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On-line Food Nutrition Labelling in the UK:
How consistent are supermarkets in their presentation of nutrition labels on-line?

Objective
To evaluate consistency levels of nutrition labelling on supermarket websites.

Design
This is a comparative, quantitative study examining page position, content and design of nutrition labels on own brand and branded products. On-line and in-store nutrition labels were examined, categorised and analysed to discern variety of label designs used and consistency between on-line and in-store labelling.

Setting
Five large on-line food retailers in the UK

Subjects
Nutrition labels displayed on 100 webpages were examined for 20 branded and own-brand products. Equivalent labels on in-store packaged products were also examined.

Results
8 different combinations of nutrition label designs were found. The on-line supermarket sites were found to use from 3 to 6 of these label combinations across the sample. The consistency level between on-line and in-store package labels ranged from 25% to 90%. In many cases the nutrition label required scrolling to view and in all cases items could be purchased without the label being visible from the search result listings.

Conclusion
The main recommendation of this paper is that on-line nutrition labelling needs to be much more consistently presented than is currently practiced, both within each website and between on-line and in-store experiences. Particular attention should be made to polychrome colour and the inclusion of summary graphics. Designers should also ensure visibility of the label and raise its vertical page position. This paper also

proposes additional expansion of the use of nutrition information on-line, using nutrition values as database fields in search criteria and checkout aggregation reporting.

Keywords: Nutrition labelling, e-supermarkets, design, supermarkets, food, health.

Introduction

Nutrition labelling is a useful tool for making healthier food choices [(1)] and there is much academic research that identifies best practice on food packaging (see systematic reviews by Cowburn & Stockley [(2)] and Drichoutis et al. [(3)]). There is, however, a lack of research that focuses on the design and position of on-line nutrition labels. According to IDG (the Institute of Grocery Distribution), a grocery research organization, approximately a fifth of UK households shop for food on-line at least once a month and in 2017 IDG predict on-line sales equivalent to £11.1 billion [(4).] Thus there is a strong rationale for the need to conduct this research and improve provision of on-line labelling.

This paper presents a systematic study of the design of nutrition labels on the websites of five major supermarkets in the UK. The research aims to identify the degree of consistency of on-line nutrition label designs across both branded and own-brand product for each on-line retailer. It also aims to examine the relative position of the labels and the content consistency of a broad spectrum of product pages. It discusses the current state of on-line nutrition labelling in the UK, with particular reference to in-store equivalence and suggests how improvements may be made through the use of dynamic displays including sorting and aggregation.

Nutrition labelling on packaging in the UK

In the UK there are currently two types of nutrition labels in use on the physical packaging of food. A mandatory nutrition table appears on the back of the package and contains detailed technical information about nutrition values. The content of this table is regulated by the European Union (EU) and therefore has high consistency levels on physical packaging. This ruling also, according to the EU regulation (No.

1169/2011), applies to distance selling (on-line selling). It is therefore expected that at the very least, a nutrition table would appear on every product webpage.

A voluntary 'front of package' labeling scheme also exists in the UK that provides a summary of nutrition values. In 2006 the UK's Food Standards Agency examined various methods for presenting nutrition information on food/drink packaging and found overwhelmingly that consumers preferred traffic light systems to other methods [(5)]. In 2013 it was reported that 60% of food found in supermarkets featured traffic light labels and 5 supermarkets had agreed to consistent labelling including Sainsbury's, Tesco, Co-op, Waitrose and Morrisons [(5)].

In 2013 the UK government published a press release announcing new consistency guidelines [(5)] based partly on findings by Draper et al. [(6)] that concluded "multiple front-of-pack label formats in the marketplace may impede consumer comprehension and discourage use". This finding supported previous research reports that found different presentation of nutrition information confusing [(7, 8)]. It is important therefore in a review of on-line labelling that both mandatory nutrition tables and optional 'front of pack' equivalents are examined together with their consistency of position, content and design.

Position of the nutrition label

Bialkova & Trijp's [(9)] results suggest that nutrition labels should always be printed in a consistent location on the package. Graham and Jeffrey [(10)] reported that, when viewing a mock shopping webpage screen, participants viewed 61% of nutrition labels located in the centre of the screen though only 37% and 34% of labels positioned on the left or right-hand positions. In addition nutrition labels had extended fixation times when placed in the central position. Neither set of authors examined the position of labels in actual on-line systems to ascertain how primary they are in the field of vision, in terms of scrolling requirements or opportunities to buy without labels present on the page.

Design of the *'Front of pack' nutrition label*

Previous research [(11, 12, 13)] demonstrates that logos and traffic light colours performed better than nutrition tables in terms of gaining attention and improving

comprehension. Use of detailed tables alone is problematic for a number of reasons. Items listed further down on the nutrition table are likely to be looked at less than those at the top [10]. According to Higginson et al. [14] fat and energy are the most looked at nutrients on the nutrition label. This may lead to difficulties such as a choice of a product that has, say, low fat content but very high sugar levels. In addition too much detailed information might be problematic for users with lower education levels [13]. Any examination of website nutrition labelling therefore has to take into consideration the use of summary 'front of pack' graphics as good practice generally, (though there are doubts in some studies about the overall impact recommended summary graphics have on sales [15]) Colour has also been found to be a useful visual cue in highlighting the health quality of food. Whilst monochromatic displays have been found to be more effective for capturing attention [9], other studies reported that consumers prefer and can better understand colour-coded designs (in particular the multiple traffic-light system) than monochromatic labels [7, 16, 17].

Content of the label

There remains contention about how best to quantify the health value of a food/drink product. Generally nutrition tables contain 'Amount per 100 grams' and 'Amount per serving' of, at the very minimum, calories, fat, saturated fat, sugar and salt content. Traffic light systems are based upon the amount of these values found in 100g of the product.

The Guideline Daily Allowance figure (GDA) or Reference Index (RI%) as it is now known in the UK, is a different system that presents a value for how much of the product's nutritional values you are recommended to have each day. The Which? Report, authored by the UK's largest consumer body, found that two thirds of the participants had heard of GDAs, but only one in five actively used them [5]. This contrasts somewhat with the findings of some published research that RI values can help in comprehending nutrition information [7,12]. Given these conflicts, RI's are often featured alongside values 'per 100g' and it's important to understand their frequency of use on-line.

Recommendations from the literature review above highlight several key criteria to assess in the consistency of nutrition labels: a consistent and salient position,

inclusion of a summary display and use of colour to aid comprehension. More contentious issues including inclusion of a RI% will also be examined to measure consistency of design content as well as presentation.

Methodology

In order to identify consistency amongst supermarket websites a systematic study of product webpages and search results pages was undertaken. In addition, physical packages were inspected to ascertain consistency level between online and in-store.

The two main hypotheses underpinning the research were:
1. Own-brand products across each supermarket site would have high consistency levels for content and visual design of nutrition information given each supermarket's responsibility for product information and brand values within the site.
2. The on-line presentation of nutrition information would, at the very least, improve on in-store physical labelling given retailers ability to present a product within a supermarket-branded interface.

Major supermarket websites in the UK that offer on-line shopping were selected for examination. These were Asda, Tesco, Waitrose, Morrisons and Sainsbury's. 10 common grocery items were chosen that represented a range of food and drink. These featured diary, meat, vegetables, meal components and snacks comprising of orange juice, coca cola, baked beans, mayonnaise, sausages, cornflakes, digestive biscuits, frozen peas, bolognese sauce and yoghurt. These reflect the major food groups bought by UK Consumers [18].
These products were also aligned with well known, brand leader manufacturers. This made branded versions likely to be stocked across all five supermarkets, allowing for direct comparison of identical products in all but one case (where a different brand of sausages was considered for Waitrose). Brands chosen were Tropicana, Coca Cola, Heinz, Hellmans, Wall's, Kellogg's, McVities, Bird's Eye, Dolmio and Onken. Webpages of 'own brand' equivalent products (equal or similar in weight/format) were also examined resulting in 20 web pages examined on each supermarket's

website.

In total 100 webpages were examined to categorise how the nutrition information was presented. Categorisation used an evaluation criteria developed specifically to account for the variability of nutrition labels, named here as the PCD (referring to position, content and design) criteria. It takes into account:

1) Position

Page Types ('search results' or 'product description') featuring nutrition labelling and scrolling required.

2) Content

Inclusion of RI% information.

3) Design

Graphical format (graphic summary or table) and colour usage.

The PCD data then was analysed in terms of consistency within each supermarket to reflect the browsing experience of a user. Comparisons were also made between supermarkets to identify if any supermarket achieved higher degrees of consistency. Comparisons were also made between on-line labels and in-store physical labels.

Webpages were examined on both a mac and PC laptop (13" and 15" respectively). Scrolling ('below the fold') judgements were based on an average screen resolution of 768 pixels in height. Data was gathered by one researcher following the exact same procedure twice to double check that data was accurate. Data was gathered in July 2015. Tablets or mobiles were not used in this particular study though these will also require examination in the future as more users switch to tablet shopping.

Results and Discussion

Position of nutrition labels

None of the supermarkets displayed any nutritional labels on the search result page. The only graphical interventions related to price, such as use of a red highlighted corner graphics displaying 'offers'. Items could all be purchased directly from this search result list view with no nutrition information shown on the page. This is a

different experience to handling a product in reality, given viewing opportunities afforded by back-of-pack and front-of-pack labels. The new EU regulation No. 1169/2011 outlines the need for information to be in the 'principal field of vision' where possible. This application of this regulation to on-line information therefore requires further review.

The lack of nutrition summary labels on the search pages showing multiple products makes it difficult to compare two products together as, unlike a real supermarket setting, the customer is unable to pick up both products simultaneously. According to Higginson et al. [(14)] comparison is the most common task performed with nutrition labels and this, it appears, needs to be supported more readily on-line.

A nutrition label was present on the product description page once the product had been clicked in all cases from the results page. Morrisons also featured an intermediate 'quick view' stage that featured less information and no nutrition labelling. This was accessed by clicking the picture of the product, arguably a larger hotspot than the small name beneath it. On the Morrisons site therefore there were two opportunities to purchase the product without the presence of nutrition labels on the web page.

Designs featuring summary formats (e.g. multiple traffic light systems showing 5 values rather than detailed nutrition tables) were much more likely to appear 'above the fold' (e.g. without the need to scroll) when viewed using a typical 768 height monitor. Table 1 shows the frequencies where nutrition information or colours were readable above the 'fold line' without the need to scroll.

	Colours & values visible 'above the fold'	Colours & values 'below the fold'.

Tesco	15	5
Asda	12	8
Waitrose	0	20
Sainsbury's	0	20
Morrison	0	20

Table 1: Frequency of nutrition labels that appeared in their entirety 'above the fold' (without scrolling) and 'below the fold'.

It highlights a general problem with many product page designs (e.g. the prioritisation of general product information above nutrition information) and should provoke more consideration amongst the designer community. Figure 1 shows an example of one of the examined pages, turned into a schematic page made to scale, where both the summary format and table were well below the fold line. The schematic approach should help designers judge relative positioning and encourage the review of the size of the product picture (which can push down the labels) as well as the use of side columns that may more easily sit adjacent to product's displayed in the centre.

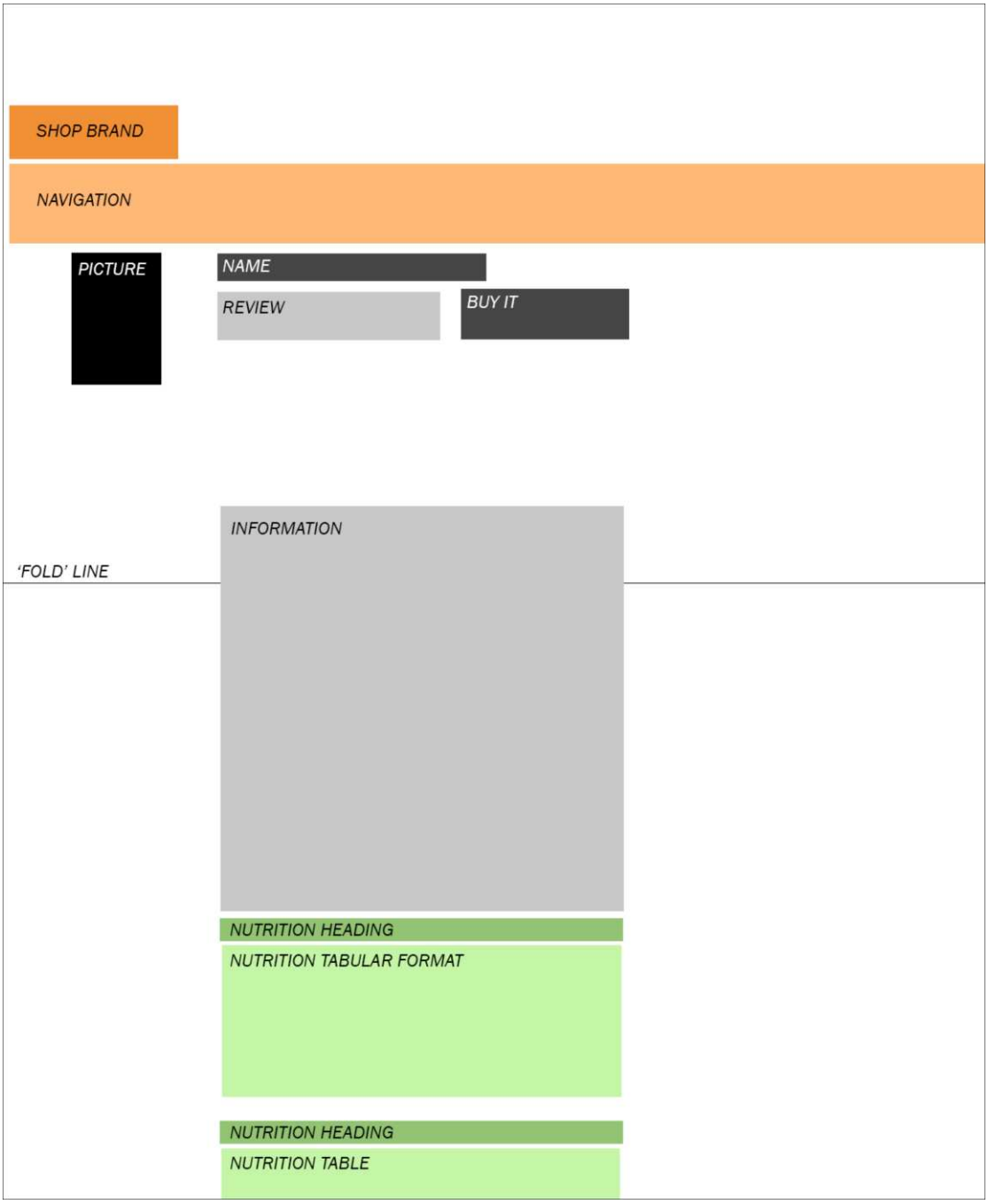

Figure 1: A schematic of one page where nutritional information was well below the 'fold line' and thus required scrolling to reach.

In 7 cases, nutrition information was found in two locations on the same page. In the case of Morrisons there were three instances of RI% found in a small paragraph of text on the right hand location whereas the nutrition information heading and table (without RI%) was lower down on the left. This could make the scanning of nutritional information particularly difficult.

Inclusion of RI %

As shown in Figure 2, in total across all supermarkets, 22% of pages did not feature the RI%. Waitrose failed to show the RI% for almost half the sample overall. In terms of actual physical packaging only 4% of products failed to feature RI% and thus the quality of information on the on-line sample as a whole is weaker than on physical products.

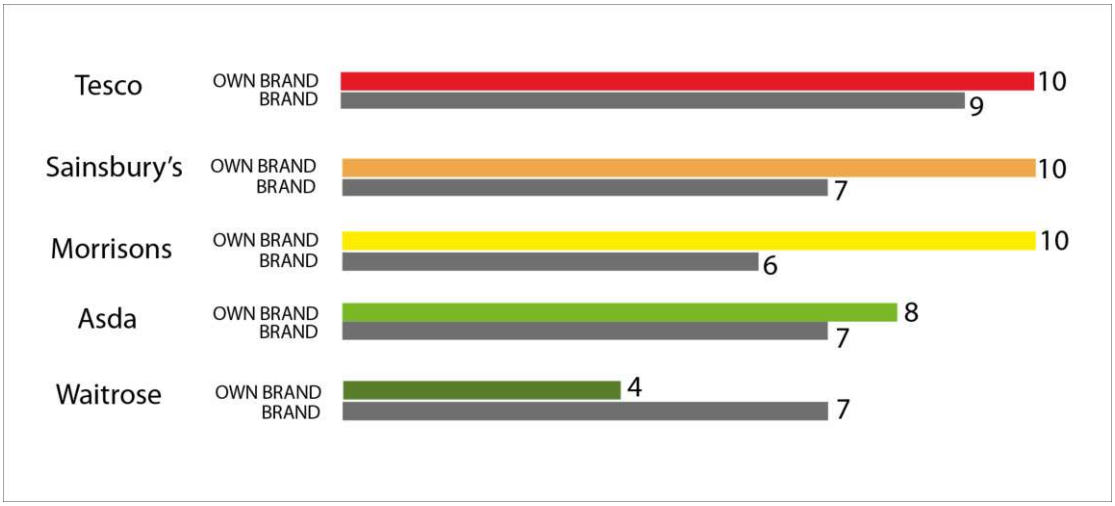

Figure 2: Frequency (out of 10) of product pages showing the RI%

The RI% appears more frequently on own-brands than branded products on-line and there is a strong level of consistency for 3 supermarkets in this respect. These 3 supermarkets also have 100% consistency on their physical packaging for RI% inclusion thus these results are somewhat expected. Waitrose, on their physical packaging are less consistent. 7/10 of their own-brand products show RI% in the supermarket whereas only 4/10 of their own brand products showed RI% on-line.

Further inconsistencies between in-store and on-line are apparent. All branded products show RI% on their physical labels and thus there appears to be a lack of accurate replication when moving from the physical pack to on-line.

Label Design Variation

In the pages examined there were a total of eight designs of nutrition label found. A 'design' could include the following variations: Inclusion of a summary (in colour or black and white), inclusion of a standard nutrition table (with table cells in colour or black and white) and the inclusion of the RI%. These designs are presented in figure 3 together with a visual key.

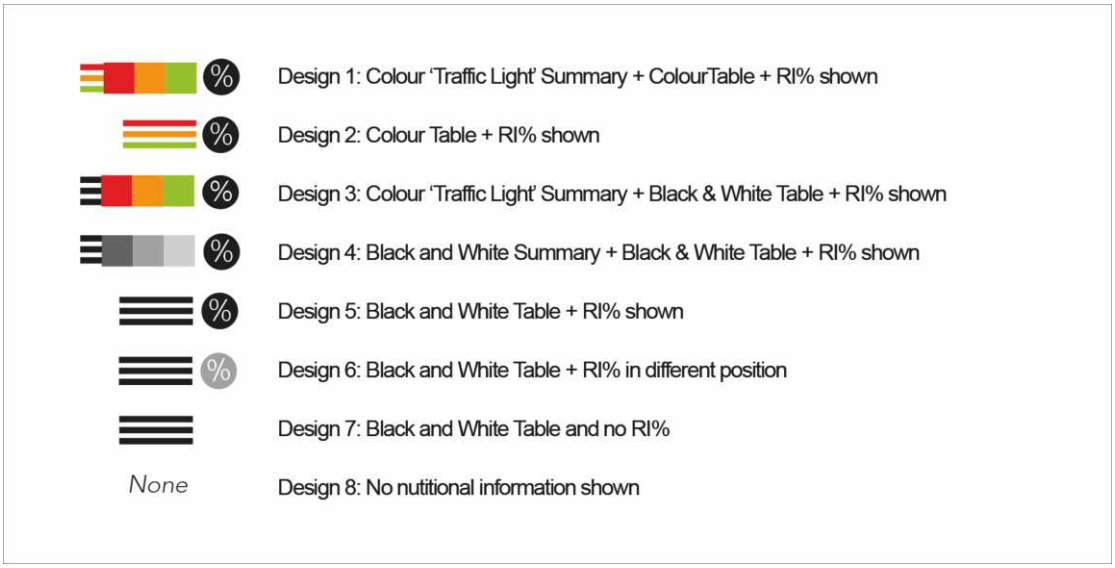

Figure 3: The 8 designs of nutrition labels

The frequency of the labels found in the 100 web page sample are shown in figure 4.

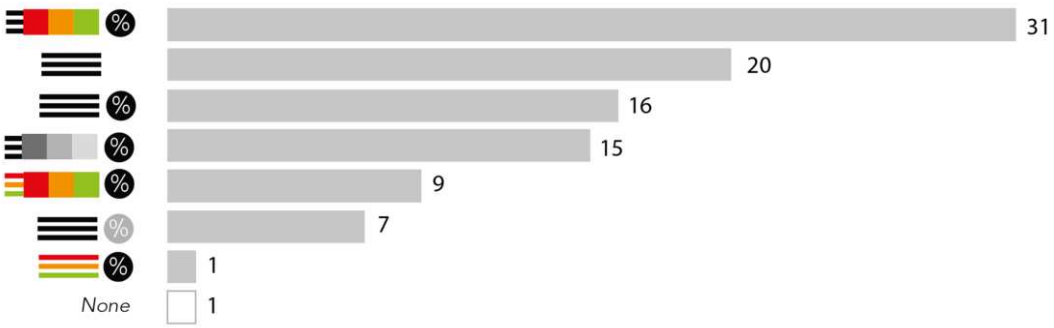

Figure 4: Percentage of nutrition labels found on-line

In all but 1 instance, all websites met the mandatory requirement to show nutrition information, albeit in the format less favoured by consumers [11]: the nutrition table. In this respect the pages were generally consistent. Black and white nutrition tables without summaries were found in 43% of the sample pages. 41% of the sample employed 'traffic light' colours either in summary format or in the table. This suggests that front-of-pack-equivalent summaries are not overly employed on-line despite the call for easier nutritional information and FSA recommendations from 2013 [19]

Figure 5 shows the frequency of label design types on in-store physical packaging across the sample of 60 products (50 own-brand and 10 branded products). As can be seen, generally physical labels are more consistent than on-line labels across the whole sample of supermarkets.

Figure 5: Frequency of nutrition label designs found in-store (out of a total of 60 products)

Colour and format of presentation

Figure 6 shows that Sainsbury's, Asda and Tesco were most likely to use traffic light colours in their on-line designs than the other supermarkets.

Figure 6: Most popular designs featured by each supermarket

Figure 6 also shows that the supermarkets appear to have chosen different dominant label designs to each other (except for Asda and Tesco using the same combination). Morrison's make no use of colour, despite their extensive use of colour for own-brands on physical in-store packaging. Strategically perhaps the use of colour for own brand product descriptions is to promote sales, though this is often not consistently done. Since colour has been highlighted in other studies as a useful device the use of colour should be extended.

Use of a simplified summary, that should be easier to glance than a nutrition table, featured in only 55/100 designs – see Figure 7 below. There appears to be no clear relationship between branded and own-brand goods and label designs used across the whole sample however supermarkets such as Tesco were able to present their own brand products with a high degree of consistency. Summary labels never replaced nutrition tables as both were present on the screen (though they were never grouped together in the same space). Generally as it has already been noted, whilst some

summaries were ‘above the fold’ all full nutrition tables required scrolling to reach which, during time-constrained usage, lessens the likelihood of viewing.

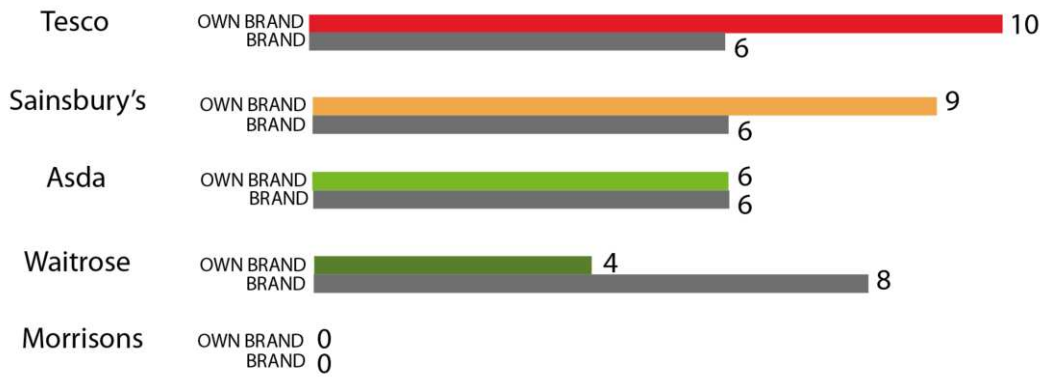

Figure 7: Number of product pages (out of 10) featuring a summary format.

Overall Consistency: How many labels do supermarkets use?

Supermarkets differ in the frequency in which they employ each design type. In terms of consistency within one site, table 2 shows the number of designs used by each supermarket (indicated by the number of rows) and frequency of those designs (the number in each row).

	Waitrose	**Morrisons**	**Asda**	**Tesco**	**Sainsburys**
Labels used (from design categories described in Figure 3)	7 x **Design 3**	13 x **Design 5**	9 x **Design 3**	12 x **Design 3**	9 x **Design 1**
	5 x **Design 4**	3 x **Design 6**	3 x **Design 4**	4 x **Design 4**	1 x **Design 2**
	8 x **Design 7**	4 x **Design 7**	3 x **Design 6**	2 x **Design 5**	3 x **Design 3**
			5 x **Design 7**	1 x **Design 6**	3 x **Design 4**
				1 x **Design 7**	1 x **Design 5**
					2 x **Design 7**
					1 x **Design 8**

Table 2: Supermarkets’ use of different label designs ordered by variety of designs used (see Figure 3 for Design Categories)

In terms of a consistent experience using one site (as is most likely to be the case when shopping) Morrisons and Waitrose provided perhaps the most consistent experiences using only 3 different label design combinations across 20 products.

Sainsbury's provided a fairly consistent experience for own brand products (9/10 of their own-brand products were designed using design 1) though it's likely that the user would still view both brands and non brands and thus the experience would still be relatively inconsistent.

Consistency between on-line and physical packaging

Given that the sample included the same 10 branded product across all the supermarkets and that each sample page represented a product that has physical packaging is was hypothesized that on-line labelling would, at the very least, mirror the physical package, if not improve on its accessibility. As previously stated, since 'front of pack' labels are not mandatory, there is still an inconsistent experience for the consumer in the supermarket itself and not all branded products feature 'front of pack' labels. However, given that nutrition information is stored within the database of the website, it, in theory, should be possible to generate 'front of pack' displays and actually improve on the current packaging provision.

Table 3 displays the degree to which the on-line product nutrition label is consistent with the physical label. Where the on-line label is the same in terms of format (e.g. colour, summary and/or table) and RI% inclusion the two are classed as equal (and thus consistent with each other). An '=' indicates consistency within Table 3. Where however, the on-line label features less accessible information (such as the loss of the summary, colour or the RI%) or improvements (such as the addition of a summary, colour or the RI%) this has also been categorised either with an upward or downward arrow respectively.

	Asda		Tesco		Sainsbury's		Morrisons		Waitrose	
	Own Brand	Brand	Own Brand	Brand	Own Brand	Brand	Own Brand	Brand	Own Brand	Brand
Orange Juice	=	=	=	=	=	=	↓	↓	=	=
Sausages	↓	↓	=	↓	=	↓	↓	↓	=	=
Yoghurt	↓	↓	=	=	=	=	↓	=	↓	↓
Cola	=	=	=	↓	=	=	↓	↓	=	=
Bolognese Sauce	=	=	=	=	=	=	↓	↓	↓	=
Frozen Peas	=	=	=	=	↓	=	↓	↓	↑	=
Digestive Biscuits	=	=	=	=	=	=	↓	↓	↓	=

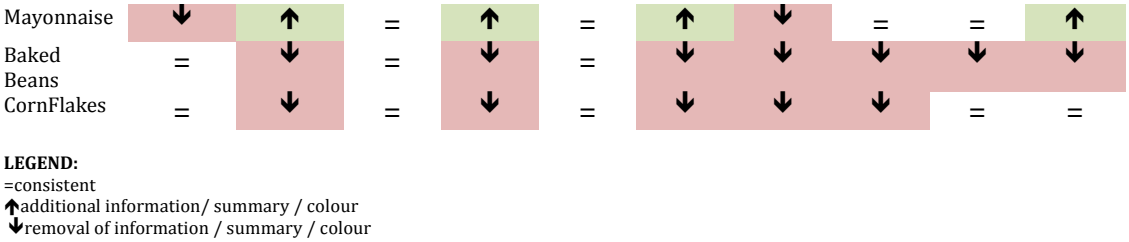

Table 3: A graphical summary of comparisons between on-line and real packaging.

As can be seen, supermarkets rate differently for consistency between on-line and in-store. Morrison's is particularly weak in consistency (90% of pages were inconsistent with in-store labelling) since product pages lack both summaries and colour on-line. In-store, both colour and summaries exist on all own-brand products.

In most cases, except Morrisons, the presentation of nutrition information was found to be mostly consistent with actual packaging in terms of colour usage. The greatest factor of inconsistency was the loss of the RI% value that was almost always present on the physical package but not always included on the product web page.

As hypothesised, most supermarkets (except Morrisons and Waitrose) achieve higher levels of consistency for their own brand products than branded products. Despite identical information being provided to retailers from manufacturers there appears to be an issue with replicating information on-line and certainly with improving information provision (such as generating summaries or generating colour displays). If the in-store experience lacks consistency there appears to be an even greater issue with on-line systems. In 99 out of the 100 pages, nutritional values were shown for each product. Thus technically it should be possible to present all products in a consistent manner for their users. This, however appears not to be the case.

Future Expansion

As the design of nutrition labels shifts, in an online environment, away from manufacturers packaging towards retailers websites, it is important to consider the

potential functionality afforded by dynamic displays.

Despite 99/100 pages displaying nutritional information there was no attempt to integrate this information within the general system architecture of the websites. Functionality such as being able to sort product listings by calorie or fat content was absent (see the proposal in Figure 8).

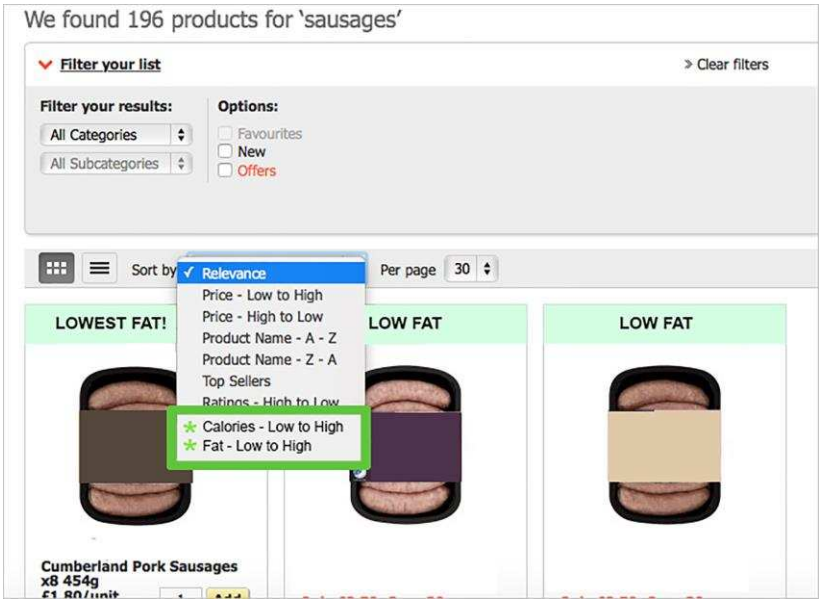

Figure 8: A proposal design for the addition of sorting by nutrition values.

The system proposed in Figure 8 would enable comparisons between products and enable the shopper to discern products with particularly low values. To counter misuse, such as the overreliance on one value such as fat, sorting could also occur amongst several nutrition values simultaneously to produce 'Top 10' product lists. Currently products are discriminated against via existing search systems by price and brand name. An additional sorting system based on nutritional values would provide the food industry with a clear incentive for improving nutritional benefits to challenge competitors. Such a proposal would require consultation with a range of stakeholders including supermarkets, the food industry and consumers, to ascertain the risks and benefits of the system.

On a more basic level, a very simple 'tick' or 'healthy option' could also be included on the search results page, dynamically generated and extracted from the database

entries for that product. As traffic light systems become more common generally, a small version could be included on the search results page that displays colours only to enable rapid scanning of comparative nutrition information.

A further proposal here involves an experience at the ‘check out’ where traffic light information is aggregated. The so-call ‘Checkout Health Check’ could provide an optional tally of an entire ‘basket’ for the five key nutrition indicators. See Figure 9.

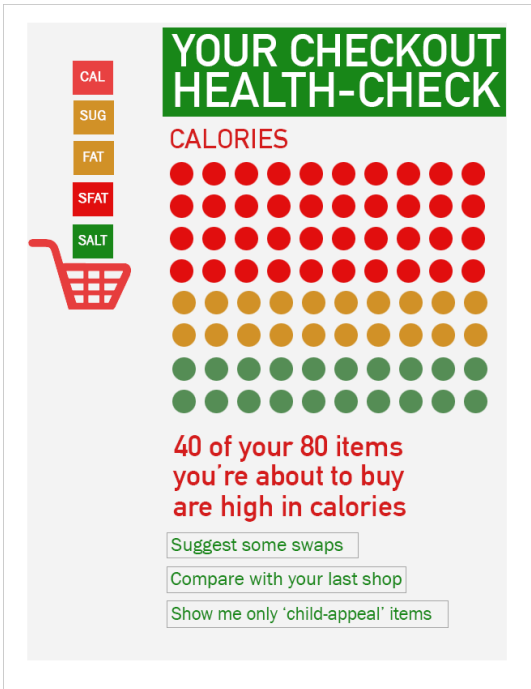

Figure 9: A proposal for an optional pop-up ‘health-check’ at the checkout.

A summary display could also calculate the average number of products with 1 to 5 red lights. With the inclusion of additional database fields this could even separate child-friendly food and provide comparisons with previous weeks/months transactions. It could also, vitally, suggest healthier options if the consumer wants to change product.

Such an aggregation system takes influence from the principle of using supermarket receipts to analyse food consumption though it offers two additional benefits: the ability to change what is bought before consumption, and the ability to show the consumer what, on a nutritional level, they are actually buying as a whole. Given the current use and interest in ‘quantified self’ health monitoring systems, particularly

using mobile technologies, there is also potential in connecting aggregated food purchase information with additional applications/monitoring software systems.

Much research would be required to find optimal designs for the aggregated display as well as who would be likely use it and how best it would fit into the system architecture of existing sites. Given the diversity of the audience any system would require user involvement and extensive testing to ensure visual designs were accessible and effective. How best to summarise this complex data, based on algorithms, is a key research question for the future.

Limitations

This study has its limitations. It only employed a small sample size of webpages. Whilst 100 webpages were viewed in total, only 20 products were examined from each website. A further study could be larger in scale though this would be unlikely to impact upon the number of label types identified, as saturation point seemed to be reached during categorisation. This study also does not involve the participation of users. Additional work is required to learn how and whether users look at and use the nutrition labels in a real online environment. Users also are needed to evaluate paper prototypes of the 'expansion' section of this paper. These currently exist only as proposals based on the existing shortfalls of the five websites studied.

This work also does not discuss the economics of the existing websites and in-depth reasons for their inconsistencies. It also does not engage with issues surrounding the legal contracts between supermarkets and their suppliers nor the commercial intent of the supermarkets themselves. These issues too, need to be engaged with in order to fully push for change.

Conclusion

This paper presented an overview of the current state of UK supermarket websites in terms of presenting nutrition information. Almost all existing nutrition labelling studies have focused on back or front-of-pack labels on packaging rather than how they are portrayed on-line. Examining the use of a relatively well established system within this new on-line environment has proved to be insightful.

This paper has highlighted inconsistencies within all the supermarket websites in terms of the use of the traffic light system and use of colour generally, inclusion of the RI%, and in some cases, position of some of the nutritional information. Generally websites are currently offering a less consistent experience than in-store and do not improve on nutrition label design found on physical products. Own-brands tend to be presented more consistently than branded products as may be expected, though not for all products.

This paper has contributed a method for judging consistency of nutrition labels using the PCD variables. It also discussed the lack of use of nutrition data as a database field that could, in the future, be employed effectively in both sorting, and checkout presentation. It appears therefore that there is still much work to be done in terms of establishing standards for on-line supermarket websites.

These results should be useful in informing future research by setting the new agenda of the study of online nutrition labels and raising questions about user engagement with the online environment. This is a timely study given rates of diet-related illness and obesity in the UK and the increasing number of consumers buying food on-line [(4)]. Supermarkets have a role to play in customer decision-making, not just in the store but increasingly on-line. Making nutrition information more fundamental to the architecture of a food retail website, by dynamic use within search results and checkout, is, the author believes, where innovation can and should occur.

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