Chapter 13: Nutrition Labelling on Food Products and Menus

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Abstract: Nutrition label information on food and drink products is intended to educate and enable consumers to make wise food choices. Legislation and policies surrounding the provision of nutrition information are outlined here, specifically those "back" and "front" of pack label versions which appear on pre-packed products, and calorie information on menus. This chapter will describe the practicalities of how consumers can use nutrition labelling to make healthier food choices and the skills and knowledge they need to be able to do so. Evidence on the impact of product and menu labelling on consumers' purchases and dietary intakes will be reviewed. Efforts to increase the equity of nutrition labels on diets and health across consumer groups are also discussed here in terms of, front-of-pack labelling, product reformulation and nutrition label education. Finally, this chapter will introduce the provision of online product nutrition information, including in supermarket websites, alongside the emerging evidence on consumers' use of these "virtual" labels.

13.1 Legislation, policy and prevalence

Nutrition label information on food products is needed by consumers to help them navigate the rapidly changing provision of food products with our current food environments, including processed foods, ready-to-eat products, and menu items offered out-of-home settings (i.e. in Cafes and Restaurants). Nutrition label information is considered a tool for consumers to use to promote healthier eating and "wise" food choices, amid the increasing global prevalence of obesity (CAC, 2011). Using nutrition labels to choose products lower in fat, saturates, sugar and salt is now a public health recommendation within UK food-based dietary guidance (PHE, 2016).

Legislation mandating that products declare nutrition information within Nutrition Facts Panels has been in place in the US since the implementation of their Nutrition Labelling and Education Act (FDA, 1995). More recently, European legislation mandated that nutrition information appears on pre-packaged products sold in EU countries, including the UK, although such information has been displayed voluntarily for many years, and was required if the product made any claims (EC, 2011). An audit of food products conducted in European countries prior to 2010 showed an average of 85% of products declared back-of-pack nutrition labelling (Bonsmann et al., 2010). The availability of nutrition label information on products can therefore be considered widespread across much of global marketplaces (EUFIC, 2018) (Figure 1).

In order to provide nutrition label information, manufacturers are expected to analyse their product's nutritional composition before declaring this data in the format required by food labelling legislation. Mandatory nutrition declarations will appear alongside other "food label" information (e.g. ingredients, cooking instructions), which are usually tabulated on the back (or side) of pre-packed products. Nutrition information elements that are required to be declared include energy (i.e. kcals / KJ) as well as the content of specific nutrients: the types

and format of which differ according to the relevant legislation (see Figure 2). Declared nutrients information for fat, saturated fat, carbohydrates, sugars, protein and salt will appear in amounts "per 100g" and/or "per serving" of the product. Nutrition labels may also include information on the contributions of a serving of the product to recommended daily amounts, usually called "Daily Values" (DV) in the US, or "Reference Intakes" (RI) in the EU/ UK (formerly Guideline Daily Amounts, GDAs) (DoH, 2016).

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Additional, alternative versions of nutrition information may also be (mostly voluntarily) provided on food labels, in line with those forms of expression allowed under the country's food labelling legislation (EUFIC, 2018). Nutrition signposting schemes, as these label versions have become known, include information panels or logos positioned on the "front-of-pack" which often provide a visual interpretation of the amounts of specific nutrients and/or energy provided per serving or other quantity of the product (Figure 3). Examples of "nutrient-level" front-of-pack schemes include the EU Reference Intakes or the UK Multiple Traffic Lights, both of which show (numerical or coloured-coded) interpretations of the content of nutrients of public health concern (i.e. energy, fat, saturated fat, sugars and salt) (DoH, 2016). Other "summary indicator" front-of-pack nutrition label schemes tend to provide an overall assessment of the product's nutritional quality or healthfulness. Such schemes include the French Nutri-Score, the Australian Health Star Rating, and the Scandinavian Keyhole or Choices logos (Bonsmann et al., 2020). Another front-of-pack scheme is known as "warning symbols" as currently used mandatorily in Chile, which indicate the presence of "high" levels of calories, saturated fat, sugar or sodium. Most front-of-pack schemes are underpinned by a criterion which determines levels of nutrients are considered "high" etc or provides an overall product "score" or "rating". This may be a

nutrient profile model or algorithm used to compute the product's overall nutritional quality or healthfulness classification (Bonsmann et al., 2020).

Insert Figure 13.3.

Front-of-pack labels vary in their provision across products and countries. Within Europe, the UK was previously found to have the highest prevalence of (several different formats of) front-of-pack labels (82% of audited products) (Bonsmann et al., 2010). In 2018, up to 20% of French products displayed Nutri-Score and uptake of the Health Star label in Australia is growing across retailers and product types (Jones et al., 2018). Although not as prevalent on products as back-of-pack nutrition labels, voluntary adoption of front-of-pack labelling is increasing (Bonsmann et al., 2020).

Also increasing is the provision of energy or "calorie" labelling on restaurant menus and within out-of-home food settings (i.e. cafés, counter sales, take-away outlets) (EUFIC, 2018). Several countries now have policies on menu labelling in restaurants or other food outlets (Rincón-Gallardo Patiño et al., 2020). In New York and other US states, mandatory calorie labelling has been required in multi-outlet restaurant chains since 2010 (see Figure 4). In Taiwan, fast food restaurants and other outlets have been required to display energy content as well as information for caffeine and sugar since 2015 (Rincón-Gallardo Patiño et al., 2020). The presentation of menu labelling information currently provided in the UK is voluntary yet informed by EU legislation and comprises of energy content (i.e. kcal / KJ) accompanied by information on Reference Intakes (RI) (DHSC, 2018).

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13.2 Does nutrition label information impact on consumers' diets?

The impact of nutrition labels on consumers' food choices depends on consumers using them appropriately to inform their food choice and purchase decisions. Practically, there are

several ways in which consumers may use the provided nutrition label information to choose products and eat a healthier diet. These include using the “per 100g” or “per serving” information elements to evaluate a product’s nutrient content levels and overall healthfulness (i.e. using “high” / “low” nutrient thresholds), or to compare two products. Consumers may also use the provided “per serving” nutrient values to track their own intakes of energy or nutrients in line with recommended daily intakes (i.e. DV/RI values) (Cowburn and Stockley, 2005).

Review evidence suggests that reading nutrition labels is associated with healthier diets, as measured by food frequency questionnaires and 24hr recalls (Anastasiou et al., 2019). A meta-analysis of studies conducted in various countries since 1990 found that food labelling decreased consumer’s intakes of energy and total fat, as well as unhealthy options (Shangguan et al., 2018). However, review evidence of consumer’s purchases choices is less convincing in terms of the impact of back-of-pack and other forms of nutrition information . An examination the effects of US mandatory labelling legislation since the early 1990s suggests this information has only modestly influenced consumers’ purchase behaviours (Patterson et al., 2017).

More promising evidence on the impact of nutrition labelling reflects the evolution of (front-of-pack) nutrition labelling formats, their increasing availability on products, and the growing research concerning such newer label types. A meta-analysis of studies encompassing various labelling formats and front-of-pack schemes suggested that nutrition labels could be expected to increase the number of people selecting a healthier food product by about 18% and decrease calorie choice/intakes by 3.5% (Cecchini and Warin, 2015). Further review evidence focussed specifically on front-of-pack labels has now suggests these significantly reduce purchased content of sugar and sodium (Croker et al., 2020).

A variety of approaches have been used to evaluate the impact of nutrition labels on consumer food choices, including experimental and real-world research. There are acknowledged limitations with the ecological validity of experimental studies that simply present consumers with product labelling via computer screens (Vyth et al., 2012). However, studies conducted in the real world need to overcome other limitations, including product-level differences in in-store label display and the tendency for consumers to over report their use of labelling (Grunert et al., 2010). New and novel research methods have been employed to quantify label viewing/use in real world settings, including with smart phone label viewing apps and wearable cameras.

Observations of consumers' actual label use behaviours in-store favour front over back-of-pack nutrition labelling. In a study of UK consumers, 66% of label readers in a supermarket study were found to have looked at front-of-pack information, whereas only 11.6% looked "elsewhere" on the pack (Grunert et al., 2010). Furthermore, consumers who frequently used (Health Star Rating or Traffic Light) front-of-pack labels via a smartphone app were more likely to have significantly healthier food purchases, compared with nutrition information panel users (Ni Mhurchu et al., 2017). A recent Danish longitudinal study of households' "home-scan" purchasing data has found that consumers' use of the front-of-pack (i.e. the Keyhole and wholegrain logos), but not back-of-pack nutrition labels, resulted in small improvements in diet quality (Rønnow, 2020).

Similar to on-pack nutrition labels, evaluations of the effects of menu calorie labelling on consumer purchases have also produced mixed findings. A recent meta-analysis of the effects of various menu labelling formats has found that this information significantly reduced calories "purchased" by -47 calories (Crockett et al., 2018). Similarly, a study evaluating (voluntary) calorie labelling within several UK workplace canteens showed a significant reduction (6.6%) in calories purchased by staff on the day after implementation (Vasiljevic et

al., 2018). However, this effect was only found within one of the six included canteens and appeared to diminish over time. There maybe limitations to the impact of menu labelling, but it is promising that the number of consumers who report seeing and using calorie labels on menus has increased inline with the increases in the availability of this information between 2007-2014 (Feng and Fox, 2018).

It is likely that consumers' use of menu labelling will depend on the setting, eating occasion and type of information provided. In terms of setting, evidence suggests that providing menu information results in a greater effect on the healthiness of foods purchased in cafeterias, compared to restaurants (Fernandes et al., 2016). In relation to eating occasion, calorie menu labelling together with contextual information on daily intakes was found to result in study participants consuming around 250 fewer calories across dinner and subsequent eating occasions, compared to groups provided with no information or calorie information alone (Roberto et al., 2010).

An alternative pathway for nutrition labels to impact on consumers' nutritional intakes is via product reformulation. Declaration of nutrition information on product by manufacturers is now thought to influence whether and how (pre-packed and menu) products are reformulated (Rincón-Gallardo Patiño et al., 2020; Shangguan et al., 2018). Recipe (product) reformulation can improve the products' nutritional composition by, for example, reducing levels of energy or specific nutrients of public health concern (e.g., sugars, salt, saturated fat). A motivation for manufacturers' product reformulation iniatives includes a desire to avoid declaring "red" traffic lights on products' front-of-pack nutrition labels. Evidence from New Zealand suggests that the reformulation of products to lower their energy and sodium content was greater for products with (compared to those without) the Health Star Rating front-of-pack nutrition labels during a two-year (2014 – 2016) time frame (Mhurchu et al., 2017). In

restaurants, menu labelling is associated with decreases in the calorie content of menu options, and more "healthier" options (Saelens et al., 2012).

13.3 Variations in consumer understanding and use of nutrition label information

Global evidence suggests that around 50% of consumers report using nutrition labels, with frequent label users likely to be female and possess higher levels of education and income (Campos et al., 2011). Use of nutrition labels has been outlined as a process comprising of several internal and external influences which result in an individual consumer evaluating a product and making a food choice or purchase decision (Figure 5) (Grunert et al, 2010). First, consumers must be "exposed" to nutrition label information, including via the (mandatory) display of these labels, yet a key influence on the attention consumers pay to this information appears to be the location and format of nutrition labels on product packaging (Bialkova and van Trijp, 2010). In addition, consumers' motivations including their desire to attain nutrition goals or adhere to dietary restrictions are key to them viewing and utilising this information. A general lack of motivation to engage with labels (or lack of interest in healthy eating) is currently considered a major "bottle neck" to consumers' use of this information (Grunert et al., 2010).

Insert Figure 13.5.

After perceiving the provided nutrition label information, consumers then need to read, locate, and understand the elements presented on it. Consumers tend to look for (locate) nutritional elements they wish to avoid such as fat, calories, sugars or salt content, and may be more inclined to view information positioned towards the top of the label rather than the bottom (Graham et al., 2012). Understanding the intended meaning of the information, which includes accurately locating and interpreting specific elements of label data, is important since these tasks will form the basis of consumers' product evaluations (Grunert et al., 2010).

Most consumers appear to be able to locate specific information (i.e. per 100g), but research has revealed a general lack of understanding of specific elements of nutrition information including "serving size" and label data, which features terminology reflecting recommended daily amounts such as "percent daily values (DV)", "Reference Intakes" (RI) or "Guideline Daily Amounts" (Cowburn and Stockley, 2005). This is of potential important since the display and use of the "per 100g" or "Guideline Daily Amounts" label elements are thought to influence consumers' evaluation of a product's healthfulness (Raats et al., 2015). In addition, it is possible that poor levels of understanding of labelled serving size information may partly explain why there is a lack of evidence regarding this label element's impact on consumers' dietary intakes (Anastasiou et al., 2019).

Although tempting, it should not be assumed that consumers who claim to frequently use nutrition labels, or who are highly personally motivated to do so, are those who fully understand and properly interpret the information provided. Nutrition information may not be fully understood, even among frequent label users (Sharif et al., 2014). Furthermore, consumers themselves may not realise that they lack proper understanding of nutrition label information. As highlighted by a large European Study, 77% of consumers claimed to understand the term "Guideline Daily Amounts" although only 33% were able to give the correct meaning (Gregori et al., 2014).

In general, those least likely to properly understand nutrition label information include older adults, as well as consumers with lower incomes or educational attainment (Campos et al., 2011). Besides numeracy, levels of health literacy (defined as an individual's "…*ability to identify, interpret and use information related to health*") is now also a clear determinant of nutrition label use and understanding in the US (Persoskie, 2017). In addition, the possession of basic nutrition knowledge (i.e. of the concepts and processes related to nutrition and health) is also thought to support the correct understanding and interpretation of nutrition

label information (Grunert et al., 2010). Overall, there is clearly a requirement for consumers to possess specific skills and knowledge attributes in order to properly understand nutrition labels and therefore for this information to be effective at informing food choices.

To help reduce the potential for inequalities in the use and understanding of nutrition label information and increase the effect of labelling on consumers' food choices, there exists a role for educating consumers about "how to use" nutrition labels. Such education is required by labelling legislation, including the US 1990 Nutrition Labelling and Education Act (FDA, 1995). Nutrition label education, including web-based "training" or sessions delivered by dietitians, is likely to improve consumer understanding and intended use of this information (Moore et al., 2018). However, there is presently a need to identify the types of population education and awareness initiatives that are most effective at encouraging consumer use and understanding of nutrition labelling (EUFIC, 2018).

Improving consumers' use and understanding of nutrition labels is an often-cited rationale for proposals to implement or mandate specific front-of-pack label formats (Bonsmann et al., 2020). To this end, which front-of-pack label formats should be displayed on food products is the subject of much cross-sector discussion, as reflected by the recent UK Government consultation on nutrition labelling following exit from the EU (Brexit) (DHSC, 2020). The public health policy preference is for a consistent single front-of-pack scheme, including at EU-Level, since the existence of multiple different versions of front-of-pack labels in the marketplace is thought to create consumer confusion (Bonsmann et al., 2020). As such, much research has been performed with consumers to determine the most "effective" front-of-pack nutrition label in terms understanding and using this information to accurately identify the "healthier" product choice, including with consumers considered "nutritionally at risk" and possess little pre-existing nutrition knowledge (Ducrot et al., 2015).

In terms of menu labelling, differences also exist between consumer groups in their understanding and use of this information. High-frequency users of menu labelling include those from sociodemographic groups who are likely to possess low health literacy and educational attainment levels (Feng and Fox, 2018). In addition, the impact of menu labelling (i.e. decreases in calories purchased) has been found to be greater in higher socioeconomic groups (Sarink et al., 2016). Socioeconomic characteristics of consumers who use labels frequently are important to consider, since these may influence the ability to understand and "act" on menu labels. For example, label uses may not fully understand or be unable to "act" on the recommendations of the label information, particularly if this involves paying higher prices for healthier items (Green et al., 2015). Accompanying contextual information on calorie recommendations may also be required for labelling to impact food choices given that a third of surveyed UK consumers did not know their recommended calorie intakes (NatCen,2017).

In real life, nutrition labels are not the only influence on consumers' product evaluations and purchase choices. This information will, at best, be integrated with other influences that occur both on-pack and within the retail environment, including price, brand, marketing messages and other claims (Nabec, 2017). Hence, in order to navigate the variety and complexity of the provided product information, consumers need to prioritise the types of information (e.g., organic vs sugar content) they use. Overall, for the provided nutrition information to impact on health and promote healthy eating, consumers need to possess high levels of knowledge, understanding and individual agency (use of personal resources) (Adams et al., 2016).

13.4 Online product nutrition information

In the UK and other EU countries, it is mandatory to provide product nutrition information for food products sold online (i.e. distance selling) (EC, 2011). Many retailers now declare this information at point-of-purchase within product information webpages, usually as tables

providing back-of-pack nutrition label information and using images of front-of-pack labels (for an example see Figure 6). Evidence is emerging on how the provided information is used by consumers and can influences food choices (Jilcott Pitts et al., 2018).

Insert Figure 13.6.

Evidence from studies undertaken with consumers within "mock" online supermarkets suggest that providing this information could help consumers to choose healthier products (Jilcott Pitts et al., 2018). In contrast, research within a real-life online supermarket has shown that implementation of traffic light front-of-pack nutrition labels on various products had no impact on sales of healthier foods (Sacks et al., 2011). Furthermore, online product nutrition information was found to be poorly attended to in a study examining shoppers' actual viewing (measured using eye-tracking) of product webpages, as displayed within a UK retailer's website (Benn et al., 2015). In this study, both quantitative and qualitative data collected from participants revealed that shopping (online or offline) requires high cognitive load (e.g., sticking to a budget, remembering who in the household eats what) and involves decisions that are beyond the food itself, but extend to the consumer's other, wider values (e.g., environmental). When shopping online, this combination of need for prioritisation and use of inner cognitive resources, makes routine use of individual product nutrition information by consumers unlikely. Instead, consumers appear to spend more time viewing product images whilst making food choice decisions based on product familiarity or category (i.e. organic, fresh) (Benn et al., 2015).

Two aspects of the presentation of online "virtual" nutrition information that could potentially influence its use by consumers include its location and presentation format. Both aspects are known to influence consumer attention to on-pack labels yet have been shown to vary considerably across and within major UK supermarket websites (Stones, 2016). In these environments, some mandatory (back-of-pack) nutrition label information also appears to be

located “below the fold” of the product webpage, requiring consumers to scroll down in order to view this information (Stones, 2016), or to click on the item and go to another page (Benn et al., 2015). It is therefore possible that online shoppers could purchase a product without viewing nutrition label information.

Advances in technology can help reduce the requirement for consumers to consult product nutrition information. Websites and Apps can now present consumers with a (filtered) list of products according to their personalised preferences. For example, products may be ordered by nutritional values or listed by attribute (e.g. low saturated fat, high fibre). Online supermarket websites can also suggest specific “tailored” food swaps to shoppers, including products lower in saturated fat (Jilcott Pitts et al., 2018). With these technologies product nutrition label information is being utilised within “behind-the-scenes” algorithms to provide consumers with interpretive, realistic product listings which they can control. The application of product nutrition information in these ways may therefore encourage consumers’ (indirect) use of labels, in keeping with their personal motivations and circumstances. Whether the presentation of nutrition information in these virtual formats, combined with consumers’ use of these technologies, can impact on real-world purchase choices remains to be fully evaluated.

13.5 Conclusions

Although the provision of nutrition and menu labelling has increased, there is a need to improve the efficacy of this information on consumers’ food choices and purchases, including when shopping online. To improve population-level health via nutrition labelling, policy makers can refer to the specific nature and effects of both mandatory and voluntary nutrition labelling in individual countries. Improving the design format of front-of-pack nutrition information and adopting menu labels, whilst making the provision of both mandatory, could help reduce the disparities in consumers’ understanding and use of this

information. To increase the impact of nutrition labelling on consumers' diets, corresponding initiatives are needed such as consumer-targeted nutrition label education and industrial product reformulation to improve declared values. Furthermore, developing personalised technologies could reduce the need for shoppers to actively consult online (or on-pack) nutrition labels whilst still enabling their use of this information. Evidence on the effects of such online tools, including product listings, is now required.

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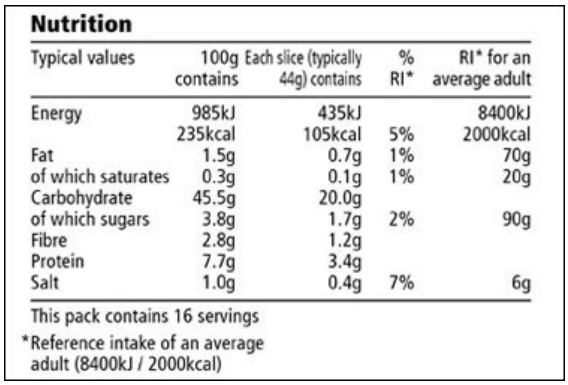
Figure 1. Global overview of mandatory and voluntary nutrition labelling (EUFIC 2018).

Figure 2 Examples of back-of-pack nutrition label formats, which include mandatory elements, commonly used in the UK (top), US (left, bottom) and Australia (right, bottom).

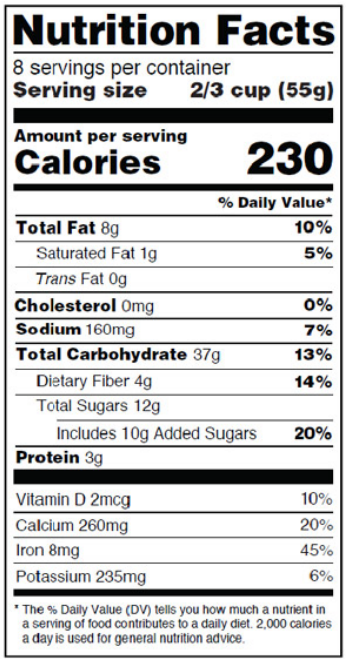


Nutrition

Typical values	100g contains	Each slice (typically 44g) contains	% RI*	RI* for an average adult
Energy	985kJ 235kcal	435kJ 105kcal	5%	8400kJ 2000kcal
Fat	1.5g	0.7g	1%	70g
of which saturates	0.3g	0.1g	1%	20g
Carbohydrate	45.5g	20.0g		
of which sugars	3.8g	1.7g	2%	90g
Fibre	2.8g	1.2g		
Protein	7.7g	3.4g		
Salt	1.0g	0.4g	7%	6g

This pack contains 16 servings

*Reference intake of an average adult (8400kJ / 2000kcal)



Nutrition Facts

8 servings per container

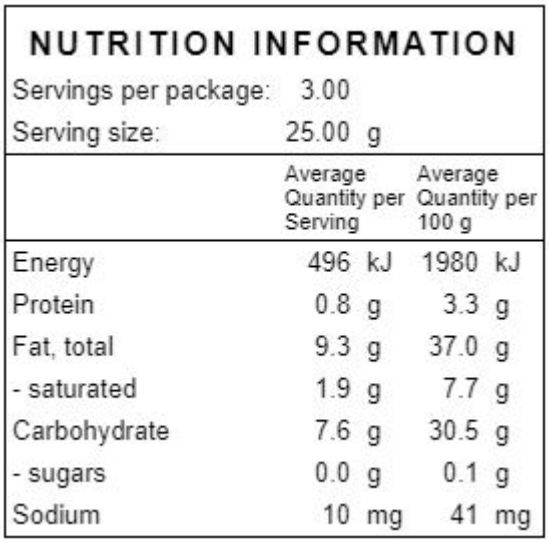
Serving size **2/3 cup (55g)**

Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.



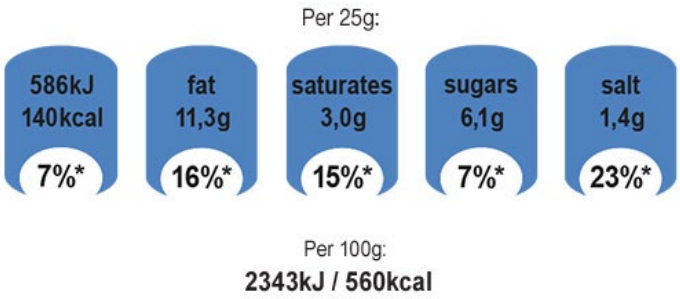
NUTRITION INFORMATION

Servings per package: 3.00

Serving size: 25.00 g

	Average Quantity per Serving	Average Quantity per 100 g
Energy	496 kJ	1980 kJ
Protein	0.8 g	3.3 g
Fat, total	9.3 g	37.0 g
- saturated	1.9 g	7.7 g
Carbohydrate	7.6 g	30.5 g
- sugars	0.0 g	0.1 g
Sodium	10 mg	41 mg

Figure 3. Examples of current front-of-pack nutrition label signposting schemes from around the world. Top: EU Reference Intakes, Middle left: Current UK Multiple Traffic Lights, Middle right: Nutri-Score, Bottom left: Australian Health Star Rating, Bottom Right: Chilean Warning Symbols



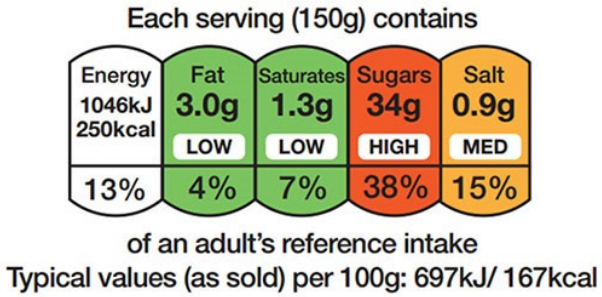


Figure 4. US Food and Drug Administration illustration of restaurant calorie menu labelling.

Figure 5. A conceptual framework of consumer use of nutrition labels, including influences. Extended from Grunert and Wills (2007) and Nabec (2018).

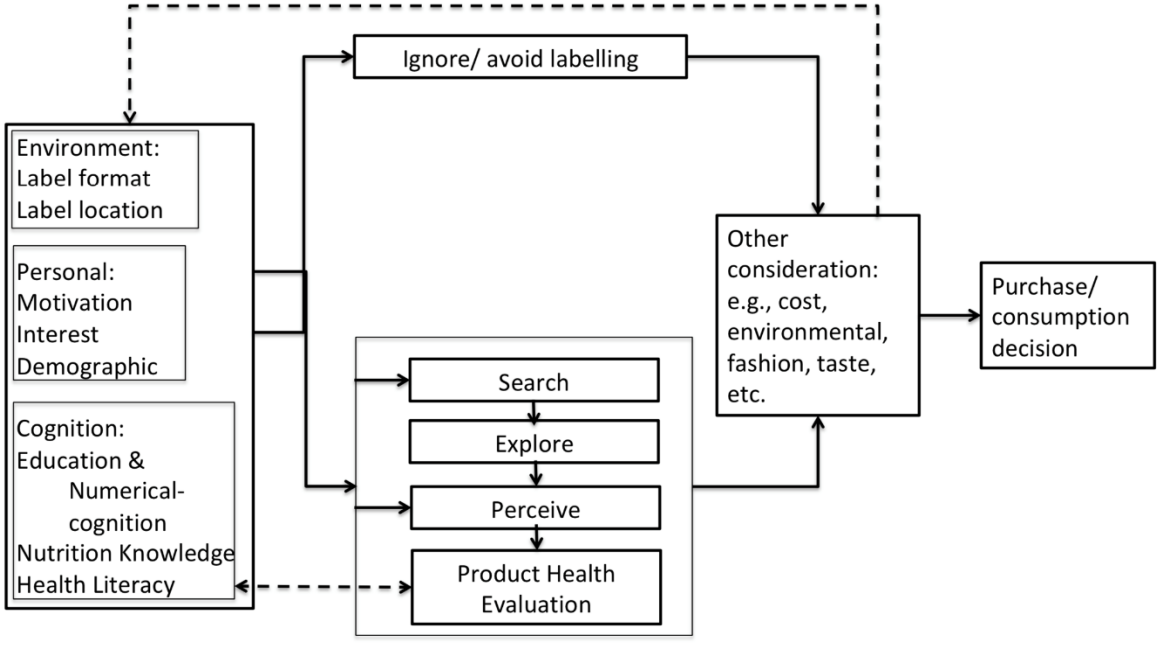


Figure 6. A UK retailer's online supermarket product information webpage, with annotations of specific information elements (from Benn et al, 2015).