

The impact of social factors on the nutrition of German children and adolescents

They say you are what you eat, but do you eat what you are?

Sebastian Mader, Malte Rubach, Wolfram Schaecke

Abstract

According to the KiGGS (The German Health Interview and Examination Survey for Children and Adolescents) baseline study of 2003–2006, the diet of most German boys and girls falls far short of the recommendations for an optimized mixed diet (optimiX®). On average, in terms of food consumption as a proportion of total energy intake, this group consumes only three quarters of the recommended amount of positively encouraged foods, and they over-consume “tolerated” food groups, consuming two and a half times the recommended amount. The triple-A model identifies neutral factors (especially available income), protective factors (especially high level of educational attainment), and risk factors (especially a migration background) affecting nutritional behavior. The results highlight the importance of setting-oriented promotion of healthy habits on the one hand, and the need for further research into modeling and analysis strategies on the other hand.

Keywords: nutritional behavior research, children and adolescents, nutrition-related health inequality, triple-A model, KiGGS, German Health Interview and Examination Survey for Children and Adolescents, optimiX®

fundamental deficiencies in the currently available analysis of the situation in Germany as a whole [10–12].

Research question

In attempting to answer the question of whether you eat what you are, this article will primarily focus on identifying the main social factors that influence the nutritional behavior of children and adolescents.

Methodology

Theory

The basis for this study is the “triple-A model”, which is based on the principles of behavioral economics and neuroeconomics. According to this model, the three driving factors that affect nutritional behavior are the affordability, availability, and accessibility of foods [13, 14]. The concept of affordability encompasses both direct costs and opportunity costs. The concept of availability refers to the availability of healthy foods, as well as to the surrounding opportunity structure, and thus to the contextual features of a social space. Finally, accessibility refers to internalized cultural knowledge and the associated scripts. In order to draw up a picture of accessibility, we look at educational background or level of educational attainment,

Introduction

Diet-related and partially diet-related chronic degenerative diseases are causing an increasing burden on the social welfare system and on individual quality of life [1–3]. There is also health inequality in this country [3–5]. In order to develop effective political approaches to help get people on the right track with nutrition at an early stage, it is essential to know the social factors that influence nutritional behavior, especially in children [6–9]. The socio-epidemiological survey studies conducted by the Robert Koch Institute (RKI) within the framework of health monitoring have now paved the way for addressing

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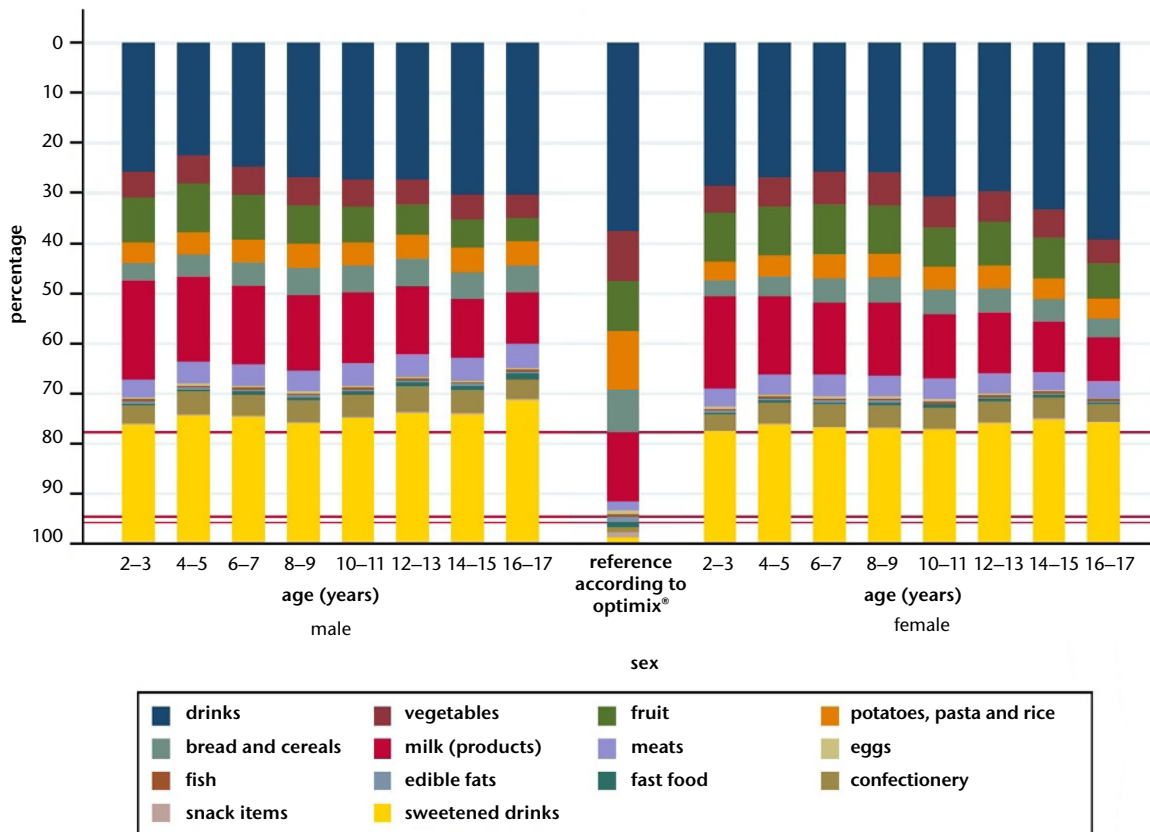


Fig. 1: Average proportions of optimiX® food groups relative to total intake level (g/day) by sex and age in KiGGS 0 compared to the corresponding recommendations according to optimiX® (n = 8,558)

as well as normative attitudes and associated characteristics as regards the socio-economic and socio-cultural attributes of foodstuffs/dishes [14].

Data

The study data was based on the German Health Interview and Examination Survey for Children and Adolescents baseline study (Public Use File KiGGS 0 of the RKI [15]) from the years 2003–2006, as a unique study in Germany and a fully conceptualized socio-epidemiological study in children and adolescents living in Germany between the ages of 1 and 17 (n = 17,641) [12]. Due to missing values for several variables, the analysis data set for this study was reduced to 8,558 cases.

In KiGGS 0, intake was comprehensively recorded using a validated food frequency questionnaire (FFQ) [8, 16]. The daily intake levels in grams (g/day) that the authors of this study calculated based on this [17] were converted into the daily energy intake in kilocalories (kcal/day) by assigning average energy densities [18–21].¹

Analysis strategy

The associative analysis-based tracing of intake back to the three dimensions of the triple-A model available in the KiGGS baseline study (♦ Figure 3) was carried out in three steps:

1. explanation of the total intake (sum of the food group-specific

consumption of all food groups that are included in the optimized mixed diet [optimiX®]) [22, 23]) in g/day and kcal/day using linear OLS regression,

2. modeling of intake on the food group level using the optimiX® categories in g/day and kcal/day (linear OLS regression), and
3. calculation of the relative risks of deviation from the prescribed gender and age-specific balanced intake/energy balance² [22–25] using multinomial logistic regression.

¹ Tables 1 and 2 in the online supplement provide an overview of the descriptive statistics of all variables included in the analyses.

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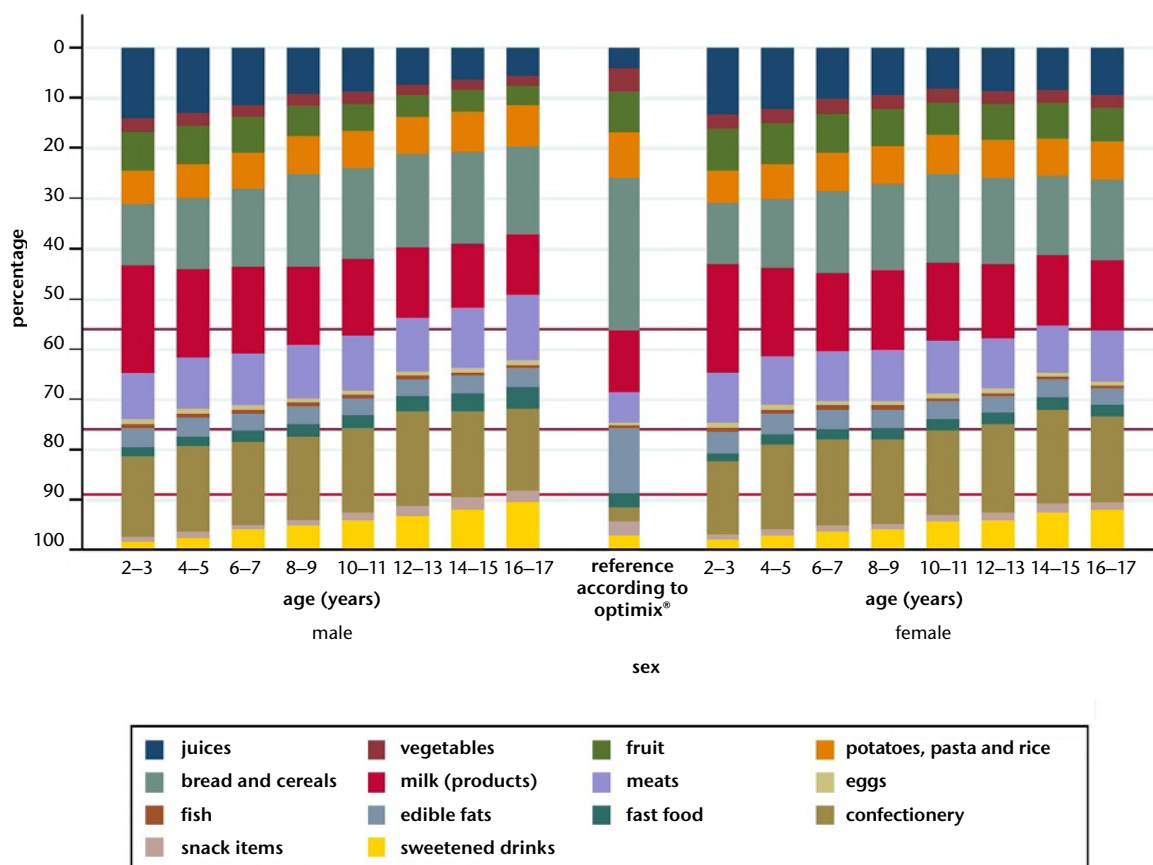


Fig. 2: Average proportions of optimiX® food groups relative to total energy intake (kcal/day) by sex and age in KiGGS 0 compared to the corresponding recommendations according to optimiX® (n = 8,558)

Results

The diet of most children and adolescents in Germany falls far short of the recommendations according to optimiX®

It was noted that in the case of “tolerated” food groups with low vitamin/mineral content and high energy density (fast food, confectionery, snack items, and sweetened drinks), both the intake level (♦ Figure 1) and the energy intake (♦ Figure 2) exceeded the recommendations (on average 25% of total energy intake). This is two and a half times the reference value for “tolerated foods”. A large portion of this intake took place through the consumption of confectionery and sweetened drinks (17% of energy

intake). Accordingly, the KiGGS population fell short of the reference values for positively encouraged foods (fruit, vegetables, potatoes, pasta, rice, bread, cereals and low-energy density/energy-free drinks) by an average of 14 percentage points. This is equivalent to 75% of the reference value for positively encouraged foods.

On average, girls and boys in Germany managed to consume only about half of the recommended energy intake percentages for vegetables and bread and cereals. As for the moderately recommended food groups, it should be noted that the proportional consumption of meat and sausages was almost two times higher than recommended. The proportional consumption of milk/

dairy products reduced as age increased.

² Here, the reference category designation of eating “as recommended” describes the range of values between 0.90 and 1.10 times [25] the optimum recommended intake/energy balance (measured intake relative to age and sex-adjusted recommended consumption) [22–24]. On this basis, four categories of deviation from the recommendations are defined: Values between 0 and 0.50 are categorized as “far too little”, values between 0.50 and 0.90 are categorized as “too little”, values between 1.10 and 1.50 are categorized as “too much” and values above 1.50 are categorized as “far too much”.

³ For a summary comparison of the theoretically expected effects versus the empirically observed effects, see ♦ Tables 3 and 4 in the online supplement.

The triple-A model identifies robust neutral factors, protective factors, and risk factors

Overall, the results of the regression analysis provide evidence that the triple-A model is empirically relevant here (♦ Figure 3). All models trace intake back to all of the variables that can be seen in ♦ Figure 3.

A background of high educational attainment was found to be a particularly strong protective factor in terms of consumption of a diet that complies with the recommendations in children and adolescents. Interestingly, the protective character of high educational attainment among natural parents only manifested as a reduced intake of tolerated foods, and not in an increased intake of positively encouraged food groups. Regardless of this, available income was generally a neutral factor. Only intake of confectionery was affected by income: going down by about 25 kcal/day for each additional € 1,000 of household income available.

The main risk factors that were found were regional deprivation, a migration background, and older birth cohorts. Compared to the corresponding rural population in western Germany, children and ado-

lescents who lived in rural areas in the former GDR were at greater risk of eating too much (43 kcal/day more in confectionery, 33 kcal/day more in both milk/dairy products and bread/cereals, and 45 kcal/day more in fruit). However, these East/West differences were not present among residents of cities with more than 100,000 inhabitants. Boys and girls with a migration background consumed more than their “native” counterparts (apart from juices and sweetened drinks), which manifested predominantly in an overconsumption of confectionery of 50 kcal/day. The highest increase in energy intake per year of age was recorded for bread and cereals, followed by confectionery and sweetened drinks, as well as meat and sausages. However, birth cohort was found to have no effect with regard to fruit and vegetables, for example.

The employment status of parents was found to have contrasting effects: Compared to those with an unemployed parent, children and adolescents with a mother or father working part-time had a lower relative risk of eating too much, whereas full-time employment of either the mother or the father was associated with a higher relative risk of the child eating too little.

Discussion

Initial attempts at explanation using the triple-A model highlight the need for further research

In conclusion, this article has shown that the triple-A model successfully contributed to explaining the individual nutritional behavior of girls and boys in Germany between 2003 and 2006.³ Nevertheless, the article also shows that further research is needed into modeling and analysis strategy: Therefore, it is essential to:

1. replicate the results using other suitable socio-epidemiological survey data,
2. learn more about the spatial supply structures (availability and opportunity structures), and
3. analyze the courses of individual lives using panel data (this could in principle be done with KiGGS, for example [12]).

Use the carrot, not the stick

The results also highlight the need for setting-oriented promotion of health – getting people on the right track at an early stage in order to ensure health equality in the context of nutrition [6–9]. As shown by the analysis results for the parents’ educational background, for the impact of a migration background, and for the birth cohort, child day care centers, kindergartens, and schools should be considered as important settings for learning about healthy living [7]. As a result, nutrition education in early childhood and communal catering are the focus of future fields of action [26].

The tables in the online supplement provide an overview of the descriptive statistics of all variables included in the analyses, along with the comparison of the theoretically expected effects versus the empirically observed effects.

The primary author can also provide further information on the statistics upon request.

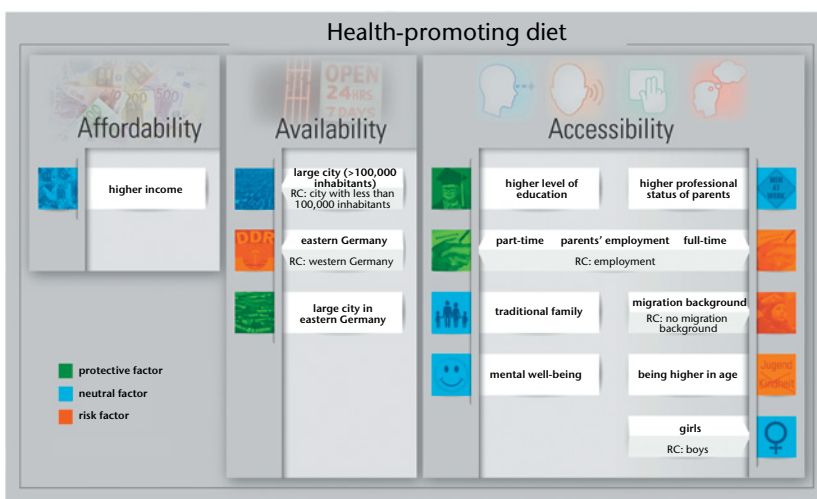


Fig. 3: Summary of the examination results of all analysis steps (n = 8,558)
 RC = reference category

Conflict of Interest

The authors declare no conflict of interest.

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