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Nutritional adequacy of meals from an independent catering facility versus chain-restaurants for young adults

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Background/Objectives: Eating out-of-home has been associated with the increasing prevalence of obesity. While some chain-restaurants provide nutritional information for their products, smaller independent catering facilities may not provide such information. The aim of this study was to assess the nutritional adequacy of meals provided to young adults at an independent catering facility and compare them with meals provided by chain-restaurants.

Subjects/Methods: Meals were analysed in 2014 in the UK in relation of nutrient provision to targets for macro- and micro-nutrients. One-way ANOVA was performed to compare menus between the restaurants included in the analyses.

Results: 2,056 meal-combinations were analysed, 210 from the student accommodation and 1,846 from five largest national chain-restaurants. Mean (SD) nutritional content was; student accommodation: 1193(269)kcal, fat 52.0(22)g, saturated fat 24.5(14.5)g, protein 42.4(28.5)g, carbohydrate 117.0(30)g, chain-restaurants: 922(160)kcal, fat 40.0(9.7)g, saturated fat 14.5(5.8)g, protein 31.2(6.5)g, carbohydrate 104.2(16.6)g. Meals from the student accommodation presented significantly more calories than the meals in all five chain-restaurants (p=0.0015).

Conclusions: Meal-provision in the student accommodation was in excess of energy-requirements and higher than the meals offered in chain-restaurants. Regulating or setting nutritional standards for all places that provide food is essential as current food provision may favour unwanted weight-gain and diet-related diseases.
Background/Objectives

Food eaten out of home has been suggested as a contributing factor to the obesity epidemic (Jeffery et al. 2006), and portion sizes have increased steadily over the past 20 years (Benson, 2009). Chain-restaurants have been particularly criticised both for the nutritional quality of the food they provide and the way they advertise their products, especially to children. Chain-restaurants, however, account only for approximately 25% of the total sales of food eaten outside home in the UK, while small independent catering facilities account for the majority (75%) (DEFRA, 2011). More importantly, catering facilities in institutions such as universities, hospitals, and schools that usually provide more than one meal/day to service users are subject to minimal nutritional control posing a greater risk for the development of obesity and diet-related diseases. Only since April 2015, compulsory food standards were introduced in hospitals in England but still food quality varies greatly between hospitals and areas. Attention has been drawn to the nutritional content of chain-restaurant food, but no studies exist on nutritional provision in settings such as student accommodation, which provide food on a repeated daily basis. Catered accommodation takes the pressure off young adults from preparing and cooking their meals, while cost is also included in the accommodation price but this convenience comes with uncertain health implications. Food eaten outside home is often higher in calories and of poorer nutritionally quality (Prentice & Jebb, 2003) and people rarely can estimate the calorie content or the nutritional value of the food on offer (Chandon & Wansink, 2007). This is a particular public health concern because young adulthood; once a period of optimal health is now a period where rapid weight gain occurs (Nikolaou et al. 2015, Crombie et al. 2009) and poor eating habits can be established (Demory-Luce et al. 2004). Students also can often be food insecure and relying solely on the food provided by the university due to the cost of studying and the cost of food (Hughes, 2012). Poor diet is not only a major contributing factor for chronic diseases, but can also affect the academic performance of students.
(Florence et al. 2008). An awareness of the energy contents of meals may be valuable for interventions to prevent unwanted weight gain, diet-related diseases, and nudge caterers to review and modify the nutritional content of the food on offer.

The present study analysed the nutritional content of the menu offered to university students living in catered accommodation and 1) compare it to current dietary recommendations and 2) with popular meals provided by the five largest chain restaurants in the UK.

Subjects and Methods

This study was exempt from IRB approval.

Location of catering facilities included in the study

1) The catered accommodation, located in an urban university, provides accommodation for approximately 120 students, mostly 1st year. Breakfast and evening meals are included in the accommodation price. The hall is located a 40-minute walk or 10-15 minute bus journey away the main University’s campus. The closest retail grocery outlets were a 20 minute-walk away. Very limited cooking facilities are available on-site, so most students rely on meals provided in the hall.

2) The top five chain restaurants holding the largest share in the UK market were included in this study. Those were, according to the turnover in millions 1) McDonalds (£1,872m) 2) JD Wetherspoons (£1,038m) Greggs (£708m), 4) KFC (£614m) and 5) Costa coffee (£610m) (Statistica, 2013) Outlets of these five chain-restaurants were within the same postcode as the catered accommodation (Figure 1).

Menus

1) The menu comprised a five-week cycle, developed by the catering staff employed by the University, without any nutritional guidance. The main focus of caterers was on low food-
costs and wastage. All meals were prepared and cooked on site by in-house catering staff using standardised recipes. For meat and fish products, standard portions were purchased (110g per portion of meat and 170g per portion for fish) and other cooked food (eg rice, soup, potatoes) was served using standard utensils allowing the estimation of the calorie content of meals. Recipes, including ingredient lists, for all dishes served in the hall, were made available to the researcher for analysis by catering staff. Stock rooms were checked and all commercially prepared ingredients used for cooking or preparations of the meals were recorded.

2) All of the chain-restaurants had nutritional information of the products on sale available on-line and at the point of sale. Nutritional information available on-line included number of calories, amount of fat, saturated fat and salt. Three of these restaurants (McDonalds, Greggs, KFC) have made voluntarily pledges to reduce the calories consumed and started posting calorie information at the point of sale from 1 Jan 2013, under the English Health Department Responsibility Deal (DoH, 2014). The two remaining (JD Wetherspoons and Costa coffee) are partners in the Responsibility Deal since 2011.

Meal combinations

1) Evening meals comprised three courses. From a choice of three different main course dishes, students could only choose one, as well as a starter, dessert and a piece of fruit, or two pieces of fruit, or a piece of fruit and a pot of yogurt (125ml). The side dishes (rice, chips, and vegetables) were served using the same utensils to ensure portion-size consistency. In view of the numerous possible meal combinations, for this study it was assumed that each service user would choose the three-course meal. The meal-options for analysis were created by two formulae: meal-option 1 = starter + main course (from a choice
of 3) + side dishes + dessert; meal-option 2 = starter + main course (from a choice of 3) + side dishes + item of fruit.

2) Meal-combinations were created from the items listed using main course food items and a dessert, and a side dish. A side dish was used in order to be directly comparable with the meals provided at the hall.

Data Analyses/Statistics

All possible meal-combinations provided in the hall were compiled using an Access database (Microsoft Office Access, 2013). Nutritional composition of macronutrients and micronutrients of meal choices of the evening meal were determined using nutrient analysis software (WinDiets, Robert Gordon University, 2010). When commercial ingredients used in the preparation of meals were not listed, then that item was added to the database using manufacturer’s nutrient values.

All possible meal-combinations provided in the five chain-restaurants were compiled in an Excel database using the nutritional information provided on the websites of the companies.

After data had been checked for normalcy, mean values and distributions of macronutrients and micronutrients were calculated and related to the UK Dietary Reference Values (DRVs) for macronutrients and Reference Nutrient Intake (RNIs) for micronutrients (DoH, 1991).

One-way analysis of variance (ANOVA) was used to test for differences between the catered accommodation menu and the chain-restaurants’ menus for calories, macronutrients, and sodium, using SPSS 21 (SPSS, Chicago). Post hoc comparisons between pairs were also conducted. In order to keep the probability of type 1 error below 0.05, our main comparison pair was between the means of the catered accommodation menu and the means of all chain restaurants’ menus.

Results
Accommodation Meals

A total of 210 combinations for evening meal choices were created from the five–week menu cycle, 105 with a dessert (meal-option 1) and 105 replacing the dessert with two pieces of fruit (meal-option 2). Mean values for macronutrients and micronutrient contents are shown on Table 1. The mean (SD) nutritional contents of meal-option 1 were 1193(269)kcal, fat 52.0(22)g, saturated fat 24.5(14.5)g, protein 42.4(28.5)g, carbohydrate 117.0(30)g, vitamin C 74(78)mg, iron 14(9)g, calcium 217(211)mg. Proportional energy contents were carbohydrate 39%, protein 14%, fat 39%, sat fat 18%. Mean nutritional contents of meal-option 2 were; 896(215)kcal, fat 29.0(17)g, saturated fat 9.9(8)g, protein 35.0(22)g, carbohydrate 125.0(24)g, vitamin C 90(75)mg, iron 6.3(2)g, calcium 206(189)mg. Proportional energy contents for meal-option 2 were carbohydrate 56%, protein 16%, fat 29%, sat fat 10%.

Nutritional adequacy of meal-options.

In general, almost all meal-options (86%-100%) exceeded the 30% recommendations for energy and for macronutrients. While most meal-options were adequate for most micronutrients, there were marked short-falls for some, especially iodine and calcium.

Meal-option 1

Young men: Expressed as % of Guideline Daily Amount (GDA) the mean values of macronutrients for this option were 48% of energy, with 55% of fat, 80% of saturated fat, 45% of protein and 98% of carbohydrate. Almost all meals exceeded the 30% recommendation for energy (n=105, 100%), for fat (n=103, 98%), for saturated fat (n=88, 84%), for protein (n=95, 90%), and for carbohydrate (n=105, 100%). The 30% recommendation was only met by 33% (n=35) of the meals for iodine,
13% (n=15) for calcium. A significant proportion of meals exceeded the 100% recommendation for fat (n=10, 9%) and for saturated fat (n=20, 18%).

Young women: Expressed as %GDA, this option provided means of 60% of energy, 74% of fat, 120% of saturated fat, 56% of protein, and 130% of carbohydrate of the GDA. All meals exceeded the 30% recommendation for energy (n=105, 100%), for fat (n=105, 100%), for saturated fat (n=105, 100%), and for carbohydrate (n=105, 100%). The 30% recommendation was only met by 10% (n=9) of the meals for iodine, and 5% (n=5) for calcium. A significant proportion of meals exceeded the 100% recommendation for fat (n=15, 14%) and for saturated fat (n=75, 71%).

Meal-option 2

Young men: Expressed as %GDA, this option provided means 36% of energy, 30% of fat, 33% of saturated fat, 37% of protein, and 104% carbohydrate. A high proportion of meals exceeded the 30% recommendation for energy (n=90, 86%), for fat (n=88, 84%), for saturated fat (n=40, 38%), for protein (n=90, 86%), and for carbohydrate (n=105, 100%). The 30% recommendation was only met by 18% (n=20) of meals for iodine, 20% (n=18) for calcium. Only a small proportion of meals exceeded the 100% recommendation for saturated fat (n=5, 5%).

Young women: Expressed as %GDA, this option provided means of 45% of energy, 41% of fat, 50% of saturated fat, 47% of protein, and 139% of carbohydrate. Most meals exceeded the 30% recommendation for energy (n=100, 95%), for fat (n=96, 91%), for saturated fat (n=55, 52%), for protein (n=103, 98%), and for carbohydrate (n=105, 100%). The 30% recommendation was only met by 18% (n=20) of meals for iodine, 20% (n=18) for calcium. Only a small proportion of meals exceeded the 100% recommendation for saturated fat (n=15, 14%).
Chain-restaurants Menus

In total, 1,846 meal-combinations were created for the five chain-restaurants; 1) McDonalds=799, 2) JD Wetherspoons=496, 3) Greggs=180, 4) KFC=143, 5) Costa coffee=228. Mean values, standard deviation, and the range for calories, fat, saturated fat, protein, carbohydrate and sodium are shown in Table 2 (JD Wetherspoons provides only the calorie content of meals and Greggs provides does not provide information on saturated fat).

Comparison between independent catering facility and chain-restaurants menus

Catered accommodation and chain restaurants menus were compared for calorie and macronutrient content. Meal-option 1 was significantly higher in calories than all the meals offered in all of the five-chain restaurants (p=0.015), fat (p= 0.02) and saturated fat (p<0.001). Meal option-2 was not different than the menus in the five chain restaurants.

Discussion

The current study aimed to assess the suitability of the nutritional composition of meals offered to young adults provided in a small independent catering facility within a UK University, compared with guidelines and with menus offered from chain-restaurants. The hall provided meals in excess of the 30% of requirements and so did the chain restaurants. Guidance from the former UK Food Standards Agency (FSA), now Department of Health, recommends that an evening meal should provide 30% of Guideline Daily Amount (GDA) of energy requirements (FSA, 2011), i.e. 600 kcal for women and 750 kcal for men. The meals offered to young adults in this hall greatly exceeded
this 30% energy recommendation, two-fold for energy and up to three-fold for certain macronutrients. For many micronutrients, most meal-options were ample, and indeed exceeded 100% of daily requirements, but low contents were seen for some essential nutrients like iodine and calcium and vitamin D. Young adults often follow chaotic lifestyles and may commonly skip meals, or need extra energy to sustain sporting activities, in which case providing extra energy at evening meals might be desirable. However, since few young adults now engage in regular sporting activity and many are prone to rapid unwanted weight gain (Nikolaou et al. 2015), routinely providing energy well above average requirements is unwise, at least without some warning. A youth choosing the highest calorie three-course option would exceed these recommended amounts for the evening meal by 1,630 kcal for women and 1,480 kcal for men. Making such high energy choices every day is improbable, but would lead to weight gains of about 6 kg per month, assuming that each kg weight gain requires a surplus intake of 7,000 kcal (Garrow, 1974). Assuming that young adults had average requirements and over time chose a range of meal-options which provided the average energy content (1193 kcal, about 400 kcal above requirement), this excess from evening meals alone would still lead to weight gain would still be about 1.6 kg/month.

When the meals provided in the accommodation were compared with the menus offered in chain restaurants, they proved to be 8%-35% higher in calorie content. Since, large chain-restaurants accounts for only a small proportion of the food eaten outside home, targeting only those, as in New York (Bernell, 2010), or under the English DoH ‘Responsibility Deal’ (DoH, 2014) to provide calorie information will have only a minor impact on the obesity crisis. A catered student accommodation is an interesting and important example of a smaller independent catering outlets, as it provides meals to young adults on a daily basis, which may have cumulative effects on health. It is likely that the patterns of nutrient contents will be similar in other commercial outlets. Consumers need better provision, in terms of menu and recipe design, at least to allow nutritionally
balanced meals to be chosen by those who want them, and to warn them when energy or nutrient contents are undesirable for long-term health.

Without nutritional information, it would be difficult for consumers to guess how the energy or nutrient contents relate to their needs or to recommended values for a meal. Even trained health professionals, such as dietitians, struggle to estimate nutritional contents of foods accurately (Backstard et al. 1997) or to identify when a menu is meeting the requirements for specific macronutrients. Commercial ready meals are currently nutritionally chaotic (Celnik et al. 2012). It has been suggested that to improve health meals should be designed to provide 30% of macronutrients and micronutrients, as a ‘default position’. This can easily be achieved by modifying recipe-ingredients, as shown by modifying traditional pizza recipes to match nutritional guidelines (Combet et al. 2014).

There are several limitations in this study with the most important being the inability to measure the nutrient content of meals on offer with direct calorimetry. However, all meals are cooked on site with fresh ingredients and the principal researcher worked closely with the catering staff in order to get details of each recipe used. Also, quantities of ingredients used for preparing each recipe were confirmed by examining the ingredients orders and the stock room. Students residing in the hall were also observed during meal times hence the meal-options created and analysed for this study were realistic (Nikolaou et al. 2015).

Nutritional analyses of meal-options offered to young adults in an independent catering facility revealed excessive energy, carbohydrate, fat and saturated fat, and variable micronutrient contents compared to current recommendations. While desirable in certain cases, excess energy content is hard to identify and may promote unwanted weight gain and consumption of nutritionally
unbalanced diets. The nutritional profile of those menus was worse when compared with menus offered from chain-restaurants.
References


Food Standards Agency. FSA nutrient and food based guidelines for UK institutions. 


Table 1: Nutritional compositions of evening meal-options from the UK for macronutrients and micronutrients, analysed in 2014

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Meal-option 1</th>
<th>Meal-option 2</th>
<th>DRV/RNI Females</th>
<th>DRV/RNI Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)</td>
<td>1193 858-1774</td>
<td>896 594-1431</td>
<td>2000</td>
<td>2500</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>52 17.6-105.5</td>
<td>29 5.6-78.5</td>
<td>70</td>
<td>95</td>
</tr>
<tr>
<td>Saturated Fat (g)</td>
<td>24.5 4.7-60.3</td>
<td>9.9 0.8-34.9</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>42.4 15.8-129.3</td>
<td>35 15-119</td>
<td>75</td>
<td>94</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>117 86-188</td>
<td>125 83-166</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>Vitamin A (ug)</td>
<td>1092 28-3390</td>
<td>1167 202-3255</td>
<td>600</td>
<td>700</td>
</tr>
<tr>
<td>Thiamin (mg)</td>
<td>24 0.12-433</td>
<td>24 0.2-433</td>
<td>0.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>0.81 0.09-3.58</td>
<td>0.87 0.2-3.7</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>Niacin (mg)</td>
<td>25 2.4-105</td>
<td>25 2-105</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>Vitamin B6 (mg)</td>
<td>2.9 0.39-15</td>
<td>3.3 0.9-15.5</td>
<td>1.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Vitamin B12 (ug)</td>
<td>1.5 0-5</td>
<td>1.2 0-5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Folate (ug)</td>
<td>105 30-330</td>
<td>124 54-359</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>74 4.5-237</td>
<td>90 23.2-256</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Vitamin D (ug)</td>
<td>4.5 0-13</td>
<td>5.3 1-13.5</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>217 37-819</td>
<td>206 47-849</td>
<td>800</td>
<td>1000</td>
</tr>
<tr>
<td>Magnesium (mg)</td>
<td>102 38-228</td>
<td>180 31-114</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>1295 141-2972</td>
<td>1281 49-2987</td>
<td>6000</td>
<td>6000</td>
</tr>
<tr>
<td>Potassium (mg)</td>
<td>1514 622-3419</td>
<td>604 234-1373</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Iron (g)</td>
<td>14 2.5-59</td>
<td>6.3 3.8-12.2</td>
<td>14.8</td>
<td>8.7</td>
</tr>
<tr>
<td>Zn (mg)</td>
<td>19 0.6-149</td>
<td>16 2-150</td>
<td>7</td>
<td>9.5</td>
</tr>
<tr>
<td>Mn (mg)</td>
<td>3.4 0.3-28.5</td>
<td>3.1 0.7-29</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Se (ug)</td>
<td>26 1.1-163.4</td>
<td>28 3-165</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>I (ug)</td>
<td>210 8-2678</td>
<td>145 0-2678</td>
<td>150</td>
<td>150</td>
</tr>
</tbody>
</table>

DRV= Dietary Reference Value, RNI=Reference Nutrient Intake
Table 2: Mean nutritional content of meals provided to the five biggest chain-restaurants in the UK for energy and key macronutrients, analysed in 2014

<table>
<thead>
<tr>
<th></th>
<th>Calories (kcal)</th>
<th>Fat (g)</th>
<th>Saturated Fat (g)</th>
<th>Carbohydrate (g)</th>
<th>Protein (g)</th>
<th>Sodium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Range</td>
<td>Mean (SD)</td>
<td>Range</td>
<td>Mean (SD)</td>
<td>Range</td>
</tr>
<tr>
<td>McDonalds</td>
<td>820 (289)</td>
<td>292-1240</td>
<td>26.4 (16.9)</td>
<td>8.0-67.0</td>
<td>29.9 (14.5)</td>
<td>110-590</td>
</tr>
<tr>
<td>JD Wetherspoons</td>
<td>1,101 (267)</td>
<td>688-1,456</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Greggs</td>
<td>885 (181)</td>
<td>630-1,170</td>
<td>45.2 (12.1)</td>
<td>27.0-59.0</td>
<td>107.3 (13.6)</td>
<td>22.0-31.5</td>
</tr>
<tr>
<td>KFC</td>
<td>773 (61)</td>
<td>430-1,100</td>
<td>39.8 (9.9)</td>
<td>19.5-54</td>
<td>80.9 (15.9)</td>
<td>24.5 (6.3)</td>
</tr>
<tr>
<td>Costa Coffee</td>
<td>855 (149)</td>
<td>648-1,132</td>
<td>35 (9.1)</td>
<td>18.5-49.0</td>
<td>105.7 (22.6)</td>
<td>26.6 (5.4)</td>
</tr>
<tr>
<td>Meal 1</td>
<td>1,193 (268)</td>
<td>858-1,774</td>
<td>52 (22)</td>
<td>17.6-105.5</td>
<td>117 (30)</td>
<td>42.4 (28.5)</td>
</tr>
<tr>
<td>Meal 2</td>
<td>896 (215)</td>
<td>594-1,431</td>
<td>29 (17)</td>
<td>5.6-78.5</td>
<td>125 (24)</td>
<td>35 (22)</td>
</tr>
</tbody>
</table>

*JD Wetherspoons only provided information on the calorie content of food items on the menu

*Greggs did not provide the saturated fat content of food items on sal3
Figure 1: Location of the catering outlets compared in this study in Scotland, UK

All outlets are within the same postcode, G20.