

Short Communication

Nutritional quality and acceptability of a weekly vegetarian lunch in primary-school canteens in Ghent, Belgium: 'Thursday Veggie Day'

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Abstract

Objectives: To determine the nutritional adequacy and acceptability to children of vegetarian lunches served on 'Thursday Veggie Day' – a public health initiative in Ghent (Belgium) primary schools.

Design: A comparison of food leftovers from main courses on regular days and Thursdays was made using a visual plate waste method. The nutritional value of the vegetarian meat analogue and meat components of main courses served on five 'Thursday Veggie Days' and five comparable conventional main courses was evaluated using three criteria (maximum 30% of energy from fat, maximum of one-third of fat as saturated fat and minimum 1.5 g of dietary fibre per 420 kJ).

Setting: Two canteens from primary schools in Ghent, Belgium, participating in the 'Thursday Veggie Day' campaign.

Subjects: Primary-school children aged between 6 and 12 years.

Results: In total, 1242 and 472 main course plate waste observations of conventional and vegetarian menus, respectively, were evaluated. There was no significant difference in plate waste between vegetarian (16.7%) and conventional (17.3%) main courses. Overall, the five vegetarian components were found to be nutritionally adequate with a mean score of 2.2 out of 3, compared with 0.4 for the meat component. However, three of the vegetarian components provided >30% of energy from fat and, in one, the amount of saturated fat exceeded one-third of total fat.

Conclusions: Vegetarian canteen meals offered as part of 'Thursday Veggie Day' appear to be nutritionally appropriate and as acceptable as conventional main courses to children in primary schools in Ghent.

Keywords
Schools
Food services
Child
Vegetarian diet
Plate waste

In May 2009, the 'Thursday Veggie Day' campaign was launched in Ghent, a Flemish university town of nearly 250 000 people. The Ghent City Council adopted Thursdays as a vegetarian day for public canteens in an attempt to motivate employees in public settings to eat less meat. The campaign was launched in cooperation with the Belgian vegetarian organization EVA (Ethical Vegetarian Alternative; <http://www.vegetarisme.be>). For the purposes of 'Thursday Veggie Day', 'vegetarian' refers to lacto-ovo-vegetarian meals in which no meat, poultry or fish is consumed, but dairy products and eggs are allowed.

Vegetarian diets are associated with a number of health advantages including lower BMI⁽¹⁾, improved blood lipid levels and lower risk of IHD⁽²⁾, diabetes, diverticular

disease⁽³⁾ and some cancers^(2,4). Also, observations from large prospective cohorts suggest that lifestyle patterns including low meat intake are associated with increased longevity⁽⁵⁾. Few studies have looked at the health benefits of vegetarianism in childhood; however, a vegetarian diet has been associated with higher fruit and vegetable intake among children⁽⁶⁾. Vegetarian children also tend to be leaner⁽⁷⁾, and tracking of overweight⁽⁸⁾, obesity⁽⁹⁾ and obesity-related diet behaviour⁽¹⁰⁾ from childhood to adulthood has been reported, supporting the need for implementation of preventive measures during childhood.

In September 2009, the project was expanded to include all primary schools (age 6–12 years), early childhood education centres (age 3–6 years) and kindergartens

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(age 18 months–3 years) in Ghent. In October 2010, 93% of meals in Ghent city schools were vegetarian on Thursdays⁽¹¹⁾. Parents who do not want their child to eat a vegetarian meal are able to order a conventional meal (although this is rare).

In order to contribute to the goal of enhanced public health, the ‘Thursday Veggie Day’ initiative in schools would need to result in children consuming food that is more nutritious than conventional meals. This relies both on the foods offered on ‘Thursday Veggie Day’ being more nutritious than conventional meals and on these foods being sufficiently acceptable to children to be eaten.

The objectives of the present study were therefore to: (i) investigate how acceptable the vegetarian meals were to children; and (ii) assess the nutritional quality of the vegetarian meals offered on ‘Thursday Veggie Day’ in two primary schools.

Methods

In cooperation with the Department of Education in the city of Ghent, two schools were contacted to participate in the study because they provided lunch for at least 100 children each school day.

All school lunches in primary schools in Ghent, including the meals for ‘Thursday Veggie Day’, are prepared and delivered as meal components by the same caterer (Deliva, Genk). All meal components are delivered as standardized portions. The sizes of these portions are formalized in an agreement between the caterer and the city of Ghent and are based on the most recent instructions of Kind & Gezin (‘Child & Family’), a Flemish governmental advisory organization for families and young children⁽¹²⁾. The portion size for soup is set at 200 ml. All main courses are divided into the following meal components: sauces (50 g), vegetables (175 g), potatoes or other starch components (175 g), and meat or vegetarian meat analogues (such as a tofu burger; 110 g). Because no standard portion sizes are provided for desserts we used weights of common standard measures in our calculations (e.g. one apple)⁽¹³⁾.

Evaluation of acceptability

A visual plate waste study was used to determine if the children found the vegetarian school lunches acceptable⁽¹⁴⁾.

A tick sheet with a five-point rating scale from ‘none consumed’ to ‘all consumed’ was used to assess food leftovers of edible portions of each of the different meal components using a standardized procedure. At the time of data collection, conventional menus comprised more meal components than the vegetarian menus, leading to a higher number of plate waste observations for conventional meals. In each school, four plate waste observations were performed on four different observation days: two on a regular day and two on a ‘Thursday Veggie Day’. The observed vegetarian menus were the four consecutive menus from a 1-month menu cycle at the time of data collection. The conventional menus that were observed were selected at random from the same menu cycle as the vegetarian menus.

Before data collection, a pilot test was performed during which the investigator tested plate waste estimation accuracy by scoring the waste of twenty-four lunch trays and comparing these results with weighted plate waste. All estimations fell between 85% and 105% of measured weights and were therefore considered sufficiently accurate.

Data analysis was performed using the statistical software package PASW Statistics version 18.0.0 (IBM SPSS Inc., Chicago, IL, USA). Differences in visual plate waste between conventional and vegetarian menus were tested using the Mann–Whitney *U* rank test. Statistical significance was determined by $P < 0.05$.

Evaluation of nutritional quality

The meat and vegetarian (‘primary’) components of five consecutive vegetarian menus and five comparable conventional menus were evaluated during the winter season (Table 1). Product sheets provided by the caterer listed all ingredients for each component. This information was used to calculate the amount of energy, saturated fat and fibre provided per 100 g of prepared product using the Belgian food composition database Nubel⁽¹⁵⁾ and the portion sizes described above. Only the meat and vegetarian components of the main courses were calculated because accompanying components of the conventional and vegetarian main courses were identical (e.g. both meat and veggie balls in tomato sauce were accompanied by green beans and mashed potatoes).

Three criteria were used for the nutritional evaluation of the primary component of the main course: (i) a maximum

Table 1 Conventional and vegetarian primary components of the main courses selected for nutritional evaluation

Main course number	Primary component		Accompanying components
	Meat	Vegetarian	
1	Meat balls in tomato sauce	Veggie balls in tomato sauce	Green beans, mashed potatoes
2	Lasagne bolognaise	Spinach lasagne	Ratatouille
3	Turkey escalope with gravy	Soya strips with vegetarian gravy	Apple sauce, cooked potatoes
4	Sweet and sour chicken	Veggie chunks with pineapple and sweet and sour vegetables	Carrots, rice
5	Pork escalope with gravy	Vegetarian schnitzel	Leeks in cream, cooked potatoes

Table 2 Plate waste observations during eight canteen lunches in two primary schools, Ghent, Belgium

Waste	'Thursday Veggie Day'											
	No						Yes					
	Soup		Conventional main course		Dessert		Soup		Vegetarian main course		Dessert	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
0 ('all consumed')	381	92.0	842	67.8	332	80.2	301	80.9	298	63.1	279	75.0
¹ / ₄	3	0.7	159	12.8	14	3.4	16	4.3	80	16.9	6	1.6
¹ / ₂	10	2.4	107	8.6	15	3.6	13	3.5	56	11.9	11	3.0
³ / ₄	11	2.7	52	4.2	5	1.2	23	6.2	28	5.9	12	3.2
1 ('none consumed')	9	2.2	82	6.6	48	11.6	19	5.1	10	2.1	64	17.2
Total	414	100	1242	100	414	100	372	100	472	100	372	100

Table 3 Nutritional properties of five conventional and five vegetarian components of ten main courses*, Ghent, Belgium

Parameter	Meat component of meals					Vegetarian component of meals				
	1	2	3	4	5	1	2	3	4	5
Total amount of fat (g)	7.7	5.1	1.9	4.1	5.0	3.1	1.8	7.4	3.5	15.0
Total energy (kJ)	655	616	483	523	533	401	424	449	388	1045
% Energy from fat	44.1	31.2	15.3	29.9	35.1	29.0	16.1	62.3	34.2	54.2
% Fat from SFA	43.8	36.3	57.7	42.8	54.4	15.5	40.1	27.6	18.5	10.0
Total amount of fibre (g/420 kJ)	0.3	0.8	0.0	0.3	0.0	1.7	1.7	2.3	2.0	2.0
Nutrition score (out of 3)	0	0	1	1	0	3	2	2	2	2

*Parameters calculated per 100g of prepared product (except for fibre: g per 420kJ of prepared product). Bold highlighting indicates a poor nutritional quality score.

of 30% of energy from fat; (ii) a maximum of one-third of fat as saturated fat; and (iii) a minimum of 1.5 g of dietary fibre per 420 kJ⁽¹⁶⁾. For the present study, the maximum achievable score for each primary component was 3, which required that all three nutritional evaluation criteria were met.

Results

In total, 3286 observations were performed (Table 2). The small apparent difference in waste from the main course between vegetarian menus (mean rank 876) and conventional menus (mean rank 850) was not statistically significant ($U = 284\,232$; $P = 0.247$). For soup and dessert, there was a significant difference in intake between 'Thursday Veggie Day' and regular days. Both for soup ($U = 68\,522$; $P < 0.001$) and dessert ($U = 72\,445$; $P = 0.048$), there was less waste on a regular day compared with a vegetarian one.

The nutritional properties of the ten main courses are presented in Table 3. The percentage of energy from fat exceeded 30% in three out of five of both the conventional and vegetarian components. In all meat components, the percentage of fat from saturated fat was higher than one-third. This was the case for only one of the vegetarian alternatives. All the vegetarian components provided a minimum of 1.5 g of fibre per 420 kJ compared with none of the meat components.

Discussion

The present results demonstrate that vegetarian meals can be both nutritious and acceptable to a primary-school population. However, vegetarian meals are not always nutritious – three vegetarian main courses exceeded the 30% of energy from fat criterion because of their high fat absorption during preparation (e.g. schnitzel), suggesting that care must be taken when designing vegetarian menus. One vegetarian menu (spinach lasagne) also failed the criterion of having a maximum of one-third of fat from saturated fat because of its full-fat cheese content (cheese sauce).

For the nutritional evaluation, only the meat and vegetarian alternative components of main courses were assessed. Because of the low fibre content of meat, the conventional components yielded a low score for that criterion. However, this does not necessarily imply a low fibre content for the entire conventional meal. If, for instance, the accompaniments were vegetables and potatoes, then the conventional meals would provide less fibre than the meals with the vegetarian alternative, but would still be likely to provide more than 1.5 g of fibre per 420 kJ.

Overall, the findings of the study indicate that the children from the examined primary schools in Ghent find the vegetarian lunches as acceptable as the conventional menus. This suggests that vegetarian meals may be acceptable as part of the usual menu cycle on other weekdays. Certainly, there was no evidence that less of the vegetarian

main course was being consumed than the conventional main course, nor was there any evidence of compensatory additional consumption of the soup or dessert courses when a vegetarian main course was offered. In fact, when vegetarian main courses were offered, significantly less soup and dessert were consumed.

No previous studies have evaluated the concept of weekly vegetarian days; however, our findings are similar to those of Lazor *et al.*⁽¹⁷⁾, who tested the acceptance of soya products in middle-school lunches. They found that middle-school students in a large and highly diverse school district readily accepted soya alternatives over conventional menus.

Adult vegetarians, even those who continue to consume dairy products, have been shown to have a lower BMI than their meat-eating counterparts, and although the association is less clear in young children, by adolescence, vegetarians have a lower BMI⁽⁷⁾. A weekly vegetarian school lunch is unlikely, on its own, to modify risk of chronic disease; however, it may influence childhood eating behaviour over the rest of the week, and it may also influence the wider family eating behaviour if the child finds the vegetarian school lunch palatable. Via these vegetarian school lunches children can also discover new tastes, which is important in childhood populations. On the other hand, the potential of only environmental changes to improve dietary behaviour should not be overestimated. As reviewed by Van Cauwenberghe *et al.*⁽¹⁸⁾, strong evidence of positive effects on fruit and vegetable intakes was found in children only for multicomponent interventions combining education and environmental changes. Therefore, EVA has published 'Thursday Veggie Day' educative tools for teachers, a step-by-step plan for implementation in schools and promotional material (<http://www.donderdagveggiedag.be>).

Conventional school meals in Belgium, as in other Western countries, are not vegetarian. 'Thursday Veggie Day' is the first project to change this tradition. To be successful, not only is it important that the menus being served are nutritious, but also that the children are willing to eat them. To our knowledge, the present study is the first to investigate these issues. Another strength of the study is that the vegetarian menus were not masked. The children knew that they were eating vegetarian meals and yet there was no difference in food intake compared with menus containing meat, poultry or fish products. The menus that were analysed for their nutritional quality were supplied to all primary schools in Ghent, so the nutritional quality data are applicable to all schools. However, only two primary schools were involved in the plate waste study. The selection of the schools was based on the number of canteen lunches served, so that a large variety of individuals with different demographics would be included. Also, the schools were different in terms of geography with one being more rural in a formerly independent municipality, whereas the other is located close to the city centre. Further investigation of the acceptability of

these menus to children from other schools, ages and socio-economic classes is therefore necessary. In addition, menus from the summer cycle should also be evaluated.

Conclusion

'Thursday Veggie Day' demonstrates that it is possible to provide nutritious vegetarian meals that are as acceptable to primary-school children as conventional meals. Nevertheless, further investigation of food composition and appreciation of these meals by children from more schools, ages and socio-economic classes is necessary, as is investigation of whether consuming a weekly vegetarian meal at school influences eating behaviour outside school and health outcomes.

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References

1. Spencer EA, Appleby PN, Davey GK *et al.* (2003) Diet and body mass index in 38 000 EPIC-Oxford meat-eaters, fish-eaters, vegetarians and vegans. *Int J Obes Relat Metab Disord* **27**, 728–734.

2. Craig WJ & Mangels AR (2009) Position of the American Dietetic Association: vegetarian diets. *J Am Diet Assoc* **109**, 1266–1282.
3. Crowe FL, Appleby PN, Allen NE *et al.* (2011) Diet and risk of diverticular disease in Oxford cohort of European Prospective Investigation into Cancer and Nutrition (EPIC): prospective study of British vegetarians and non-vegetarians. *BMJ* **343**, d4131.
4. Gonzalez CA, Jakszyn P, Pera G *et al.* (2006) Meat intake and risk of stomach and esophageal adenocarcinoma within the European Prospective Investigation Into Cancer and Nutrition (EPIC). *J Natl Cancer Inst* **98**, 345–354.
5. Singh PN, Sabate J & Fraser GE (2003) Does low meat consumption increase life expectancy in humans? *Am J Clin Nutr* **78**, 3 Suppl., 526S–532S.
6. Smith AD, Emmett PM, Newby PK *et al.* (2011) A comparison of dietary patterns derived by cluster and principal components analysis in a UK cohort of children. *Eur J Clin Nutr* **65**, 1102–1109.
7. Sabate J & Wien M (2010) Vegetarian diets and childhood obesity prevention. *Am J Clin Nutr* **91**, issue 5, 1525S–1529S.
8. Singh AS, Mulder C, Twisk JW *et al.* (2008) Tracking of childhood overweight into adulthood: a systematic review of the literature. *Obes Rev* **9**, 474–488.
9. Starc G & Strel J (2011) Tracking excess weight and obesity from childhood to young adulthood: a 12-year prospective cohort study in Slovenia. *Public Health Nutr* **14**, 49–55.
10. Craigie AM, Lake AA, Kelly SA *et al.* (2011) Tracking of obesity-related behaviours from childhood to adulthood: a systematic review. *Maturitas* **70**, 266–284.
11. Stad Gent (2010) Eén jaar Donderdag Veggiedag in de Gentse scholen. <http://www.gent.be/eCache/THE/4/159.bGlzdHZpZXC9cGVyc2JlcmJjaHRlbnl9hcmNoaWVvmJnJlYz0xNjEyNjMmeWVhcj0yMDEwJm1vbnRoPTU.html> (accessed May 2011).
12. Child and Family (2010) English pages. <http://www.kindengezin.be/algemeen/english-pages.jsp> (accessed January 2010).
13. Health Council Belgium (1997) *Household Weights and Measures. A Manual for a Standardised Quantification of Food Items in Belgium*. Brussels: Superior Health Council.
14. Connors PL & Rozell SB (2004) Using a visual plate waste study to monitor menu performance. *J Am Diet Assoc* **104**, 94–96.
15. NUBEL (2004) *Belgian Food Composition Table*, 4th ed. Brussels: Ministry of Public Health.
16. Flemish Institute for Health Promotion and Disease Prevention (2010) Vlaams Instituut voor Gezondheidspromotie en Ziektepreventie. <http://www.vigez.be> (accessed January 2010).
17. Lazor K, Chapman N & Levine E (2010) Soy goes to school: acceptance of healthful, vegetarian options in Maryland middle school lunches. *J Sch Health* **80**, 200–206.
18. Van Cauwenberghe E, Maes L, Spittaels H *et al.* (2010) Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and 'grey' literature. *Br J Nutr* **103**, 781–797.