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SUMMARY

Front-of-pack (FoP) traffic light nutrition labelling has been widely proposed as a tool to improve public health nutrition. Current evidence suggests that whilst consumers generally find them to be useful and an important source of information about a particular food or ingredient, this may have limited value in isolation when considering a person's overall nutritional intake. This study sought to examine UK consumers' use of existing FoP traffic light food labelling and ascertain public perception of a novel 'till receipt' summary providing nutritional information about consumers' entire shopping purchases. 237 respondents completed an online questionnaire between May-June 2016. Almost two thirds were female ($n = 152$, 64.1%) and the largest proportion of responses were received from those aged 25-32 years ($n = 53$, 22.4%) and 41-50 years ($n = 53$, 22.4%). 83.5% of respondents suggested that they currently use traffic light information to inform their food purchases and 'health' was reported as the most important factor influencing food choice (42.2%; $n=100$). Notably, 54.4% of respondents indicated that the novel till receipt system could provide a solution to the potential limitations of existing FoP labelling and could help inform healthier food purchases. Our findings strengthen the existing evidence base to suggest that traffic light information is a useful tool to aid consumer food purchases. Moreover, our outcomes propose that consumers may benefit from a new receipt-based traffic light system which provides a more holistic summary of their entire food purchases.

INTRODUCTION

In the UK almost two thirds of adults and a third of children are either obese or overweight (Craig et al., 2015) and it is estimated that these figures will rise to almost 90% of adults and two-thirds of children by 2050. An effective strategy to promote healthier food choices has the potential to reduce the prevalence of obesity and other associated co-morbidities. One such strategy has been front-of-pack (FoP) traffic light food labelling where a food may be labelled as containing high (red), moderate (amber) or low (green) amounts of fat, saturated fat, sugar and salt, with the premise that foods with 'green' indicators are healthier and to be preferred over those designated with 'red'. The provision of FoP information in the UK is currently voluntary but, if provided must meet the guidelines as set by the Food Standards Agency (FSA, 2013). Most pre-packed and convenience foods have the traffic-light information displayed on the front of the label whilst this data is often not included on fresh or homemade products (e.g. fruit, vegetables, bakery products, etc.).

There is evidence to suggest consumers generally find nutritional labels to be useful (Hawthorne et al., 2006; Misra, 2007) and consumers have also reported that they can provide an important source of information (Lindhorst et al., 2007; Smith et al., 2000). Conversely, interpretation of nutritional labelling can in fact be a potential barrier to healthy food choices as it requires a high level of numeracy and literacy skills (Rothman et al., 2006). Additionally, there is a desire for a more simplified presentation of information (Crawford & Baghurst, 1990) as some consumers find different nutrition label formats confusing (Grunert et al., 2010) and generally preferred simplified graphical information with minimal quantitative data (Feunekes et al., 2008; Geiger et al., 1991).

Furthermore, the fact that FoP traffic light labelling for individual foods/ingredients does not provide a holistic overview of a consumer's overall food purchases may also be a limitation of the current model. For example, the current system does not consider that the consumer likely eats a wide variety of foods across any given time frame and so reliance on the current system to provide adequate information as to the healthiness (or not) of a person's overall diet is potentially very limited.

A key aim of this study is to explore the potential benefits and consumer acceptability of holistic nutrition labelling. For example, it has recently been demonstrated that consumers were ~11 times more likely to avoid foods with more 'reds' than those with more 'greens' (~6 times more likely to choose) (Scarborough et al., 2015). This finding suggests that consumers may potentially avoid selecting foods which would otherwise have superior health benefits. For example, some consumers may select foods that are displayed with all 'green' labels despite having minimal nutritional value (e.g. Diet Cola, Low-calorie Jelly, 'Slimming' products etc.) whilst intentionally

avoiding other foods displayed with ‘amber’ or ‘red’ labels despite having potential nutritional benefits (e.g. Dairy Products, Avocado, Mackerel, Nuts & Seeds etc.). Thus this study will provide consumers with a display of traffic light information as a *summary* of their whole shop rather than just on an individual food-by-food basis. By providing a summary of the nutritional information that takes into account all of a consumers purchases at the end of a till receipt, it is anticipated that any misinterpretation of information on FoP labels for individual food items will be minimised. Additionally it is anticipated that this system would seek to account for the nutritional value of foods which currently do not provide FoP information (e.g. fruit and vegetables, small packages etc.). Thus, a till-receipt system may allow the traffic light guidance to become a more useful tool for providing nutritional guidance and a more effective method to influence consumer food choices.

METHODS

Recruitment

Following institutional ethical approval, which conformed to the Declaration of Helsinki, survey completion was undertaken using an online survey tool (Bristol Online Survey), which is fully compliant with UK Data Protection laws and meets UK accessibility requirements. The questionnaire was accessible for a period of 4 weeks during May-June 2016. Recruitment involved a ‘campaign’ approach whereby self-selected open invitations were posted on frequently visited websites to target as many respondents as possible (e.g. social media websites including Facebook & Twitter). Messages were posted with a link to the survey where any individuals who clicked on the study link were subsequently directed to an informed-consent form before being screened for eligibility. Whilst this approach may not necessarily yield a random sample, Witte & Howard (1999) suggest that this method can still elicit useful social science data so long as the sample size is sufficiently large.

Exclusion criteria

The first question of the survey asked participants to identify what role they played in food purchasing decisions. Participants who stated that they “made little or no input into food purchasing decisions” were excluded from the survey.

Survey content & questions

The first part of the questionnaire contained initial questions to determine typical shopping habits and demographic data of respondents. The second part of the questionnaire contained two questions to determine current awareness and use of existing FoP traffic light information. The final part of the questionnaire required respondents to compare existing FoP traffic light information (as per

current Food Standards Agency UK guidelines, FSA 2013) to a novel exemplar till receipt system summarising the data from all the food purchased (see example in **Figure 1**. and survey template in **Appendix**).

Insert Figure 1 near here

Participants were required to indicate their preferred mode of information. Additionally, participants were asked to explain their reasoning and compare different graphical displays to ascertain the most popular visual display. The survey included Likert scale-type questions (quantitative) and open ended or text-response questions (qualitative).

Data Analysis

Quantitative data analysis was provided by the survey software directly and exported for confirmation and further analysis. For qualitative analysis, the inductive content analysis approach involved identifying initial thematic categories followed by a more comprehensive review of themes within the data. This review was conducted independently by the researchers to ensure they accurately represented the data and the outcomes were subsequently reviewed to ensure that thematic categorisation was consistent.

RESULTS

In total, 237 responses were received, almost two thirds of which came from female respondents ($n = 152$, 64.1%) and the largest proportion of responses were received from those aged 25-32 years ($n = 53$, 22.4%) and 41-50 years ($n = 53$, 22.4%). Participant demographics are shown in more detail in **Table 1**. Most respondents ($n = 140$, 59.1%) indicated that they had a 'joint role' in food purchases in their household with the remainder indicating that they were the 'sole decision maker' ($n = 97$, 40.9%) for food purchases.

Quantitative Analysis

Quantitative analysis showed that 75.1% of respondents ($n = 178$) have noticed existing traffic light information and understand its meaning (**Figure 2**.). This is in comparison to just 3.8% of respondents ($n = 9$) who suggested that they had either never seen traffic light information on food labels or that they did not understand what the information meant. Notably only 16.5% ($n = 39$) of respondents reported that they never used traffic light information to make their purchasing decisions.

Insert Figure 2 near here

42.2% (n=100) reported that ‘health’ was the most highly influential factor influencing their food choices whilst ‘cost’ was identified by only 23.2% (n=55) (**Figure 3.**).

Insert Figure 3 near here

When asked to compare the existing FoP traffic light nutrition labelling to the novel till receipt system, 54.4% of respondents indicated that the new system could have some value either as a stand-alone system or alongside the current FoP system.

Qualitative Analysis

Benefits of the Existing FoP traffic light labelling

The main theme identified by respondents to support the use of existing FoP traffic light labelling was that many consumers may not actually look at till receipts:

- “Most people don’t look at their receipts”
- “FoP is always available – I might lose my receipt and not everyone in the family has access to the receipt”
- “Receipts get thrown away”

An additional sub-theme identified was that respondents have a desire to know about nutritional information immediately at the point of food selection, rather than retrospectively on a till receipt at the end of a shopping visit.

- “It allows us to make a choice BEFORE we purchase them....seems a bit too late if this information comes after purchase”
- “It allows the shopper to include or reject the product as part of their food choices. The receipt summary does not offer this level of choice”
- “The FoP labelling is obvious when you select each item. The receipt based system gives you information too late”.

The final sub-theme in support of the current FoP traffic light labelling system was that respondents felt that the receipt-based system could have limitations for those who shop at multiple locations or undertake several smaller shopping trips in any given period.

- “The receipt-based system is only appropriate if you buy all of your items in one place at the same time”
- “When you shop at multiple stores it would be hard to combine receipts together”

Benefits of the new Receipt-based traffic light summary

The main theme identified by respondents to support the new receipt-based traffic light summary was that it would be highly beneficial to see the combined nutritional characteristics of their total shopping purchases rather than individual foods.

- “It represents your average intake rather than individual items that you may lose track of”
- “The combined effect is important as we can see the real impact of the whole trolley. In the main people do not always understand how much they are actually consuming.....this would hopefully give people a greater insight into their complete diet”
- “I feel a receipt-based system better displays how the treats and the healthy items in your weekly shop balance out”
- “A weekly shop can be 150 items or more for a large family. So a summary of the whole shopping list to check on the overall healthiness would be preferable”

An additional sub-theme identified was that respondents suggested that the imagery or aesthetically pleasing nature of the till receipt graphics was more likely to attract the consumers attention and impact on their food choices.

- “More eye-catching – more likely to actually read it!”
- “More fun and interesting visually”
- “More impact on the audience with a visual representation rather than numbers”.

The final sub-theme in support of the new receipt-based traffic light labelling system was that the receipt-based system might allow greater time to reflect upon food choices and make positive changes in the long-term.

- “Useful to see a receipt afterwards and review purchases, promoting positive changes in the future”
- “More time to look at the receipt after shopping and analyse for next time”
- “It summarises your whole shop...I like it - It could become a bit of a game for me!”

DISCUSSION

Research to date suggests that traffic light food labelling has the potential to influence food choices and dietary intake (Fitzgerald et al., 2008; Kim et al., 2001; Neuhouwer et al., 1999). Whilst some studies have reported concerns about the ease of understanding (McArthur et al., 2001; Peters-Teixeira & Badrie, 2005), our findings support the work of several others who have also indicated that traffic light labelling is well understood by a range of populations (Grunert et al., 2010; Hawthorne et al., 2006; Hieke & Wilczynski, 2012).

Additionally in our study over 80% of respondents indicated that traffic light nutritional information has an influence on their food purchasing decisions and this adds further evidence to similar findings in other countries (e.g. 82% in New Zealand (Gorton et al., 2009); 65% in Ireland and 63% in France (Grunert & Wills, 2007)). However, it is interesting that in our study 'health' was identified as the most influential factor on consumer food choice whereas most previous research indicates that 'cost/price' has the biggest impact on food purchasing decisions (Pollard, Steptoe & Wardle, 1998; Piche & Garcia, 2001; Balcombe et al., 2010). This difference may potentially be attributed to the socio-economic status of our respondents in comparison to that of other studies. The majority of our respondents stated they were employed (83.5%) with the median total annual household income of £40,000-£50,000, in comparison to the UK median of £25,660 per household (ONS, 2016). Thus it is likely that, with a higher disposable income, the majority of our respondents have a greater freedom of choice with regards to their food purchases and can give much greater consideration to the potential impact of any purchases on their health. Furthermore our findings are in agreement with that of others who have also reported that traffic light food labelling may prompt consumers to consider their health when buying foods and therefore increase the likelihood of healthier food choices (Sonnenberg et al., 2013). It is important to note that the outcomes of this research should be taken in the context of the population from which the sample was drawn. Although the survey was widely distributed and had no specific target population, it is acknowledged that the respondents were predominantly white British females with a higher stated income than the UK median. Thus future research should aim to recruit from a more diverse sample to improve the ecological validity of the study and in particular, elucidate whether similar findings would be reported by those from a lower socio-economic status and different ethnic background.

Our findings provide additional evidence to question the validity of existing FoP traffic-light information and the appropriateness of red, amber or green labels as a measure of how healthy a food product might be. For instance, given that the majority of our respondents indicated that they frequently use FoP traffic-light information to help inform purchasing decisions, our outcomes suggest that any misinterpretation of the perceived healthiness of a particular food based upon its red, amber or green labelling has the potential to have significant impact upon consumer food

choices. A unique aspect of this study was to potentially expose whether nutritional information about a consumer's food choices needed to consider a more rounded approach rather than focussing on individual foods. Whilst the respondents in this study suggested that FoP information still has an important role to play, over half of respondents (54.4%) indicated that a receipt-based summary would have some supplementary value and aid their decision-making processes. Furthermore it is also important to acknowledge the potential limitations of the till-receipt system itself. For example, many consumers are likely to buy products from a range of shops and will often buy foods for multiple people within a household. Therefore it is difficult to get a truly comprehensive representation of the nutritional value of an individual's diet. Nonetheless, it is suggested that the till receipt concept proposed here would still provide a more accurate representation of a person's diet than the existing FoP labelling on individual foods. Further research should seek to explore this concept in more detail across a wider range of populations and larger sample size. The addition of focus groups and discussion forums would also elucidate the comments obtained within our qualitative analysis and provide greater understanding of the potential benefits or challenges of a receipt-based traffic light system. Finally, given the largely positive reception to the concept of a receipt-based summary of nutritional information, it would now be of interest to establish whether this can actually have any measurable impact on the healthiness of food purchases. As indicated by the qualitative responses, some consumers were able to recognise the opportunity for reflection and evaluation of previous food purchases and consider how this process might help inform future choices. Thus future work should seek to provide the receipt-based traffic light information to a wide a range of consumers within a longitudinal time frame (e.g. 6 months) to assess the impact on their shopping habits.

An important next step of this concept would be to determine the feasibility of implementing such a strategy within the wider population. It is likely that investment in infrastructure will be required in order to develop the software to summarise nutritional information and print coloured receipts. Whilst supermarkets may initially be reluctant to invest in this technology, it could be suggested that it would encourage consumers to do their entire shop in one store and promote consumer loyalty. The incorporation of an online portal where consumers can monitor their progress could help encourage adherence and reinforce positive changes to behaviour. Moreover, with the increasing availability of technology use whilst consumers are in the process of shopping (e.g. Waitrose 'Quick Check' Scanner, Tesco 'Scan As You Shop'), there is scope in the future to provide a 'running total' and/or summary of nutritional intake at the point of purchase and even prompt consumers towards healthier food choices.

CONCLUSION

This investigation sought to determine the public perception of a novel receipt-based summary of traffic light nutrition information in comparison to existing front-of-pack information. Whilst the majority of consumers indicated that FoP information had an important role to play, they were also able to recognise the potential limitations of this information and acknowledge how a receipt-based system could add value. Future work should seek to explore the receipt-based system further and understand how it may be best utilised to have greatest impact on healthier consumer food purchases.

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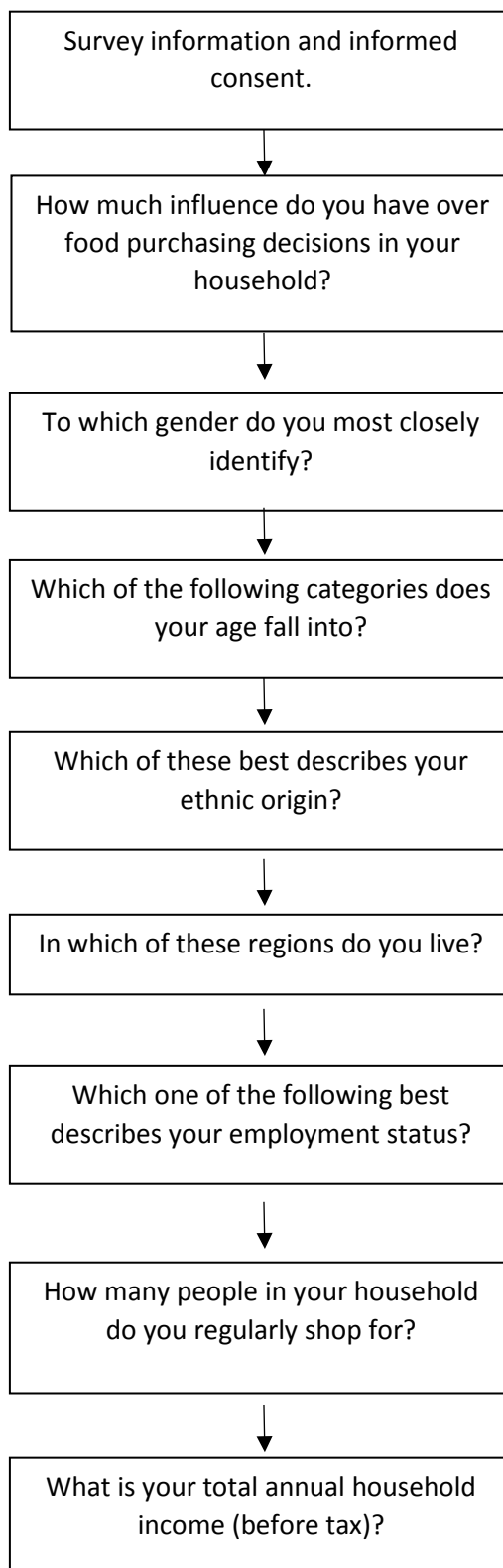
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Appendix - Survey Template



To what extent are you aware of existing front-of-packaging traffic light nutritional information such as that displayed in the image below (exemplar image provided)?



To what extent do you currently use front-of-packaging traffic light nutritional information to make your food choices?



Which of these do you feel would be most effective in providing you with useful nutritional information?

A: Nutritional information about an *individual* food item (exemplar image provided)?

B: Nutritional information *summarising* all food purchased (exemplar image provided)?

Please provide a reason for your choice.....



To what extent do the following factors influence your food choices?

A: Health

B: Special Offer/Promotion

C: Cost

D: Recognised Brand

E: Familiarity



Which system (if any) do you prefer?

A: Existing front-of-packaging traffic light food labelling

B: The till-receipt summary of nutrition information

C: Both systems are equally effective at providing nutrition information?