SOUTH AFRICAN CONSUMER PERCEPTION OF FIVE FRONT-OF-PACK LABEL FORMATS

Tracey Hutton* & Annelie Gresse

ABSTRACT

Front-of-pack food labels help consumers to make healthier food purchases and are thus an important tool for improving public health. Consumers' label preferences directly influence their motivation regarding the use of front-of-pack labels. However, to date no consensus has been reached globally, or in South Africa, on which front-of-pack label format is the most effective at guiding healthier food choices. This study compared the perceptions of five front-of-pack labels formats among consumers in Nelson Mandela Bay.

In this cross-sectional exploratory study with 359 participants, an interviewer-administered survey was conducted at twelve randomly selected retail food locations. The perceptions of five front-of- pack label formats (Reference Intake, Multiple Traffic Light label, Nutri-Score, health endorsement logo and warning labels) were assessed during the survey procedure.

The health endorsement logo achieved the highest number of positive responses (n = 833), closely followed by the Nutri-Score (n = 813), while the Reference Intake received the highest number of negative responses (n = 437). Overall, both the health endorsement logo and Nutri-Score were positively perceived in terms of likeability and comprehensibility. The Multiple Traffic Light label was perceived to be trustworthy (38.7%, n = 139) and useful in terms of providing the necessary nutritional information (39.4%, n = 141). Participants identified the Reference Intake format as being difficult to understand (41.5%, n = 149). Overall, the results of this study point to participants preferring evaluative front-of-pack labels that make use of interpretative colours, symbols and text.

— Ms T Hutton*
Department of Dietetics
Faculty of Health Sciences
Nelson Mandela University
Port Elizabeth
South Africa
Tel: +27 (0) 41 504 4826
Email: tracey.hutton@mandela.ac.za
*Corresponding author

— Prof A Gresse
Department of Dietetics
Faculty of Health Sciences
Nelson Mandela University
Port Elizabeth
South Africa
Tel: +27 (0) 41 504 2048
Email: annelie.gresse@mandela.ac.za

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INTRODUCTION AND BACKGROUND

Globally, non-communicable diseases (NCDs) are responsible for the highest annual mortality rate than all other causes combined (World Health Organization (WHO), 2014). In South

Africa (SA), NCDs account for an estimated 51% of all deaths (WHO, 2018). An increased intake of ultra-processed high fat, sugar and salt (HFSS) foods has been identified as one of the reasons for the rising NCD burden in SA. The influx of transnational food and beverage companies has led to HFSS foods being readily available, affordable and acceptable to the South African consumer (Igumbor *et al*., 2012; Spires *et al*., 2016,). Front-of-pack labels (FoPLs) appear on the front of food packages and make use of interpretative words, colours and symbols to help consumers accurately assess the nutrient profile of food products (Cecchini & Warin, 2016; Hersey *et al*., 2013; Van Kleef & Dagevos, 2015).

Currently, FoPL formats vary in appearance, type of nutritional information displayed and the extent to which they provide evaluative judgments on the healthiness of food products (Kanter *et al*., 2018). Reductive FoPLs display key nutrients from the back-of-pack label (such as fat, sugar and sodium) in a reduced 'snapshot' format. However, they do not provide any evaluative judgement on a food product's nutritional value (Newman *et al*., 2014). Evaluative FoPLs, on the other hand, interpret the nutritional value of a food product and thereby evaluate the overall healthiness of a food product for the consumer (Talati *et al*., 2016). Nutrient specific FoPLs provide specific information on individual nutrient levels while summary indicator FoPLs provide a single, overall judgement of a food product's nutritional value. Hybrid FoPLs contain both nutrient specific and summary indicator information (Talati *et al*., 2019).

Globally, there is much debate regarding which FoPL system is most effective at stimulating informed healthier food choices (Kelly & Jewell, 2018). Positive perception is an essential pre-requisite to label usage (Grunert & Wills, 2007). Consumer preferences directly influence their motivation to engage with and thus use FoPLs (Van Kleef *et al*., 2008). Research has shown that consumers prefer simple label formats (Koen *et al*., 2018a) that are quickly understood (Méjean *et al*., 2014), easy to identify, trustworthy (Hawley *et al*., 2013), accurate, non-coercive (Grunert & Wills, 2007) and useful in terms of information provided (Ducrot *et al*., 2015a).

Considering the global nature of the marketplace, the implementation of a FoPL standard is under formal consideration by the Codex Committee (Codex Alimentarius Commission, 2016). However, as Mandle *et al*. (2015) pointed out, there is a dearth of information on how food labels are perceived in emerging economies such as SA (Selvanathan & Selvanathan, 2004), particularly among urban and rural consumers from lower socioeconomic backgrounds. If a common FoPL standard is to be implemented for use worldwide in a national standard-setting (WHO, 2019), it is important to assess the label preferences of South African consumers to inform future policy decisions as food labelling preferences differ across countries and subgroups (Grunert *et al*., 2010). Considering the paucity of FoPL research conducted in SA, the present study, that was conducted as a Masters study (Hutton, 2020), aimed to address this research gap by assessing the FoPL perceptions of South African consumers.

METHODS

A cross-sectional, exploratory study design was employed to assess the food label preferences of consumers who reside in the Nelson Mandela Bay (NMB) region within the Eastern Cape Province, SA. Ethics approval was granted by Faculty Postgraduate Studies Committee, Nelson Mandela University, Port Elizabeth, SA (ethics clearance reference number H18-HEA-DIET-006).

Sampling, participants and data collection procedure

Food retailers were used as study locations and were identified by means of cluster sampling. The NMB region is divided into 60 wards. Using aerial maps, wards that did not have a food retailer located within the ward were excluded. The remaining wards were then given a number (from one to 25). Twelve wards were then

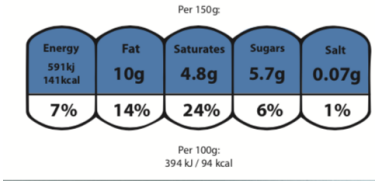
Reference Intake (RI) Monochrome, reductive nutrient specific labels that display levels of energy, total fat, saturates, sugars and salt (Food and Drink Federation, 2014).	
Multiple Traffic Light (MTL) label Format is similar to the RI, however it makes use of interpretative traffic light colours to assist consumers to assess the nutritional levels of food products (United Kingdom Department of Health, 2013).	
Health endorsement logo (HEL) Evaluative, summary indicator labels (Kanter *et al.*, 2018) that are only displayed on products that meet a defined set of nutritional criteria (Kelly & Jewell, 2018)	
Nutri-Score Evaluative label that makes use of a scale of five colours (from dark green to red) with corresponding letters (A to E) to provide an evaluation of healthfulness (Mialon *et al.*, 2018).	
Warning labels (WLs) Nutrient specific, evaluative labels which are displayed on food when a predetermined threshold of a critical nutrient has been exceeded (Neal *et al.*, 2017, Pettigrew *et al.,* 2017).	

FIGURE 1: FRONT-OF-PACK LABELS USED IN THIS RESEARCH STUDY

randomly selected using Microsoft Excel's random number generator function. As a major food retail chain had retail outlets in each of the randomly selected wards, it was decided to approach the food retailer to seek permission to conduct research at each of the identified food retail outlets. This permission was granted.

Study participants (N=359) had to be older than 18 years, willing and legally able to provide written informed consent, able to read and understand English (as the stimuli used was presented in English) and reside in NMB. On the day of data collection, fieldworkers approached the first person exiting the retailer. If that person declined or was unable to participate, the next person exiting was approached. A short description of the study was provided, after which the participants were screened for eligibility and informed consent was attained. Face-to-face interviews were held in a quiet area near the exit from the retailer.

Data collection

Data were collected by means of an interviewer-administered questionnaire. The questionnaire was adapted, with permission, from a questionnaire used in the NutriNet-Santé study that was conducted in France (Julia & Hercberg, 2017a). For the present study, the adapted questionnaire and survey procedure was tested for face validity by experts in the field and construct validity during a pilot study conducted by the principal researcher with the assistance of a dietitian and trained BSc Dietetics students, at one of the stores of the food retailer selected for the study by including participants of different ages, genders and races. The full data collection procedure was done during the pilot

TABLE 1: DEMOGRAPHIC PROFILE OF PARTICIPANTS (N = 359)

Category	Sub-category	n (%)
Gender	Male	127 (35.3)
	Female	232 (64.7)
Age	<32	122 (34.0)
	32 - 47	122 (34.0)
	>47	115 (32.0)
Ethnicity	Black	252 (70.2)
	White	39 (10.9)
	Mixed-race	60 (16.7)
	Indian	4 (1.1)
	Asian	1 (0.3)
	Other	3 (0.9)
Home Language	English	41 (11.4)
	Afrikaans	72 (20.1)
	IsiXhosa	234 (65.2)
	Other	12 (3.3)
Relationship Status	Single	171 (47.6)
	In a relationship/engaged	35 (9.7)
	Married	121 (33.7)
	Divorced	12 (3.3)
	Widowed	20 (5.6)
Number of Dependents	0	78 (21.7)
	1	75 (20.9)
	2	88 (24.5)
	3	54 (15.0)
	4	36 (10.0)
	5	15 (4.2)
	6	6 (1.7)
	7	3 (0.8)
	8	3 (0.8)
	9	1 (0.3)
Level of Education	Never attended school	2 (0.6)
	Primary school	45 (12.5)
	High school	222 (61.8)
	Diploma	60 (16.7)
	Degree	17 (4.7)
	Post-graduate	13 (3.4)
Employment Status	Unemployed	125 (34.8)
	Employed	139 (38.7)
	Self-employed	33 (9.2)
	Student	28 (7.8)
	Retired	34 (9.3)
Household Income	R0 – R1058	60 (16.7)
	R1059 – R4250	89 (24.8)
	R4251 – R9250	47 (13.1)
	R9251 – R20 000	28 (7.8)
	R20 001 - R31 833	16 (4.5)
	R31 834 – R65 583	7 (1.9)
	R65 584 – R141 500	2 (0.6)
	More than R141 500	0 (0)
	I don't know.	20 (5.6)
	I don't wish to tell you.	90 (25.1)

study to measure the time that it would take to complete the process and to determine whether the participants understood the questions.

Before commencing with the survey procedure, a brief explanation of each FoPL was provided to the participant. Section one of the questionnaire assessed demographic information; section two comprised a ranking task to assess the objective understanding of the different FoPLs, while section three ascertained participant FoPL preferences. To assess FoPL preferences, participants were shown images of five FoPLs (Figure 1). Participants were then asked to choose one FoPL that best corresponded with the proposed statement. The FoPLs were displayed to participants in varying orders, based on a Latin Square Design, to control for potential order effects. Participants were only able to select one FoPL per statement and a "none of these labels" option was included. Statements compared FoPLs in terms of liking, trustworthiness, usefulness, feelings of coercion and perceived ease of identification, use and understanding. The literature has shown that these dimensions influence consumer perception and thus the use and understanding of food labels. Similar dimensions have also been previously applied in several labelling studies (Ducrot *et al*., 2015a; Julia & Hercberg, 2017b; Mejean *et al*., 2013; Talati *et al.*, 2019).

Statistical Analysis

Data were captured by the primary researcher on Microsoft Excel and then analysed using Statistica Version 13 (2018). Frequencies and percentages were calculated to assess the most frequently chosen FoPL in response to each statement. Pearson chi-square tests were used to determine associations between sociodemographic factors and label preferences. Where significant differences were found, odds ratio tests were conducted to compare individual cases. All tests of significance were two-sided and a p-value < 0.05 was considered significant.

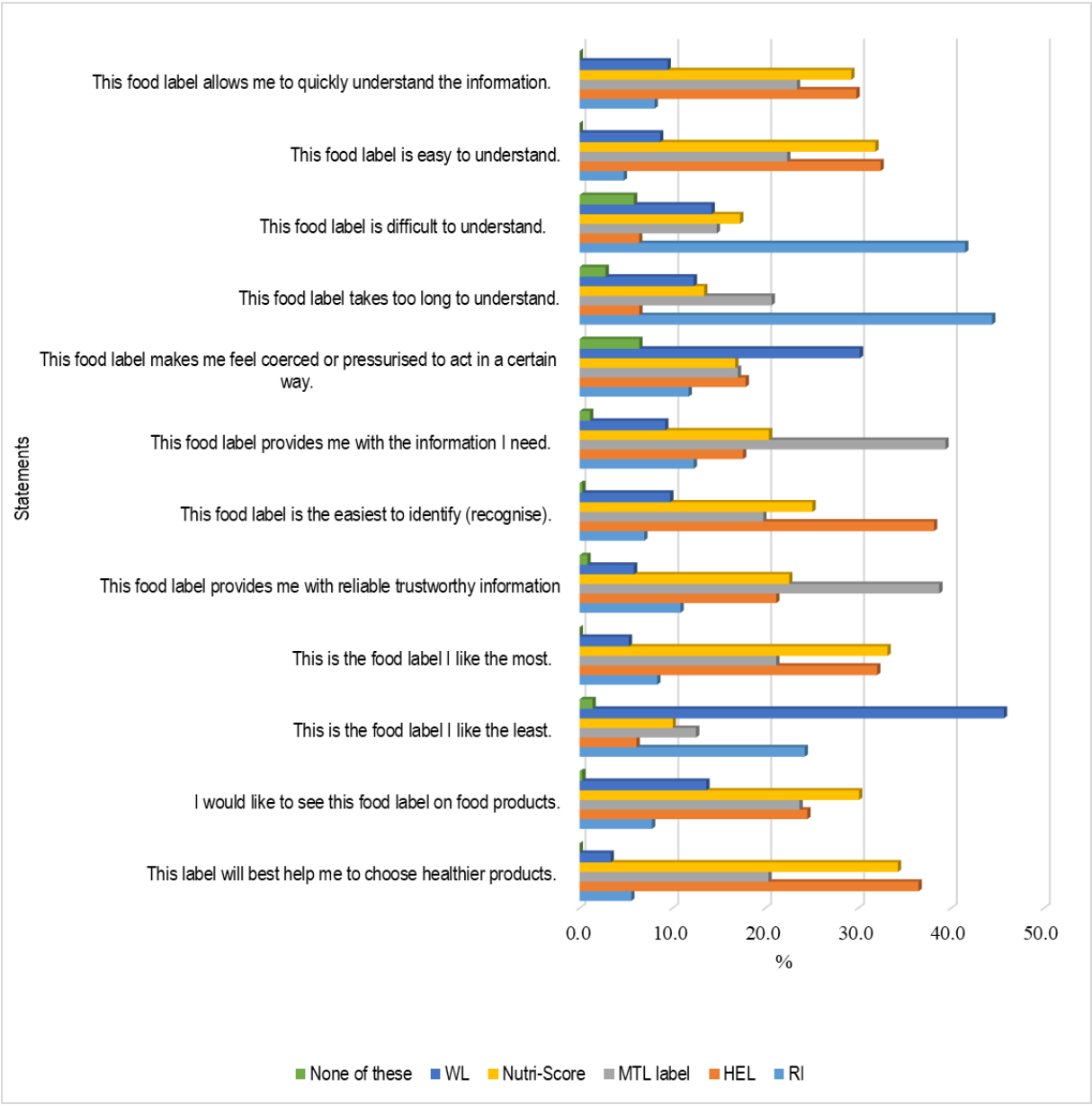
RESULTS

Sociodemographic information

Table 1 details the participants' demographic data. The majority of participants were female (64.7%), which may be due to the fact that in SA, females are primarily responsible for household grocery shopping (Koen, 2017; Van der Merwe *et al*., 2013). The mean age of participants was 41.2 (SD = 16.25, range: 18–87 years). The majority of the participants were black (70.2%) and spoke isiXhosa as their home language (65.2%). Most participants had some form of high school (61.8%) or post-high school qualification (24.8%). Just over a third of participants were unemployed (34.8%), which is in line with NMB's unemployment rate of 36.6% (Eastern Cape Socio Economic Consultative Council, 2017). A total of 149 (41.5%) of the participants reported a monthly household income of ≤ R4 250 and were thus categorised as low income earners (Standard Bank, 2016).

FoPL preferences across all subgroups

The positive domain statements assessed aspects such as likeability, usefulness, noticeability, credibility and comprehensibility. The health endorsement logo (HEL) (833 positive responses) was the FoPL that received the overall highest number of favourable responses across all the positive dimension statements, followed closely by the Nutri-Score (813 positive responses) and the Multiple Traffic Light (MTL) label (749 positive responses). More specifically, the HEL and Nutri-Score received a similar percentage of responses to the statements: 'this label will best help me to choose healthier products' (HEL–36.5%, Nutri-Score – 34.3%); 'this is the food label I like the most' (Nutri-Score – 33.1%, HEL – 32%); 'this food label is easy to understand'(HEL – 32.4%, Nutri-Score – 31.8%) and 'this food label allows me to quickly understand the information' (HEL – 29.8%, Nutri -Score – 29.2%). Participants were of the opinion that the HEL would be easiest to identify (38.2%). The MTL label was perceived as reliable and trustworthy (38.7%) and most useful in contributing necessary information



WL, warning label; MTL, multiple traffic light; HEL, health endorsement logo; RI, Reference Intake

FIGURE 2: FRONT-OF-PACK LABELS CHOSEN IN RESPONSE TO THE STATEMENTS ASSESSING FRONT-OF-PACK LABEL PREFERENCES

(39.4%). The negative domain statements assessed aspects such as dislike, complexity of information and any perceived feelings of coercion. The Reference Intake (RI) (437 negative responses) and warning labels (WLs) (367 negative responses) yielded the highest number of unfavourable responses on the negative dimension statements. The WL received the highest percentage of responses to the statements: 'this is the food label I like the least' (45.7%) and 'this food label makes me feel coerced or pressurised to act in a certain way' (30.2%). The RI was perceived as taking too long (44.4%) and being too difficult to understand (41.5%). Figure 2 shows the percentage each FoPL received in relation to each of the statements.

FoPL preferences of specific subgroups

Significant differences were found among different ethnicities with regards to which FoPL was perceived as most reliable and trustworthy ($p<0.008$). Black participants did not find the RI

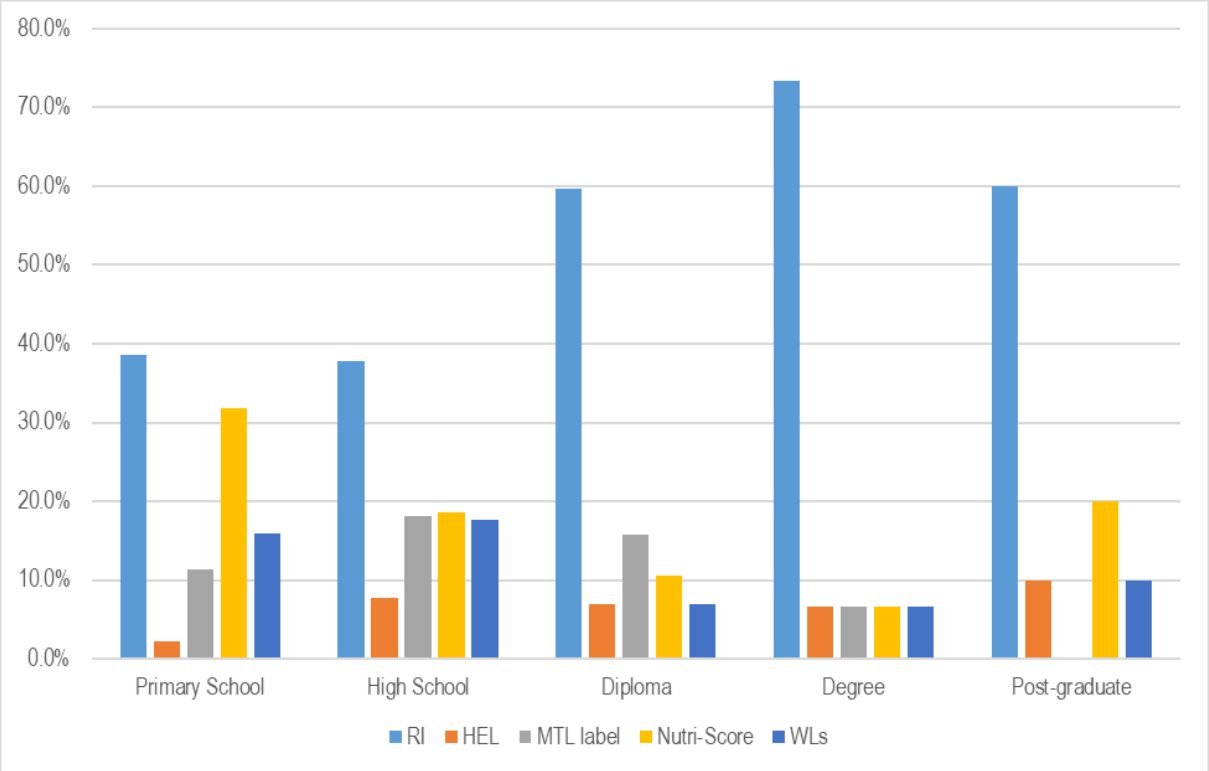
as trustworthy as white and mixed-race participants. Only 7.5% of black participants chose the RI as most trustworthy, when compared to the white (21.6%) and mixed-race participants (18.6%). Overall, the MTL label scored highest in trustworthiness across all ethnicities. More specifically, 37.3% of black participants, 48.7% of white participants and 37.3% of mixed-race participants chose the MTL label as being most trustworthy. There was also evidence ($p<0.056$) that participants with different levels of education perceived different labels as being most difficult to understand. Participants with some form of primary school education perceived the Nutri-Score as being more difficult to understand (31.8%), when compared to participants with higher levels of education. Yet, across all levels of education, the RI was consistently chosen as being the most difficult label to understand (Figure 3). Significant differences were found among genders with regards to which FoPL was easiest to understand ($p<0.00002$) and most useful in guiding healthier food purchases ($p<0.01$). Males perceived the Nutri-Score to be easiest to understand (48.8%), whereas the females chose the HEL (36.4%) (Figure 4). Males (44.1%) also indicated that the Nutri-Score would be most useful in terms of identifying healthier food products, whilst females (36.6%) perceived the HEL to be most helpful in this.

DISCUSSION

The present study provided new evidence on how five FoPL formats, currently used worldwide (Talati *et al*., 2019), are perceived by South African consumers. In SA, no published data could be found that directly compare the perceptions of the five FoPL formats used in this study. Overall, when assessing the total number of positive responses, the HEL was most favourably perceived. However, the Nutri-Score achieved a very similar number of positive responses (833 vs 813 responses respectively). Both labels were positively perceived in aspects such as aiding consumers to choose healthier food products, likeability and comprehensibility. Participants found that the HEL was easiest to identify. The HEL, designed for the purposes of the present study, used bright colours typically associated with health (yellow, blue and green) (Wąsowicz *et al*., 2015). In addition, a white background has been shown to increase saliency (Cabrera *et al*., 2017). Previous research has shown that polychromatic food labels are more noticeable than monochromatic food labels (Antunez *et al*., 2015; Becker *et al*., 2015).

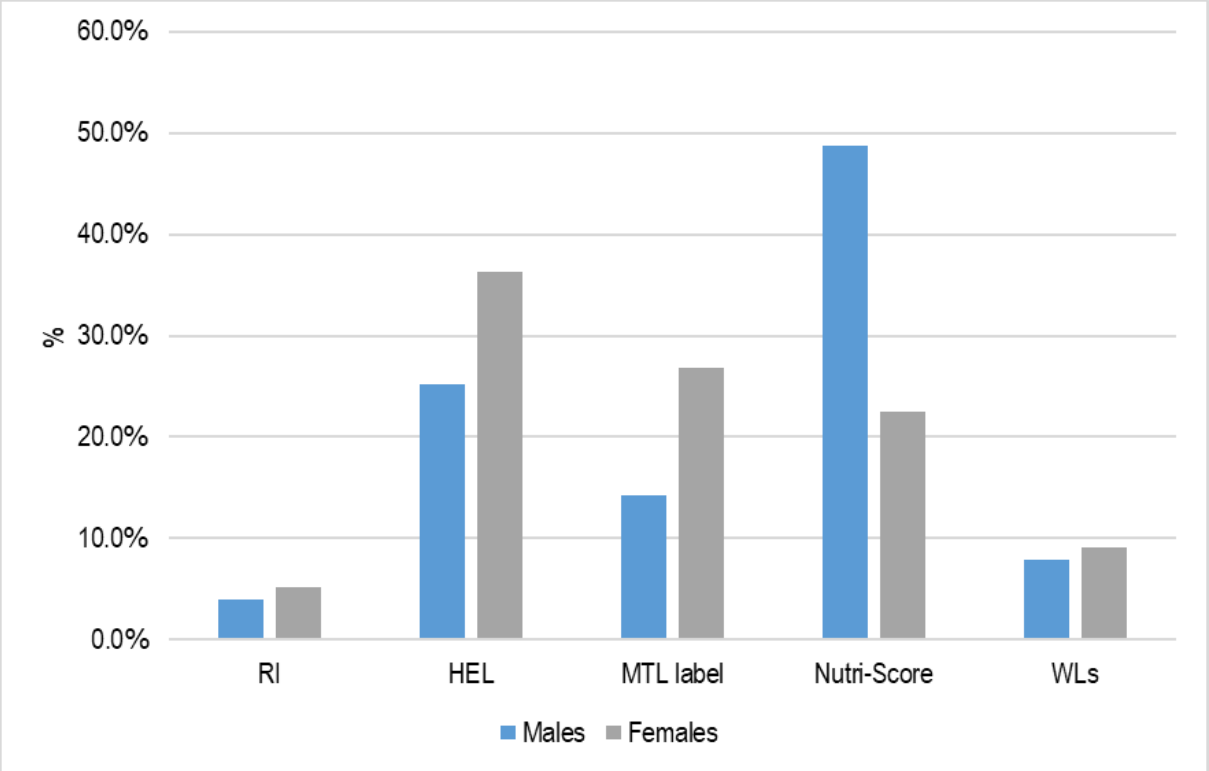
As with the present study, previous research found that HELs are generally positively perceived by South African consumers (Koen *et al*., 2018b). HELs are widely used in SA, where up to five HELs may be displayed on a single food product (Koen *et al*., 2018a). It can thus be assumed that some participants may have been familiar with the HEL format. This familiarity with HELs may have influenced participant perceptions (Talati *et al*., 2019). Although research conducted on the HEL has shown favourable results both locally (Koen *et al*., 2018a) and internationally (De la Cruz-Góngora *et al*., 2017; Swedish Food Agency & Ipsos, 2015), HELs have been criticised for not allowing negative evaluations of a products' nutritional value. This may be problematic as research has shown that in the presence of a HEL, consumers may over-estimate a product's nutritional value, which may lead to overconsumption of the food product (Van Kleef & Dagevos, 2015). Furthermore, FoPLs that allow for negative evaluations act as implicit subconscious cues that guide automatic and impulsive reactions to food (Rohr *et al*., 2015). Negative evaluative judgements have also been shown to influence food purchasing decisions more often than positive evaluative judgements (Scarborough *et al*., 2015).

The Nutri-Score performed well in all positive dimension statements. The Nutri-Score was also chosen as the second most trusted FoPL (after the MTL label). Although positively perceived overall, participants with lower education levels identified the Nutri-Score as being difficult to understand. This contradicts the findings of Ducrot *et al*. (2015b) who reported that the Nutri-Score was well understood among individuals with lower



RI, Reference Intake; HEL, health endorsement logo; MTL, multiple traffic light; WLs, warning labels

FIGURE 3: COMPARISON OF LEVELS OF EDUCATION IN RESPONSE TO THE STATEMENT "THIS FOOD LABEL IS DIFFICULT TO UNDERSTAND."



RI, Reference Intake; HEL, health endorsement logo; MTL, multiple traffic light; WLs, warning labels

FIGURE 4: COMPARISON OF GENDERS IN RESPONSE TO THE STATEMENT "THIS FOOD LABEL IS EASY TO UNDERSTAND."

TABLE 2: COMPARISON OF THE FRONT-OF-PACK LABEL PERCEPTIONS OF THE PRESENT STUDY WITH SIMILAR STUDIES CONDUCTED WORLDWIDE

Front-of-pack label perception studies	Present study n = 359	French NutriNet-Sante´ cohort study n = 13 578 (Ducrot *et al*., 2015a)*	French NutriNet-Santé cohort study n = 21 702 (Julia *et al*., 2017)* **	Front-of-pack International Comparative Experiment n = 12 015 (Talati *et al*., 2019)**
Countries in which the studies were conducted.	South Africa	France	France	12 Countries+
Statement	Most selected label in relation to the proposed statement.			
This label will best help me to choose healthier products.	HEL	GDA	Graded	Not included
I would like to see this food label on food products.	Graded	GDA	Graded	Not included
This is the food label I like the least.	WL	HEL	RI	Not included
This is the food label I like the most.	Graded	GDA	Graded	MTL label
This food label provides me with reliable trustworthy information.	MTL label	GDA	MTL label	MTL label
This food label is the easiest to identify (recognise).	HEL	Graded	Graded	Not included
This food label provides me with the information I need.	MTL label	GDA	MTL label	MTL label
This food label makes me feel coerced or pressurised to act in a certain way.¥	WL	None of these	None of these	Not included
This food label takes too long to understand.	RI	GDA	RI	RI
This food label is difficult to understand.	RI	GDA	RI	RI
This food label is easy to understand.	HEL	Graded	Graded	WL
This food label allows me to quickly understand the information.	HEL	Graded	Graded	Not included

HEL, health endorsement logo; GDA, Guideline Daily Amounts; WL, warning label; MTL, multiple traffic light; RI, Reference Intake.
*WL was not included in the study.
**HEL was not included in the study.
+Argentina, Australia, Bulgaria, Canada, Denmark, France, Germany, Mexico, Singapore, Spain, the UK and the USA.
¥ Phrased as "this FOP label is guilt laden in the study conducted by Julia et al. (2017) and "this FOP label makes me uncomfortable" conducted by Ducrot et al. (2015a).

education levels. Research has shown that the Nutri-Score performs well in terms of consumer perception, objective understanding, influencing portion sizes and improved nutritional quality of food purchases (Ducrot *et al.*, 2015a; Ducrot *et al*., 2015b; Ducrot *et al*., 2016; Egnell *et al*., 2018; Julia *et al*., 2016; Julia *et al*., 2017).

The MTL label was favourably perceived among all subgroups as being most trustworthy and useful in providing the necessary nutritional information. International research shows that the MTL label is viewed as trustworthy across various countries (Egnell *et al*., 2019; Julia *et al*., 2017; Talati *et al*., 2019). Talati *et al*. (2019) has suggested that the presence of the nutrient specific information on the MTL label inspires trust among consumers, as opposed to the simpler label formats (such as the HEL). This is important, as both local (Van der Colff *et al*., 2016) and international (Cowburn & Stockley, 2005; Hawley *et al*., 2013) research shows that consumers are more likely to use food labels that they deem as credible. The fact that

participants preferred the MTL label on all positive dimension aspects, compared to the RI, highlights the influence of symbolic colours (i.e. 'red' meaning 'stop' and 'green' meaning 'go') on consumer perceptions of FoPLs. Considering that the monochromatic RI displayed similar nutrient specific information as the MTL label, it is noticeable that the addition of symbolic colours increased participants' perceptions regarding aspects such as likeability, understanding, credibility, usefulness and noticeability. This is in line with a review conducted by Hersey *et al*. (2013), which showed that consumers more easily understand nutrient specific FoPLs that make use of symbolic colours compared to purely monochromatic reductive labels.

The WL was chosen as the least liked label. Furthermore, participants felt that it elicited feelings of coercion or being pressurised to act in a certain way. In the study conducted by Talati *et al*. (2019), in which the WL was also the least liked FoPL, the authors suggested this may be due to the stark negative nature of the label. Egnell *et al*. (2018) proposed that consumers may perceive the WLs more positively if salient colours were added to the label design. This corresponds with focus group discussions held by Vargas-Meza *et al*. (2019), which found that red WLs were better perceived than black WLs by Mexican consumers. Research has shown that WLs have performed well in terms of stimulating healthier food choices (Correa *et al*., 2019) and thereby potentially healthier product reformulations (Ares *et al*., 2018).

The present study is particularly useful, as results can be compared with international studies that have used similar dimensions to assess FoPL perceptions (Table 2). When comparing the present study to similar international studies, the Nutri-Score was also positively perceived among participants in different countries. Similarly, the MTL label is consistently viewed as being trustworthy and providing needed information. The RI, on the other hand, is consistently perceived as being difficult to understand in many of the countries.
The study had several limitations. Enlarged images of the FoPLs were displayed to the participants. In a real-life shopping environment, consumers would be exposed to smaller images of the FoPLs displayed on actual food packages. This may have influenced the perception of participants on aspects such as ease of identification. Furthermore, perceptions were assessed in a survey setting and not in an actual shopping environment (where factors such as marketing promotions, health claims and time-constraints may influence consumers' perceptions). Lastly, the survey was conducted in NMB and therefore the results cannot be generalised to the greater South African population. The study, however, provides novel information on FoPL preferences among local consumers and thereby may inform future FoPL policies in SA. Further research should include assessing FoPL perceptions across culturally diverse groups in SA, particularly among rural South Africans.

CONCLUSION

Overall, the results of this study indicate that consumers' prefer evaluative FoPL systems which make use of interruptive aids such as symbolic colour and symbols. Furthermore, consumers view reductive FoPL formats, such as the RI, as being difficult to understand. The present study also provides insight into how local South African consumers' perceptions of FoPL differ when compared to other countries. This is important, considering the proposed aim of standardising FoPL systems worldwide.

REFERENCES

Antunez, L., Gimenez, A., Maiche, A. & Ares, G., 2015, 'Influence of interpretation aids on attentional capture, visual processing, and understanding of front-of-package nutrition labels', *Journal of Nutrition Education and Behaviour,* 47(4):292-299, viewed 2 April 2020, from doi: 10.1016/j.jneb.2015.02.010.

Ares, G., Aschemann-Witzel, J., Curutchet, M. R., Antúnez, L., Machín, L., Vidal, L., Martínez, J. & Giménez, A., 2018, 'Nutritional warnings

and product substitution or abandonment: policy implications derived from a repeated purchase simulation', *Food Quality and Preference,* 65:40- 48, viewed 21 December 2018, from doi: 10.1016/j.foodqual.2017.12.001.

Becker, M. W., Bello, N. M., Sundar, R. P., Peltier, C. & Bix, L., 2015, 'Front of pack labels enhance attention to nutrition information in novel and commercial brands', *Food Policy,* (56):76-86, viewed 19 February 2019, from doi: 10.1016/j.foodpol.2015.08.001.

Cabrera, M., Machin, L., Arrua, A., Antunez, L., Curutchet, M. R., Gimenez, A. & Ares, G., 2017, 'Nutrition warnings as front-of-pack labels: influence of design features on healthfulness perception and attentional capture', *Public Health Nutrition,* 20(18):3360-3371, viewed 9 July 2019, from doi: 10.1017/ S136898001700249X.

Cecchini, M. & Warin, L., 2016, 'Impact of food labelling systems on food choices and eating behaviours: a systematic review and meta-analysis of randomized studies', *Obesity Reviews,* 17(3):201-210, viewed 18 May 2019, from doi: 10.1111/obr.12364.

Codex Alimentarius Commission, 2016, *Joint FAO/WHO Food Standards Programme. Codex Committee on Food Labelling. Forty-Third Session, Ottawa, Ontario, Canada, 9–13 May 2016. Proposal for new work concerning a global standard for front of pack interpretive nutrition labelling*, viewed 16 April 2020, from http://www.fao.org/fao-who-codexalimentarius/ sh- proxy/en/?lnk=1&url=https%253A%252F% 252Fworkspace.fao.org%252Fsites% 252Fcodex%2 52FMeetings%252FCX-714-43%252FCRD%252Ffl43_CRD17x.pdf.

Correa, T., Fierro, C., Reyes, M., Dillman Carpentier, F. R., Taillie, L. S. & Corvalan, C., 2019, 'Responses to the Chilean law of food labeling and advertising: exploring knowledge, perceptions and behaviors of mothers of young children', *The International Journal of Behavioral Nutrition and Physical Activity,* 16 (1):21, viewed 18 June 2019, from doi: 10.1186/s12966-019-0781-x.

Cowburn, G. & Stockley, L., 2005, 'Consumer understanding and use of nutrition labelling: a systematic review', *Public Health Nutrition,* 8 (1):21-28, viewed 12 February 2018, from doi 10.1079/PHN2004666.

De la Cruz-Góngora, V., Torres, P., Contreras-Manzano, A., Jáuregui de la Mota, A., Mundo-Rosas, V., Villalpando, S. & Rodríguez-Oliveros, G., 2017, 'Understanding and acceptability by Hispanic consumers of four front-of-pack food labels', *International Journal of Behavioral Nutrition and Physical Activity,* 14 (1):1751, viewed 14 July 2019, from doi: 10.1186/s12889-019-8108-z.

Ducrot, P., Julia, C., Méjean, C., Kesse-Guyot, E., Touvier, M., Fezeu, L. K., Hercberg, S. & Peneau, S., 2016, 'Impact of different front-of-pack nutrition labels on consumer purchasing intentions: a randomized controlled trial', *American Journal of Preventive Medicine,* 50 (5): 627- 636, viewed 14 June 2018, from doi: 10.1016/j.amepre.2015.10.020.

Ducrot, P., Méjean, C., Julia, C., Kesse-Guyot, E., Touvier, M., Fezeu, L., Hercberg, S. & Péneau, S., 2015a, 'Effectiveness of front-of-pack nutrition labels in French adults: results from the NutriNet-Sante cohort study', *PLOS One,* 10(10):e0140898, viewed 23 July 2018, from doi: 10.1371/journal.pone.0140898.

Ducrot, P., Méjean, C., Julia, C., Kesse-Guyot, E., Touvier, M., Fezeu, L. K., Hercberg, S. & Péneau, S., 2015b, 'Objective understanding of front-of-package nutrition labels among nutritionally at-risk individuals', *Nutrients,* 7 (8):7106-7125, viewed 20 December 2018, from doi: 10.3390/nu7085325.

Eastern Cape Socio Economic Consultative Council, 2017, *Nelson Mandela Bay Metro Municipality socio-economic review and outlook 2017*, viewed 10 April 2020, from https://www.ecsecc.org/documentrepository/ informationcentre/nelson-mandela-bay-metro-municipality_31887.pdf

Egnell, M., Kesse-Guyot, E., Galan, P., Touvier, M., Rayner, M., Jewell, J., Breda, J., Hercberg, S. & Julia, C., 2018a, 'Impact of front-of-pack nutrition labels on portion size selection: an experimental study in a French cohort', *Nutrients,* 10(9):e1268, viewed 13 March 2019, from doi:10.3390/nu10091268.

Egnell, M., Talati, Z., Gombaud, M., Galan, P., Hercberg, S., Pettigrew, S. & Julia, C., 2019, 'Consumers' responses to front-of-pack nutrition labelling: results from a sample from the Netherlands', *Nutrients,* 11(8):1817, viewed 2 April 2020, from doi: 10.3390/nu11081817.

Food and Drug Federation, 2014, *Food and drink labelling: a tool to encourage healthier eating*, viewed 4 June 2018, from http://www.foodlabel.org.uk/corporate_pubs/Food_Drink_Labelling_toolkit.pdf.

Grunert, K. G., Wills, J. M. & Fernandez-Celemin, L., 2010, 'Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK', *Appetite,* 55(2):177-89, viewed 7 March 2018, from doi: 10.1016/j.appet.2010.05.045.

Grunert, K. G. & Wills, J. M., 2007, 'A review of European research on consumer response to nutrition information on food labels', *Journal of Public Health,* 15(5):385-399, viewed 14 March 2018, from doi: 10.1007/s10389-007-0101-9.

Hawley, K. L., Roberto, C. A., Bragg, M. A., Liu, P. J., Schwartz, M. B. & Brownell, K. D., 2013, 'The science on front-of-package food labels', *Public Health Nutrition,* 16(3):430-439, viewed 2 February 2018, from doi: 10.1017/S1368980012000754.

Hersey, J. C., Wohlgenant, K. C., Arsenault, J. E., Kosa, K. M. & Muth, M. K., 2013, 'Effects of front-of-package and shelf nutrition labeling systems on consumers', *Nutrition Reviews,* 71 (1):1- 14, viewed 25 March 2019, from doi: 10.1111/nure.12000.

Hutton, T.R., 2020, 'Front-of-pack label preferences and understanding among consumers in the Nelson Mandela Bay area', MSc. dissertation, Dept. of Human Nutrition and Dietetics, Nelson Mandela University.

Igumbor, E. U., Sanders, D., Puoane, T. R., Tsolekile, L., Schwarz, C., Purdy, C., Swart, R., Durão, S. & Hawkes, C., 2012, 'Big Food, the consumer food environment, health, and the policy response in South Africa', *PLOS Medicine,* 9(7):e1001253, viewed 19 December 2019, from doi: 10.1371/journal.pmed.1001253.

Julia, C., Blanchet, O., Méjean, C., Péneau, S., Ducrot, P., Allès, B., Fezeu, L. K., Touvier, M., Kesse-Guyot, E. & Singler, E., 2016, 'Impact of the front-of-pack 5-colour nutrition label (5-CNL) on the nutritional quality of purchases: an experimental study', *International Journal of Behavioral Nutrition and Physical Activity,* 13 (1):101, viewed 20 December 2019, from doi: 10.1186/s12966-016-0416-4.

Julia, C. & Hercberg, S., 2017a, 'Development of a new front-of-pack nutrition label in France: the five-colour Nutri-Score', *Panorama*, 3 (4):712-725, viewed 10 April 2020, from https://apps.who.int/iris/handle/10665/325207.

Julia, C. & Hercberg, S., 2017b, 'Nutri-Score: evidence of the effectiveness of the French front-of- pack nutrition label', *Ernahrungs Umschau,* 64(12):181-187, viewed 23 March 2018, from doi: 10.4455/eu.2017.048.

Julia, C., Peneau, S., Buscail, C., Gonzalez, R., Touvier, M., Hercberg, S. & Kesse-Guyot, E., 2017, 'Perception of different formats of front-of-pack nutrition labels according to sociodemographic, lifestyle and dietary factors in a French population: cross-sectional study among the NutriNet-Sante cohort participants', *British Medical Journal Open,* 7(6):e016108, viewed 27 August 2019, from doi: 10.1136/bmjopen-2017-016108.

Kanter, R., Vanderlee, L. & Vandevijvere, S., 2018, 'Front-of-package nutrition labelling policy: global progress and future directions', *Public Health Nutrition,* 21(8):1399-1408, viewed 16 December 2018, from doi: 10.1017/S1368980018000010.

Kelly, B. & Jewell, J., 2018, '*What is the evidence on the policy specifications, development processes and effectiveness of existing front-of-pack food labelling policies in the WHO European region?',* viewed 10 April 2020, from https://www.euro.who.int/__data/assets/pdf_file/0007/384460/Web-WHO-HEN-Report-61-on-FOPL.pdf.

Koen, N., 2017, 'The influence of nutrition labelling and logos on food purchasing behaviour in Cape Town, Western Cape, South Africa', PhD thesis, Division of Human Nutrition, Stellenbosch University.

Koen, N., Wentzel-Viljoen, E. & Blaauw, R., 2018a, 'The development of a single health-endorsement logo for South Africa', *Public Health Nutrition*, 21(8):1444-1454, viewed 19 March 2018, from doi: 10.1017/S1368980018000034.

Koen, N., Wentzel□Viljoen, E., Nel, D. & Blaauw, R., 2018b, 'Consumer knowledge and use of food and nutrition labelling in South Africa: a cross-sectional descriptive study', *International Journal of Consumer Studies*, 42 (3): 335-346, viewed 7 February 2018, from doi: 10.1111/ijcs.12422.

Mandle, J., Tugendhaft, A., Michalow, J. &

Hofman, K., 2015, 'Nutrition labelling: a review of research on consumer and industry response in the global South', *Global Health Action,* 8:25912, viewed 11 February 2019, from doi: 10.3402/gha.v8.25912.

Méjean, C., Macouillard, P., Péneau, S., Hercberg, S. & Castetbon, K., 2013, 'Consumer acceptability and understanding of front-of-pack nutrition labels', *Journal of Human Nutrition and Dietetics,* 26(5):494-503, viewed 17 February 2018, from doi: 10.1111/jhn.12039

Méjean, C., Macouillard, P., Péneau, S., Lassale, C., Hercberg, S. & Castetbon, K., 2014, 'Association of perception of front-of-pack labels with dietary, lifestyle and health characteristics', *PLOS One,* 9(3):e90971., viewed 24 April 2018, from doi: 10.1371/journal.pone.0090971.

Mialon, M., Julia, C. & Hercberg, S., 2018, 'The policy dystopia model adapted to the food industry: the example of the Nutri-Score saga in France', *Journal of the World Public Health Nutrition Association,* 9(2):109-120, viewed 20 December 2018, from doi: 10.26596/wn.201892109-120.

Neal, B., Crino, M., Dunford, E., Gao, A., Greenland, R., Li, N., Ngai, J., Ni Mhurchu, C., Pettigrew, S., Sacks, G., Webster, J. & Wu, J., 2017, 'Effects of different types of front-of-pack labelling information on the healthiness of food purchases—a randomised controlled trial', *Nutrients*, 9(12):1284, viewed 6 April 2018, from doi: 10.3390/nu9121284.

Newman, C. L., Howlett, E. & Burton, S., 2014, 'Shopper response to front-of-package nutrition labeling programs: potential consumer and retail store benefits', *Journal of Retailing,* 90 (1):13-26, viewed 5 April 2018, from doi: 10.1016/j.jretai.2013.11.001.

Pettigrew, S., Talati, Z., Miller, C., Dixon, H., Kelly, B. & Ball, K., 2017, 'The types and aspects of front-of-pack food labelling schemes preferred by adults and children', *Appetite*, 109:115-123, viewed 21 February 2018, from doi: 10.1016/j.appet.2016.11.034.

Rohr, M., Kamm, F., Koenigstorfer, J., Groeppel-Klein, A. & Wentura, D., 2015, 'The color red supports avoidance reactions to unhealthy food', Experimental Psychology, 62 (5):335-345, viewed 8 July 2019, from doi: 10.1027/1618-3169/a000299.

Scarborough, P., Matthews, A., Eyles, H., Kaur, A., Hodgkins, C., Raats, M. M. & Rayner, M., 2015, 'Reds are more important than greens: how UK supermarket shoppers use the different information on a traffic light nutrition label in a choice experiment', *International Journal of Behavioral Nutrition and Physical Activity.* 12(1):151, viewed 15 March 2019, from doi: 10.1186/s12966-015-0319-9.

Selvanathan, S. & Selvanathan, E. A., 2004, 'Empirical regularities in South African consumption patterns', *Applied Economics,* 36 (20):2327-2333, viewed 22 February 2019, from doi: 10.1080/0003684042000280328.

Spires, M., Delobelle, P., Sanders, D., Puoane, T., Hoelzel, P. & Swart, R., 2016, 'Diet-related non- communicable diseases in South Africa: determinants and policy responses', *South African Health Review,* (1):35-42, viewed 10 April 2020, from http://hdl.handle.net/10520/EJC189320.

Standard Bank, 2016, *The SA consumer in brief,* viewed 18 February 2020, from https://www.salga.org.za/SALGA%20Council%20of%20Mayors%20Web/Documents/Standard%20Bank%20SALGA.pdf.

Swedish Food Agency & Ipsos, 2015, *A qualitative study concerning the keyhole's influence over 25 years on product developmen*t, viewed 16 April 2020, from https://www.livsmedelsverket.se/globalassets/publikationsdatabas/rapporter/2015/keyholes-influence-on-product-development-2015.pdf?AspxAutoDetectCookieSupport=1.

Talati, Z., Egnell, M., Hercberg, S., Julia, C. & Pettigrew, S., 2019, 'Consumers' perceptions of five front-of-package nutrition labels: an experimental study across 12 countries', *Nutrients,* 11(8):e1934, viewed 3 June 2020, from doi: 10.3390/nu11081934.

Talati, Z., Pettigrew, S., Kelly, B., Ball, K., Dixon, H. & Shilton, T., 2016, 'Consumers' responses to front-of-pack labels that vary by interpretive content', *Appetite,* 101:205-213, viewed 6 April 2018, from doi: 10.1016/j.appet.2016.03.009.

United Kingdom Department of Health, 2013, *Guide to creating a Front of Pack (FOP) nutrition label for pre-packed products sold through retail outlets*, viewed 10 April 2020, from https://www.food.gov.uk/sites/default/files/

media/document/fop-guidance_0.pdf.

Van der Colff, N., Van der Merwe, D., Bosman, M., Erasmus, A. & Ellis, S., 2016, 'Consumers' prepurchase satisfaction with the attributes and information of food labels', *International Journal of Consumer Studies.* 40(2):220-228, viewed 12 February 2018, from doi: 10.1111/ ijcs.12245.

Van der Merwe, D., Bosman, M., Ellis, S., de Beer, H. & Mielmann, A., 2013 'Consumers' knowledge of food label information: an exploratory investigation in Potchefstroom, South Africa', *Public Health Nutrition,* 16(3):403 -408, viewed 7 February 2018, from doi: 10.1017/S136898001200287X.

Van Kleef, E. & Dagevos, H., 2015, 'The growing role of front-of-pack nutrition profile labeling: a consumer perspective on key issues and controversies', *Critical Reviews in Food Science and Nutrition,* 55(3):291-303, viewed 25 May 2018, from doi: 10.1080/10408398.2011.653018.

Van Kleef, E., Van Trijp, H., Paeps, F. & Fernández-Celemín, L., 2008, 'Consumer preferences for front-of-pack calories labelling', *Public Health Nutrition,* 11(2):203-213, viewed 6 April 2018, from doi: 10.1017/ S1368980007000304.

Vargas-Meza, J., Jáuregui, A., Pacheco-Miranda, S., Contreras-Manzano, A. & Barquera, S., 2019, 'Front-of-pack nutritional labels: understanding by low- and middle-income Mexican consumers', *PLOS One,* 14 (11):e0225268, viewed 11 March 2020, from doi: 10.1371/journal.pone.0225268.

Wąsowicz, G., Styśko-Kunkowska, M. & Grunert, K. G., 2015, 'The meaning of colours in nutrition labelling in the context of expert and consumer criteria of evaluating food product healthfulness', *Journal of Health Psychology,* 20(6):907-920, viewed 18 March 2019, from doi: 10.1177/1359105315580251

World Health Organization, 2018, *Noncommunicable diseases country profiles 2018*, viewed 26 February 2020, from https:// www.who.int/nmh/publications/ncd-profiles-2018/en/.

World Health Organization, 2019, *Guiding principles and framework manual for front-of-pack labelling for promoting healthy.diets,* viewed 16 April 2020, from https://www.who.int/ nutrition/publications/policies/guidingprinciples-labelling-promoting- healthydiet.pdf?ua=1.