Public Health Nutrition: 8(1), 21–28 DOI: 10.1079/PHN2004666

Consumer understanding and use of nutrition labelling: a systematic review

Gill Cowburn* and Lynn Stockley
British Heart Foundation Health Promotion Research Group, Department of Public Health, University of Oxford, Old Road Campus, Headington, Oxford OX3 7LF, UK

Submitted 29 March 2004: Accepted 5 August 2004

Abstract

Objective: To explore published and unpublished research into consumer understanding and use of nutrition labelling which is culturally applicable in Europe.
Design: A systematic review undertaken between July 2002 and February 2003.
Results: One hundred and three papers were identified that reported on consumer understanding or use of nutrition labelling, most originating from North America or northern Europe. Only a few studies (9%) were judged to be of high or medium–high quality. We found that reported use of nutrition labels is high but more objective measures suggest that actual use of nutrition labelling during food purchase may be much lower. Whether or not consumers can understand and use nutrition labelling depends on the purpose of the task. Available evidence suggests that consumers who do look at nutrition labels can understand some of the terms used but are confused by other types of information. Most appear able to retrieve simple information and make simple calculations and comparisons between products using numerical information, but their ability to interpret the nutrition label accurately reduces as the complexity of the task increases. The addition of interpretational aids like verbal descriptors and recommended reference values helps in product comparison and in putting products into a total diet context.
Conclusions: Improvements in nutrition labelling could make a small but important contribution towards making the existing point-of-purchase environment more conducive to the selection of healthy choices. In particular, interpretational aids can help consumers assess the nutrient contribution of specific foods to the overall diet.

Keywords
Nutrition labelling
Consumer understanding and use
Systematic review

The present paper reports the findings of a systematic review that examined world-wide published and unpublished research into consumer understanding and use of nutrition labelling which is culturally applicable in Europe. The review aimed to explore existing evidence about the extent to which consumers understand and use nutrition labelling when making point-of-purchase decisions on food selection. It also aimed to identify methods by which nutrition labelling could be improved and to suggest appropriate methods to address identified gaps in existing research.

Background

Creating supportive environments that help people to make healthy choices is an important underlying principle in promoting health. Nutrition labelling is one example of a population-based approach aimed at helping to make the food selection environment more conducive to healthy choices by providing information to consumers about the nutrient content of a food. This information, along with a knowledge of basic nutrition principles, interest and confidence in adopting a healthy diet, is intended to contribute to informed food purchase decisions. The provision of on-pack nutrition information also forms an important element of consumer protection – consumers have as much right to know the nutrient content of the foods they choose to purchase as they do to know its country of origin and that it is safe to eat.

To assist trade and to help consumers, existing nutrition labelling formats have been defined by guidance and legislation. International guidelines, in the form of the Codex General Standard for the labelling of pre-packaged foods, were most recently updated in 2001[1]. In the European Union (EU), the 1990 Council Directive (90/496/EEC) on nutrition labelling rules for foodstuffs for the ultimate consumer and for mass caterers[2] was adopted by all member states, including the UK, where regulations and guidance govern its implementation[3,4]. In the EU, nutrition labelling is currently not compulsory unless a nutrition claim is made. Where this is so, nutrition labelling becomes mandatory and two types of nutrition label

**Corresponding author:* Email gill.cowburn@dphpc.ox.ac.uk

content are permitted: group 1 – energy value, amounts of protein, carbohydrate and fat (the so-called 'Big 4') and group 2 – energy value, amounts of protein, carbohydrate, sugars, fats, saturates, fibre and sodium (the 'Big 8'). The Directive also mandates the measurement units and format that must be used.

In the USA, recognition that nutrition labelling plays a supportive role in nutrition education resulted in a review of the legislation under the Nutrition Labelling and Education Act. This involved several measures, including mandatory labelling of all packaged products (except for some exempted products) sold in the USA and intended for purchase by consumers[5]. Similarly, Canada, Australia and New Zealand have recently moved to mandatory nutrition labelling, although the format and content of nutrition labels in these countries vary[6,7]. Other countries have adopted a similar approach to the EU – using voluntary labelling, except for special categories of foods and when nutritional claims are made for fortified, enriched or otherwise modified foods such as those reduced/low in fat[8].

Nutrition labelling alone is likely to offer limited success as a strategy to improve the nutritional health of a population. Nutrition labelling is generally only applied to pre-packaged foods, so the consumer is provided with little nutritional information about foods purchased either unpackaged or pre-prepared; for example, by catering outlets. In addition to the voluntary nature of nutrition labelling in some countries, pack size constraints mean that there is a natural limitation to the quantity of nutrition information that can be made available. Poor nutrition knowledge may also reduce the ability of some consumers to interpret the nutrition information provided.

Given these limitations, in theory at least nutrition labelling ought to be supplemented by other nutrition education strategies. However, in practice, the nutrition information provided on the label may be the only source of information available to the consumer at the point of purchase, so it is important that they are able to understand and use this information to guide their food selection. But what does understanding and use actually mean? Understanding the nutrition information provided on the label implies that consumers recognise and know what each nutrient term and measurement unit means; and that they understand the relationships between different nutrients and the role of each nutrient in the body and in terms of healthy eating. Using the provided information suggests that consumers can find the nutrition information panel, will look at and read it, and are able to interpret it in order to make a variety of decisions about a food purchase. Examples of the decisions which consumers might need to be able to make are shown in Table 1.

It has long been recognised that the current European nutrition labelling formats do not meet consumer needs, perhaps because their content and format have primarily been consequences of legislative requirements rather than being designed specifically as an aid to consumers. Thus there have been calls for changes to be made to nutrition labelling in Europe to make it comprehensive, clear and easier to use[9–14]. A revision of the 1990 Directive is currently taking place. In order to contribute to this process, the European Heart Network commissioned a systematic review into consumer understanding and use of nutrition labelling which is culturally applicable in Europe. The present paper reports the findings of the main focus of that review, undertaken between July 2002 and February 2003.

Table 1 Decisions consumers might need to be able to make using the nutrition information panel on food labels

Identify the amount of a specific nutrient a product contains
Assess what counts as a low or high amount of the nutrient
Decide the overall healthiness of a product
Compare a specific nutrient content (or the overall nutrient content) of a product with one or more similar products or between different types of products
Calculate the amount of a nutrient eaten in a serving
Assess the product in the context of a meal choice or daily intake

Method

The review searched international sources for published and unpublished research into consumer understanding and use of nutrition labelling which is culturally applicable in Europe.

Search strategy

Published research world-wide was identified using electronic and other searches. Details of the search terms and the electronic databases searched are shown in the Appendix. All electronic databases were searched from the earliest record to the end of June 2002. Two other types of search were undertaken: searches of specialist journals likely to include relevant information but not included in standard electronic sources, and additional searching using the reference lists of some relevant articles obtained from identified papers. Unpublished research was identified by an Internet search and via key international contacts, using the European Heart Network and the International Union of Health Promotion and Education as the initial points of contact. All identified research was managed using Reference Manager bibliographic software (ISI Researchsoft/Thomson Scientific, Berkeley, CA, USA).

The review included studies carried out anywhere in the world provided they focused on consumer understanding and use of nutrition labelling which could be culturally applicable to a European setting. This was defined as research carried out in a country with an overlapping cultural heritage and perceptions to current European countries. Nutrition labelling was defined as the nutrition information panel (and any associated information like Guideline Daily Amounts) provided on

https://doi.org/10.1079/PHN2005666 Published online by Cambridge University Press

the pack. The review included studies that explored the provision of nutrition labelling for the general population in a variety of situations, except catering outlets. Included studies assessed whether consumers looked at nutrition labels and their knowledge, or attitudes, or beliefs, or perceptions, or understanding, or preferences for, or ability to use or way in which they used nutrition labelling. Papers reporting any type of study design and any type of process or outcome measure were considered for inclusion.

Research into broader aspects of food labelling (like brand naming and package design) and of other types of nutrition information provision (such as ingredient listing, health claims and quality assurance schemes) was excluded. Papers examining the impact of nutrition labelling on the diet quality of consumers were also outside the scope of this review.

Data extraction

An initial screen of title and abstract was done to ensure that included papers reflected the needs and scope of the review. This included a full-text translation of all non-English abstracts. When a title and abstract could not be clearly rejected, the full text of the article was obtained for further scrutiny. Included studies were divided between the two reviewers. Resource restrictions meant that each reviewer assessed their own batch of studies and no cross-checking between reviewers was undertaken. Information from each included study was collected using a standard data extraction form.

Eligible studies were also subjected to a standard quality assessment adapted from published criteria[15,16]. Studies were categorised into one of five bands: high-quality studies met all of the relevant criteria, medium–high-quality studies were classed as intermediate between high and medium, medium-quality studies met half of the relevant criteria, medium–low-quality studies were classed as intermediate between medium and low, and low-quality studies met none of the relevant criteria. Findings were weighted towards the higher-quality evidence.

Results

Of the 129 papers that met the inclusion criteria, 103 papers (80%) were identified that reported on consumer understanding or use of nutrition labelling. A full list of references identified during the review and the findings of the 26 papers that reported on point-of-purchase educational initiatives or nutrition claims (a secondary focus of the review) are reported elsewhere[17]. Of the 178 papers that were identified during the searches which failed to meet the inclusion criteria, most were excluded because either they did not contain consumer data or reported some other aspect of food labelling or information which was not culturally applicable to a European setting.

About half of the studies on consumer understanding and use of nutrition labelling (57%, $n = 59$) reported research from North America, with most of these (93%, $n = 55$) coming from the USA. Although about one-third of papers ($n = 32$) reported research originating in Europe, most of the studies (78%, $n = 25$) came from the UK. The remaining European studies took place in northern Europe (in the Scandinavian countries, Ireland, The Netherlands and Germany). We found no studies from southern European countries that met our inclusion criteria.

Only nine included studies were judged to be of high or medium–high quality[18–26]. These came from the UK (four), the USA (three), Canada (one) and Australia/New Zealand (one). Most papers were of moderate quality and others had significant methodological flaws. About one-third (28%) took place in realistic settings, with people actually making food purchase decisions. Most studies used convenience samples of the general adult population, with only 18 studies (17%) using representative samples of an area. Three studies particularly targeted older people, one study looked at adolescents and four studies focused on people living on a low income. No studies specifically targeted the label-reading habits of people from different minority ethnic groups. Many studies targeted primary food shoppers within households and there was a female bias in these studies. A range of study designs were found, cross-sectional surveys being used most commonly (57%), with experimental designs used in 15% of included studies.

Consumer understanding of nutrition labelling

Nineteen studies reported consumer preferences and understanding of terms and measurement units used on the nutrition information panel. The highest quality of study that was identified was medium–high ($n = 3$). Most studies relied on self-reported measures of understanding, although five studies used some form of objective measure to probe understanding of terminology.

The studies found that although some consumers could understand some of the information on nutrition labelling, in general they reported finding nutrition labelling confusing, especially the use of some technical and numerical information. Consumers reported that they did understand the terms ‘fat’, ‘calories/kilocalories’, ‘sugar’, ‘vitamins’ and ‘salt’. The concepts and terms reported as least well understood were the relationship between calories and energy; sodium and salt; sugar and carbohydrate; and the terms cholesterol and fatty acids. Consumers had difficulty in understanding the role that different nutrients mentioned on labels played in their diet. They also had difficulty converting information from g per 100 g to g per serving and serving size information also proved difficult to interpret. Percentage energy was not well understood. In general, older consumers and people with lower levels of education or income were

likely to have the most difficulty understanding the terms used on food labels.

In the 21 studies which assessed consumer nutrition knowledge (of the type needed to interpret the nutrition information panel), this was reported to be moderate or low. These studies mostly used self-reported measures. Very few reports of intervention studies attempting to address this specific nutrition knowledge deficit were identified.

Consumer use of nutrition labelling

Do consumers look at nutrition labels?

Seventy-four studies (72%) assessed whether consumers actually look at nutrition labels during food purchasing. Eight of these studies were judged to be of high ($n = 3$) or medium–high quality. We found that most consumers claimed to look at nutrition labels often or at least sometimes. Some claimed that looking at labels influences their purchases, especially for unfamiliar foods. Label readers reported using nutrition labels to avoid certain nutrients and to assess the specific nutrient content (particularly fat, calories and sugar) of different products. Reasons for not reading nutrition labels included lack of time, size of print on packages, lack of understanding of terms and concerns about the accuracy of the information.

Although levels of self-reported label reading were found to be high, studies using verbal protocol analysis (a more objective method which elicits participants' thoughts as they are undertaking a task, the task in these studies was to make 'usual' and 'healthy' shopping choices using nutrition labels) suggested that consumers may simply look at the nutrition information panel but not process the information further[20,21,26].

Which consumers look at nutrition labels?

Men were less likely to report an interest in reading nutrition labels. Women, those on a higher income and people who have attained a higher level of educational achievement were most likely to report looking at labels. Consumers with a special interest or positive attitude to diet and health were more likely to report higher levels of label reading. The label-reading habits of older people are unclear.

Consumer use of numerical and non-numerical presentation of nutrition information

Fifty-five studies (53%) were identified which assessed whether consumers could use nutrition information that was presented either numerically (used as the standard format in many countries) or non-numerically (which interprets numerical information either verbally or graphically). Figures 1 and 2 show examples of these different types of nutrition labelling. Five of these studies were judged to be of high or medium–high quality ($n = 4$).

This pack contains 1 serving of 450 g

NUTRITION INFORMATION		
Typical values	Per serving	Per 100 g
Energy	3200 kJ 760 kcal	710 kJ 170 kcal
Protein	36 g	8 g
Carbohydrates	59 g	13 g
Of which sugars	11 g	3 g
Fat	43 g	10 g
Of which saturates	18 g	4 g
Fibre	2 g	1 g
Sodium	1 g	Trace

Fig. 1 An example of a numerical labelling format – current EU 'Big 8' label

NUTRITION						
This product typically provides				Guideline Daily Amounts		
Per Burger (approx. 57g)		PER 100 g		Women	Men	Child (7-10 yrs)
Calories	140 kcal	245 kcal		2000 kcal	2500 kcal	1800 kcal
Fat	11 g	19 g	HIGH	70 g	95 g	65 g
(of which Saturates	5 g	9 g)	HIGH	20 g	30 g	18 g
Salt	0.6 g	1 g	HIGH	5 g	7 g	4.5 g
Protein	9 g	16 g	HIGH	36 g	44 g	32 g
Carbohydrate	1 g	2 g	LOW	250 g	350 g	225 g
(of which Sugars	Trace g	Trace g)	LOW	50 g	65 g	45 g
Fibre	0.6 g	1 g	LOW	18 g	18 g	14 g
Fruit & Veg	Nil	Nil		5 portions	5 portions	5 portions
If you eat fewer or more calories, adjust the fat and salt and other nutrients accordingly. Always try to eat 5 x 80g portions of fruit and vegetables per day.						

Fig. 2 An example of a non-numerical labelling format showing simple verbal descriptors and benchmark Guideline Daily Amounts – current Co-operative Wholesale Society Ltd label

Table 2 summarises the identified studies ($n = 35$) which reported on one or more of the common tasks consumers might undertake when using numerical or non-numerical nutrition information on food labels, as identified previously in Table 1. The remaining studies could not be categorised, either because insufficient information was provided about the tasks participants were asked to perform ($n = 11$) or because the studies addressed some other aspect of labelling use, such as mechanisms for data gathering.

Most consumers seemed able accurately to locate and retrieve simple information (such as the amount of a specific nutrient a product contains) from nutrition labels, whether this information is presented numerically or non-numerically. However, some studies found that even this simple form of label reading was influenced by a range of factors[23,27–29]. Consumers read labels more accurately if they were familiar with the label format and interested in health and nutrition and were less accurate with lower levels of educational achievement and increasing age.

Although consumers with higher levels of educational achievement were most able to use nutritional information presented numerically to assess whether a single food contained low or high amounts of particular nutrients, studies reported consumers regularly making mistakes and suggested that this might be because they were unsure of recommended intake levels against which to compare the nutrient content. The studies that compared and tested the use of numerical and non-numerical information in this context concluded that the use of simple verbal descriptors and/or a recommended reference value might aid accuracy on this type of task.

https://doi.org/10.1079/PHN2005666 Published online by Cambridge University Press

Table 2 Common tasks consumers might undertake when using numerical or non-numerical nutrition information on food labels

Common tasks when using nutrition labelling	Identified studies*	Number
Identify the amount of a specific nutrient a product contains	British Market Research Bureau (1985); Byrd-Bredbenner (1994, 2000*a*,*b*,*c*,*d*, 2001); Institute of Grocery Distribution (1998); National Institute of Nutrition (1999); Research Services Ltd (1995); Scott (1994); Sullivan (1995); Viswanathan (1994); Yeomans (1986)	14
Assess what counts as a low or high amount of the nutrient	Black (1992); Byrd-Bredbenner (1994); Co-operative Wholesale Society Ltd (2002); Levy (2000); Scott (1994)	5
Decide the overall healthiness of a product	Barone (1996); Li (2002); Mohr (1980); Research Services Ltd (1995); Rudd (1986, 1989); Viswanathan (1994)	7
Compare a specific nutrient content (or the overall nutrient content) of a product with one or more similar products or between different types of products	Black (1992); Byrd-Bredbenner (1994); Co-operative Wholesale Society Ltd (1993); Food Standards Agency (2001); Institute of Grocery Distribution (1998); Levy (1991, 1996, 1998); Lewis (1992); Mohr (1980); Research Services Ltd (1995); Rudd (1986); Sullivan (1995)	13
Calculate the amount of a nutrient eaten in a serving	British Market Research Bureau (1985); Byrd-Bredbenner (2000*a*,*b*,*c*,*d*, 2001); Co-operative Wholesale Society Ltd (1993); Jacoby (1997); Kloop (1981); Levy (1998); Miller (1997); National Institute of Nutrition (1999); Research Services Ltd (1995); Sullivan (1995); Yeomans (1986)	15
Assess the product in the context of a meal choice or daily intake	Black (1992); Burton (1994, 1996, 1999); Byrd-Bredbenner (1994, 2000*a*,*b*,*c*, 2001); Co-operative Wholesale Society Ltd (1993); Daly (1976); Levy (1996); Levy (1998, 2000); Mohr (1980); Rudd (1986, 1989)	17

*A full list of references identified during the review is available from the authors.

Similarly, consumers were generally better able to judge the overall healthiness of a product when some form of benchmark was present. Although studies have assessed numerical presentations such as daily reference values and average brand values alongside verbal and graphical presentations, no clear consensus emerges about the most useful format for the presentation of reference information. There is some evidence that consumers with higher levels of nutrition label knowledge may find reference information more useful in assessing the healthiness of a product than those consumers with less knowledge[30].

Consumers were found to be able to use numerical data accurately to make simple comparisons between products[22], although some consumers performed better when the differences they were comparing were for well-known nutrients[9] or when the products were similar[31]. One study reported that consumers found more complex comparisons between products difficult to perform and suggested that they tended to use a single nutrient (like fat) as a measure against which to assess the whole product[18]. The addition of numerical or non-numerical interpretational aids appears to increase accuracy of product comparison. Several studies concluded that the use of benchmarks was helpful[32–35]. Although one study found that use of verbal descriptors reduced accuracy compared with numerical information[36], other studies support their use[34,35,37] and others suggest that verbal banding information should be presented alongside numerical information, as consumers (in particular those interested in nutrition and health) used verbal banding to detect large differences between products and referred to numerical information for precision[18]. Other types of non-numerical information such as bar charts, star ratings and pie charts seemed more confusing to consumers than verbal banding, although some consumers were able to interpret bar charts more accurately than numerical information[38,39].

There were broadly consistent findings across the studies which asked consumers to use the nutritional information to undertake a variety of typically required calculations, such as to calculate the amount of a nutrient in a serving of a particular product. Consumers could fairly accurately use numerical information to perform simple calculations but accuracy levels fell as the complexity of the tasks increased. In some studies, this pattern was influenced by unfamiliarity with label format or limited use of nutrition labels, lower levels of educational achievement and increasing age[28,29,31,40,41]. Two studies (assessed as of medium and low quality) tested how non-numerical interpretational aids like bar and pie charts helped consumers to perform typical calculations. In both studies, consumers were less accurate using these graphical representations than with numerical data[42,43].

Consumers seemed to find it particularly difficult to use nutrition label information to place an individual product into the context of their overall diet. Adding some kind of benchmark, either in a numerical (such as the percentage of dietary reference values which is used in the USA, or guideline daily amounts used on a voluntary basis in the UK) or non-numerical format, seems to help consumers make this kind of judgement. Of the non-numerical labelling systems that have been tested, consumers preferred bar charts but were more accurate when using verbal descriptors in more objective tests of label use.

Discussion

This review used a systematic approach to searching and assessing the existing world-wide evidence base on

https://doi.org/10.1079/PHN2005666 Published online by Cambridge University Press

nutrition labelling (namely, a predefined, transparent and reproducible process to identify, select and analyse studies). However, resource constraints meant that the reference lists of relevant papers were not routinely searched to find additional papers, so although we attempted to be comprehensive it is likely that some studies will have been missed in the reviewing process. Also, a single reviewer assessed each paper rather than a sample of papers being cross-checked by a second reviewer, another potential source of bias. Despite these limitations, this review is presented as the most thorough review of the evidence on consumer understanding and use of nutrition labelling to date.

We found only nine papers that were judged by our system to be of high or medium–high quality. As only about one-third took place in realistic settings, we cannot conclude with any certainty that our findings reflect how consumers behave when they are actually making food purchase decisions. In addition, many studies relied on subjective, self-reported measures of understanding and use, and some studies used samples of volunteer participants whose views and use of nutrition labelling may not be typical of the general population. This makes it difficult to use the evidence base to build up a picture that accurately reflects consumers' habitual use of nutrition labelling.

We recognise the methodological challenges of assessing the value of a mixed evidence base such as was identified during this review. Our approach was to assess each paper individually against a set of established criteria and to weight our conclusions towards the higher-quality evidence. However, we acknowledge that a wider debate exists around these criteria and their use. Weighting the evidence in this way also means that our conclusions are largely based on a relatively few studies.

In common with other reviews, the majority of studies we identified originated from North America. This may be a reflection of the importance given to nutrition labelling as a public health nutrition strategy in the USA compared with other countries or simply reflect nutrition research funding priorities, publication bias or some combination of all of these factors. We found only one-third of studies based on European consumers and these were biased towards consumer views in northern Europe, in particular the UK. While this may reflect differences in the provision of nutrition information across Europe – estimates suggest that 80% of pre-packaged foodstuffs provide nutrition labelling information in the UK compared with 30% in Greece[44] – it makes it problematic to draw firm conclusions and to develop a framework for action to improve nutrition labelling in Europe when so little is known about consumer understanding and use of nutrition labelling in a broad European context. More work needs to be done to explore the needs of consumers in Europe, in particular those in southern Europe. Table 3 shows the research gaps which need to be addressed in order to provide a more solid foundation for proposals for the further development of nutrition labelling in Europe.

Table 3 Identified research gaps in consumer use and understanding of nutrition labelling

More research is needed to elucidate consumer understanding and use of nutrition labelling in European countries other than the UK; in particular, those in southern Europe
More use is required of methodologies that assess understanding and use of labels in real-life situations
Objective methods of assessing nutrition label understanding and use need to be developed and refined
The evidence base would benefit from studies using larger, more representative samples and by eliciting information about the label-reading habits and interpretation abilities of special population groups such as older people, minority ethnic groups and younger people
More research is needed to explore what motivates people to use nutrition labels. Not much is known about any differences between label users and non-users and in particular what measures would encourage non-users to change their behaviour
Very little research was identified of interventions to increase understanding and use of nutrition labels
More research could help to explore any association between label reading and diet quality

Accepting the limitations of the existing evidence base, there are some general issues to be raised from our findings. Although reported use of nutrition labels is high, more objective measures suggest that actual use of nutrition labelling during food purchase may be much lower. This suggests that consumers in studies of nutrition labelling use are open to socially desirable reporting and may look at nutrition labels without being able to fully understand all of the information provided. Reported reasons for non-use of nutrition labels include lack of time, presentation of the information, lack of understanding of terms and concerns about the accuracy of the information. Little is known about how to motivate and encourage non-users to change their behaviour.

Our findings suggest that whether or not consumers can understand and use nutrition labelling depends on the purpose of the task. Available evidence suggests that consumers who do look at nutrition labels can understand some of the terms used but are confused by other types of information. Most appear able to retrieve simple information and make simple calculations and comparisons between products using numerical information, but their ability to interpret the nutrition label accurately reduces as the complexity of the task increases. The addition of interpretational aids like verbal descriptors and recommended reference values helps in product comparison and in putting products into a total diet context. So, if the overall aim of the nutrition label is to help consumers place a selected food into the context of an overall diet, format changes may help more consumers with this task.

There are indications that people both prefer and are more accurate at using label formats with which they are familiar. It is not clear to what extent this is due to

https://doi.org/10.1079/PHN2005666 Published online by Cambridge University Press

exposure to the format or due to educational initiatives that may have accompanied the introduction of a new format (as in the USA, where the label format was completely revised in 1994). Again, little is known about what types of educational interventions might improve consumers' understanding and use of nutrition labelling. As there is also little existing evidence about a link between nutrition labelling use and diet quality, the impact on consumers' diets of nutrition labelling in general or of specific format changes remains largely unknown, and an area ripe for further investigation.

The complexities of the influences on food choice and behaviour change are well documented, but improvements in nutrition labelling could make a small but important contribution towards helping to make the existing point-of-purchase environment more conducive to the selection of healthy choices. However, such improvements must be set within a context of wider action to promote better nutrition across Europe.

Acknowledgements

This review was kindly funded by the European Heart Network, a Brussels-based alliance linking heart foundations and other non-governmental organisations committed to the prevention of cardiovascular disease in 25 countries across Europe.

References

1 Joint Food and Agricultural Organization of the United Nations (FAO)/World Health Organization (WHO) Food Standards Programme. *Codex Alimentarius Food Labelling Complete Texts*, revised 2001, Rome: FAO/WHO, 2001.
2 Council Directive 90/496/EEC on nutrition labelling for foodstuffs of 24 September 1990. *Official Journal of the European Communities* L276 of October 1990. Luxembourg: European Commission, 1990; 40–4.
3 The Food Labelling Regulations (UK). SI 1996 no.1449, as amended. London: Her Majesty's Stationery Office, 1996.
4 Ministry of Agriculture, Fisheries and Food (MAFF). *Guidance Notes of Nutrition Labelling*. London: MAFF, 1994.
5 US Food and Drug Administration (FDA). *Guide to Nutrition Labelling and Education Act (NLEA) Requirements*. Rockville, MD: FDA, 1994.
6 Sibbald B. Canada's nutrition labels: a new world standard? *Canadian Medical Association Journal* 2003; **168**(7): 887.
7 Curran MA. Nutrition labelling: perspectives of a bi-national agency for Australia and New Zealand. *Asia Pacific Journal of Clinical Nutrition* 2002; **11**(2): S72–6.
8 Tee ES, Tamin S, Ilyas R, Ramos A, Tan WL, Lai DK, *et al*. Current status of nutrition labelling and claims in the South-East Asian region: are we in harmony? *Asia Pacific Journal of Clinical Nutrition* 2002; **11**(2): S80–6.
9 Research Services Ltd. *Nutrition Labelling Study*. London: Ministry of Agriculture, Fisheries and Food, 1995.
10 Food and Drink Federation (FDF)/Institute of Environmental Health Officers (IEHO). *The FDF–IEHO National Food Safety Report*. London: FDF/IEHO, 1993.
11 Bureau Europeen des Unions de Consommateurs. *Position Paper on the Labelling of Food*. Brussels: Bureau Europeen des Unions de Consommateurs, 2001.
12 Kafatos AG, Codrington CA, eds. Eurodiet Reports and Proceedings [special issue]. *Public Health Nutrition* 2001; **4**(2A): 265–436.
13 European Heart Network. *Food, Nutrition and Cardiovascular Disease Prevention in the European Union*. Brussels: European Heart Network, 1998.
14 Food Standards Agency (FSA), Food Advisory Committee. *Review of Food Labelling 2001*. London: FSA, 2001.
15 NHS Centre for Reviews and Dissemination. *Report Number 4*, 2nd ed. York: NHS Centre for Reviews and Dissemination, 2001.
16 http://hebw.uwcm.ac.uk/projectmethodology
17 European Heart Network. *A Systematic Review of the Research on Consumer Understanding of Nutrition Labelling*. Brussels: European Heart Network, 2003.
18 Black A, Rayner M (Coronary Prevention Group). *Just Read the Label*. London: The Stationery Office, 1992.
19 Guthrie JF, Fox JJ, Cleveland LE, Welsh S. Who uses nutrition labeling, and what effects does label use have on diet quality? *Journal of Nutrition Education* 1995; **27**(4): 163–72.
20 Higginson C, Kirk TR, Rayner M, Draper S. How do consumers use nutrition label information? *Nutrition and Food Science* 2002; **32**(4): 145–52.
21 Higginson C, Rayner M, Draper S, Kirk TR. The nutrition label – which information is looked at? *Nutrition and Food Science* 2002; **32**(3): 92–9.
22 Levy A, Fein S. Consumers' ability to perform tasks using nutrition labels. *Journal of Nutrition Education* 1998; **30**(4): 210–7.
23 National Institute of Nutrition. *Nutrition Labelling: Perceptions and Preferences of Canadians 9*. Ontario: National Institute of Nutrition, 1999.
24 Neuhouser ML, Kristal AR, Patterson RE. Use of food nutrition labels is associated with lower fat intake. *Journal of the American Dietetic Association* 1999; **99**(1): 45–53.
25 Paterson D, Zappelli R, Chalmers A. *Food Labelling Issues – Consumer Qualitative Research*. Canberra: Australia and New Zealand Food Authority, 2001.
26 Wyn Thomas B, Boaz A, Rayner M. *Food Labelling and Healthy Food Choices*. Oxford: British Heart Foundation Health Promotion Research Group, 1997.
27 Byrd-Bredbenner C, Wong A, Cottee P. Consumer understanding of US and EU nutrition labels. *British Food Journal* 2000; **102**(8): 615–29.
28 Byrd-Bredbenner C, Alfieri L, Wong A, Cottee P. The inherent educational qualities of nutrition labels. *Family and Consumer Sciences Research Journal* 2001; **29**(3): 265–80.
29 Byrd-Bredbenner C, Kiefer L. The ability of elderly women to perform Nutrition Facts label tasks and judge nutrient content claims. *Journal of Nutrition for the Elderly* 2000; **20**(2): 29–46.
30 Li F, Miniard PW, Barone MJ. The facilitating influence of consumer knowledge on the effectiveness of daily value reference information. *Journal of the Academy of Marketing Science* 2002; **28**(3): 425–36.
31 Sullivan AD, Gottschall-Pass KT. Food label nutrition literacy: tool development and assessment. *Journal of the Canadian Dietetic Association* 1995; **56**(2): 68–72.
32 Institute of Grocery Distribution (IGD). *Voluntary Nutrition Labelling*. Watford: IGD, 1998.
33 Byrd-Bredbenner C. Designing a consumer friendly nutrition label. *Journal of Nutrition Education* 1994; **26**: 180–90.
34 Co-operative Wholesale Society Ltd. *Putting the Consumer First*. London: Co-operative Wholesale Society Ltd, 1993.
35 Food Standards Agency (FSA). *Nutrition Labelling: Qualitative Research*. London: FSA, 2001.
36 Levy AS, Fein SB, Schucker RE. Nutrition labelling formats: performance and preference. *Food Technology* 1991; 116–21.
37 Lewis CJ, Yetley EA. Focus group sessions on formats of

nutrition labels. *Journal of the American Dietetic Association* 1992; **92**(1): 62–6.
38 Mohr KG, Wyse BW, Hansen RG. Aiding consumer nutrition decisions: comparison of a graphical nutrient density labeling format with the current food labeling system. *Home Economics Research Journal* 1980; **8**(3): 162–72.
39 Rudd J. Aiding consumer nutrition decisions with the simple graphic label format. *Home Economics Research Journal* 1986; **14**(3): 342–6.
40 Byrd-Bredbenner C, Alfieri L, Kiefer L. The nutrition label knowledge and usage behaviours of women in the US. *BNF Nutrition Bulletin* 2000; **25**: 315–22.
41 Klopp P, MacDonald M. Nutrition labels: an exploratory study of consumer reasons for non-use. *Journal of Consumer Affairs* 1981; **15**: 301–16.
42 British Market Research Bureau. *Consumer Attitudes to and Understanding of Nutrition Labelling: Quantitative Stage*. London: Consumers' Association, 1985.
43 Yeomans Y. Practical use of nutrition labels. *BNF Nutrition Bulletin* 1986; **11**: 12–22.
44 European Commission. *Report of the Application of Directive 90/496/EEC on Nutrition Labelling for Foodstuffs*. Brussels: European Commission, 2002.

Appendix

The following MeSH index and free text terms were used (separately and in combination) for all of the electronic searches except for ASSIA, CAB and ISI, where a simpler combination of the same terms was used: food, nutrition, diet, labelling, labelling, information, point-of-choice, point-of-purchase, packet, package, food industry, policy, consumer.

Electronic databases searched	
AMED	ERIC via CSA
Aslib Index to Theses	Inspec
ASSIA via Cambridge Scientific	JNEB
Abstracts CSA	LISA – Library and Information Science Abstracts on web
BIOLOGICAL ABSTRACTS	MEDLINE
Biological Sciences via CSA	PAIS International
BIOME	PSYCHINFO
CAB Abstracts using ERL	Sociological Abstracts via CSA
CAB Health using ERL	Science Citation Index via ISI
CINAHL	SIGLE
COCHRANE and associated registers	Social Science Citation Index via ISI
EMBASE on web	Zoological records

The Internet search terms used were: labelling or labelling, and food or nutrition, and consumer, and research, not genetic or irradiation or allergy or allergies.

https://doi.org/10.1079/PHN2005666 Published online by Cambridge University Press