Dietary behaviour in Germany
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Fast food consumption among 12- to 17-year-olds in Germany – Results of EsKiMo II

Abstract

Consuming high amounts of fast food can lead to an excessive intake of energy and subsequently promote obesity. Obesity increases a person’s risk for diabetes and cardiovascular diseases. The second wave of the German Health Interview and Examination Survey for Children and Adolescents (KiGGS Wave 2, 2014–2017) included the Eating study as a KiGGS Module (EsKiMo II, 2015–2017) which assessed the self-reported dietary habits of children and adolescents in Germany. The analysis of the data permits an overview of the fast food consumption of 12- to 17-year-olds (n=1,353). Girls consume 57.5 grams and boys 86.3 grams of fast food per day on average (around 400 grams and 600 grams per week, respectively). Pizza is the most consumed fast food product, followed by filled pita and sausage/meat products such as curry sausage. Adolescent girls on average get 6.5% and boys 7.8% of total daily energy intake from fast food. 23% of 12- to 17-year-olds get at least 10% of their daily energy intake from fast food (high consumers). Significant differences between the proportion of high consumers exist regarding sex, age, socioeconomic status, community size, type of school and media consumption. Compared to EsKiMo I (2006), girls’ daily energy intake from fast food has remained nearly constant, whereas that of boys has dropped substantially. From a nutrition physiology perspective, the aim should be to further reduce fast food consumption.

1. Introduction

The environment of many children and adolescents’ today is conducive to overweight and obesity [1]. Results from the second wave of the German Health Interview and Examination Survey for Children and Adolescents (KiGGS Wave 2, 2014–2017) have shown that 15.4% of 3- to 17-year-old children and adolescents in Germany are overweight and/or obese and 5.9% obese [2]. Being obese at childhood and adolescent age is considered to be a strong predictor for obesity at adult age. Obesity is often related to stigmatisation and health issues and is also an important risk factor for non-communicable diseases such as cardiovascular diseases and type 2 diabetes [1, 3].

Becoming overweight or obese depends not only on physical activity, an important factor is also dietary behaviour, with a number of factors influencing food choices. These include taste and individual preferences, but also price, availability and changes to daily routines which may lead a person to eat ready made or takeaway meals more frequently [4].
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The continuously growing turnover and opening of new fast food restaurants by the major chains also in Germany is proof of fast food’s great popularity [5–7].

In general, fast food is highly processed and highly standardized to ensure preparation within a very short time (in fast food restaurants and at snack stands) and eaten immediately, often on-the-way [8]. Fast food is mostly eaten as a snack and usually contains less essential nutrients and dietary fibre. However, the glycaemic index (measure describing the effects of foods containing carbohydrates on blood glucose levels) of fast food is often higher than that of a full meal. This means fast food is, in spite of large portion sizes, less satiating, which therefore can lead to higher total daily energy intake [9, 10]. Adolescents often feel a desire to distinguish themselves from the food habits of their parents, which in combination with the unconventional atmosphere of fast food that is often eaten without cutlery and plates [11] could be a reason why they often opt for fast food [12].

Due to its high degree of processing and its low micronutrient density, fast food is viewed critically for its role in the development of overweight and obesity [13]. Fast food is usually rich in fat, contains high amounts of highly processed carbohydrates, and is rich in salt and hidden sugars [8, 14], and therefore considered unhealthy [11]. Nutrition-physiologically healthy fast food does exist, yet only plays a marginal role [8]. Studies have shown that adolescents who live in areas with a greater availability of fast food also ate more fast food, and their overall dietary patterns were also less healthy [15]. Consuming large amounts of fast food is moreover related to a higher risk to develop diabetes, metabolic syndrome and cardiovascular diseases [14].

Numerous studies have indicated a link between regularly consuming fast food and gaining weight [4, 16, 17]. As a measure to prevent overweight, obesity and non-communicable diseases and in the interest of a balanced diet, fast food should not be consumed regularly [18, 19].

To survey the dietary habits of children and adolescents in Germany, KiGGS Wave 2 included the Eating study as a KiGGS Module (EsKiMo II, 2015–2017) based on self-reported data as one of its modules. Data analysis provides findings on the fast food consumption habits of 12- to 17-year-olds. This could help develop recommendations for prevention. Based on EsKiMo II data, the aim of this analysis is to describe fast food consumption of 12- to 17-year-olds in Germany and how fast food contributes to daily energy intake against the backdrop of sociodemographic and lifestyle factors. Furthermore, the proportion of 12- to 17-year-olds was determined, who get at least ten percent of their total energy from fast food (high consumers).

2. Methodology
2.1 Study design and study population

EsKiMo II is a survey of the dietary habits of 6- to 17-year-old children and adolescents in Germany. The study was conducted as a module of KiGGS Wave 2 between June 2015 and September 2017. KiGGS forms part of the health monitoring system at the Robert Koch Institute (RKI) and includes repeated cross-sectional surveys of children and adolescents aged 0 to 17 that are representative for Germany. The KiGGS baseline study (2003–2006) was conducted as an examination and interview survey, the first follow-up study (KiGGS Wave 1, 2009–2012) as a telephone-based interview.
The assessed foods that were categorized as fast food were divided into eight categories (Table 1). This selection was based on the same definition of fast food as in EsKiMo I and used food names, because data on the place of consumption was not collected and consequently not taken into account (for example for pizza). Sauces, which are frequently consumed together with fast food and often contain a lot of fat and/or sugar, are included here as fast food too.

Fast food intake in grams and in kilocalories (kcal) was calculated per person per day as well as total daily energy intake. The proportion of energy from fast food was calculated by dividing the total energy intake from fast food by total energy intake. Like in EsKiMo I those who got at least ten percent of their daily energy from fast food were defined as high consumers [29]. Other institutions also recommend

**Fast food consumption**

The 12- to 17-year-old participants were asked about the food they had eaten during the last four weeks using a computer-based dietary history interview (Dietary Interview Software for Health Examination Studies, DISHES). DISHES is a survey instrument validated for adults [25]. Trained nutritionists conducted the dietary interview during home visits. Consumption frequencies and portion sizes were enquired for all foods and each meal. To better evaluate portion sizes, model plates and a photo book [26, 27] were used. The data was coded based on version 3.02 of the German Food Code and Nutrient Data Base (BLS) [28].

<table>
<thead>
<tr>
<th>Fast food category</th>
<th>Selected foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pizza</td>
<td>All kinds of pizza</td>
</tr>
<tr>
<td>Burger</td>
<td>Hamburgers, cheeseburgers, gyros-burgers, chicken burgers, veggie burgers, fish burgers</td>
</tr>
<tr>
<td>Filled pita bread and similar products</td>
<td>Döner kebab, falafel, lahmacun, gyros, börek, pide, wrap</td>
</tr>
<tr>
<td>Sausages/Meat</td>
<td>Curry sausage, sausage (also chicken and soy sausages), hot dog, meat loaf on roles, meatballs in bread</td>
</tr>
<tr>
<td>Potatoe products</td>
<td>French fries, country potatoes</td>
</tr>
<tr>
<td>Chicken products</td>
<td>Roast chicken, chicken nuggets, chicken wings</td>
</tr>
<tr>
<td>Sauces</td>
<td>Fast food chain sauces, mayonnaise, remoulade, ketchup</td>
</tr>
<tr>
<td>Other foods</td>
<td>Spring roles, mozzarella sticks, fried fish in bread, matjes roles, onion rings, vegetarian nuggets, fried squid rings</td>
</tr>
</tbody>
</table>

**Table 1**

Types of fast food and selected foods

Source: Own table
Self-reported data on sport activities was summarised into four groups: no sport, less than two hours, two to four hours and over four hours per week.

2.3 Statistical methods

Mean values and 95% confidence intervals for daily fast food consumption and the proportion of energy from fast food stratified by sociodemographic and lifestyle factors were determined for girls and boys. Due to the unequal distribution of fast food consumption levels, relevant distribution factors (median and interquartile ranges) were described. Multivariate variance analysis was applied to determine the relationship between the determined percentage of energy from fast food and sociodemographic and lifestyle factors. Differences depending on sociodemographic and lifestyle factors were tested using f-tests. The proportion of high consumers was stratified with 95% confidence intervals by sociodemographic and lifestyle factors. Differences in the proportion of high consumers were tested for significance based on chi-squared tests. A statistically significant difference between groups is assumed when the corresponding p-value is smaller than 0.05.

Missing data led to the exclusion of a number of participants from individual indicators: 19 from the socioeconomic status; 9 from the migration background; 49 from the type of school; 64 from sports activities and 41 from the media consumption indicators, respectively.

The calculations were carried out using an adapted weighting factor for EsKiMo II that corrects deviations within the sample from the population structure with regard to regional structure (rural area/urban area), age. limiting the energy intake from specific unhealthy foods to ten percent of total energy intake [30].

Sociodemographic and lifestyle factors

The analysis included information on sociodemographic and lifestyle factors assessed within KiGGS Wave 2 for the 12- to 17-year-olds. Family socioeconomic status (SES) was defined based on a multi-dimensional index which considers the answers parents provided in questionnaires on school education and training, professional status and equivalised household income. SES allows the definition of a low, medium and high status group [31]. Participants were considered as having a migration background if they themselves had migrated, or, if at least one of their parents had not been born in Germany, or, if both parents had migrated or did not hold German citizenship [32]. The municipalities in which participants lived were divided into four groups based on community sizes (as of 31 December 2015) (<5,000, 5,000–<20,000, 20,000–<100,000 and ≥100,000 inhabitants) [33]. Schools were classified as secondary, secondary modern, comprehensive, grammar (Hauptschule, Realschule, Gesamtschule or Gymnasium) and other schools. For the analysis, Germany was divided into five regions: North West (Schleswig-Holstein, Bremen, Hamburg, Lower Saxony), North Rhine-Westphalia, Center (Hesse, Rhineland-Palatinate, Saarland), East (Berlin, Brandenburg, Mecklenburg Western Pomerania, Saxony, Saxony Anhalt, Thuringia) and South (Bavaria, Baden-Wuerttemberg). Data on media usage was divided into three categories based on time spent watching TV/DVDs, playing game consoles/computer games and other PC/internet activities: less than three hours, three to six hours and over six hours per day.

In terms of quantity, pizza is the most consumed fast food among 12- to 17-year-olds.
Fast food consumption among 12- to 17-year-olds in Germany – Results of EsKiMo II

3. Results

Nearly all 12- to 17-year-olds (97.8%) reported that they had eaten fast food at least once during the four weeks before the interview. On average, they consume 72.3 grams of fast food (158 kcal) per day. 11.5% of participants (7.3% of girls and 15.5% of boys) consume more than 150 grams of fast food per day. Girls on average eat 57.5 grams (125 kcal) and boys 86.3 grams of fast food (188 kcal) per day (data not shown). For both sexes, pizza is proportionally the most consumed fast food, followed by filled pita, as well as sausage/meat products (Figure 1).

12- to 17-year-olds on average get 7.2% of their daily energy from fast food (data not shown). Compared to boys (7.8%), girls (6.5%) get a smaller proportion of their daily energy from fast food. The proportion of energy from fast food increases with age and is lower for those with higher family SES. Girls and boys with a migration background get a higher proportion of their energy from fast food than boys and girls without a migration background. Compared to their peers from other regions, boys and girls in the eastern states of Germany get the lowest percentage of their energy from fast food. Pupils at secondary, secondary modern and comprehensive schools get a larger proportion of their energy from fast food than those at grammar schools. Adolescents who spend more time with electronic media, get a larger proportion of their energy from fast food than their peers with lower levels of media usage. Community size and levels of sport activity had no influence on fast food consumption neither in girls nor boys (Table 2).

Multivariate analyses

In the following step, all variables that potentially have an influence were included within a statistical model. When simultaneously adjusted for all independent variables, 12- to 17-year-olds’ average daily energy intake from fast food in Germany is significantly associated to type of school,
Table 2

Daily percentage of energy from fast food by sex, sociodemographic and lifestyle factors (n=727 girls, n=626 boys)*

Source: EsKiMo II (2015–2017)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Mean (%)(95% CI)</th>
<th>Median (%)</th>
<th>1st quartile (%)</th>
<th>3rd quartile (%)</th>
<th>n</th>
<th>Mean (%)(95% CI)</th>
<th>Median (%)</th>
<th>1st quartile (%)</th>
<th>3rd quartile (%)</th>
</tr>
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<tbody>
<tr>
<td><strong>Total</strong></td>
<td></td>
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<tr>
<td><strong>Girls</strong></td>
<td>727</td>
<td>6.5 (5.9–7.2)</td>
<td>5.3</td>
<td>2.7</td>
<td>8.9</td>
<td>626</td>
<td>7.8 (7.1–8.5)</td>
<td>6.4</td>
<td>3.5</td>
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<td><strong>Boys</strong></td>
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<tr>
<td>12–13 years</td>
<td>248</td>
<td>5.5 (4.8–6.2)</td>
<td>4.6</td>
<td>2.2</td>
<td>7.5</td>
<td>250</td>
<td>7.0 (6.2–7.8)</td>
<td>5.8</td>
<td>3.6</td>
<td>9.3</td>
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<tr>
<td>14–15 years</td>
<td>259</td>
<td>6.7 (5.5–7.8)</td>
<td>5.1</td>
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<td>8.8</td>
<td>204</td>
<td>8.3 (7.3–9.3)</td>
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<td>3.7</td>
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<td>16–17 years</td>
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<td>7.4 (6.2–8.6)</td>
<td>5.7</td>
<td>3.4</td>
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<td>172</td>
<td>8.2 (6.7–9.7)</td>
<td>6.0</td>
<td>3.0</td>
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<tr>
<td>Low</td>
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<td>7.6 (5.7–9.5)</td>
<td>5.6</td>
<td>2.4</td>
<td>12.0</td>
<td>53</td>
<td>9.1 (6.1–12.1)</td>
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<td>3.6</td>
<td>12.4</td>
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<td>Medium</td>
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<td>6.3 (5.8–7.2)</td>
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<td>3.0</td>
<td>9.0</td>
<td>390</td>
<td>7.8 (7.1–8.5)</td>
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<td>3.6</td>
<td>10.0</td>
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<tr>
<td>High</td>
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<td>4.3</td>
<td>2.3</td>
<td>7.2</td>
<td>175</td>
<td>7.1 (6.1–8.2)</td>
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<td>3.4</td>
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<tr>
<td>Yes</td>
<td>88</td>
<td>7.0 (5.3–8.6)</td>
<td>5.4</td>
<td>2.3</td>
<td>11.8</td>
<td>59</td>
<td>10.0 (7.2–12.7)</td>
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<td>8.7</td>
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<td>&lt;5,000 inhabitants</td>
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<td>7.8</td>
<td>154</td>
<td>7.7 (6.6–8.9)</td>
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<td>5,000–&lt;20,000 inhabitants</td>
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<td>8.6</td>
<td>174</td>
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<td>20,000–&lt;100,000 inhabitants</td>
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<td>11.8</td>
<td>182</td>
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<td>116</td>
<td>7.6 (6.3–8.8)</td>
<td>6.8</td>
<td>3.7</td>
<td>9.9</td>
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<td><strong>Region</strong></td>
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<tr>
<td>North west</td>
<td>86</td>
<td>6.3 (4.9–7.7)</td>
<td>4.8</td>
<td>1.9</td>
<td>9.1</td>
<td>83</td>
<td>9.1 (6.9–11.3)</td>
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<td>North</td>
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<td>Rhine-Westphalia</td>
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<td>11.2</td>
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<td>216</td>
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<td>East</td>
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<td>7.7</td>
<td>135</td>
<td>8.1 (7.0–9.3)</td>
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<td>4.1</td>
<td>10.1</td>
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<td>South</td>
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<td>Secondary/secondary modern/compren-</td>
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<tr>
<td>Other type of school, without school leaving certificate</td>
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</tbody>
</table>

CI = confidence interval, n = unweighted number of participants

*Missing data led to the exclusion of a varying number of participants from the analysis for individual indicators.

Continued on next page
### Table 2 Continued

Daily percentage of energy from fast food by sex, sociodemographic and lifestyle factors (n=727 girls, n=626 boys)^

Source: EsKiMo II (2015–2017)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean (%)</td>
</tr>
<tr>
<td><strong>Sport activity (per week)</strong></td>
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<td></td>
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<tr>
<td>None</td>
<td>175</td>
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</tr>
<tr>
<td>&lt;2 hours</td>
<td>152</td>
<td>5.8</td>
</tr>
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<td>2–4 hours</td>
<td>200</td>
<td>7.0</td>
</tr>
<tr>
<td>&gt;4 hours</td>
<td>168</td>
<td>5.9</td>
</tr>
<tr>
<td><strong>Media consumption (per day)</strong></td>
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<td></td>
</tr>
<tr>
<td>&lt;3 hours</td>
<td>243</td>
<td>5.4</td>
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<tr>
<td>3–6 hours</td>
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<td>6.4</td>
</tr>
<tr>
<td>&gt;6 hours</td>
<td>188</td>
<td>8.1</td>
</tr>
</tbody>
</table>

CI = confidence interval, n = unweighted number of participants

*Missing data led to the exclusion of a varying number of participants from the analysis for individual indicators.

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Figure 2

Average proportion of energy from fast food after multivariate adjustment by sex (n=727 girls, n=626 boys)

Source: EsKiMo II (2015–2017)
Girls on average get 6.5% and boys 7.8% of their daily energy from fast food.

community size, region and amount of time spent with media per day. Pupils of secondary, secondary modern, comprehensive and grammar schools get a significantly higher proportion of their daily energy from fast food than pupils from other school types. Girls in communities with 20,000–<100,000 inhabitants get a significantly higher amount of their energy from fast food than girls in communities with a population of under 5,000 or of 5,000–<20,000. Girls from North Rhine-Westphalia and the central region of Germany get a significantly higher percentage of their energy from fast food than those in the eastern states of Germany. Girls who spend over six hours per day on media get a significantly higher amount of their daily energy from fast food than girls who spend less than three hours on media (Figure 2).

When adjusted for all independent variables, the average daily percentage of energy 12- to 17-year-old boys get from fast food is significantly associated to age group, migration background and the region, in which they live. 14- to 15-year-olds get a significantly higher percentage of their daily energy from fast food than 12- to 13-year-olds. Boys with a migration background get a significantly higher percentage of their energy from fast food than those with no migration background. Furthermore, boys from the eastern states of Germany get a significantly lower percentage of their energy from fast food than boys from north western
Germany (Figure 2). There are no significant differences in percentage of energy from fast food by family SES or levels of sport activity of girls and boys.

Proportion of high consumers of fast food

Table 3 shows the proportion of high consumers who get at least ten percent of their daily energy from fast food. This applies to around 23.0% of 12- to 17-year-olds. The proportion of high consumers is significantly higher for boys (26.5%) than girls (19.3%). The proportion of high consumers increases significantly with age. Boys and girls with low SES (35.5%) get at least ten percent of their daily energy from fast food significantly more often than boys and girls with high SES (17.4%). A significantly higher number of girls and boys get at least ten percent of their daily energy from fast food in communities with a population between 20,000 and 100,000 people than in communities with between 5,000 and 20,000 people. In the eastern states of Germany, the percentage of high consumers (15.9%) is lower, and in central Germany it is higher (30.5%) compared to other regions. However, none of these regional differences are significant. The proportion of high consumers among those who go to secondary, secondary modern and comprehensive schools is significantly higher than

Table 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
<th>(95% CI)</th>
<th>p-value</th>
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<tr>
<td><strong>Sex</strong></td>
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<td></td>
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<tr>
<td>Girls</td>
<td>727</td>
<td>19.3</td>
<td>(14.3–24.3)</td>
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<tr>
<td>Boys</td>
<td>626</td>
<td>26.5</td>
<td>(21.6–31.4)</td>
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<tr>
<td><strong>Age group</strong></td>
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<tr>
<td>12–13 years</td>
<td>498</td>
<td>17.3</td>
<td>(12.9–21.7)</td>
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<tr>
<td>14–15 years</td>
<td>463</td>
<td>22.9</td>
<td>(17.1–28.7)</td>
<td></td>
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<tr>
<td>16–17 years</td>
<td>392</td>
<td>28.3</td>
<td>(21.9–34.7)</td>
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<td>Low</td>
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<td>(22.8–48.1)</td>
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<td>21.1</td>
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<tr>
<td>High</td>
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<td>17.4</td>
<td>(12.1–22.7)</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Yes</td>
<td>147</td>
<td>29.9</td>
<td>(19.6–40.3)</td>
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<tr>
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<td>21.6</td>
<td>(18.1–25.1)</td>
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<td><strong>Community size</strong></td>
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<td></td>
<td></td>
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<tr>
<td>&lt;5,000 inhabitants</td>
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<td>(14.3–25.9)</td>
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<td>372</td>
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<td>(12.6–22.9)</td>
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<tr>
<td>20,000–100,000 inhabitants</td>
<td>381</td>
<td>31.2</td>
<td>(23.2–39.2)</td>
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<tr>
<td>≥100,000 inhabitants</td>
<td>281</td>
<td>21.8</td>
<td>(13.7–29.9)</td>
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<td><strong>Region</strong></td>
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<td>North west</td>
<td>169</td>
<td>28.9</td>
<td>(19.3–38.4)</td>
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<td>North Rhine-Westphalia</td>
<td>252</td>
<td>24.6</td>
<td>(16.6–32.6)</td>
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<td>Centre</td>
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<td>(15.3–45.8)</td>
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<td>East</td>
<td>465</td>
<td>15.9</td>
<td>(11.7–20.0)</td>
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<td>South</td>
<td>305</td>
<td>19.1</td>
<td>(13.3–24.8)</td>
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</tr>
<tr>
<td><strong>Type of school</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Secondary/secondary modern/comprehensive schools</td>
<td>532</td>
<td>27.9</td>
<td>(21.9–34.0)</td>
<td>0.0374</td>
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<tr>
<td>Grammar schools</td>
<td>692</td>
<td>20.5</td>
<td>(16.1–24.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Sport activity (per week)</strong></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>None</td>
<td>267</td>
<td>25.6</td>
<td>(16.8–34.4)</td>
<td>0.8404</td>
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<tr>
<td>&lt;2 hours</td>
<td>237</td>
<td>24.9</td>
<td>(16.3–33.5)</td>
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<tr>
<td>2–4 hours</td>
<td>344</td>
<td>22.8</td>
<td>(16.4–29.2)</td>
<td></td>
</tr>
<tr>
<td>&gt;4 hours</td>
<td>441</td>
<td>21.8</td>
<td>(16.6–27.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Media consumption (per day)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3 hours</td>
<td>441</td>
<td>14.7</td>
<td>(10.0–19.3)</td>
<td>0.0004</td>
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<tr>
<td>3–6 hours</td>
<td>536</td>
<td>23.0</td>
<td>(17.0–28.9)</td>
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<tr>
<td>&gt;6 hours</td>
<td>335</td>
<td>32.9</td>
<td>(25.3–40.5)</td>
<td></td>
</tr>
</tbody>
</table>

CI = confidence interval, n = unweighted number of participants

*Missing data led to the exclusion of a varying number of participants from the analysis for individual indicators.
for those who attend grammar schools. 32.9% of participants who spend a lot of time on media, get at least ten percent of their daily energy from fast food, whereas this applies to only 14.7% of those with low levels of media consumption. Migration background and levels of sport activity had no significant impact on high consumer figures.

4. Discussion

During a four-week period, nearly all 12- to 17-year-olds had consumed fast food at least once. Almost one quarter of boys and girls get at least ten percent of their daily energy from fast food. Based on the same definition of fast food, EsKiMo I (2006) had found that adolescents get 191 kilocalories (kcal) per day from fast food (girls 126 kcal, boys 252 kcal) [11]. EsKiMo II data shows that while this average value has remained the same for girls during the last ten years, it has dropped for boys (girls 125 kcal, boys 188 kcal). Reasons for the changes regarding fast food consumption were not recorded in EsKiMo.

When putting these results into perspective, it is important to consider the possibly limited comparability with other studies. One reason is the lack of a uniform definition of fast food. Fast food is a highly culture-dependent term and subject to changes over time.

EsKiMo II results show that boys get a significantly higher percentage of their average energy from fast food and more often at least ten percent of their energy from fast food than girls. This indicates differences in the dietary habits of girls and boys. One reason could be the less restrained eating habits of boys [36]. Some studies have shown significant age differences in the fast food consumption of children and adolescents. Older children, thereby, on average eat more fast food than younger children [37–39]. A Canadian study, covering the entire over-two-year old population, found that the group with the highest levels of fast food consumption (248 kcal per day) was male adolescents (14- to 18-year-olds) [12]. The results presented here likewise confirm significant age differences for levels of fast food consumption among 12- to 17-year-old boys. Furthermore, compared to the youngest, the proportion of high consumers is significantly higher among the older participants. Adolescents seek autonomy and independence and spend more time outside of the home during their leisure time. The significance of belonging to a peer group becomes very important during this age phase. Fast food is very popular among adolescents and is considered a part of a diet that expresses a lifestyle [40].

The greater spread of fast food consumption among 12- to 17-year olds with low SES is a reason that there are no significant differences by SES of average fast food consumption (Table 2). However, girls and boys with low SES get at least ten percent of their daily energy from fast food significantly more often than girls and boys with high SES.

Very likely, the significant difference in the average proportion of energy boys with and without migration background get from fast food is related to the definition used here. Our definition includes food that culturally belongs to the regions many migrants come from and which are therefore presumably consumed more frequently by this group. Notwithstanding, analyses from a number of countries indicate a higher density of fast food restaurants in neighbourhoods with a higher percentage of migrants [41].
The percentage of energy boys and girls get from fast food is highest for communities with a population between 20,000 and 100,000 people. In these communities, the proportion of 12- to 17-year-olds who get at least ten percent of their daily energy from fast food is also highest compared to communities of other sizes. A potential explanation, why girls and boys in the eastern states of Germany eat the least fast food is possibly the lower density of fast food restaurants in rural areas [41], and the east has more rural areas than other parts of Germany. Furthermore, in the former East, school cantines are more common than in the former West German states and are frequented by more children [42]. Adolescents who regularly eat at school very likely eat fast food less frequently.

The connection between media consumption and choosing more unhealthy foods has repeatedly been observed for adolescents [43–45]. The effect has also been related to TV advertising for unhealthy foods [46, 47]. However, based on the structure of the data, it was not possible to establish a cause-and-effect relationship between fast food and media consumption.

One limitation of the study is that the data does not allow determining where and in which combination participants ate. Precisely recording where foods were eaten or bought and in which combination participants consume them is however hardly possible for a four-week period. Furthermore, from a nutrition physiology perspective, it is more important, what participants eat and not where. From this angle we can analyse fast food independently of where it is consumed. However, meals classified as fast food that are prepared at home can, nutrition physiologically, be more valuable than those bought outside.

A further limitation is the study’s cross-sectional design. Cross-sectional data can only reveal relationships, it is not possible to derive causalities. Self-reported data on dietary habits can also be biased due to what people feel are socially expected answers [48]. Frequently, people do under-report the consumption of foods that society considers not favourable such as fast food. Inversely, foods considered as healthy could well be over-reported, and then reduce the relative amounts of energy participants get from fast food. A further source of bias could be that participants do not correctly remember what they have eaten. To minimise the effects of such mistakes, the DISHES software, which includes plausibility tests, highly standardises the collection of data on food consumption. Furthermore, measures of quality assurance such as training interviewers and the presence of field coordinators during the field phase were conducted to ensure that interviews were performed properly [22]. Moreover, it is important to bear in mind that fast food was centrally defined for the analysis and not by the participants. The definition can therefore be considered as standardised and transparent.

A key strength of the study is that, based on a broad sample, EsKiMo II provides representative data on the dietary habits of children and adolescents from across Germany. Through the connection of this study to KiGGS Wave 2, relationships with a number of sociodemographic and lifestyle factors can be analysed. The 40.1% response rate of KiGGS Wave 2 is satisfactory and comparable to the response rates achieved by other health monitoring studies [20]. The re-participation rate of EsKiMo II of 59.4% was thereby clearly higher [22]. To further optimise representativity, weighting factors were developed and applied in the analyses.
Conclusion and Outlook
Nearly one quarter of 12- to 17-year-olds gets at least ten percent of their daily energy from fast food. During the last ten years, levels of fast food consumption have remained more or less equal for girls, but dropped for boys. From a health policy and prevention perspective, reducing levels of fast food consumption remains important. One possible approach could be the provision of healthier fast food options and thereby increase the appeal of balanced and health promoting diets. Besides, it has been discussed that the number of fast food restaurants and snack stands in proximity to schools could be reduced [50], similar to the approach taken with cigarette machines [49], while making school meals healthier and more attractive. It could also be worth considering introducing nutrition as a school subject. Some countries have already introduced policies to reduce fast food consumption [50–52]. These include a tax on unhealthy foods and a simultaneous reduction of tax on, for instance, fruit and vegetables, to stimulate changes in consumption patterns. A 20% increase in the price of fast food would presumably lead to a ten percent cut in consumption [51]. A systematic review among adolescents in the US showed that increasing the cost of fast food can lead to weight reduction among adolescents. Accordingly, adolescents with low or medium SES and a higher body mass index would benefit most from a tax on fast food [51]. Further research is required to understand the relationship between consuming fast food and other types of food. A possible approach could be to analyse how much sweets, salty snacks and soft drinks, fast food high consumers in Germany eat.

Data protection and ethics
All of the Robert Koch Institute’s studies are subject to strict compliance with the data protection provisions set out in the Federal Data Protection Act (BDSG). Hannover Medical School’s ethics committee assessed the ethics of EsKiMo II and approved the study as an amendment to KiGGS Wave 2 (No. 2275-2015). Participation in the study was voluntary. The participants and/or their parents/legal guardians were also informed about the aims and contents of the study, and about data protection. Informed consent was obtained in writing.

Funding
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Conflicts of interest
The authors declared no conflicts of interest.

Acknowledgement
First and foremost, we would like to thank the study participants and their parents. We are also very grateful for the support provided by the study teams behind EsKiMo and KiGGS, and for the excellent work that they undertook during data collection. We also thank Werner Hofmann (University of applied sciences, Fulda) for his advice on statistics in the preparation of analysis.

References
Fast food consumption among 12- to 17-year-olds in Germany – Results of EsKiMo II


23. Lage Barbosa C, Brettschneider AK, Haftenberger M et al. (2017) Comprehensive assessment of food and nutrient intake of children and adolescents in Germany: EsKiMo II – the eating study as a KiGGS module. BMC Nutrition 3(75)


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Consumption of organic food by children in Germany – Results of EsKiMo II

Abstract

Data from the second Eating study as a KiGGS module (EsKiMo II, 2015–2017), are used to determine the contribution of food produced by organic farming (organic food) to the diet of children aged between six and eleven years (n=1,190) in Germany. Dietary intake was assessed by food records during a total of four days. Information on the proportion of organic food intake relative to daily food intake was used to differentiate between three groups: children who did not consume organic food; children whose diet contains 8.0% or less of organic food; and children whose diet comprises more than 8.0% of organic food. The 8.0% threshold represents the mean proportion of organic food eaten by children whose diet includes any amount of organic produce. In total, 63.2% of children eat organic food. The diet of 43.0% of children contains 8.0% or less of organic food, with the diet of 20.2% comprising more than 8.0% of organic food. Vegetables and fruit are among the most commonly consumed organic products. While consumption frequency of organic food does not differ by sex or age, consumption frequency increases with higher socioeconomic status. The large proportion of children (63.2%) who eat organic food suggests that health, environmental and ethical motives play a role in the food choices made by families with children.

Introduction

Organic foods are grown using organic farming methods; the requirements that these products have to meet are set out in the European regulation on organic products [1]. In 2010, a binding EU-wide labelling system was introduced for organic products (the EU organic logo). In addition, a state-regulated system and private labelling systems are also established in Germany. In some cases, the requirements governing the use of these systems are stricter than those stipulated in the EU regulation. Labelling organic foods can enable consumers to make informed food choices.

The range of organic foods available is steadily rising. Over the last 20 years, sales of organic food have multiplied throughout the world. In 2017, organic food occupied a 5.1% market share in Germany [2]. Health-related and ethical motives, such as animal welfare and protecting the environment, are among the main reasons that people buy organic food [3–6]. The German National Nutrition Survey II (NVS II, 2005–2006) found that 44.9% of adults aged between 18 and 80 occasionally or regularly bought organic produce. Compared to people without organic purchase, the dietary intake of people who buy organic foods is more closely in line with the German Nutrition Society’s dietary...
KiGGS Wave 2
Second follow-up to the German Health Interview and Examination Survey for Children and Adolescents

Data owner: Robert Koch Institute

Aim: Providing reliable information on health status, health-related behaviour, living conditions, protective and risk factors, and health care among children, adolescents and young adults living in Germany, with the possibility of trend and longitudinal analyses

Study design: Combined cross-sectional and cohort study

Cross-sectional study in KiGGS Wave 2
Age range: 0–17 years
Population: Children and adolescents with permanent residence in Germany
Sampling: Samples from official residency registries - randomly selected children and adolescents from the 167 cities and municipalities covered by the KiGGS baseline study
Sample size: 15,023 participants

KiGGS cohort study in KiGGS Wave 2
Age range: 10–31 years
Sampling: Re-invitation of everyone who took part in the KiGGS baseline study and who was willing to participate in a follow-up
Sample size: 10,853 participants

KiGGS survey waves
- KiGGS baseline study (2003–2006), examination and interview survey
- KiGGS Wave 1 (2009–2012), interview survey
- KiGGS Wave 2 (2014–2017), examination and interview survey

More information is available at www.kiggs-studie.de/english

Consumption of organic food by children in Germany – Results of EsKiMo II

Aim: Data owner: Robert Koch Institute

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- KiGGS Wave 2 (2014–2017), examination and interview survey

More information is available at www.kiggs-studie.de/english

In the first nationwide representative nutritional study of children and adolescents, EsKiMo I, a module of the German Health Interview and Examination Survey for Children and Adolescents (KiGGS baseline study, 2003–2006), more than half (about 56%) of parents of 6- to 11-year-olds stated that they had bought organic food [8]. Although purchasing behaviour is an important determinant of consumption, the amount of organic food consumed by individuals and which household members consumed organic foods remained unclear.

Analyses on food consumption provide information about the actual contribution of organic food to the total diet of children. A higher proportion of organic food provided to their own children is an indicator that parent’s purchasing behaviour is particularly (health-)conscious. In addition to the expected health benefits, animal welfare and environmental motives also play a role when purchasing organic food. Furthermore, information on the contribution of organic food to the diet is important for future risk assessments. Organic products generally contain lower levels of pesticides [4, 9] and veterinary drug residues [10]. The use of synthetic additives in the production of organic products is also minimal [9]. In addition, there may also be differences between organically and conventionally produced foods in terms of nutrient composition and levels of other active substances such as antioxidants and polyphenols [4].

Nevertheless, there are very few population-based studies of organic food intake. The French NutriNet-Santé cohort study (2009–2011) found that about two-thirds of adult women and three-fifths of adult men consumed organic foods occasionally or frequently [11, 12]. Additionally, this study observed a negative correlation between a high intake of organic food and the incidence of metabolic syndrome [13]. However, no extensive population-based studies have been available on children’s dietary intake of organic food in Germany until now.

The second Eating study as a KiGGS module (EsKiMo II, 2015–2017), provides data on the dietary intake of organic foods among children aged between six and eleven years. In the following, the results are described in relation to sex, age and family socioeconomic status (SES).

Indicator

EsKiMo II (2015–2017) was carried out as a module of the second follow-up survey to the German Health Interview and Examination Survey for Children and Adolescents (KiGGS Wave 2, 2014–2017). KiGGS is part of the health monitoring system at the Robert Koch Institute and includes repeated cross-sectional surveys of children and adolescents aged between 0 and 17 (KiGGS cross-sectional study) that are representative for Germany. The KiGGS baseline study (2003–2006) was conducted as an examination and interview survey, KiGGS Wave 1 (2009–2012) as a telephone-based interview survey and KiGGS Wave 2 (2014–2017) as a combined examination and interview survey. The concept and design of KiGGS Wave 2 have been described in detail elsewhere [14, 15]. Between June 2015 and September 2017, 2,644 children and adolescents aged between 6 and 17 who had participated in the cross-sectional survey of KiGGS Wave 2 also took part in EsKiMo II. Detailed information
threshold is the mean percentage of organic food eaten by children who do consume organic food.

The study also reported within which food groups foods of organic origin are frequently consumed. In order to do so, in EsKiMo II each food recorded during the study period was assigned to one of 29 groups and these groups were classified according to consumption frequency of organic foods. This made it possible to identify the proportion of children who ate the ten most frequently cited organic foods.

Family SES was measured through a multidimensional index based on the information parents provided on educational background, occupational status and equivalised household income. The SES index allows for a differentiation between low, medium and high status groups [19].

The results are presented as frequencies stratified by sex, age and SES of the family [19]. The calculations were performed using a weighting factor that was developed for EsKiMo II. This weighting factor corrects for deviations from the population structure with regard to regional structure (rural area/urban area), age (in years), sex, federal state (as of 31 December 2015), German citizenship (as of 31 December 2014), parental level of education (Microcensus 2013 [20]), and differences in participation in the dietary survey associated with seasonality, SES of the family and the child’s school type. This article presents the results as frequencies with 95% confidence intervals (95% CI). The precision of frequencies can be assessed using confidence intervals; wide confidence intervals indicate a greater statistical uncertainty in the results. The differences in the frequencies of the proportion of organic food consumed were analysed by sex, age and SES using a chi-square test. A statistically significant difference between groups is assumed when the corresponding
p-value, once the weighting factor and the survey design have been taken into account, is smaller than 0.05.

## Results and discussion

Organically produced foods play a role in our diets already from a young age. In total, 63.2% of children between the ages of six and eleven consume organic food; about one third of these (21.0%) do so on a daily basis. On average, 8.0% of the food eaten by children who do consume organic food is produced by organic farming. 43.0% of children have a dietary intake of organic food amounting to 8.0% or less; whereas 20.2% have a dietary intake of more than 8.0% of organic food. An average intake of 8.0% (median 4.0%) among children who eat organic foods seems plausible, as organic food occupied a market share of 5.1% of total sales in 2017 [2].

The frequency distribution of the proportion of organic food consumed did not differ by sex or age group (Table 1). However, a social gradient was identified: children from families with a low SES are most often non-consumers of organic products, whereas the proportion of children whose diets consist of more than 8.0% of organic food increases significantly with rising SES (Table 1). Similar observations were made by the French NutriNet-Santé study. The French study found that the proportion of adults who regularly consume organic food increased with education, occupational status and income [12]. In addition, the German NVS II study found that adults who purchased organic food more often had a higher SES than those who did not [5, 7]. Presumably, price acts as a barrier to low-income households for the purchase of organic food; as is indicated by multivariate analyses from NVS II [7].

### Table 1
Proportion of organic food in the diet by sex, age and socioeconomic status (n=584 girls, n=606 boys)  
Source: EsKiMo II (2015–2017)

<table>
<thead>
<tr>
<th>No consumption of organic food</th>
<th>Organic food consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤8.0%* (95% CI)</td>
</tr>
<tr>
<td>%</td>
<td>% (95% CI)</td>
</tr>
<tr>
<td>Total (girls and boys)</td>
<td>36.8 (32.8–40.9)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>35.3 (29.9–40.7)</td>
</tr>
<tr>
<td>Boys</td>
<td>38.3 (32.4–44.1)</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
</tr>
<tr>
<td>6–8 years</td>
<td>35.8 (30.1–41.5)</td>
</tr>
<tr>
<td>9–11 years</td>
<td>37.9 (32.6–43.1)</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>65.1 (53.7–76.4)</td>
</tr>
<tr>
<td>Medium</td>
<td>34.0 (28.5–39.4)</td>
</tr>
<tr>
<td>High</td>
<td>19.5 (14.7–24.3)</td>
</tr>
</tbody>
</table>

CI = confidence interval  
*The 8.0% threshold is the mean level of organic food consumption found among children who eat organic produce.
The proportion of organic food in total consumption increases with higher socioeconomic status.

Vegetables and fruit are among the most commonly consumed organic produce in children.

The observation of a larger proportion of organic food among children from families with a high SES suggests that education and income play a role in children’s consumption of organic food.

In addition to identifying the groups who eat the most organic food, EsKiMo II also demonstrates of which food groups organic foods are frequently consumed. Figure 1 shows the proportions of consumers who eat the ten most frequently consumed organic foods. Foods of plant origin, such as vegetables and fruit, are among the most commonly reported organic foods; they form part of the diets of 35.9% and 28.7% of children, respectively. It should be noted that organic meat and processed meat are rarely reported and that organic meat does not appear among the ten most frequently consumed organic foods. Results from the first EsKiMo study (2006) also show that organic meat was seldom purchased and that organic fruit and vegetables were bought more often (by parents of children aged between six and eleven) [8].

When interpreting the results, it is important to consider that the data on food intake was self-reported. In the case of branded products, internet research was used to verify whether an organic variant of a product was commercially available. This could not be done in the case of loose or unpackaged goods, such as fruit and vegetables, or for takeaway foods. As a result, it is impossible to completely rule out the presence of errors in the data on organic food intake. Furthermore, the dietary assessment only covered a short time frame of four days. Although it should be possible to use data collected over a four-day period to differentiate people who eat no organic foods from those with a low or high organic food intake, individual participants may still have been wrongly categorised because the probability of eating organic food increases with the length of the assessment. Finally, self-reported data (on organic foods) may be biased by social desirability. This could have led to an overestimation of organic food intake.

Nevertheless, the EsKiMo II module is the first to provide population-based data on the proportion of organic food consumed by children aged between six and eleven in Germany. The high proportion of children who consume organic foods suggests that health, environmental and ethical motives play a role in the choice of food selected by families with children.

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Conflict of interest
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References
Consumption of organic food by children in Germany – Results of EsKiMo II


18. Lage Barbosa C, Brettschneider AK, Haftenberger M et al. (2017) Comprehensive assessment of food and nutrient intake of children and adolescents in Germany: EsKiMo II – the eating study as a KiGGS module. BMC Nutrition 3(1)


Energy drink consumption among 12- to 17-year-olds in Germany – Results of EsKiMo II

Abstract

Energy drinks are soft drinks that usually contain a large content of caffeine and sugar. Excessive caffeine intake can lead to side effects such as nausea and anxiety. Up to three milligrams of caffeine per kilogram of body weight per day is considered safe for children and young people. The second Eating study as a KiGGS Module (EsKiMo II, 2015–2017) collected nationwide representative data about children’s and adolescents’ dietary behaviour. To collect food intake data from 12- to 17-year-olds (n=1,353), a dietary history interview was used. 8.9% of the girls and boys stated that they had consumed energy drinks during the four-week reference period, with nearly a quarter of these individuals (n=99) exceeding the limit of safe caffeine intake solely through their consumption of energy drinks. This corresponds to 2.2% of the 12- to 17-year-olds in Germany. In addition to a general warning about the high levels of sugar present in sugary drinks, awareness also needs to be raised among young people about the dangers of excessive caffeine intake resulting from the consumption of energy drinks. Regulations governing sales and advertising should also be considered.

Introduction

In recent years, sales of energy drinks have risen sharply throughout the world [1]. These drinks are particularly popular among younger people. Manufacturers often aim their drinks at this target group and do so under the premise of improved concentration and strengthened performance [2, 3]. Energy drinks contain high levels of caffeine. Caffeine occurs naturally in plant constituents, and is traditionally consumed in the form of coffee, tea, soft drinks and processed cocoa powder [4]. Energy drinks usually contain 32 milligrams of caffeine per 100 millilitres, which is twice the level found in commercially available cola drinks. However, energy drinks contain other substances such as taurine, glucuronolactone and inositol, which can also have physiological effects, [5] and they usually contain high levels of sugar.

However, it is the high caffeine content found in commercially-available energy drinks that has recently led researchers to focus increasingly on these products. For example, in 2015, the European Food Safety Authority (EFSA) published a report on the safety of caffeine. The report includes guidelines for caffeine intake from all dietary sources for the general healthy population as well as for subgroups such as children and adolescents. The EFSA recommends that young people should not consume more than three milligrams of caffeine per kilogram of body
KiGGS Wave 2
Second follow-up to the German Health Interview and Examination Survey for Children and Adolescents

Data owner: Robert Koch Institute

Aim: Providing reliable information on health status, health-related behaviour, living conditions, protective and risk factors, and health care among children, adolescents and young adults living in Germany, with the possibility of trend and longitudinal analyses

Study design: Combined cross-sectional and cohort study

Cross-sectional study in KiGGS Wave 2
Age range: 0–17 years
Population: Children and adolescents with permanent residence in Germany
Sampling: Samples from official residency registries - randomly selected children and adolescents from the 167 cities and municipalities covered by the KiGGS baseline study
Sample size: 15,023 participants

KiGGS cohort study in KiGGS Wave 2
Age range: 10–31 years
Sampling: Re-invitation of everyone who took part in the KiGGS baseline study and who was willing to participate in a follow-up
Sample size: 10,853 participants

KiGGS survey waves
- KiGGS baseline study (2003–2006), examination and interview survey
- KiGGS Wave 1 (2009–2012), interview survey
- KiGGS Wave 2 (2014–2017), examination and interview survey

More information is available at www.kiggs-studie.de/english

Energy drink consumption among 12- to 17-year-olds in Germany – Results of EsKiMo II

KiGGS is part of the health monitoring system at the Robert Koch Institute and includes repeated cross-sectional surveys of children and adolescents aged 0 to 17 that are representative for Germany (KiGGS cross-sectional study). The KiGGS baseline study (2003–2006) was conducted as an examination and interview survey, KiGGS Wave 1 (2009–2012) as a telephone-based interview survey and KiGGS Wave 2 (2014–2017) as an examination and interview survey. The concept and design of KiGGS Wave 2 have been described in detail elsewhere [9, 10].

As part of the EsKiMo study, nationwide representative data were collected on the nutritional behaviour of 6- to 17-year-old children and adolescents in Germany. Data on the dietary intake of 12- to 17-year-olds was gathered for EsKiMo II with a computer-assisted, modified dietary history interview using the Dietary Interview Software for Health Examination Studies (DISHES) [11]. Trained nutritionists conducted face-to-face interviews with the participants about their usual eating habits at mealtimes. The questions covered the previous four weeks. Data were also collected on energy drink intake, including the quantity of drinks that the participants consumed. Data were collected on portion sizes by demonstrating standard plate and cup sizes, using a picture book [12, 13] or by providing information about commercially-available portion sizes. The DISHES software package includes Version 3.02 of the German Nutrient Database (BLS) [14] and additional data on specific foods. Detailed information about the methodology and the study design implemented for EsKiMo II is available elsewhere [15, 16].

The following analyses are based on data from 1,353 children and adolescents (727 girls, 626 boys) aged 12 to 17. The proportion of participants who stated that they had consumed energy drinks at least once in the four-week period is stratified by sex, age and socioeconomic status (SES) [17].

Caffeine intake was evaluated using the EFSA’s recommended safe levels of caffeine for children and adolescents [6]. Caffeine intake from energy drinks was calculated using

Indicator
EsKiMo II (2015–2017) was implemented within the framework of KiGGS Wave 2 (2014–2017). KiGGS is part of the health monitoring system at the Robert Koch Institute and includes repeated cross-sectional surveys of children and adolescents aged 0 to 17 that are representative for Germany (KiGGS cross-sectional study). The KiGGS baseline study (2003–2006) was conducted as an examination and interview survey, KiGGS Wave 1 (2009–2012) as a telephone-based interview survey and KiGGS Wave 2 (2014–2017) as an examination and interview survey. The concept and design of KiGGS Wave 2 have been described in detail elsewhere [9, 10].

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Energy drink consumption among 12- to 17-year-olds in Germany – Results of EsKiMo II

FACT SHEET

Almost twice as many young people aged between 16 and 17 consume energy drinks as those aged between 12 and 13. However, this difference is only statistically significant for boys. Almost the same percentage of girls (9.7%) as boys (8.7%) consume energy drinks. 12- to 17-year-olds from families with a low SES have an almost three times more frequent intake of energy drinks than those from families with a high SES (15.8% vs 5.4%). Nevertheless, this difference is not statistically significant (Table 1).

The use of different survey instruments, reference periods and age groups complicates attempts to compare these results with findings from previous international studies. In a 2012 survey of 16 European Union member states, which was commissioned by the EFSA, around 60% of 1,068 children and adolescents aged between 10 and 18 surveyed in Germany stated that they had consumed energy drinks in the year leading up to the survey [1]. Furthermore, the Prevention Radar (2019) of the health insurance company DAK-Gesundheit found that 13% of school pupils in Germany had consumed energy drinks before and during school in the last 30 days. However, the majority of pupils drank energy drinks less than once a month [19]. As these results imply that energy drinks are consumed on an irregular basis, the four-week survey period in EsKiMo II may have led the study to slightly underestimate the actual figures.

Energy drinks account for 4.3% of total caffeine intake (from all types of caffeinated drinks) by young people in Germany. Analyses of estimates of caffeine intake using data from the Dortmund Nutritional and Anthropometric Longitudinally Designed Study (DONALD) also show that energy drinks only account for a small proportion of total

data on the daily intake of energy drinks (grams per day) and the level of caffeine that these drinks contain (milligrams per 100 grams). A caffeine database was composed within EsKiMo II to document the caffeine levels present in various foodstuffs. The figures on caffeine contained in the database are the result of a literature review undertaken by the authors, as well as figures provided by the Federal Office of Consumer Protection and Food Safety (BVL) and the Chemical and Veterinary Examination Office Karlsruhe (CVUA). Information on body weight is based on self-reported data collected during the DISHES interviews.

The calculations were carried out using a weighting factor that corrects deviations within the EsKiMo II sample from the population structure with regard to regional structure (rural area/urban area), age (in years), sex, federal state (as of 31 December 2015), German citizenship (as of 31 December 2014), parental education level (Microcensus 2013 [18]) and differences in survey participation according to seasonality, family socioeconomic status and a child’s school type.

The results are presented as prevalences (frequencies) with 95% confidence intervals (95% CI). Prevalences are estimates, the precision of which can be assessed through the use of confidence intervals; wide confidence intervals indicate greater statistical uncertainty in the results. A statistically significant difference between groups is assumed when the corresponding p-value is less than 0.05, after taking into account weighting and the survey design.

Results and discussion

8.9% of the young people state that they have consumed energy drinks over the last four weeks. Consumption of energy drinks among both sexes increases with age: almost twice as many young people aged between 16 and 17 consume energy drinks as those aged between 12 and 13. However, this difference is only statistically significant for boys. Almost the same percentage of girls (9.7%) as boys (8.7%) consume energy drinks. 12- to 17-year-olds from families with a low SES have an almost three times more frequent intake of energy drinks than those from families with a high SES (15.8% vs 5.4%). Nevertheless, this difference is not statistically significant (Table 1).
Almost 9% of 12- to 17-year-olds consumed energy drinks during a four-week period.

Nearly a quarter of energy drink consumers exceeded safe levels of caffeine intake.

caffeine intake from all types of caffeine-containing beverages [20]. Slightly under a quarter (24.3%) of energy drink consumers (n=99) exceed the EFSA's safe caffeine intake of three milligrams per kilogram of body weight per day or in a single dose. This corresponds to 2.2% of the young people in the studied age group. However, since these results are based on self-reported data about dietary intake, and it is possible that the participants provided socially desirable responses, the results may underestimate the actual level of caffeine intake.

A moderate dietary intake of energy drinks and other caffeinated drinks is considered harmless [6]. However, the results from EsKiMo II show that one in four energy drink consumers (and this applies to girls and boys) exceed the safe intake of caffeine through their consumption of energy drinks alone. The German Federal Institute for Risk Assessment's survey of people with a particularly high intake of energy drinks also indicates that on some occasions these individuals consume excessively large quantities amounting to one litre or more [2]. Bans on the sale of energy drinks (particularly in schools) and restrictions on marketing aimed at young people, therefore, should be examined at the national level in order to minimise the risk of the side effects linked to excessive caffeine intake. Other countries have already put regulatory measures in place in this regard [3]. Lowering the maximum permissible level of caffeine in energy drinks represents a further possibility, particularly as manufacturers tend to ensure that their products contain the highest permissible level of caffeine.

Energy drinks are sugary drinks. In December 2018, the German Federal Ministry of Food and Agriculture published a National Reduction and Innovation Strategy, which also included the sugar found in convenience products [21]. Further measures will probably have to be implemented in order to significantly reduce the levels of sugar that people consume. For example, a higher tax on drinks that contain large amounts of sugar is currently discussed. Evaluations from other countries show that sugar taxes help to reduce the sale of sugary soft drinks [22].

### Table 1

Prevalence of energy drink consumption by sex, age and socioeconomic status 
(n=727 girls, n=626 boys)

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>(95% CI)</th>
<th>%</th>
<th>(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls (total)</td>
<td>9.1</td>
<td>(5.8–12.3)</td>
<td>8.7</td>
<td>(5.9–11.4)</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12–13 years</td>
<td>7.7</td>
<td>(1.8–13.5)</td>
<td>5.3</td>
<td>(2.2–8.3)</td>
</tr>
<tr>
<td>14–15 years</td>
<td>7.1</td>
<td>(2.0–12.3)</td>
<td>7.0</td>
<td>(3.3–10.7)</td>
</tr>
<tr>
<td>16–17 years</td>
<td>12.2</td>
<td>(6.1–18.2)</td>
<td>13.3</td>
<td>(6.7–19.9)</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>19.4</td>
<td>(8.0–30.8)</td>
<td>11.0</td>
<td>(0.7–21.2)</td>
</tr>
<tr>
<td>Medium</td>
<td>6.2</td>
<td>(3.4–9.0)</td>
<td>9.8</td>
<td>(6.3–13.3)</td>
</tr>
<tr>
<td>High</td>
<td>6.6</td>
<td>(0.0–15.1)</td>
<td>4.6</td>
<td>(0.8–8.3)</td>
</tr>
<tr>
<td>Total (girls and boys)</td>
<td>8.9</td>
<td>(6.7–11.0)</td>
<td>8.9</td>
<td>(6.7–11.0)</td>
</tr>
</tbody>
</table>

CI = confidence interval
No differences in the consumption of energy drinks were identified between the sexes.

Energy drinks were consumed about twice as often by 16- to 17-year-olds as by 12- to 13-year-olds.

Funding
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Energy drink consumption among 12- to 17-year-olds in Germany – Results of EsKiMo II

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Utilisation of canteens offering healthy food choices as part of workplace health promotion in Germany

Abstract
Ensuring that canteens offer employees healthy food choices is a settings-based measure of workplace health promotion. The German Health Update (GEDA 2014/2015-EHIS) surveyed the knowledge and use of canteens with healthy food choices by 18- to 64-year-old female and male employees. Over the previous twelve months, 64.6% of women and 66.2% of men had, where available, eaten at canteens with healthy food options at their place of work. These figures on canteen use decline with age. The most frequent use is by employees in the high education group. Women working full-time eat in canteens offering healthy food choices more often than women working part-time. No difference in relation to the number of hours worked is observed for men. Healthy food choices in canteens should continue to be promoted.

Introduction
An appropriate diet and sufficient physical activity are important factors for health that contribute significantly to the prevention of non-communicable diseases such as type 2 diabetes, cardiovascular diseases and cancer [1]. The German Nutrition Society (DGE) has developed recommendations for a healthy diet which include consuming vegetables and fruit daily and consuming a needs-oriented amount of fish and dairy products [2]. However, these recommendations are often not put into practice or only partially [3]. For example, only around 40.4% of women and 23.9% of men eat vegetables every day [4]. The workplace provides an opportunity to promote a healthy diet, since a large proportion of the population works regularly. In 2017, around 71.5% of women and 78.9% of men aged 15 to 65 were in work [5].

The workplace health promotion can promote an appropriate diet through behaviour-related measures such as providing nutritional advice and information. However, settings-based measures to change the foods offered in canteens, cafeterias and vending machines are particularly effective [6]. The choice of food offered in canteens can even have an effect on employees with little interest in a healthy diet such as young men [7]. In 2017, around 19% of employees aged 14 and over ate at canteens and workplace cafeterias, while 13% went to bakeries or snack stalls and 4% went to restaurants [8].

Increasing the availability and accessibility of healthier products at workplace canteens can potentially lead people to make healthier food choices [9, 10]. One option is to display fruit and vegetables so they are easily visible, or to reduce the number of products that are less healthy. So-called ‘nudges’ can also unconsciously facilitate healthier food choices [9–11], for example, if healthier food is displayed attractively. To be successful, measures to promote
Utilisation of canteens offering healthy food choices as part of workplace health promotion in Germany

Healthy workplace diets must target both the setting and the individual behaviour [9].

In the context of workplace health promotion, little is known about the number of canteens in Germany offering healthy food choices. To date, relevant data have been published by the German National Association of Statutory Health Insurance Funds (GKV-Spitzenverband) in their annual prevention reports [12] and from individual studies [13]. The survey GEDA 2014/2015-EHIS made it possible for the first time within health monitoring at the Robert Koch Institute to map the population’s use of canteens with healthy food options. Of particular interest was the extent to which socio-demographic factors and the number of hours worked influence canteen choices.

**Indicator**

The indicator utilisation of canteens offering healthy food choices was populated in GEDA 2014/2015-EHIS using self-reported data from respondents completing paper-based or online questionnaires. The first question asked was ‘In the last 12 months, has your company had a canteen with healthy food offers (e.g. daily offer of vegetables, fresh salad and vegetarian dishes, regular offer of jacket or backed potatoes)?’ Respondents could answer with ‘Yes’, ‘No’, or ‘Don’t know’. If the answer was yes, the subsequent question was ‘Did you take up this offer?’, with the answers being ‘Yes’ or ‘No’. These questions were based on the study by Zok [13] and included additional examples from the DGE recommendations in ‘Eating at the Workplace and in Canteens’ [14]. The number of times people ate at canteens was not surveyed in GEDA 2014/2015-EHIS.

People were categorised as employed if they answered the question ‘Which life situation currently best applies to you?’ by stating that they were ‘working full-time, part-time or semi-retired’, were ‘marginally employed’, were having a ‘voluntary social/ecological/cultural year’, or were in ‘voluntary military service’ or in ‘federal volunteer service’ over the past twelve months. Employed people were divided into two groups depending on the number of hours they worked: ‘working part-time’ (which also included marginally-employed and semi-retired people) and ‘working full-time’. The results were stratified by sex, age group and education.

The analyses are based on data collected from 2,627 employed persons aged 18 to 64 who knew of a canteen at their workplace that offered healthy food options (1,244 women, 1,383 men). The present article reports on relative frequencies with 95% confidence intervals (95% CI). Confidence intervals were used to assess the precision of the estimated values, whereby broad confidence intervals indicate a greater statistical uncertainty of results. A significant difference is assumed if the p-value taking weighting and survey design into account is smaller than 0.05. The calculations were carried out using a weighting factor that corrects deviations from the population structure within the sample (as of 31 December 2014) with regard to sex, age, district type and education. The district type reflects the degree of urbanisation and corresponds to the regional distribution in Germany. The International Standard Classification of Education (ISCED), which is based on data on school and professional qualifications, was used to make the education data comparable [15]. The article German Health Update: New Data for Germany and Europe in issue
Utilisation of canteens offering healthy food choices as part of workplace health promotion in Germany


Results and discussion
The analyses of GEDA 2014/2015-EHIS show that around two-thirds of the women and men surveyed (64.6% and 66.2%, respectively) eat at a canteen that offers healthy food choices. No significant differences were observed between the sexes. The proportion of employees who take advantage of healthier options declines significantly in the 45- to 64-year-old age group. The difference between the youngest and the oldest age group is 10.3% for women and 8.4% for men. With the exception of the oldest group of women, employees of all ages in the high education group are more likely to eat at a canteen with healthy food choices than employees in the medium or low education group.

Table 1
Relative frequencies of eating at a canteen with healthy food options over the past twelve months by sex, age and education status (n=1,244 women, n=1,383 men)*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Women (%) (95% CI)</th>
<th>Men (%) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>64.6 (61.8–67.2)</td>
<td>66.2 (63.5–68.7)</td>
</tr>
<tr>
<td>18–29 years</td>
<td>70.6 (64.4–76.1)</td>
<td>69.9 (63.7–75.5)</td>
</tr>
<tr>
<td>Low education group</td>
<td>74.8 (53.2–88.5)</td>
<td>71.1 (52.7–84.5)</td>
</tr>
<tr>
<td>Medium education group</td>
<td>65.5 (57.3–72.8)</td>
<td>66.7 (58.3–74.2)</td>
</tr>
<tr>
<td>High education group</td>
<td>80.9 (70.9–88.1)</td>
<td>78.6 (68.1–86.4)</td>
</tr>
<tr>
<td>30–44 years</td>
<td>67.3 (61.9–72.2)</td>
<td>70.5 (66.3–75.4)</td>
</tr>
<tr>
<td>Low education group</td>
<td>58.6 (32.0–80.9)</td>
<td>57.8 (32.9–79.3)</td>
</tr>
<tr>
<td>Medium education group</td>
<td>61.7 (54.4–68.6)</td>
<td>66.8 (60.4–72.7)</td>
</tr>
<tr>
<td>High education group</td>
<td>77.3 (70.3–83.0)</td>
<td>76.4 (71.1–80.9)</td>
</tr>
<tr>
<td>45–64 years</td>
<td>60.3 (56.3–63.9)</td>
<td>61.5 (57.5–65.3)</td>
</tr>
<tr>
<td>Low education group</td>
<td>69.6 (57.9–79.3)</td>
<td>62.4 (49.1–74.0)</td>
</tr>
<tr>
<td>Medium education group</td>
<td>57.5 (52.3–62.6)</td>
<td>57.2 (50.7–63.4)</td>
</tr>
<tr>
<td>High education group</td>
<td>62.4 (57.1–67.4)</td>
<td>66.6 (62.2–70.7)</td>
</tr>
</tbody>
</table>

CI=Confidence interval
* Based on all people who know of a canteen at their workplace that offers healthy food options.

This difference is not significant in the group of men aged 16 to 29 (Table 1).

Significant differences were observed for women with regard to the number of hours worked. Women working full-time were more likely to state that they ate at a canteen with healthy food options than women working part-time (68.9% vs. 58.2%). No comparably significant differences were found for men (66.4% vs. 61.5%, Figure 1). The extent to which the specific working hours of women and men in part-time employment influences their choice of food cannot be deduced from the survey data.

The results of GEDA 2014/2015-EHIS essentially confirm the picture given by the sparse data on the promotion of workplace canteens offering healthy food choices, which forms part of the workplace health promotion in Germany. The 2008 Fehlzeiten-Report (report on absenteeism), for example, similarly indicates that around two-thirds of

Figure 1
Relative frequencies of eating at a canteen with healthy food options by sex and number of hours worked (n=1,244 women, n=1,383 men)*

Source: GEDA 2014/2015-EHIS

Two-thirds of male and female employees make healthy food choices if canteens provide healthy food options.
The use of canteens with healthy food options declines with age.

Employees in the high education group are the most likely to take advantage of these offers.

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employees (66.9%) eat at canteens with healthy food options, and also finds a tendency towards lower rates in the older age groups [13]. An increase since then would have been expected, since the number of companies introducing measures to workplace health promotion in co-operation with statutory health insurance (SHI) has quadrupled to 17,672 over the past decade [12]. On the other hand, less than a third of the companies supported by SHI actually implemented a ‘healthy diet at work’ as part of efforts to workplace health promotion (for example 2014: 32%, 2017: 25%) [12, 17].

The lack of change in the use of canteens with healthy food options could therefore indicate that, as yet, only a few of the approximately 3,482,000 companies [18] have set their canteens up to offer healthy food choices as part of their workplace health promotion, possibly also because some do not have a canteen at all, for example where there are only a few employees.

In contrast to GEDA 2014/2015-EHIS, the Fehlzeiten-Report found higher usage for men (70.5%) than for women (62.2%) [13]. In GEDA 2014/2015-EHIS, slightly higher rates were recorded for women (64.6%) and slightly lower rates for men (66.2%). Further studies should show whether rates for women really have caught up with those of men in recent years. The more frequent use of healthy food options at canteens by employees with high levels of education is consistent with the general observation that groups with higher socioeconomic status are more likely to utilise preventive measures [19]. While the aim of settings-based preventive measures is, among other things, to help reduce social inequalities in health by modifying workplace conditions, canteens offering healthy food choices appear to be missing relevant target groups. This raises the question as to whether healthier choices at canteens are more expensive and therefore less attractive to low-income groups. These results suggest that further research should collect and evaluate information on the implementation of measures, the employment structure, the workplace and other influencing factors not provided by GEDA 2014/2015-EHIS. Any interpretation of GEDA data should consider the fact that these data are self-reported by employees, and may therefore be biased due to socially desirable responding or misinterpretation of questions.

The results presented on the use of canteens offering healthy food choices within as part of workplace health promotion show that, while Germany has begun to promote healthier food choices at canteens, in respect of equity in health, not all population groups are being reached equally. Quality standards for canteens should be further promoted [20], as should healthy food options in canteens. This would also help meet the increasing demand for healthy food options in the workplace [21].

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The use of canteens with healthy food options declines with age.

Employees in the high education group are the most likely to take advantage of these offers.
Women working fulltime eat at canteens offering healthy food choices more frequently than women working part-time. There is no difference in relation to hours worked for men.
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