

# Lunch in all-day schools in North Rhine-Westphalia based on menus and recipes<sup>1</sup>

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## Summary

As all-day schools are becoming increasingly common, adequate catering must be provided for the pupils at lunchtime. If the children and adolescents are provided with a balanced lunch, this can help them greatly in achieving healthy nutrition. In a subsample of the „State Survey of Midday Catering in NRW“ of all-day schools, the menus and recipes for lunch were compared with the DGE [German Society for Nutrition] Standard and the hot meal of the Optimised Mixed Diet of the FKE. Although the menus consistently made a good impression, this could not be confirmed at the nutrient level. In many cases, the nutrient density of vitamins and minerals was unsatisfactory, particularly when the hot meal of the Optimised Mixed Diet was taken as reference. Evaluation of the menus indicated that most kitchens are making good progress. However, they need more support in improving their recipes.

**Keywords:** school catering, all-day school, lunch, menus, nutrients, children and adolescents

of a core survey and a detailed survey. The core survey in the total sample provided structural data on the school and its midday catering [4, 5]. In a subsample, the detailed survey collected the nutritional characteristics of the available food on the basis of menus and recipes. These were then evaluated on the basis of the “DGE Quality Standard for School Catering”<sup>2</sup> [6] and the hot meal of the “Optimised Mixed Diet” of the Research Institute of Child Nutrition (FKE) [8]. The present manuscript contains essential data in the detailed survey (◆ Figure 1).

## Methods

### Survey

The total randomised sample for the core data consisted of 1,164 all-day schools. From this, a randomised subsample for collecting the detailed data was selected of 189 all-day schools with the corresponding kitchens. In the invitation letter about the core data, these schools were also requested to send their current 4-weeks menus and to grant the FKE access to their food provider, so that the corresponding recipes could be collected.

## Introduction

As all-day schools are becoming increasingly common, adequate catering must be provided for the pupils at lunchtime. According to the Conference of the Ministers of Education and the Arts, all-day schools must provide lunch on days with all-day schooling. It is not specified whether this must be a hot meal, or whether a cold meal is acceptable [1].

Lunch in Germany is normally a hot meal. This contains a different mixture of foods and nutrients than in conventional cold meals [2]. If the pupils are provided with a balanced lunch, all-day schools can provide nutrition that will help children and adolescents from all levels of society to remain healthy [3].

The 2009–2010 “State Survey of Midday Catering in NRW” consisted

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<sup>2</sup>The survey employed the 2009 version of the DGE Quality Standard for School Catering. The third edition (2011) has now appeared [7].

The detailed survey was split into the components of questionnaires, menus and recipes and was addressed to the on-site kitchen management or to the management of external kitchens.

The questionnaires were used to collect structural data on the kitchen, including its food capacity, the qualification of the staff and the use of guidelines. To evaluate the frequency of the available foods, nine groups of dishes were prepared from the information in the menus. The frequency with which the nine groups of dishes were used by the kitchen was compared with the information in the DGE Checklist [6], as well as the Checklist for the hot meal in the Optimised Mixed Diet [8].

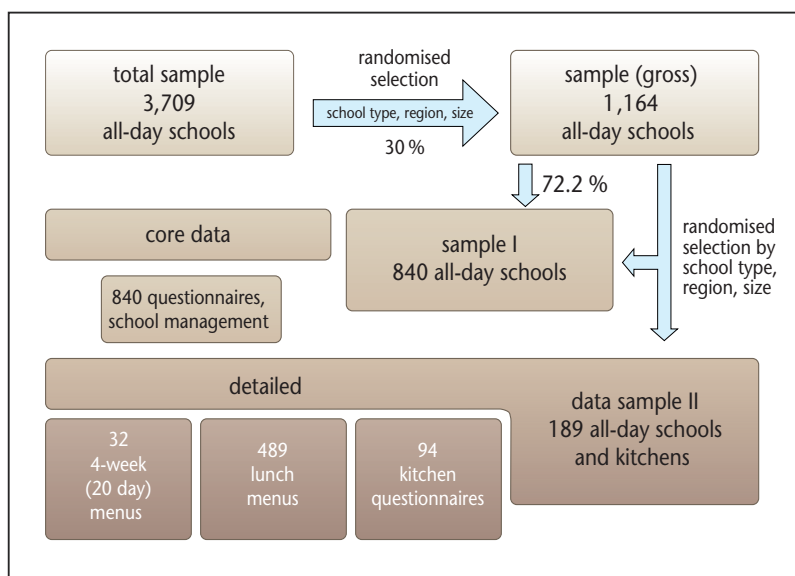


Fig. 1: Sampling and sampled group of the all-day schools in NRW participating in the survey

To evaluate the nutrient content, the recipes were recorded at the same time as the menus, over a period of two consecutive weeks. For this purpose, the kitchen management were supplied with recipe forms, together with instructions on how to complete them. Nutrient densities (g[mg]/MJ) were used to evaluate the nutrients in the recipes, as this permits evaluation independently of the portion size. Information on the portion sizes was not available.

### Evaluation

For the evaluation of the data, the kitchens were categorised as follows:

#### Internal kitchen

**Mixed kitchen:** Most of the dishes were prepared fresh on site. However, ready-to-use products were also on the menus.

**Deep-freeze system:** Deep-frozen food was regenerated on site and normally complemented with

raw fruit and vegetables and/or salads.

#### External kitchen

**Cook and hold system:** The dishes were prepared in an external kitchen, kept hot and supplied to the school.

**Cook and chill system:** The dishes were prepared in an external kitchen, and delivered cooled to the school, where they were heated up before being distributed.

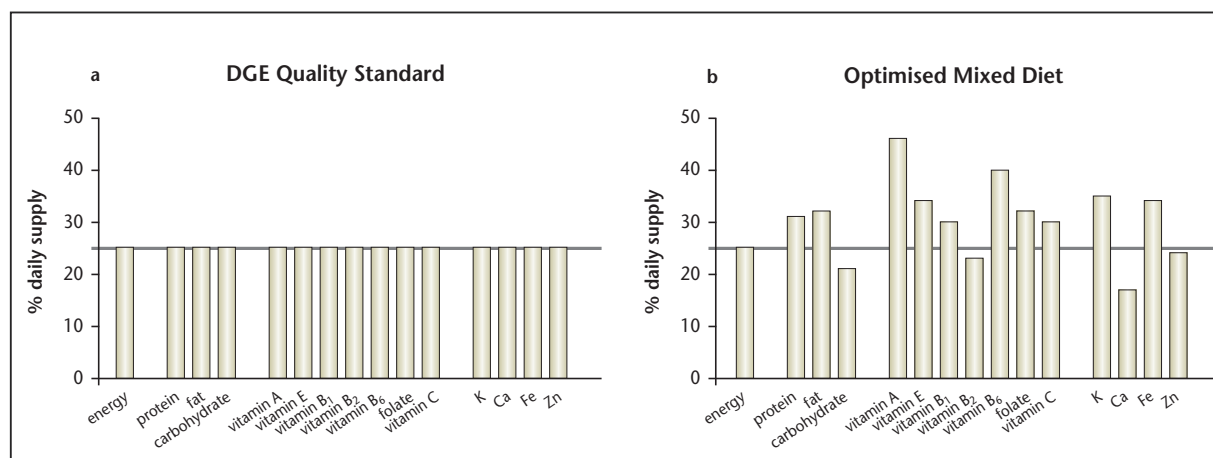


Fig. 2: Two approaches to evaluate lunches with respect to nutrient content:

- a) DGE Quality Standard: 25 % of the reference values of the DGE for the daily supply of nutrients [6]
- b) Optimised Mixed Diet: mean nutrient supply of the lunch in the 7-day menu of the Optimised Mixed Diet, expressed as % of daily nutrient supply [8]

The content of energy and nutrients in the available lunches was calculated using the food and nutrient database LEBTAB (♦Box). The evaluation was based on the derived nutrient density (mg/MJ), which permits age-independent evaluation. The calculations correct for average nutrient losses during conventional preparation. On the other hand, additional losses from differences in periods of keeping the food hot were not considered. As a criterion for nutrients, the DGE Quality Standard uses the “quarter” approach, which means that a meal should supply

**LEBTAB** is the special in-house database for foods and nutrients. It is specially planned for child nutrition and contains data on the energy content and > 30 nutrients for currently > 12,000 foods and products.

The information on the nutritional values of basic foods in LEBTAB is taken from standard tables of nutritional values, e. g. Souci-Fachmann-Kraut; the values for combined products are taken from recipe simulation using the list of ingredients and the declared levels of nutrients. The foods in LEBTAB reflect the food market for children in Germany [9].

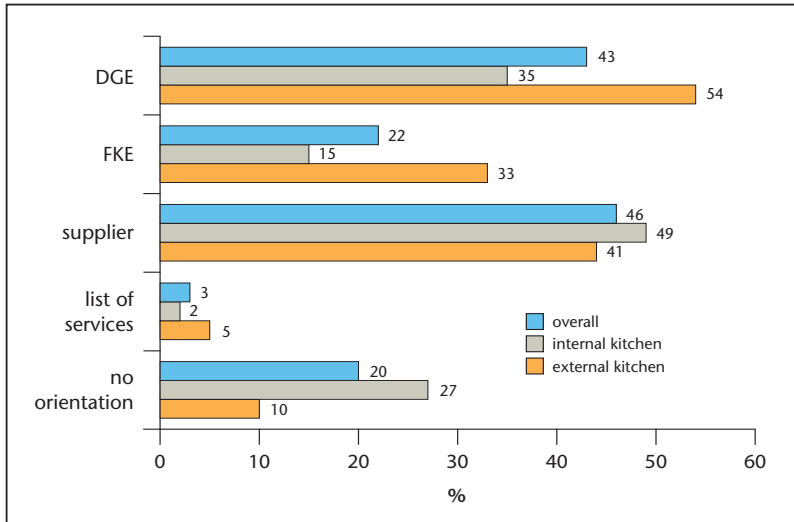


Fig. 3: Orientation aids used by kitchen managements when preparing menus and recipes (n = 94)  
Multiple answers allowed  
DGE = German Society for Nutrition; FKE = Research Institute of Child Nutrition

25 % of the D-A-CH reference values for the supply of energy and the relevant nutrients per day (♦Figure 2). As shown in ♦Figure 2, the Optimised Mixed Diet considers foods and nutrient patterns that are typical of meals [2]. The meals should be adjusted in such a way that they complement each other in a building block system to yield a daily supply in accordance with recommendations. A specific type of meal, e. g. a hot meal, must not contain the same proportion of nutrients as other meals.

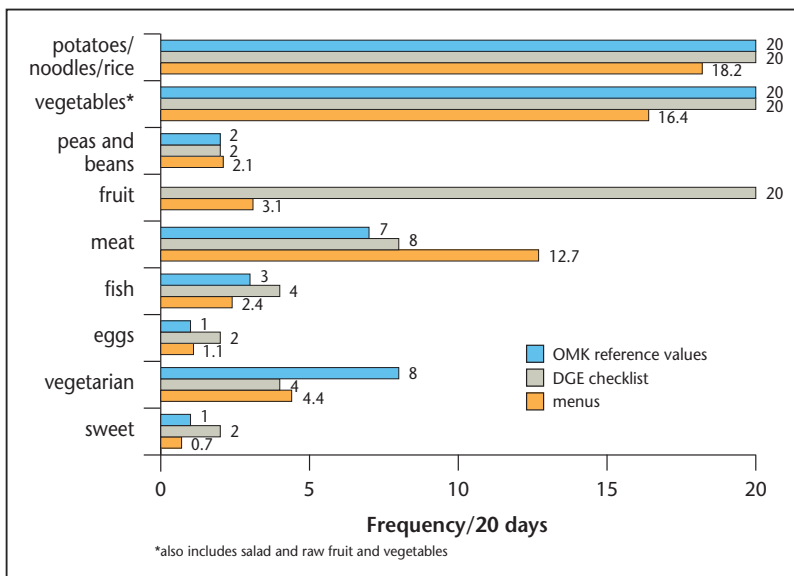


Fig. 4: Frequency of the inclusion of individual groups of dishes in lunch, in comparison to the DGE checklist and the hot meal of the Optimised Mixed Diet (OMK) (n = 32)  
DGE = German Society for Nutrition

## Results

Detailed data were supplied by 189 all-day schools and comprised a total of 94 questionnaires (55 internal kitchens, 39 external kitchens), 32 complete 4-week menus and 489 recipes.

### Dish selection and staff

Most kitchen managements base their selection of dishes and recipes on information from suppliers (46 %) and DGE Standards (43 %), followed by FKE recommendations (22 %). Similar distributions were found in the stratification between

internal and external kitchens. In all, internal kitchens more rarely employ orientation aids than do external kitchens (◆ Figure 3).

In almost all external kitchens, trained staff – cooks, nutritionists, dieticians – were responsible for preparing lunch. In most kitchens (92 %), cooks were employed. In 36 % of kitchens, nutritionists or dieticians were also employed. Only in internal kitchens were there persons responsible without professional qualifications. Here they made up the largest group (44 %).

Somewhat more than half of kitchen managers (60 %), internal and external, stated that their staff had to take training courses. 23 % of kitchen managers sent their staff to courses on child nutrition and 35 % to courses on school catering.

### Foods and menus

For most groups of dishes, there are only minor differences between the recommendations of the DGE Standard and the Optimised Mixed Diet. However, the frequency of vegetarian dishes in the Optimised Mixed Diet is roughly twice that in the DGE Standard.

Another difference is that the DGE recommends a portion of fruit with each lunch. In the Optimised Mixed Diet, fruit is mainly a component of the cold meals. The hot meal can contain fruit as an ingredient (e. g. in apple-carrot-salad) (◆ Figure 4).

In the survey, the availability of many foods or dishes in the menu was roughly in accordance with the recommendations of DGE and FKE, e. g. for potatoes/noodles/rice (available on 18 of 20 days recommended), vegetables (16/20) and peas and beans (2/2). Meat was available much more often than recommended (13/7 OMK and 13/8 DGE), but fish more rarely (2/3 and

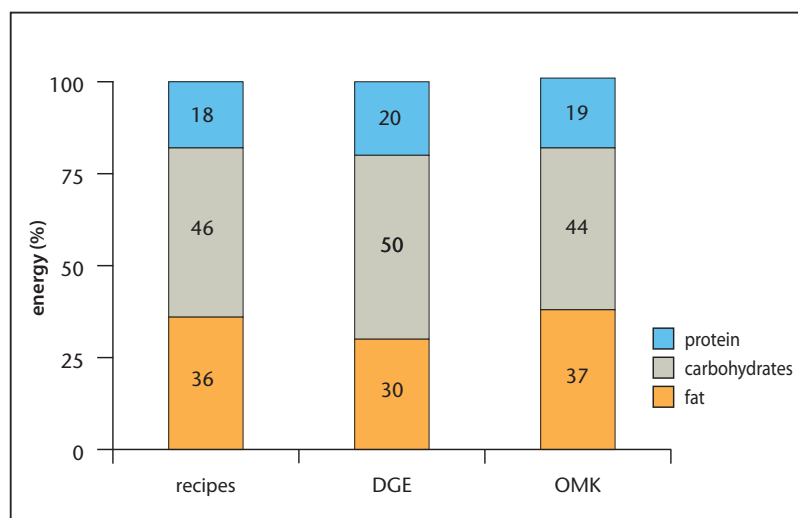


Fig. 5: Mean percentage contributions of macronutrients to the energy content of the lunch in comparison with the DGE Quality Standard and the values of the hot meal in the Optimised Mixed Diet (OMK) (n = 489)  
DGE = German Society for Nutrition

2/4, respectively). For vegetarian dishes, the frequency of availability (4/4 DGE, 4/8 OMK) was in accordance with the recommendations of the DGE and was thus only half as great as recommended by the FKE. Fruit was available much more rarely than recommended by the DGE (3/20) (◆ Figure 4).

In nearly all schools (96 %), drinks were available for lunch; they were almost always (91 %) free. In most of the schools (87 %), mineral water was available, followed by tap water (42 %) and tea (unsugared 41 %, sugared 14 %).

### Nutrient densities

The mean proportions of carbohydrates, fat and protein in the energy content in the recipes largely corresponded to the values of the hot meals in the Optimised Mixed Diet. Relative to the DGE Quality Standard, the proportion of fat was clearly higher (36 % vs. 30 %); the proportion of carbohydrates was lower and the proportion of protein slightly lower. The exact values are shown in ◆ Figure 5.

The calculated nutrient densities for calcium, iron, vitamin B<sub>1</sub> and folate in the recipes are shown in ◆ Figure 6. On average, they lay below the values of the DGE Standard, although the densities for fiber, magnesium and vitamin C were higher. The recipes were generally poorer in comparison with the nutrient densities in the Optimised Mixed Diet (which are generally higher than in the DGE Standard), than in the comparison with the DGE Standard (◆ Figure 6).

There were no differences between the internal and external kitchens in the evaluation of the menus, recipes, available dishes or nutrient densities.

### Discussion

Current recommendations for the hot lunch at schools contain different definitions of lunch, depending on the source of the recommendations.

In addition to the hot main menu, the DGE Quality Standard demands additional components, in the form of salad, fruit and a dessert [7]. The

hot meal – including salad, fruit and a dessert – should supply 25 % of the daily requirements of energy and all relevant nutrients.

The prevention concept in the FKE Optimised Mixed Diet assumes that the hot menu, including salad, makes up a complete meal and that milk and fruit are included in the normal cold meals [2, 8], so that the different daily meals complement each other to provide daily nutrient supply in accordance with the recommendations [10]. The FKE assumes that integrating milk and fruit in the hot meal would bring a risk that they might displace the typical foods in the hot meal (such as specific vegetables, wholemeal noodles, fish and meat).

The kitchens more often base themselves on the DGE Standard than on the FKE recommendations. One reason for this might be that the DGE Standard enjoys national support from the IN FORM campaign and is therefore better known [11].

The results of the present evaluation of dishes and recipes depend - in some cases on which of the current recommendations are used as comparison.

**Available foods and dishes**

For many groups of dishes, the recommended frequency of availability is approximately fulfilled – according to the menus. This applies to important plant foods such as potatoes/noodles/rice, vegetables and peas and beans – all of which are important in nutritional supply and in prevention. Within the general diet of children and adolescents in Germany, the consumption of these foods is much less than the recommendations of the Optimised Mixed Diet [12]. For meat, the recommendations are exceeded – both in school foods and in general consumption. On the other hand, the recommended values for fish are not reached [12].

A study with a similar structure has been performed in Saxony, another

German state. In most groups of dishes, this found similar frequencies of availability to the present study [13]. However, both meat and fish dishes were more often available than in NRW.

Paediatric nutritionists complain that inadequate consumption of vegetable foods and excessive consumption of meat are unfavourable from the point of view of preventive medicine. The menus only confirm this for the availability of meat. A similar favourable result was found in Saxony. Further studies are needed to see whether this result also applies to other regions in Germany.

In spite of the generally positive assessment of the composition of the menus from the kitchens in the survey, none of the 4-week menus fulfilled all of the criteria of the DGE Standard or of the Optimised Mixed Diet simultaneously. Nevertheless, it is welcome news that the kitchens already fulfil some of the recommendations.

**Drinks**

All the consumption surveys in recent years agree that children in Germany should generally drink more and select their drinks more carefully [12]. This recommendation [14, 15] has apparently been accepted in NRW. Almost all schools offer free drinks at lunch. In many cases, this includes water, the drink of first choice [8].

However, these favourable results could not be confirmed in the Saxony survey [13], where only just half of all-day schools offered a free drink at lunch. Moreover, the quality of the free drink was often not in accordance with the recommendations, due to its high energy content. More than half of the schools offered juice (57 %), some also soft drinks (12 %), but only 14 % drinking water [13].

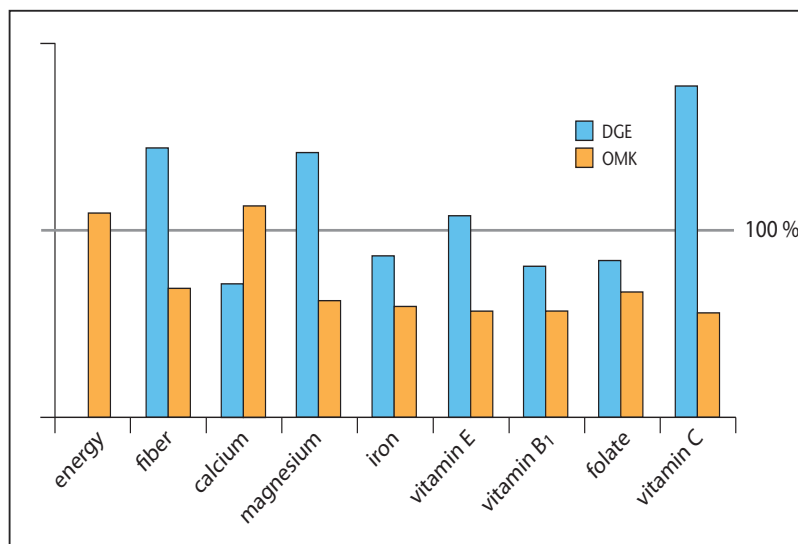


Fig. 6: Mean energy (MJ/g) and nutrient density (mg/MJ), expressed as percentage of the values of the DGE Quality Standard and of the hot meal of the Optimised Mixed Diet (OMK) (each 100 %) As the DGE Quality Standard provides no information on the portion size for lunch, it was not possible to calculate a reference value for the energy density of the DGE Standard. DGE = German Society for Nutrition

## Nutrient densities

The special feature of this survey was that, in addition to the menu assessment, the quality of the available meals was assessed, also on the basis of calculations of nutritional value. To achieve this, the (mostly semi quantitative) information on the 489 recipes had to be converted into gram weights.

Although the mean energy densities of the recipes were in accordance with the recommendations of the OMK<sup>3</sup>, the nutrient densities for vitamins and minerals were often unsatisfactory, particularly in comparison with the OMK hot meal. The reason for this may be that the hot meal of the Optimised Mixed Diet exhibits a specific food profile in comparison to conventional cold meals. Thus the hot meal should contain higher densities of specific nutrients, particularly vitamins, in order to complement the lower levels – e. g. of vitamin C – in cold meals. This is considered in the FKE recommendations – or even demanded as a consequence (♦ Figure 2). In contrast, the DGE employs the general one quarter approach. Thus the content of some of the nutrients (fiber, magnesium, vitamins E and C) reach the DGE lunch recommendations, but not those of the FKE.

Although there was general compliance with the recommendations of the DGE and FKE at the level of foods and dishes, this was not reflected at the level of nutrients. Thus, the nutritional quality of the warm lunches in schools was slightly overestimated on the basis of the menus. One reason for this may be that menus do not supply the necessary details about the foods and ingredients used, e. g. the amount of vegetables in the dish, the weight and type of fat additive or the part of the animal used to provide meat.

The actual quantities consumed were not measured in either approach – neither menus nor recipes.

These results confirm the results of a previous state-wide FKE survey on catering in child day-care centres [16], which concluded that menus alone do not permit a reliable estimation of the nutritional quality of lunch.

## Surveys in other European countries

Although menus are rarely used in other countries as an evaluation criterion for school catering, a variety of nutrient-related surveys have been performed on school lunches. In a French study, the fat content of the lunch provided was calculated as 43 energy %, which exceeds the standard to an even greater extent than in the present study [17].

In the present study, the recommendations of the DGE Standard for calcium, iron, vitamin B<sub>1</sub> and folate could not be reached. Calcium, iron and folate were also below the standard values in a study on school lunches in Great Britain [18].

However, there are also positive examples of high quality school lunches in other countries. Thus, a Finnish study found that both the macronutrients and the nutrient densities of vitamins and minerals in school lunches were in accordance with the Finnish recommendations [19]. The Finnish and German recommendations are similar. School lunch in Finland enjoys a long tradition; the study even concluded that it was healthier than lunch in the family [19].

Due to the heterogeneity of the methods in other European studies it is impossible to reach any general conclusions.

## Limitations

The survey of the detailed data to evaluate the nutrient content of the school lunch turned out to be more

difficult to implement than expected: In most cases, the schools did not directly provide food. Thus, contact with the food providers had to be indirect and through the schools.

In order to evaluate the available food on the basis of the DGE Standard, 4-week menus were requested. Frequencies of dishes could not be evaluated for kitchens which sent a 2-week or 3-week menu. Complete 4-week menus were only available for 32 kitchens – although some of these supplied several schools. Independently of the menus, recipes from all kitchens were used in the recipe evaluation. Thus, an extensive database of 489 meals was available for the nutrient-related evaluation of the food.

Because of the considerable effort required to prepare the documents, it can be assumed that highly motivated kitchens are over-represented. As a consequence, the nutritional quality of the available lunches may possibly have been overestimated. For future studies, it may be a challenge of how a compromise can be found between the necessary detailed precision of the documents and the effort demanded of the kitchens.

## Conclusions

The quality of lunches in school catering can best be evaluated on the basis of recipes. Results from menus just provide orientation, as the nutrient content cannot be accurately estimated, due to the lack of information on quantities.

In the present survey, the recommendations on the preparation of menus were fulfilled to a greater extent than those for nutrient content, which can essentially be derived from the composition of the recipes.

<sup>3</sup>No portion size (g) is given in the DGE Quality Standard, so that energy density could not be calculated. ►

Further support is needed to improve the recipes – for example, by increasing the size of the vegetable portions and reducing the size of the meat portions. This support might be in the form of training on food and meal selection. This is particularly the case when it is borne in mind that the present data might be biased in favour of kitchens interested in nutrition.

Finally, when attempting to improve recipes, it should never be forgotten that the pupils must enjoy eating the meals.

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#### Conflict of Interest

The authors declare no conflict of interest according to the guidelines of the International Committee of Medical Journal Editors.

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#### References

1. Ständige Konferenz der Kultusminister der Länder in der Bundesrepublik Deutschland, Allgemein bildende Schulen in Ganztagsform in den Ländern in der Bundesrepublik Deutschland. Statistik 2002 bis 2006. Bonn (2008)
2. Kersting M, Clausen K, Alexy U (2009) Mahlzeiten in der Kinderernährung – ganzheitlich oder mechanistisch betrachtet. *Ernährungs Umschau* 56: 410–412
3. Muckelbauer R, Kalhoff H, Müller-Nordhorn J et al. (2011) Childhood Overweight and Obesity: Introduction into Epidemiology and Prevention Strategies. *Current Nutrition & Food Science* 7: 191–199
4. Kufeld A, Clausen K, Krämer C, Kersting M (2013) Mittagsverpflegung in Ganztags-schulen aus Sicht der Schulleitungen: Landesweite Erhebung in NRW Ganztags-schule [in Druck]
5. Clausen K (2012) Mit der Schulverpflegung zu einer gesunden Kinderernährung. *Lern-chancen* 87/88: 96–99
6. Bölts M, Bausch K, Bechthold A et al. Qualitätsstandards für die Schulverpflegung. Deutsche Gesellschaft für Ernährung e.V. (DGE), Bonn (2009)
7. Bölts M, Girbardt R, Hoffmann C et al. DGE-Qualitätsstandard für die Schulverpflegung. Deutsche Gesellschaft für Ernährung e.V. (DGE), Bonn (2011)
8. Kersting M, Clausen K. Empfehlungen für das Mittagessen in Kindertagesstätten und Ganztags-schulen. Forschungsinstitut für Kinderernährung Dortmund (2012)
9. Sichert-Hellert W (2007) German food composition database for dietary evaluations in children and adolescents. *Journal of Food Composition and Analysis* 20: 63–70
10. Kersting M, Clausen K, Alexy U (2012) Kinderernährung heute – Grundlagen und lebensmittelbezogene Ernährungsrichtlinien. *Kinder- und Jugendarzt* 43: 433–437
11. Bundesministerium für Ernährung, LuV. *IN-Form.de – Das Portal für gesunde Ernährung und mehr Bewegung*. URL: [www.in-form.de](http://www.in-form.de) Zugriff 22.04.13
12. Mensink G, Hesecker H, Richter A et al. *Forschungsbericht (EsKiMo)*. Robert Koch Institut, Bonn (2007)
13. Benterbusch R, Ziesch M. Schulverpflegung in Sachsen. Erhebung und Analyse der Verpflegungssituation an allgemein bildenden Schulen. Sächsisches Staatsministerium für Soziales und Verbraucherschutz (SMS), Referat Presse- und Öffentlichkeitsarbeit (2010)
14. Manz F, Wentz A (2003) 24-h hydration status: parameters, epidemiology and recommendations. *Eur J Clin Nutr* 57(Suppl 2): S10–S18
15. Muckelbauer R, Libuda L, Clausen K et al. (2009) Promotion and provision of drinking water in schools for overweight prevention: randomized, controlled cluster trial. *Pediatrics* 123: e661–e667
16. Clausen K. Kindertagesstätten-Ernährungs-Situations-Studie (KESS). Forschungsinstitut für Kinderernährung Dortmund, Dortmund (2000)
17. Bertin M, Lafay L, Calamassi-Tran G et al. (2012) School meals in French secondary state schools: Do national recommendations lead to healthier nutrition on offer? *Br J Nutr* 107: 416–427
18. Prynne CJ, Handford C, Dunn V et al. (2006) The quality of midday meals eaten at school by adolescents; school lunches compared with packed lunches and their contribution to total energy and nutrient intakes. *Public Health Nutr* 16(6): 1118–1125
19. Hoppu U, Lethisalo J, Tapanainen H (2010) Dietary habits and nutrient intake of Finnish adolescent. *Public Health Nutr* 13 (6A): 965–972

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