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Benefits of a Modified Traffic Light Labelling System for Food Products

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The prevalence of cardiovascular diseases, type 2 diabetes mellitus, and other diet-related chronic diseases is increasing worldwide due to the global rise in overweight and obesity. Numerous ways to communicate nutritional information to consumers can be considered to effectively improve eating habits, thereby counteracting this development. Traffic light labels have been discussed in Germany as a possible tool to communicate easy-to-understand information about the nutritional value of food products. However, the design of traffic light labels discussed to-date is aimed only at reducing the intake of fat, saturated fatty acids, sugar, and salt. The aspect of consuming adequate amounts of vitamins, minerals, and dietary fibre has been neglected so far. Traffic light labelling including information on this aspect of a healthy diet would significantly improve the potential for promoting healthier diets.

A healthy diet provides a balanced supply of important macronutrients, micronutrients, and other dietary components to prevent deficiency diseases. It simultaneously reduces the risk of diet-related chronic diseases caused by an oversupply of certain critical nutrients. In the medium and long term, consuming too much salt, refined carbohydrates, and fats – especially saturated fatty acids – increases the risk of overweight, obesity, and diet-related chronic diseases, such as cardiovascular diseases, diabetes mellitus type 2, and certain cancer diseases. In this context, the World Health Organization (WHO 2015a) warns of a global overweight and obesity crisis. In Germany, 52% of the adult population is currently considered overweight. Furthermore, in 2008, direct healthcare costs resulting from the excessive consumption of sugar, salt, and saturated fatty acids totalled EUR 16.8 billion in Germany (i.e. EUR 205 per person) (DESTATIS 2013; Meier et al. 2015). A voluntary traffic light label conceived and implemented by the British Department of Health (2013) is a possible tool to make the content of total fat, saturated fatty acids, sugar, and salt in foods readily comprehensible using the green, yellow, and red traffic light colours. A green traffic light indicates a correspondingly low fat, sugar, or salt content per 100 g of the food product (or per 100 ml in case of liquids), whereas a red traffic light signals a correspondingly high content of fat, sugar, or salt and is also intended to encourage reduced consumption of the food product labelled this way. The goal of traffic light labels is to offer orientation for consumers regarding the fat, sugar, and salt contents of a food product, encouraging consumers not to exceed the upper reference intake values for their average daily intake of these dietary components.

While consumers generally want easy-to-understand nutritional information on food packaging, such as traffic light labels, scientific studies on the effectiveness of the current British traffic light labelling show inconsistent results (see, e.g., Temple and Faser 2014; Emrich et al. 2017). One possible reason for this is that the nutritional information of current traffic light labels does not adequately represent the complex nutritional quality of food products. The traffic light labelling discussed so far is only aimed at reducing the intake of components considered risky (e.g., disqualifying nutrients such as fats, saturated fatty acids, sugar, and salt), since they increase the risk of diet-related chronic diseases if consumed in excess. However, the aspect of an adequate supply of nutrients considered positive from a nutritional perspective (e.g., qualifying nutrients such as vitamins, minerals, fibre, etc.) by preventing deficiency-related diseases is disregarded in the current traffic light label.[1] This Policy Brief proposes modified traffic light labelling, which is

[1] In view of the current supply situation (without supplementing) in Europe, the risk of an excessive intake of vitamins, minerals, fibre, and the like is disregarded and these components are designated simply as "positive" in the following.

the first that also takes into account the adequate intake of dietary components considered positive from a nutritional perspective and discusses further innovative improvements.

Current traffic light labelling

To date, the British traffic light labelling classifies foods according to their nutrient content of (saturated) fats, sugar, and salt using the three traffic light colours (green, yellow, and red). For instance, the following classification is specified for the traffic light labelling of the absolute fat content per 100 g of a food product: green for a fat content of less than 3 g, yellow for a fat content between 3 g and 17.5 g, and red for a fat content of more than 17.5 g (Department of Health 2013). The traffic light classification of the absolute nutrient content per food product has been established by an expert commission and is based on the EU reference values in terms of the upper reference values for a moderate daily intake of fat, saturated fatty acids, total sugar, and sodium (in the form of table salt). Figure 1 shows an example of such a traffic light label.

The EU reference values are based on the recommendations of the European Food Safety Authority (EFSA) and are documented in Regulation (EU) No. 1169/2011 of the European Parliament and Council of 25 October 2011 on the provision of food information to consumers (EU 2011). They have already been largely applied for nutritional labelling by the European confederation of food and drink industries (FoodDrinkEurope 2016).[2] These EU reference values (reference intakes, RI) for fat, sugar, and salt apply for adults of normal weight aged 18 years and over with an assumed daily energy intake of 2,000 kcal for women and 2,500 kcal for men. For some people with a low average physical activity level (PAL < 1.4) and especially for older consumers, these assumed daily energy intakes are significantly above the corresponding German guideline values (DGE et al. 2015). Furthermore, because RIs are intended for the nutrition of adults, the assumed energy intakes also have to be considered too high for children. The reference value for sugar specified by the EU has to be viewed critically as well. The EU reference value of sugar is defined as total sugar, meaning all mono- and disaccharides contained in a food product (with the exception of polyols used as sugar substitutes, such as the sugar alcohols mannitol, sorbitol, and isomalt). Therefore, unlike the sugar reference values of other institutions, the EU reference values of 90 g total sugar for women and 110 g total sugar for men do not refer only to added sugar but to all types of sugar added to and naturally occurring in the food product, including lactose (DGE 2007). Furthermore, the additional reduction of the reference value for the daily intake of free sugar to a maximum of 5% of total calorie intake proposed by the WHO is not yet considered in the EU reference values (WHO 2015b).[3]

Modification of traffic light labelling

Relative nutrient content per food product

The content of dietary components considered positive could also be classified by a modified traffic light label, similar to the current traffic light classification of dietary components considered risky. Yet in the case of positive nutrients such as vitamins or minerals, the adequate minimum intake values according to the EU nutrient reference values (NRV) would be applied, rather than the upper reference intake values (RI) as for fat, sugar, and sodium. However, in order to determine the content of (saturated) fats, sugar, and salt as well as vitamins (e.g., vitamin D, vitamin B12, and folic acid), minerals (e.g., iron, calcium, and magnesium), and fibre in a uniform and comparable manner, the modified traffic light classification should be based on the relative nutrient content instead of the absolute nutrient content used in the current British traffic light system.

The relative nutrient content corresponds to the percentage reference intake (% RI) information on food packaging. The relative nutrient content per 100 g serving is the nutrient content per 100 g of the food product relative to the reference value proposed by the EU for the daily intake of the respective nutrient. Thus, the relative nutrient content for components considered positive from a nutritional perspective as well as those considered risky is calculated as follows, per 100 g of a food product:

$$\text{Relative nutrient content per 100g of food product} = \frac{\text{Nutrient amount per 100g of food product}}{\text{Reference value of this nutrient}}$$

The calculation of the relative nutrient content will be illustrated below using the example of a pizza Margherita (Figure 1), respectively for a risky component already included in the current traffic light label (such as total fat), and for a new, positively considered component that is included in the new labelling system proposed in this Policy Brief (such as calcium). Depending on the preparation method, 100 g of a pizza Margherita provides about 5 g of fat and about 50 mg of calcium. The EU reference value for total fat intake limits the average daily fat intake to a maximum of 70 g (EU 2011). For the relative fat content of a pizza Margherita, this results in a value of 0.071, which means that consuming 100 g of such a pizza already covers 7.1% of the tolerable fat intake per day. According to current traffic light labelling, this value would

[2] Some of the EU reference values of FoodDrinkEurope deviate from the D-A-CH reference values in Germany, Switzerland, and Austria (DGE 2007). A possible use of national reference values would have to be discussed as part of European traffic light labelling.
[3] For comparison, see the recommendations of the WHO, the American Institute of Medicine, or the Eurodiet Nutrition Population Goals. In its definition of sugar ("free sugar"), the WHO considers, in addition to added sugar, only types of sugar that occur naturally in honey, fruit juice, fruit juice concentrate, and syrup.

Figure 1: Current traffic light labelling, pizza Margherita example

correspond to a yellow traffic light for the fat content (see Figure 1) because, as explained above, a yellow traffic light indicates a fat content between 3 g and 17.5 g per 100 g of food product.

For calcium, which has not been included in the traffic light system to date, the EU nutrient reference value recommends an average daily intake of 800 mg calcium for an adult (EU 2011).[4] Hence, the relative calcium content is 0.063, meaning that 100 g of such a pizza would cover 6.3 % of the average daily calcium demand. Thus, such a modified approach based on the relative nutrient content offers a consistent way to not only evaluate the content of risky nutrients but also the content of positive dietary components such as vitamins, minerals, and fibre in relation to their respective reference values. Another possible approach to calculate the relative nutrient content would be the nutrient density.[5]

Assignment and representation of traffic light colours

Based on the calculated relative nutrient contents, the dietary components of foods can then be classified with the three traffic light colours. For the risky nutrients that are already included in the traffic light label (salt, [saturated] fats, and sugar), the classification thresholds for the absolute nutrient contents from the Department of Health (2013) can be easily converted to the corresponding thresholds for the relative nutrient contents for green, yellow, or red traffic light classifications. The higher the relative nutrient content of the risky nutrient, the less beneficial to health the food product tends to be in general, and the more likely the traffic light signal is to be red.

For the proposed modified traffic light labelling presented here, an independent expert commission would similarly have to define the thresholds for green, yellow, and red classification of the traffic lights regarding the relative contents of vitamins, minerals, and other dietary components considered positive. However, in contrast to the classification of risky nutrients, the higher the relative content of a positive dietary component is, the healthier the food product is in general and the more likely a green indicator will be.

A remaining disadvantage of the current labelling system is that hard cut-off values for the classification thresholds of nutrient contents for the three distinct traffic light colours red, yellow, and green are difficult to derive by statistical methods. Moreover, the considerably wide classification ranges of the nutrient contents for the three traffic light colours (e.g., a fat content between 3 g and 17.5 g for a respective yellow traffic light) do not allow a differentiated nutritional comparison of food products very well (DGE 2009). Yet defining a continuous colour gradient for the traffic light signals is an easily implemented solution to this problem. That means, instead of the current three distinct colours for a specific traffic light signal, a traffic light colour with correspondingly adjusted green, yellow, and red colour proportions would be applied depending on the relative nutrient content. Food products with a total fat content of 4 g and 16 g, for example, would no longer be uniformly labelled with an identical yellow traffic light indicator, but with a blend of yellow and very little red proportions for a fat content of 4 g, and a blend of yellow and a lot of red proportions for a fat content of 16 g (also see Figure 2).

Selection of potential risky and healthy dietary components

The selection of nutrients included in the traffic light label should be based on a significant link between the intake of the respective nutrient and the resulting disease burdens and healthcare costs. Such a relationship is well-proven in the current scientific literature for the excessive consumption of (saturated) fats, sugar, and salt (see, e.g., Plass et al. 2014), which is why these risky components should continue to be included in traffic light labelling.[6]

The necessary selection of components that are beneficial for health is far more complex. However, the selection process of Katz et al. (2009) might be suggested, which, among others, calls for mainly positive answers to the following questions: Does peer-reviewed literature provide a strong support for the association between the respective nutrient intake and health? Can a scientifically validated average human intake range (or upper and lower limits) of this dietary component be derived from experimental studies? Is the sufficient intake of the respective healthy component considered to be highly relevant to public health in the application region?

For Germany, scientifically validated information for a recommended nutrient intake is available according to the D-A-CH reference values for the following components among others: vitamin A (retinol equivalents), vitamin B1, vitamin B2, vitamin B6,

[4] For comparison, the recommended calcium intake according to the D-A-CH reference value is 1,000 mg per day (DGE et al. 2015).
[5] For comparison, the recommended calcium intake according to the D-A-CH reference value is 1,000 mg per day (DGE et al. 2015).
[6] Here the preceding discussion of added sugar may require adapting the definition of sugar. Including additional components such as trans-fatty acids is conceivable as well.

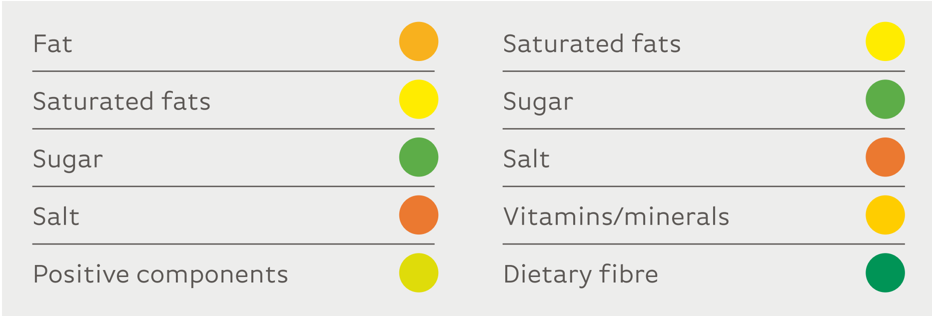

Figure 2: Possible traffic light modification, whole grain pizza Margherita example

vitamin B12, niacin equivalents, folate equivalents, vitamin C, calcium, magnesium, iron, zinc, and iodine (DGE et al. 2015). But according to the results of the German National Nutrition Survey II by the Max Rubner Institute (MRI 2008), the average intake of folic acid (folate equivalents) and iodine (not including iodised salt) is significantly below the D-A-CH reference values for more than half the population. Some population strata are also poorly supplied with vitamin D, vitamin E, calcium, magnesium, and iron. Furthermore, Hauner et al. (2012) point out a negative correlation between the consumption of fibre and the risk for the development of obesity, hypertension, coronary heart disease, and type 2 diabetes mellitus, yet the median fibre intake in Germany is below the respective desirable nutritional reference intake value as well.

Aggregation of nutrient indicators

Against the background of ongoing disease burdens and healthcare costs resulting from the excessive consumption of sugar, salt, and (saturated) fats, it appears that the established disaggregated representation of these risky components in a traffic light label remains justified. Although such a disaggregated representation would in principle be conceivable for the aforementioned positive components (vitamins, minerals, etc.) as well, an aggregated representation of these positive components seems to be preferable due to the limited space on food packaging and for a better overview of the nutritional value considering various healthy nutrients and their respective relative nutrient contents. For such an aggregation of the corresponding relative nutrient contents of the dietary components considered healthy, equally weighted averages are often preferred (see, e.g., Chiuve et al. 2012).[7] Then the thresholds for the green, yellow and red classification – or preferably for the continuous colour gradients – of the traffic light label can be derived on the basis of such an aggregated relative nutrient content for all selected positive components. This can be done in the same way as using the individual nutrients as the basis. Additionally, a side note should document the selected positive nutrients aggregated in the traffic light label. Detailed information about considered nutrients could also be provided on the packaging or on the manufacturer's website.

The modified traffic light label as a supplementary measure for healthier nutrition

The current form of the traffic light label should be enhanced by the relative nutrient content of positive nutrients to overcome one of the most crucial criticisms of current traffic light labelling discussed here: the failure to consider vitamins, minerals, and dietary fibre that are important for health. Furthermore, a continuous colour gradient for the traffic light signals compared to the currently applied three distinct traffic light colours would offer a much more differentiated indication of the relative nutrient contents.

The design of such a modified traffic light label as discussed in this Policy Brief could look like the traffic light versions presented in Figure 2 using a whole grain pizza Margherita as an example. Here the first version aggregates all components considered positive in one category, "Positive components," and the second version presents the two separate categories, "Dietary fibre" and "Vitamins/minerals," while omitting the total fat category. Regardless of the exact ultimate design of traffic light labelling, such modified labelling would additionally identify the positive nutritional contribution of the considered food product regarding its contents of vitamins, minerals, and fibre. Furthermore, the increased proportion of red in the new gradual traffic light colour for the salt content in Figure 2 emphasises that the salt content of such a pizza classified as "moderate" (previously a yellow traffic light) nearly approaches the reference value for the salt content classified as "high" (previously a red traffic light).

Even the modified traffic light labelling, however, does not support a generally applicable classification into healthier and less healthy food products. This applies in particular since the quality of human nutrition is not determined by a single labelled food product, but by all food products consumed on average. Traffic light labelling merely approximates reference values per 100 g of food product on the basis of the nutrient reference intake values for daily nutrition. Furthermore, the modified traffic light label does not provide any

[7] A scientifically substantiated additional weighting in terms of representing the effect size of consuming the various vitamins and minerals on health is virtually impossible to realise with current observational studies.

recommendations for the average daily consumption amount of the labelled food products. Individual criteria such as age, gender, physical activity, specific life situations (such as pregnancy), and other factors relevant for nutrition (such as meal patterns) remain unconsidered due to the compressed form of representation (DGE 2007, 2009).

However, when traffic light labelling is considered as a complement to other measures for healthier nutrition, such as optimising menus in communal catering or providing adequate nutritional knowledge for everyone, the modifications presented here significantly improve the information potential of traffic light labelling without becoming too elaborate from a technical perspective. Future research should test the practical effectiveness of the traffic light concept introduced here.

Further Information

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