



Design and methods of the German monitoring of packaged food in the European context

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ABSTRACT

Reformulation strategies to reduce the energy, salt, sugar, total fat, and saturated fat content of packaged food are one means to improve the food offer and facilitate healthier food choices. In Germany, the “National Reduction and Innovation Strategy for Sugar, Fats, and Salt”, which runs from 2019 to 2025, is accompanied by a yearly product monitoring of packaged food. The product monitoring focuses on food categories with a major contribution to dietary intake of sugar, total and saturated fat, and salt, and on products targeted at children. Nutrition labelling information taken from manufacturer’s websites serves as the primary data source and is collected manually. Analyses include the current energy, salt, sugar, total fat, and saturated fat content as well as changes of energy and nutrient content over time at the level of food categories and subcategories. Monitoring results are presented on a yearly basis for the comprehensive product range and, for selected product categories, for top-selling products. Differences in data collection and evaluation methods and limited information about the approaches taken by others hinder the comparison with further national monitoring approaches in Europe. Ongoing research projects related to the German monitoring of packaged food seek to a) automate the German data collection and b) harmonize the monitoring across Europe.

1. Introduction

Excess intakes of energy, sugar, fat, and salt are one of the root causes of the persistently high prevalence rates of obesity and non-communicable diseases (Commission of the European Communities, 2007; Council of the European Union, 2016; WHO Regional Office for Europe, 2022). European consumers are faced with a large variety of packaged food, many of which are too high in sugar, total and saturated fat, or salt (Storcksdieck genannt Bonsmann et al., 2019). Reducing the energy, salt, sugar, and fat content of packaged food is widely recognised as one means to improve the food offered and thus facilitate healthier food choices. In 2016, the European Union called upon its Member States to have national plans for the reformulation of packaged food in place by the end of 2017 and advocated accompanying these measures with national monitoring systems (Council of the European Union, 2016). To date, there is only sparse information about the implementation of different monitoring systems and the applied methods. Additionally, corresponding reports often are only available in national languages and grey literature.

In late 2018, Germany adopted the “National Reduction and Innovation Strategy for Sugar, Fats, and Salt” (NRI) (Bundesministerium für Ernährung und Landwirtschaft (BMEL, 2018)). This NRI was developed in dialogue with stakeholders of national nutrition, health, and consumer protection associations, the food industry, and science representatives, and has a particular focus on children and adolescents (Bundesministerium für Ernährung und Landwirtschaft (BMEL, 2018)). It comprises a range of different measures including innovation funding to develop food products with less sugar, salt, or fat, promoting food literacy, and reformulation initiatives for selected food categories over the period 2019–2025. The reformulation initiatives build on voluntary commitments of the food industry and so far comprise commitments to reduce sugar content in soft drinks, child-targeted breakfast cereals, and child-targeted sweetened dairy products, and salt content in frozen pizza, bread, and cooked meat products by 2025 (BMEL, 2020).

As part of the NRI, the German Ministry of Food and Agriculture commissioned the Max Rubner-Institut (MRI) to carry out an annual product monitoring of packaged food available on the German retail market to track their energy and nutrient content over time and thus

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inform the reformulation progress. The main reference points for this annual product monitoring are data from 2016 and 2018, when the MRI conducted two market overviews of frequently purchased packaged food. These market overviews gave insights into the energy and nutrient contents in 19 food categories available on the German market (Demuth et al., 2018; Pfau et al., 2018).

The aim of the present paper is to describe the design and methods of the German monitoring of packaged food (product monitoring) and to put it in the context of monitoring approaches of other European

countries.

2. Materials and methods

The basic principles of the annual monitoring were developed in a systematic process along the following steps: Define criteria for the selection of food categories to monitor, develop a list of criteria to identify food products targeted at children, draft a defined monitoring schedule for the selected food categories, and develop and continuously revise

Table 1

Schedule of the monitored food categories from 2016 to 2022 in the German monitoring of packaged food.

Food categories	Baseline surveys	1. Follow-up surveys	2. Follow-up surveys
Sweetened yoghurt	2016*	2019	2022
Sweetened curd			
Breakfast cereals			
Frozen pizza		2020	
Bread and bread rolls			
Meat preparations			
Sausages			
Muesli, nut & fruit bars			
Cold sauces (e. g. Ketchup)			
Pasta sauces		2021	
Frozen complete convenience meals			
Plant based meat alternatives			
Biscuits and other fine bakery			
Soups and stews			2022
Soft drinks	2018	2019	2022
Sweetened milk drinks	2019	2022	
Ready meals for infants	2020		
Puréed products in squeezable pouches			
* Further food categories assessed during the first market overview 2016: fish/seafood; vegetables/mushrooms/legumes; potatoes; grains; snacks from different food groups; desserts; spreads; sweets			

standard operating procedures for data collection, management, and analysis.

2.1. Selection of food categories to monitor

Four criteria, of which at least one has to apply, guide the choice of food categories to monitor:

- **The food category is a major contributor to people's intake of energy, sugar, fat and/or salt.** To identify the main sources of energy, sugar, fat, and/or salt, food consumption data of the German National Nutrition Survey II (NVS II) (Max Rubner-Institut, 2008), the statistical database Statista (Statista GmbH, n. Y), and data of the consumer research institute GfK (GfK Growth from Knowledge, 2023) are used.
- **The food category is relevant for the vulnerable subpopulations of children and adolescents.** Data of the Eating Study EsKiMo II of the German Health Interview and Examination Survey for Children and Adolescents (KiGGS) (Mensink et al., 2007) are used to identify frequently consumed food or food categories that are main sources of energy, fat, sugar, and/or salt in children's and/or adolescents' diets.
- **The food category contains mainly products with a high fat, sugar, and/or salt content.** Data from the baseline surveys of the monitoring of packaged food (Demuth et al., 2018; Pfau et al., 2018) and the German Nutrient Database (Bundesministerium für Ernährung und Landwirtschaft (BMEL, 2014) are used.
- **The food category is recommended for daily consumption by expert associations or is perceived as healthy by consumers but contains products with an unfavourable nutrient profile.** Consumers may perceive these food products as healthy because they do not associate their consumption with the intake of high amounts of nutrients that should be limited (e.g. sweetened dairy products or breakfast cereals with added sugars vs. the corresponding plain products).

2.2. Monitoring schedule

To identify changes in the nutrient content of monitored food categories over time, each category is monitored at least twice within the time frame of the NRI (2019–2025). The initial surveys from 2016 and 2018 serve as a baseline. They are complemented by further baseline surveys conducted in case the food category was not part of the initial survey (e.g. flavoured and sweetened milk drinks) or the available data from the initial survey are insufficient due to small sample sizes in the corresponding food category. Table 1. provides an overview of the monitoring schedule for the period of 2016–2022.

2.3. Subdivision of food categories

Each food category (e. g. bread and bread rolls) is further divided into subcategories to group related foods with similar characteristics (e. g. whole grain bread) or of similar composition (e.g. all types of rye

bread). The assignment to subcategories is primarily based on official German guidelines for the respective food categories, e.g. German guidelines for fine bakery products (BMEL, 2010), definitions of food industry associations, and expert advice from the MRI Departments of Safety and Quality of Cereals, of Meat, and of Milk and Fish.

2.3.1. Special subcategories for food products targeting children

In accordance with the NRI, one focus of the monitoring is on products specifically targeting children (hereafter termed child-targeted food products). To this end, a list of defining criteria was developed based on previous studies (Düren and Kersting, 2003; Germer et al., 2013); for products to qualify, at least one criterion has to apply (see Box 1).

It should be noted that the criteria exclusively consider the product and packaging design, not the more downstream marketing communications such as TV and billboard advertising, product placement or digital marketing.

Each food category is checked for child-targeted food products and their nutritional profiles are presented in a separate subcategory within the corresponding food category. Within these subcategories, ingredient lists are screened to evaluate the use of sweetening ingredients, e. g. artificial sweeteners.

2.4. Data collection

For each survey year, data are collected from August to December. Only packaged food products available in the German retail market with a European Article Number (EAN) or Global Trade Item Number (GTIN) are included. Depending on the food category (e.g. ready meals), products of home delivery services for frozen food or meals are also considered due to their substantial share of sales in the respective food category in Germany. Energy and nutrient content data are gathered from packaging labels, original websites of the manufacturers, or direct information from manufacturing companies. Declared values may differ from those established via official analytical checks by up to 20% depending on the nutrient as described in the guidance document referring to the Regulation (EU) No. 1169/2011 (European Commission (EC), 2009; EC, 2012). Studies from Germany and the EU on the accuracy of the declared values show that the deviation may differ depending on the analysed nutrient and product group. However, the majority of products comply with the given tolerance levels (Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit (LGL, 2021a, 2021b; Machackova et al., 2018; Yusta-Boyo et al., 2020).

To cover the products available on the market as completely as possible, data collection follows a stepwise process including manual online research on original manufacturers' websites, enquiries with manufacturers as well as on-site research in grocery stores. Table 2 gives an overview of the product information collected.

Manual online research for product information serves as the main data source. To identify food products of the respective food categories, a list with manufacturers of the corresponding products is created first. The information is compiled from various sources such as Statista,

Box 1

Criteria for child-targeted products.

Criteria to identify child-targeted products; At least one has to apply:

1. The name of the food product includes „child/children“ or „kids“ etc. or appeals directly to children, e.g. „chocolate bears“
2. The packaging is attractively designed for children, e.g. displaying smiling animals, or cartoon characters
3. The food product itself or its components is/are designed for children, e.g. cereal pops in the shape of bears or letters
4. The packaging includes information aimed at parents or children, e.g. „for your little ones“, notes on games for children, learning effects, or provides information about free toys or gifts like collectible picture cards inside.

Table 2
Collected product information within the monitored product categories.

Product Information	Mandatory (Y/N)	Notes
Product name	Y	Including flavour / type, if applicable
Brand	Y	
Manufacturer	Y	
Energy & nutrient content	Y	Energy, fat, saturated fatty acids, carbohydrates, sugars protein, salt or sodium as indicated on the internet / packaging. If energy is indicated only using one unit (kcal or kJ), the missing unit value is calculated (kcal value * 4184, kJ value * 0239). Similarly, if sodium is indicated instead of salt, the salt content is calculated by multiplying the sodium value by 2.54.
Pictures of the product / packaging	N	Collected if available
Ingredient list	N	Collected if available; mandatory for child-targeted products and some product categories (e.g. soft drinks)
Net weight	N	Collected if available
Serving suggestion	N	Collected if available
Physical state, e.g. refrigerated	N	Collected if available
Packing material	N	Collected if available

online shops, leaflets, or test reports. This initial link list is revised in each survey year before the start of the survey in August and expanded continuously to include new manufacturers during the data collection period. Starting from this link list, the information on the individual food products is retrieved from the manufacturer's websites and documented manually before entering it into FoodCASE (see section data management).

In case of no or incomplete product information on the websites, manufacturers are contacted and asked to provide the missing information.

On-site searches in grocery stores complete the data collection and comprise taking pictures of all sides of the packaging after the written consent of the retailer or, in the absence of consent, buying the products. If new products are identified during any of the steps, manufacturer information is added to the link list and the products are included in the survey. Webpages on the link list are checked several times for new products or new information until the end of December of each year.

2.5. Use of commercially available market data

Data collected by the MRI are complemented by purchase data of private households from the consumer research institute GfK. These purchase data are based on the GfK consumer panel for fast-moving consumer goods, which consists of 30.000 German households and is representative of the German population. The panel reports household purchases of products with EAN/GTIN for a period of one year (September – August, hereafter termed reference period). For each monitored food category and its subcategories, the following data are provided:

- **Purchased quantity in tons:** Overall purchased quantity of products belonging to the food category and subcategory in tons in the reference period
- **Number of purchasing households:** Absolute number of households having purchased products of the food category and subcategory at least once in the reference period
- **Customer reach:** Percentage of households having purchased products of the food category and subcategory at least once in the reference period

Average purchased quantity (in kilograms or litres per household) is calculated from the purchased quantity and number of purchasing households for each food category and subcategory.

Besides data on the level of food categories and subcategories, GfK provides information about purchased quantities and the number and share of purchasing households on the level of single products, including product name, brand, manufacturer, and EAN/GTIN of top-selling food products. In accordance with the Department of Market Analysis of the Thünen Institute, Germany, top-selling products are defined as belonging to the top 80% in sales volume (in tons) for the corresponding food category. The EAN/GTIN of top-selling products was obtained for all food categories between 2019 and 2021. Within the comprehensive range of products, top-selling products were identified based on name, manufacturer, and EAN/GTIN, and their energy and nutrient content was analysed and shown separately. Since 2022, the separate analysis of top-selling products is restricted to selected food categories (e.g. soft drinks). This decision was taken as average differences in energy and nutrient content between the comprehensive range of products and the top-selling products were rather small and the informational gain was too limited to justify the additional effort both in terms of time and money.

2.6. Data management

Data are managed with the food data management software FoodCASE, using a branded food module specially developed for the needs of product monitoring (Presser et al., 2018). The module has several interfaces, which allow entering nutritional values, ingredient lists as well as packaging information (e.g. GTIN/barcode). It also offers the possibility to enter additional information (e.g. “contains free sugars/sweeteners”, the level of processing or the physical state), the purchased quantity as well as the possibility to set markers to further characterize products across categories (e.g. organic products). This allows the sorting and clustering of products into subcategories by their properties. Collected data are entered manually in FoodCASE for each food product.

The plausibility of data was checked with the help of automatic control functions to detect possible errors. For example, the sum of all nutrients in grams given in the nutrient table (per 100 g or ml) must not exceed 100, and the content of saturated fat must not exceed the content of total fat. Correct categorization is checked with category-specific tests, e.g. according to legal requirements such as minimum values of protein content for bars declared as *protein bars* (European Commission, 2009).

In case of implausible values or missing data, manufacturers are requested to confirm, correct, or complete the respective data set. In case of no answer for missing data or implausible values, these product entries are declared invalid and excluded from the analysis.

2.7. Data analysis and publication

The data analysis focuses on the distribution of energy and nutrients (sugars, total fat, saturated fat, and salt) at the level of food categories and subcategories. The following statistical parameters are calculated: range (minimum and maximum values), mean, median, and quartiles P25 and P75.

Results are presented in tables and boxplots for: a) the comprehensive range of products including top-selling products, niche products, and products of small manufacturers; and b) top-selling products and thus market-relevant products for selected food categories. To identify top-selling products within the food subcategories, data on single food products provided by GfK are used (see the use of commercially available market data). For top-selling products, the weighted arithmetic mean is calculated at the level of categories and subcategories by weighting the energy and nutrient content by purchase quantity (in tons or litres).

2.7.1. Changes in energy and nutrient content over time

To evaluate changes in energy and nutrient content of food categories and subcategories over time, follow-up surveys are compared to the corresponding baseline surveys. Welch's *t*-test is applied to test for significant changes between the baseline and the first follow-up survey. In 2019 and 2020, Welch's one-tailed *t*-test was applied to detect significant reductions. Since 2021, it is also used to test for significant increases as descriptive data analysis showed shifts towards increased energy and nutrient content in several subcategories. To compare the energy and nutrient content of food categories which are surveyed three or more times (see Table 1), Welch's ANOVA is used. For all tests, the level of significance is set at $p < 0.05$. Testing for significant differences in energy and nutrient content between the survey years is only applied to subcategories with a sample size ≥ 5 .

2.7.2. Data publication

Monitoring results are published annually in a dedicated section of the MRI website (<https://www.mri.bund.de/en/topics/reduktion-von-zucker-fett-und-salz/>). The reports are freely available and, in addition to the above analyses, contain the so-called Big 7 (energy, total fat, saturated fat, protein, carbohydrates, sugars, salt, energy) data for the surveyed products groups, down to the level of the subcategories.

3. Results and discussion

The German product monitoring is designed to capture the nutritional composition of packaged food on the German market and thus help track food reformulation efforts on a regular basis. Emphasis is placed on food categories with a major contribution to dietary intakes of sugar, total fat, saturated fat, and salt, and on child-targeted products.

Besides Germany, several countries in Europe have established monitoring systems to guide their national reduction strategies and to evaluate the reformulation efforts of the industry. Even if these monitoring systems pursue the same general goal, monitoring approaches may differ according to national reformulation priorities. Often there is only sparse information on the concrete methods applied or detailed information is only available in the respective national language. Thus, an in-depth evaluation of the chosen methods remains limited and comparing the German monitoring approach within the European context is only possible for some methodological aspects, e.g. the selection of the product categories to be monitored, the process of gathering food product information, and the focus of the evaluation. Countries included in this comparison – albeit to differing degrees and not for all methodological aspects alike – are France, the Netherlands, Norway, Spain, Switzerland, and the UK (see Table 3). For these countries, information was at least partly available in German, French, or

Table 3
Methodological aspects considered in the comparison of selected national product monitorings.

Country	Selection of food categories	Collection of product information	Consider sales weighted data	Data aggregation level
France	No	Manually	Yes	Food subcategories
Germany	Yes	Manually	Yes, partly	Food subcategories
Netherlands	No information	Database	No information	No information
Norway	No information	Database	No information	No information
Spain	Yes	Manually	Yes	Food subcategories
Switzerland	Yes	Manually	No	Food subcategories
United Kingdom	Yes	Manually/web-scraping	Yes	Food categories

English, and thus accessible for evaluation by the authors.

3.1. Selection of product categories to monitor

A common characteristic of most European product monitoring approaches is their focus on selected food categories. The investigated food categories are typically identified – on the basis of national food consumption data – as major dietary sources of the monitored nutrients. Moreover, the selection may reflect key aspects of national reformulation initiatives such as voluntary target agreements or an emphasis on children and adolescents as seen in the German product monitoring but also in Spain (Agencia Española de Seguridad Alimentaria y Nutrición (AESAN, 2020), the UK (Public Health England (PHE, 2021), or Switzerland (Bundesamt für Lebensmittelsicherheit und Veterinärwesen (BLV, 2019). In contrast, the monitoring in France does not focus on selected food categories but aims to capture the entire market and cover as many product categories as possible. To date, there are reports on over 30 food categories available (Institut national de recherche pour l'agriculture l'alimentation et l'environnement (INRAE, 2022; Menard et al., 2011).

3.2. Source of information

A key element of any monitoring system is the process of gathering the necessary product information. In the European context, two approaches prevail currently: either the product information is collected manually or it is provided by manufacturers.

In Germany, France, and the UK, information is gathered mainly by manual searches using different sources of information such as manufacturers' and retailer websites or store visits (Gréa et al., 2022; Observatoire de la Qualité de l'Alimentation (Oqali, 2010; PHE, 2017).

In the Netherlands and Norway, manufacturers provide product information on a voluntary (Netherlands) or mandatory (Norway) basis in central food databases (Temme et al., 2017; The Norwegian Directorate of Health, 2019; Westenbrink et al., 2021).

In the case of Switzerland, the data source may vary between product categories. Whereas the first monitoring of sweetened yoghurt in 2016 and 2018 was based predominantly on data provided by companies which had submitted voluntary agreements to reduce sugar, the monitoring of sweetened beverages in 2021 considered online research, market visits, and retailer requests as done in Germany (BLV, 2019; Infanger, 2022).

As nutrition labelling information on food products is increasingly becoming available online, technology-supported approaches for automatically extracting this information from manufacturer websites and online shops via web-scraping are being looked into. This approach is gaining in importance in several countries. For example, it is mentioned in the final UK sugar reduction report as one new approach complementing the store visits (Office for Health Improvement & Disparities, 2022). The Belgian health authority works together with the commercial platform "daltix", which collects product, price, and promotion retail data, and the Austrian Agency for Health and Food Safety has developed its own web-scraping monitoring tool (Agence Nationale de Sécurité Sanitaire de l'Alimentation de l'Environnement et du Travail (ANSES) and l'Institut national de santé publique (Sciensano), 2021). After a manual correction, Austria publishes its data online in a consumer protection portal (Österreichische Agentur für Gesundheit und Ernährungssicherheit GmbH (AGES, 2022). In Germany, a comparable approach is currently being developed within the research project "RePro" (Snoopmedia GmbH, 2022), in which the MRI participates. Ideally, the RePro system will automatically collect product information from predefined online data sources, extract the relevant information such as nutritional values and ingredient lists, and group products into (pre)defined categories and subcategories by using artificial intelligence. In doing so, the RePro system seeks to execute as much of the time-consuming manual data collection and organisation as possible.

However, to date a fully automated monitoring is hampered by several factors. These include different website structures between individual manufacturers as well as between manufacturers and retailers, which require different handling. Some websites use complex HTML structures so that not all nutrient information can be extracted at the same time in a coherent fashion. In some cases, nutrient information is only available on pictures of the food product but not as HTML code, thus requiring elaborate image analysis or extensive manual labour for data to become accessible. Of note, a large part of the nutrition information of discount brands currently is not provided online and therefore invisible to systems based on automated web searches (ANSES and Sciensano, 2021). Lastly, the large amount of data generated by the automatic system must also be checked manually for plausibility and possible errors on the web pages.

3.3. Data preparation and presentation

Individual approaches to the respective country-specific reduction strategy are also reflected in the analysis and presentation of the respective monitoring results. Several monitoring systems in Europe consider the energy and nutrient contents of top-selling products separately or exclusively. However, a comparison on the level of top-selling products is complicated by the fact that countries use different cut-off points and sources of information such as national statistics on top retailers or brands, data from different panels such as retail or household panels, or wholesale statistics to identify those products (AESAN, 2020; Demuth et al., 2020; Oqali, 2010; PHE, 2017).

Furthermore, the level of aggregation within the data differs between countries. With the exception of the UK, where monitoring data on sugar content is reported on the level of food categories, most national monitoring reports focus on the nutrient content in food subcategories. These subcategories are often defined differently, which makes it hard to compare them. For example, one subcategory of sweetened beverages in Switzerland is “sparkling lemonades”. According to the Swiss monitoring report (Infanger, 2022), this subcategory contains all soft drinks including cola and lemonade, whereas in the German product monitoring, soft drinks are further divided into subcategories according to their type (e.g. cola) and sugar content (e.g. “light”) (Demuth et al., 2020).

In Germany, aggregation on the level of subcategories was chosen mainly for two reasons: 1) to characterise the nutritional composition of reasonably similar products; and 2) to avoid a focus on individual products, manufacturers, or types of retailers. In line with the NRI, this is done to monitor the energy and nutrient content of the spectrum of products available on the German market, but does not focus on possible differences in nutrient profiles between manufacturer and discount brands as done in the UK or France (Oqali, 2016; PHE, 2021). Furthermore, this approach allows the separate analysis of child-targeted food products within a corresponding subcategory.

3.4. Steps towards harmonization on the European level

Similar to other European food monitoring systems, product monitoring in Germany was designed as part of a national reformulation strategy. These strategies have the common goal of reducing nutrition-related diseases. However, the respective product monitoring approaches differ largely in their design and methods. These differences may be rooted in different priorities of national initiatives or different food cultures, but also in resources available, data availability and accessibility, and developments in the national food market. As a consequence, product monitoring data are currently not comparable across countries. The comparison is also made more difficult due to limited public documentation of the methods employed.

Given the EU-wide interest in food reformulation and product monitoring, the Joint Action Best-ReMaP (Best Practices – Reformulation, Marketing to children, Procurement), in which the MRI is a

consortium partner, was launched in 2020. One expected outcome of Best-ReMaP is a European food information database to ensure the sustainability of data collection on food reformulation and reformulation trends. To strengthen data comparability, the French monitoring method by Oqali (Menard et al., 2011) serves as a best practice model for monitoring and is applied in an adapted form for data collection and evaluation of five selected food categories within the 21 participating countries. In this context, the research around automation-based data collection using web-scraping and artificial intelligence (e.g. the German project RePro) should ideally consider a flexible grouping system of food products. Such an automated flexible grouping system could be an important element to provide national monitoring data for a European food database. However, some key challenges with the automated systems need to be resolved before their full potential can be harnessed (see section “Source of information” above).

To also make the most of the different national monitoring approaches applied up to now, comprehensive methodological descriptions are needed to better compare them. This, in turn, would help evaluate the progress of reformulation initiatives across Europe so far and contribute to identifying best practices in making reformulation happen. Summarizing and transferring such best practices serves to establish long-term strategies to promote healthy diets.

4. Conclusion

The German monitoring of packaged food gathers and evaluates the content of energy, sugar, total fat, saturated fat, and salt of selected food categories as well as changes over time, based on packaging information. It is based on a set of robust criteria including how to define products targeted at children, or to categorize packaged food into groups and subgroups. Furthermore, quality checks using standard operating procedures are carried out at all stages from data collection to management and evaluation. As such, this product monitoring supports the German national reformulation strategy and helps assess progress towards a healthier supply of packaged food. Comparability with other monitoring systems in Europe is currently limited, largely owing to differences in the methods applied. Recent developments such as automated data collection via web-scraping and ongoing harmonization efforts at the European level can contribute to achieving better comparability in the future. Some technological obstacles remain to be overcome, ideally helped by all manufacturers and retailers providing the mandatory nutrition information data online in an easily accessible, machine-readable format.

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Corinna Gréa: Conceptualization, Validation, Investigation, Writing – original draft, Writing – review & editing, Visualization. **Christin Turban:** Writing – original draft, Visualization, Investigation. **Silvia Roser:** Conceptualization, Writing – review & editing, Supervision. **Ingrid Hoffmann:** Conceptualization, Supervision, Writing – review & editing. **Stefan Storcksdieck genannt Bonsmann:** Conceptualization, Supervision, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

Corinna Gréa: no conflicts of interest to disclose. Christin Turban: no conflicts of interest to disclose. Silvia Roser: no conflicts of interest to disclose. Stefan Storcksdieck genannt Bonsmann: no conflicts of interest to disclose. Ingrid Hoffmann: no conflicts of interest to disclose.

Data availability

No data was used for the research described in the article.

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Use of colors

Please use colors for [Table 1](#).

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