACT5	The information I get from nutrition labels is valuable to me	**.843**	.258
ACT6	It is important for me to obtain information from nutrition labels	**.840**	.299
ACT3	I am more interested in checking the nutrition labels of new products	**.829**	.315
ACT2	Nutrition labels are important for me when I shop for food	**.828**	.361
ACT1	I am interested in reading nutrition labels	**.823**	.373
ACT4	I am more interested in checking the nutrition label of product I buy more often	**.735**	.255
ACT7	I pay attention to whether a product has a nutrition label	**.687**	.402
ACT8	I prefer to buy a product that has a nutrition label	**.632**	.338
USO2	I read the nutrition label of products before I buy them	.347	**.843**
USO7	I use the information on nutrition labels to compare products of different brands	.216	**.820**
USO5	I read the nutrition label of products the first time I buy them	.399	**.772**
USO3	I read the nutrition labels on products before consuming them	.260	**.768**
USO1	I read the nutrition labels of products	.428	**.752**
USO4	I read the nutrition labels of products to check the amount of each nutrient	.319	**.678**

Note: Estimated by the authors based on the information of the quantitative phase (Mexico, 2016)

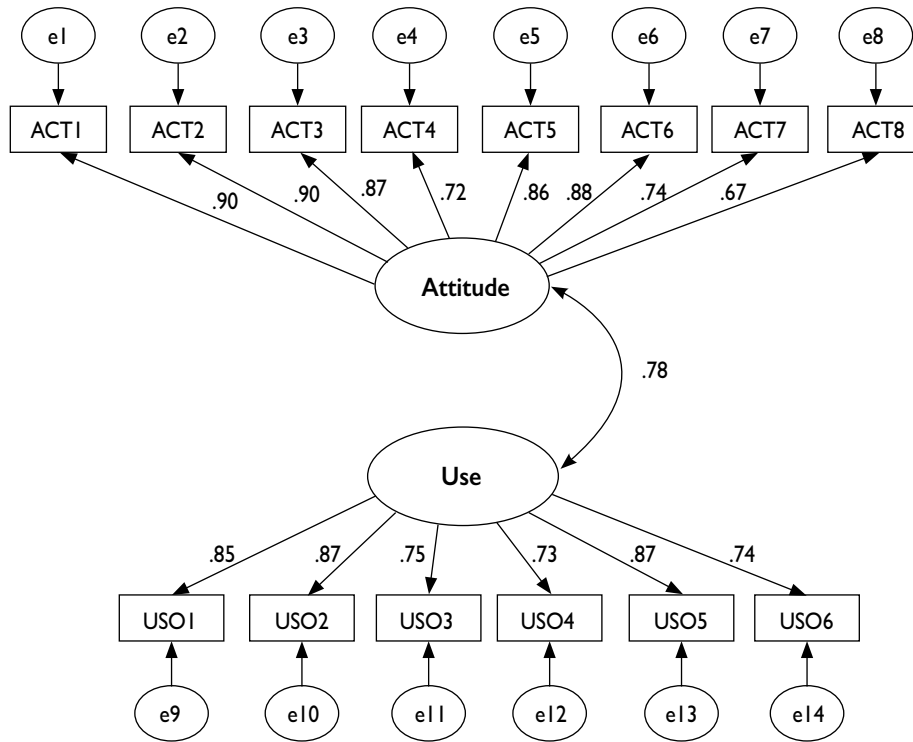Factor loading higher than 0.5 are marked in bold numbers

FIGURE 1. MEASUREMENT MODEL OF THE NUTRITION LABELS USE SCALE FOR THE ATTITUDE AND USE DIMENSIONS

Table II
ATTITUDE AND USE DIMENSIONS CONVERGENT VALIDITY FOR THE POOLED SAMPLE OF ADULTS AND STUDENTS

Variable	Item	Std Estimate	R^2	$1-R^2$	AVE	CR
Attitude	ACT1	0.901	0.812	0.188	0.682	0.944
	ACT2	0.906	0.821	0.179		
	ACT3	0.873	0.762	0.238		
	ACT4	0.725	0.526	0.474		
	ACT5	0.868	0.753	0.247		
	ACT6	0.883	0.780	0.220		
	ACT7	0.746	0.557	0.443		
	ACT8	0.667	0.445	0.555		
Use	USO7	0.771	0.594	0.406	0.660	0.920
	USO5	0.864	0.746	0.254		
	USO4	0.716	0.513	0.487		
	USO3	0.767	0.588	0.412		
	USO2	0.891	0.794	0.206		
	USO1	0.851	0.724	0.276		

Note: Estimated by the authors based on the information of the quantitative phase (Mexico, 2016)

p-indices ranged between .38 and .98. It has been sug-gested that items should have p-indices between .2 and .8.[49] Since the education level of our sample was higher than the mean education level of the general population, following Parmenter and Wardle,[41] we adjusted these indices slightly upward. Items were considered for elimination if over 90% or under 30% answered them correctly. No item scored below .30, but three items had a p-index of over .90.

The point biserial correlation index was used to assess the ability of an item to differentiate between those with a better understanding and those with a lower level of comprehension.[48] Item discrimination can be interpreted as a measure of consistency of the respondents' performance on individual items and their overall score.[50] The item-to-total score correlations were between .10 and .32. Items with discrimination indices below .20 were considered for elimination.[49]

In order to determine which items would need to be eliminated from the instrument, we considered difficulty and discrimination indices. Two items in the comprehension section scored low on both difficulty and discrimination, and were therefore eliminated from the final version of the instrument.

Finally, internal consistency for this section was as-sessed using the Kuder-Richardson internal consistency reliability index (KR-20). The KR-20 is appropriate for di-chotomic data. The KR-20 of this section was .60. Carey[50] suggests that values below .50 should be questioned.

Thus, the final version of the instrument contains 25 items divided into three sections: eight items for evaluating the consumers' attitude towards nutrition labels, six items to assess consumers' use of labels, and 11 items for assessing the consumers' comprehension of nutrition label information. The final version of the instrument is shown in tables III and IV.

Discussion

The purpose of this study was to develop and validate a measure of consumer use of nutritional labels on packaged products for Spanish speaking consumers. The results of the statistical analyses performed suggest that the final instrument is a reliable and valid measure that can be useful in the systematic study of nutrition labelling issues. To our knowledge, this is the first at-tempt to develop and validate an instrument to measure consumers' use, comprehension and attitudes towards nutrition labels outside high-income countries.

In addition to being a valid and reliable measure, the instrument presented in this paper is particularly appealing due to its length and structure. It is relatively short, which makes it an attractive measure to be in-cluded in studies of nutrition information measuring multiple variables, and its modular design allows researchers to use the complete instrument or each of the three scales independently. The three sections of the instrument exhibit good psychometric characteristics.

The scale developed in this paper presents some advantages compared to possible alternatives. For example, the Spanish version of the Nutrition Literacy Scale (NLS) used in studies with Latinos[11] comes from a translation from the original English Anglo-Saxon scale, and it focuses on nutrition knowledge. The scales employed by De Magistris and colleagues[16], and by Barreiro and colleagues[15], covered label use and

Table III
Attitude and Use items of the Nutritional Labels Scale

I. Attitude items	II. Use items
I am interested in reading nutrition labels	I read the nutrition labels of products
Nutrition labels are important for me when I shop for food	I read the nutrition label of products before I buy them
I am more interested in checking the nutrition labels of new products	I read the nutrition labels on products before consuming them
I am more interested in checking the nutrition label of product I buy more often	I read nutrition labels…
The information I get from nutrition labels is valuable to me	I read the nutrition label of products the first time I buy them
It is important for me to obtain information from nutrition labels	I use the information on nutrition labels to compare products of diffe-rent brands
I pay attention to whether a product has a nutrition label	
I prefer to buy a product that has a nutrition label	
Responses were collected on a seven-point scale, with the extremes being 1=Strongly Disagree and 7=Strongly Agree. 8=Do not remember	Responses were collected on a seven-point scale, with the extremes being, 1=Always and 7=Never

Table IV
COMPREHENSION ITEMS OF THE NUTRITIONAL LABEL SCALE

1. Which of the following is included in nutrition labels?
   - Artificial flavors
   - Preservatives
   - Fiber
   - Ingredients
2. If a product has no fat, it means that it is good for my health.
   - False
   - True
   - I don't know

Product 1	Product 2	Product 3

Product 1

Nutrition Information
Serving size: 1 piece (50g)
Servings per package: 2

Amount per serving
Energy content 140 Kcal

Total fat		**8g**
Of which		
Saturated fat		3.5 g
Trans fat		0 g
Cholesterol5		**mg**
Sodium		**400 m**
Carbohydrates		**14g**
Of which		
Sugar		1.5 g
Dietary Fiber		**1 g**
Protein		**4g**

	%PDV		%PDV
Vitamin A	0%	Vitamin C	0%
Calcium	20%	Iron	10%

The Percent Recommended Daily Vallues (%PDV) are based on the recommendation established for the Mexican population in NOM-051-SCIFI-1994

Product 2

Nutrition Information
Serving size: 1 piece (50g)
Servings per package: 2

Amount per serving
Energy content 120 Kcal

Total fat	**6**	**g**
Of which		
Saturated fat	2.5	g
Trans fat	0	g
Cholesterol	**4**	**mg**
Sodium	**300**	**m**
Carbohydrates	**7**	**g**
Of which		
Sugar	1	g
Dietary Fiber	**1.5**	**g**
Protein	**10**	**g**

	%PDV		%PDV
Vitamin A	0%	Vitamin C	0%
Calcium	10%	Iron	6%

The Percent Recommended Daily Vallues (%PDV) are based on the recommendation established for the Mexican population in NOM-051-SCIFI-1994

Product 3

Nutrition Information
Serving size: 1 piece (454g)
Servings per package: 1

Amount per serving
Energy content 670 Kcal

		% daily intake
Total fat	**41 g**	**63%**
Of which		
Saturated fat	14 g	70%
Trans fat	3 g	
Cholestero 1	**35 mg**	**12%**
Sodium	**1000 m**	**42%**
Carbohydrates	**55 g**	**18%**
Of which		
Sugar	4 g	
Dietary Fiber	**3 g**	**12%**
Protein	**19g**	**38%**

	%PDV		%PDV
Vitamin A	40%	Vitamin C	0%
Calcium	4%	Iron	15%

The Percent Recommended Daily Vallues (%PDV) are based on the recommendation established for the Mexican population in NOM-051-SCIFI-1994

3. Look at the label. How many grams of fat are there in half a package?
   - 14g
   - 8g
   - 4g
   - 17g
4. If 65g of total fat is the recommended daily amount for a 2 000 calories diet, this product has a:
   - Low fat content
   - Medium fat content
   - High fat content
   - I don't know
6. If 25g of fiber is the recommended daily amount for a 2 000 calories diet, this product has a:
   - Low fiber content
   - Medium fiber content
   - High fiber content
   - I don't know

5. If 300g of carbohydrates is the recommended daily amount for a 2 000 calories diet, this product has a:
   - Low sugar content
   - Medium sugar content
   - High sugar content
   - I don't know

10. Look at the label. If you ate three servings of this product a day, of which of these nutrients would you consume more than the recommended amount?
    - Fiber
    - Carbohydrates
    - Cholesterol
    - Sodium
11. Look at the label. If you ate three servings of this product a day, of which nutrients would you need to get more from other foods in order to get the recommended daily amount?
    - Saturated fat
    - Protein
    - Vitamin A
    - Iron

7. Looking at the labels of products 1 and 2, which product has less saturated fat?
   - Product 1
   - Product 2
   - No difference
   - I don't know
8. Which product would be the best option for someone trying to lose weight?
   - Product 1
   - Product 2
   - No difference
   - I don't know
9. Which product would be the best option for someone trying to reduce their risk of high blood pressure by lowering their sodium intake?
   - Product 1
   - Product 2
   - No difference
   - I don't know

knowledge, but with only three general items for each of these dimensions. Finally, the scale of Gonzalez-Roa & Calatrava-Requena[14] covers nutrition knowledge in detail with nine items, but does not include attitude or use. In contrast to these few attempts, our scale is developed from qualitative inquiry and from a quantitative study with Spanish speaking population, and it covers all three dimensions of attitude, use and comprehension in detail, with eight, six, and eleven items.

Although limitations still remain, covering all nutrients in the comprehension questions would require an extremely large questionnaire that would produce carryover biases in the answers. Therefore, certain micronutrients, such a vitamin A, calcium and others, had to be excluded. It is likely that these omissions had little impact on the results. Following previous research, we operationalized and measured nutrition knowledge as performance in nutrition label tasks.[26,34,24] Since these operations are not nutrient-specific, consumers who are able to perform a task with one nutrient should be able to perform the same task with another nutrient, minimizing the potential impact of using only one micronutrient in the scale. However, an interesting avenue of research in the future could be to confirm the generalizability of nutrition tasks across nutrients.

In addition, the scale was tested with an online survey, which may result in other problems, such as answering with help from others or from the internet, or self-selection biases. That is, the actual respondents of the survey may differ in some key attributes (*e.g.* nutritional knowledge) from those who filled it, and there may be an overrepresentation of subjects with higher education. These conditions may lead us to overestimate our results regarding the incidence of use and knowledge of nutrition labels. These problems call for a larger project with face-to-face interviews and random sampling in representative populations.

As previous studies suggest, social desirability bias should be considered when studying consumer use of nutrition labels. For this reason, we conducted a post hoc analysis using the short form version of the Balanced Inventory of Desirable Responding in Spanish[51], which indicated low but significant correlations between social desirability and the attitude and use dimensions of the scale ($a = 0.68$; $r_{SocDes-Attitude} = .21$; $r_{SocDes-Use} = .21$). This suggests that social desirability probably had a minor impact on our results. Still, future research may focus on different data collection methods than the one chosen in this study to explore alternatives for reducing social desirability bias, for example: complementing information gathered by our instrument with experiments in which researchers observe how consumers behave at the point of purchase. In practice, government organizations and agencies in charge of regulating labelling information regulations can benefit from the use of this instrument. For instance, any attempt to make nutritional labels more appealing to use and easy to read might employ this nutritional scale in between experiments across the considered alternative labels. Additionally, the scale might be employed to measure the impact on consumers' attitudes, use and comprehension of interventions designed to help them follow a healthier diet, such as nutrition courses, or official websites that provide nutrition tips for everyone and for specific categories of consumers.

Declaration of conflict of interests. The authors declare that they have no conflict of interests.

References

1. Secretaría de Economía, Secretaría de Salud. NOM-051-SCFI/SSA1-2010. Especificaciones generales de etiquetado para alimentos y bebidas no alcohólicas preenvasados – Información comercial y sanitaria. México: Diario Oficial de la Federación, 2010.

2. Hernández-Ávila M, Rivera J, Shamah Levy T, Cuevas L, Gómez L, Gaona E, *et al.* Encuesta Nacional de Salud y Nutrición de Medio Camino. Informe final de resultados [internet]. Cuernavaca: INSP, 2016. Available from: https://www.gob.mx/cms/uploads/attachment/file/209093/ENSANUT.pdf

3. De la Cruz-Góngora V, Villapando S, Rodríguez-Ontiveros G, Castillo-García M, Mundo-Rosas V, Meneses-Navarro S. Use and understanding of the nutrition information panel of pre-packaged foods in a sample of Mexican consumers. Salud Publica Mex. 2012;54(2):158-66. https://doi.org/10.1590/S0036-36342012000200012

4. Campos S, Doxey J, Hammond D. Nutrition labels on prepackaged foods: a systematic review. Public Health Nutrition. 2011;14(8):1496-506. https://doi.org/10.1017/S1368980010003290

5. Drichoutis AC, Lazaridis P, Nayga RM. Consumer's use of nutritional labels: A review of research studies and issues. Academy of Marketing Science Review. 2006;2006(9).

6. Variyam JN, Cawley J. Nutrition labels and obesity. NBER Working Papers Series No 11956 [internet]. Cambridge, MA: National Bureau of Economic Research Inc, 2006. https://doi.org/10.3386/w11956

7. Gorton D. Nutrition labelling: Update of scientific evidence on consumer use and understanding of nutrition labels and claims. Auckland, 2007. Available from: https://www.foodsafety.govt.nz/elibrary/industry/signposting-nutrition-study-research-projects/signs-literature-review-report_final-2.pdf

8. Wills J, Schmidt DB, Pillo-Blocka F, Cairns G. Exploring global consumer attitudes toward nutrition information on food labels. Nutr Rev. 2009;67(1):102-6. https://doi.org/10.1111/j.1753-4887.2009.00170.x

9. Miller L, Cassady DL. The effects of nutrition knowledge on food label use. A review of the literature. Appetite. 2015;92:207-16. https://doi.org/10.1016/j.appet.2015.05.029

10. Sapp SG, Jensen HH. Reliability and validity of nutrition knowledge and diet-health awareness test developed from the 1989-1991 Diet and Health Knowledge Survey. J Nutr Educ. 1997;29(2):63-72. https://doi.org/10.1016/S0022-3182(97)70157-2

11. Coffman M, LaRocque S. Development and testing of the Spanish nutrition literacy scale. Hisp Health Care Int. 2012;10(4):168-74. https://doi.org/10.1891/1540-4153.10.4.168

12. Fitzgerald N, Damio G, Segura-Pérez S, Pérez-Escamilla R. Nutrition knowledge, food label use, and food intake patterns among Latinas with and without type 2 diabetes. J Am Diet Assoc. 2008;108(6):960-7. https://doi.org/10.1016/j.jada.2008.03.016

13. De la Cruz-Góngora V, Torres P, Contreras-Manzano A, Jáuregui de la Mota A, Mundo-Rosas V, Villalpando S, Rodríguez-Ontiveros, G. Understanding and acceptability by Hispanic consumers of four front-of-pack food labels. Int J Behav Nutr Phys Act. 2017;14:28. https://doi.org/10.1186/s12966-017-0482-2

14. González-Roa MC, Calatrava-Requena J. Food labeling use and differentiated consumers behavior: A survey analysis in spanish food market. 12th Congress of the European Association of Agricultural Economists (EAAE)2008. Ghent, Belgium, 2018 [cited July 27, 2018]. Available at: http://ageconsearch.umn.edu/bitstream/43541/2/097.pdf

15. Barreiro J, Gracia A, de Magistris T. Does nutrition information on food products lead to healthier food choices? Food Policy. 2010;35(3):221-9. https://doi.org/10.1016/j.foodpol.2009.12.006

16. de Magistris T, Gracia Royo A, Barreiro J. Effects of the nutritional labels use on healthy eating habits in Spain. Agric Econ – Czech. 2010;56(11):540-51. https://doi.org/10.17221/11/2010-AGRICECON

17. Van den Wijngaart AW. Nutrition labelling: purpose, scientific issues and challenges. Asia Pac J Clin Nutr. 2002;11(2):S68-S71. https://doi.org/10.1046/j.1440-6047.2002.00001.x

18. Olaiz-Fernández G, Rivera-Dommarco J, Shamah-Levy T, Rojas R, Villalpando-Hernández S, Hernández-Avila M, et al. Encuesta Nacional de Salud y Nutrición 2006. Cuernavaca, México: INSP, 2006.

19. Barquera S, Campos-Nonato I, Hernández-Barrera L, Pedroza A, Rivera-Dommarco JA. Prevalencia de obesidad en adultos mexicanos 2000-2012. Salud Publica Mex. 2013;55(2):151-60. https://doi.org/10.21149/spm.v55s2.5111

20. Organization for Economic Cooperation and Development. Obesity and the economics of prevention: Fit not fat key facts - Mexico, Update 2014. Paris, France: OECD, 2014. Available from: https://www.oecd.org/mexico/Obesity-Update-2014-MEXICO_EN.pdf

21. Philipson T. The World-Wide Growth in Obesity: An Economic Research Agenda. Health Econ. 2001;10:1-7. https://doi.org/10.1002/1099-1050(200101)10:1<1::AID-HEC586>3.0.CO;2-1

22. Loureiro ML, Gracias A, Nayga RM. Do consumers value nutritional labels? Eur Rev Agric Econ. 2006;33(2):249-68. https://doi.org/10.1093/erae/jbl005

23. Burton S, Garretson JA, Velliquette AM. Implications of accurate usage of nutrition facts panel information for food product evaluations and purchase intentions. J Acad Mark Sci. 1999;27(4):470-80. https://doi.org/10.1177/0092070399274006

24. McArthur L, Chamberlain V, Howard AB. Behaviors, attitudes, and knowledge of low-income consumers regarding nutrition labels. J Health Care Poor Underserved. 2001;12(4):415-28. https://doi.org/10.1353/hpu.2010.0772

25. Moorman C. The effects of stimulus and consumer characteristics on the utilization of nutrition information. J Consum Res. 1990;17:362-74. https://doi.org/10.1086/208563

26. Burton S, Biswas A, Netemeyer R. Effects of alternative nutrition label formats and nutrition reference information on consumer perceptions, comprehension, and product evaluations. Journal of Public Policy and Marketing. 1994;13(1):36-47.

27. Burton S, Andrews C. Age, product nutrition, and label format effects on consumer perceptions and product evaluations. J Consum Aff. 1996;30(1):68-88. https://doi.org/10.1111/j.1745-6606.1996.tb00726.x

28. Levy AS, Fein SB, Schucker RE. Performance characteristics of seven nutrition label formats. Journal of Public Policy and Marketing. 1996;15(1):1-15.

29. Rothman RL, Housam R, Weiss H, Davis D, Gregory R, Gebretsadik T, et al. Patient understanding of food labels: the role of literacy and numeracy. Am J Prev Med. 2006;31(5):391-8. https://doi.org/10.1016/j.amepre.2006.07.025

30. Feunekes GIJ, Gortemaker IA, Willems AA, Lios R, van den Kommer M. Front-of-pack nutrition labelling: Testing the effectiveness of different nutrition labelling formats front-of-pack in four European countries. Appetite. 2008;50(1):57-70. https://doi.org/10.1016/j.appet.2007.05.009

31. Grunert KG, Fernández-Celemín L, Willis JM, Storcksdieck genannt Bonsman S, Nureeva L. Use and understanding of nutrition information on food labels in six European countries. J Public Health. 2010;18:261-77. https://doi.org/10.1007/s10389-009-0307-0

32. Moorman C. A quasi experiment to assess the consumer and informational determinants of nutrition information processing activities: The case of the Nutritional Labeling and Education Act. Journal of Public Policy and Marketing. 1996;15:28-44.

33. Sykman IR, Bloom PN, Levy AS. A proposed model of the use of package claims and nutrition labels. Journal of Public Policy and Marketing. 1997;15(2):228-41.

34. Neuhouser ML, Kristal AR, Patterson RE. Use of food nutrition labels is associated with lower fat intake. J Am Diet Assoc. 1999;99:45-50. https://doi.org/10.1016/S0002-8223(99)00013-9

35. Grunert KG, Wills JM. A review of European research on consumer response to nutrition information on food labels. J Public Health. 2007;15:385-99. https://doi.org/10.1007/s10389-007-0101-9

36. Levy AS, Fein SB. Consumers' ability to perform tasks using nutrition labels. J Nutr Educ. 1998;30(4):210-7. https://doi.org/10.1016/S0022-3182(98)70321-8

37. Cowburn G, Stockley L. Consumer understanding and use of nutrition labelling: a systematic review. Public Health Nutr. 2005;8(1):21-8. https://doi.org/10.1079/PHN2005666

38. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349-57. https://doi.org/10.1093/intqhc/mzm042

39. Brislin RW. Back-translation for cross-cultural research. J Cross Cult Psychol. 1970;1(3):185-216. https://doi.org/10.1177/135910457000100301

40. Brislin RW. The wording and translation of research instruments. Field methods in cross-cultural research. In: Lonner WJ, Berry JW (eds). Field methods in cross-cultural research, Cross-cultural research and methodology series. 8. Thousand Oaks, CA, US: Sage Publications Inc, 1986:137-64.

41. Parmenter K, Wardle J. Development of a general nutrition knowledge questionnaire for adults. Eur J Clin Nutr. 1999;53:298-308. https://doi.org/10.1038/sj.ejcn.1600726

42. Peterson R. Constructing effective questionnaires. Thousand Oaks, CA, US: Sage Publishing Inc, 2000. https://doi.org/10.4135/9781483349022

43. Mackison D, Wrieden WL, Anderson AS. Validity and reliability testing of a short questionnaire developed to assess consumer's use, understanding and perception of food labels. Eur J Clin Nut. 2010;64:210-7. https://doi.org/10.1038/ejcn.2009.126

44. Drennan J. Cognitive interviewing: verbal data in the design and pretesting of questionnaires. J Adv Nurs. 2003;42(1):57-63. https://doi.org/10.1046/j.1365-2648.2003.02579.x

45. Flesch R. A new readability yardstick. J Appl Psychol. 1948;32:221-33. https://doi.org/10.1037/h0057532

46. Fornell C, Larcker DF. Evaluating structural equations models with unobservable variables and measurement error. J Mark Res. 1981;18:39-50. https://doi.org/10.2307/3151312

47. Anderson JC, Gerbing DW. Structural equation modeling in practice: A review and recommended two-step approach. Psychol Bull. 1988;103(3):411-23. https://doi.org/10.1037/0033-2909.103.3.411

48. Domino G, Domino ML. Psychological testing: An introduction. New York: Cambridge University Press, 2006. https://doi.org/10.1017/CBO9780511813757

49. Kline P. A Handbook of Test Construction: Introduction to Psychometric Design. New York: Meuthen, 1986.

50. Carey LM. Measuring and evaluating school learning. Boston, MA: Allyn & Bacon, 2001.

51. Steenkamp JE, de Jong MG, Baumgartner H. Socially desirable response tendencies in survey research. J Mark Res. 2010;47(2):199-214. https://doi.org/10.1509/jmkr.47.2.199