EDITORIAL

Harmonising health debates around food

Abandon unhelpful ideologies and seek the common ground

Christmas is coming, and it's not just the geese that are getting fat. Celebrations over the holidays often revolve around gathering and feasting. In the northern hemisphere, baby it's cold outside and the long, silent nights may contribute to seasonal variations in physical activity.[1 2] Together, increased opportunities for eating and decreased propensity for physical activity likely contribute to the 0.4-0.9 kg weight gain found in adults home for the holidays.[3]

Mason and colleagues (doi:10.1136/bmj.k4867) target prevention of weight gain over the bleak midwinter holidays.[4] Their intervention combined regular self weighing with written information describing seasonally adapted "10 Top Tips" to help habit formation,[5] and a list of the physical activity caloric equivalents of common holiday foods they checked twice. Their randomised trial found an adjusted mean difference of −0.5 kg in weight gain at 4-8 weeks in the intervention group compared with controls.

It is intuitively attractive to focus on preventing weight gain during, rather than achieving weight loss after, the holidays. But focusing on individual weight change perhaps deals with the symptom, rather than the cause. Environmental factors are increasingly recognised to be potent determinants of eating, as well as other, behaviours.[6]

> The Prevention Strategy was about people being naughty or nice, stressing personal responsibility

Deep-pan, crisp, and even

Portion size is one environmental factor known to affect consumption.[7] Robinson and colleagues (doi:10.1136/bmj.k4982) and Roberts and colleagues (doi:10.1136/bmj.k4864) both conducted surveys of the energy content of main meal dishes served by full service and fast food restaurants.[8 9] In the United Kingdom, Robinson and colleagues report a mean energy content of 751 kcal in main meal dishes served by fast food chains, and 1033 kcal in dishes served by full service restaurant chains. Comparable figures reported by Roberts and colleagues from Brazil, China, Finland, Ghana, India, the UK, and the US combined were 1317 kcal and 809 kcal.

England's national public health agency recently recommended that midday and evening meals contain no more than 600 kcal each.[10] Robinson and colleagues found that 89% of full service dishes and 83% of fast food dishes were over this limit. Figures from Roberts and colleagues were 94% and 72%, respectively. Those deep-pan, crisp, and even pizzas aren't helping.

The tension between targeting individuals and environments represented in these three studies is laid bare in recent UK government policy. The second chapter of the Childhood Obesity Plan,[11] published in June 2018, includes proposals for food environment interventions that require people to invest few resources to benefit (low agency interventions). These gifts include further restrictions on unhealthy food advertising, bans on supermarket price and location based promotions of unhealthy food, and greater support for using planning regulations to improve local food environments.

By contrast, November's Prevention Strategy,[12] was more about whether people are naughty or nice, emphasising personal responsibility for "lifestyle decisions" and requiring them to invest substantial personal resources to prevent weight gain (high agency interventions).

Although some evidence exists on the relative benefits of high versus low agency interventions,[13-15] the tension between these two often comes down to ideology. In a context where action on environmental determinants of health behaviours often requires government regulation, and hence political will, ideology concerning the palatability of government regulation in general can become a deciding factor.

Both Robinson and colleagues and Roberts and colleagues mention the possibility of providing instore information on the calorie content of restaurant dishes. Menu labelling is an example of an intervention that might appeal to both sides of the ideological debate. It can be characterised as providing customers with information they can use, if they wish, to make healthier choices. In this framing, it is a high agency intervention requiring individuals to read, understand, interpret, and apply the information provided. Current evidence suggests a small impact of menu labelling on purchasing and consumption.[16]

But menu labelling could also be seen as a low agency intervention, requiring people to use few personal resources to benefit. Cross sectionally, US chain restaurants that voluntarily label their menus, serve dishes with fewer calories than those that do not, suggesting that menu labelling could encourage portion size reduction by the chains themselves.[17]

So far, the evidence supporting high or low agency impacts of menu labelling is weak. But if ideology is more important than evidence of effectiveness when deciding which public health interventions to implement, the menu labelling story highlights the potential value of advocates being creative in how they "sell" evidence informed interventions to different constituencies.

Peace on earth

It might also be important to think further about how different types of interventions work together. Rather than either/or, some combinations of interventions may have synergistic effects. For example, the (high agency) intervention to prevent weight gain trialled by Mason and colleagues might have a greater effect in those living in environments where restaurants serve lower calorie meals (a low agency intervention). Researchers could do more to investigate such potential synergies to understand under what circumstances they do and do not occur.

Rather than allowing themselves to fall into ideological camps, if the public health community really wants to effect change, they need to find ways to transcend ideological debates, appeal to all sides, and acknowledge the potential value of many different approaches.

Cite this as: *BMJ* 2018;363:k5028

Find the full version with references at http://dx.doi.org/10.1136/bmj.k5028

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BMJ OPINION

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Everyday living as inspiration for weight control research

Daily living is a rich source of inspiration for scientists specialising in weight management, and our interest in restaurants began with a simple problem—what to eat for lunch when trying to lose weight? Our research building at Tufts University has no cafeteria. There is yummy Chinese food just a block away, and one of us (SBR) was both partial to Chinese food and finding it hard to lose pregnancy weight. We measured the calories of some favourite meals using bomb calorimetry, which is the gold standard method for measuring food energy, and the horror of finding that a single takeout has more calories than needed for a whole day during weight loss led to a series of studies that continues today.

Our first protocols found that our Chinese takeouts were not unusual, and that most large chain restaurants in Boston serve meals containing far more calories than needed at a single meal.[1-3] We were also shocked to learn that low calorie menu items often contain more calories than stated[2]—thus thwarting the best intentions of people, like us, ordering the sensible choices to manage their weight. After that, it was a natural step to check whether restaurants across America overfeed their customers (yes, they do).[4] Our most recent study[5] examined whether American restaurants are unusually bad on a global scale. Our observation of meals in the different countries we visited for research meetings led us to suspect that restaurants were a problem everywhere, but the widespread lack of nutrition information meant that we had nothing to base our suspicion on except intuition.

> Low calorie menu items often contain more calories than stated

Setting up an international restaurant study was a huge learning curve. We found that what is considered a "meal" is radically different across countries. The main meal of the day occurs at different times in different locations, and worksite canteens are a major aspect of daily life in some countries, but not others. There were also practical matters to tackle, such as how to ensure quality control across sites (answer: video instructions and multiple phone calls) and how to import food into the US (short answer: with enormous difficulty). With the exception of fast food in China, the results consistently told the same story—that all kinds of restaurants in all tested countries serve much more food than most humans need. Based on these results we believe that restaurants in general have got off too lightly in the search for valid intervention targets to reduce global obesity, and that it is time to redress the balance.

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Measured energy content of frequently purchased restaurant meals

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Objective To measure the energy content of frequently ordered meals from full service and fast food restaurants in five countries and compare values with US data.

Design Cross sectional survey.

Setting 223 meals from 111 randomly selected full service and fast food restaurants serving popular cuisines in Brazil, China, Finland, Ghana, and India were the primary sampling unit; 10 meals from five worksite canteens were also studied in Finland. The observational unit was frequently ordered meals in selected restaurants.

Main outcome measure Meal energy content, measured by bomb calorimetry.

Results Compared with the US, weighted mean energy of restaurant meals was lower only in China (719 (95% confidence interval 646 to 799) kcal versus 1088 (1002 to 1181) kcal; P<0.001). In analysis of variance models, fast food contained 33% less energy than full service meals (P<0.001). In Finland, worksite canteens provided 25% less energy than full service and fast food restaurants (mean 880 (SD 156) versus 1166 (298); P=0.009). Country, restaurant type, number of meal components, and meal weight predicted meal energy in a factorial analysis of variance (R^2=0.62, P<0.001). Ninety four per cent of full service meals and 72% of fast food meals contained at least 600 kcal. Modelling indicated that, except in China, consuming current servings of a full service and a fast food meal daily would supply between 70% and 120% of the daily energy requirements for a sedentary woman, without additional meals, drinks, snacks, appetisers, or desserts.

Conclusion Very high dietary energy content of both full service and fast food restaurant meals is a widespread phenomenon that is probably supporting global obesity and provides a valid intervention target.

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Cite this as: *BMJ* 2017;363:k4864

Find full article with references at: http://dx.doi.org/10.1136/bmj.k4864

WHAT IS ALREADY KNOWN ON THIS TOPIC

- The prevalence of obesity continues to increase in most countries
- Fast food has been proposed as an important contributor to global obesity on the basis of nutritional information reported by large chain restaurants
- Little is known about other types of restaurant meals owing to a lack of data on measured meal energy content

WHAT THIS STUDY ADDS

- Of five countries (Brazil, China, Finland, Ghana, and India), only restaurants in China served meals containing significantly less energy than restaurants in the US
- In contrast to widespread assumptions, fast food meals contained 33% less dietary energy on average than meals from full service restaurants
- The high energy content of restaurant meals may be an important contributor to the global obesity epidemic and a potentially impactful target for public health interventions

Introduction

The prevalence of obesity is at epidemic levels in most countries.[1 2] The prevalence of obesity continues to rise, showing that effective interventions have yet to be identified.

A major limitation of previous research on restaurants and obesity is that almost all studies examining the composition of meals have used nutritional data provided by large chain restaurants.[12 18 19] This approach excludes restaurants that do not provide nutritional information, which is the case for most full service and local fast food restaurants.

This study measured the energy contents of the most frequently ordered meals in full service and fast food restaurants in five countries (Brazil, China, Finland, Ghana, and India). We compared data with the measured energy contents of the most frequently ordered US restaurant meals to test the hypothesis that large restaurant portions are not a phenomenon unique to the US.

This study measured the energy content of a representative sample of 223 popular meals purchased from 111 randomly selected full service and fast food restaurants in a major city in each of six countries (Ribeirao Preto in Brazil, Beijing in China, Kuopio in Finland, Accra in Ghana, Bangalore in India, and Boston in the US).

Methods

We extracted the US data from two previous studies that also randomly selected restaurants and measured the most frequently ordered meals,[20 23] with three additional randomly selected fast food restaurants for comparability across sites.

For the purpose of this study, we defined a "meal" as the main course with side dishes that were included at no extra charge. We did not include drinks, appetisers, and desserts that required extra payment. We used this approach because the focus of the study was to compare the most commonly ordered meals across countries, recognising that we likely underestimated total energy content of typical meal orders owing to the non-inclusion of drinks and perhaps additional courses.

Selection of restaurants and meals

The restaurant selection process involved local research teams using internet searches and site visits to identify all full service and fast food establishments in a predefined geographic area of approximately 25 km^2 in the locality of the research centre in each country. As restaurants in Ghana are used for both full service meals and fast food, selected eating establishments at this site were not distinguished by restaurant type.

Full service and fast food restaurants were randomly selected for inclusion in the study by use of a random number generator in SAS 9.4.

Meal collection and energy determination

Local research staff posed as restaurant patrons and ordered the target meals by following a standard procedure. Total meals and meal components were then weighed to within 0.1 g on a calibrated electronic balance before preparation for analysis by bomb calorimetry.

Mean energy content, meal weight, and energy density for full service and fast food restaurant meals in six countries
Values are means (SD) unless stated otherwise

Country and restaurant type	No of meals	Energy content (kcal)	P value*	Weight (g)	P value*	Energy density (kcal/g)	P value*
CHINA:							
Full service	15	1045 (289)	<0.001	484 (169)	<0.001	2.32 (0.73)	0.005
Fast food	40	561 (236)		338 (30)		1.67 (0.71)	
BRAZIL:							
Full service	10	1301 (453)	0.03	780 (327)	0.002	1.82 (0.56)	0.003
Fast food	10	862 (285)		337 (122)		2.63 (0.52)	
USA:							
Full service	71	1362 (469)	<0.001	741 (266)	<0.001	1.96 (0.65)	0.27
Fast food	19	969 (283)		475 (134)		2.12 (0.66)	
FINLAND:							
Full service	10	1135 (346)	0.48	500 (102)	0.08	2.25 (0.52)	0.45
Fast food	8	1205 (242)		593 (117)		2.06 (0.45)	
Worksite	10	880 (156)	–	668 (93)	–	1.34 (0.27)	–
INDIA:							
Full service	10	1414 (488)	0.22	855 (416)	0.59	1.86 (0.63)	0.54
Fast food	10	1129 (389)		731 (311)		1.68 (0.53)	
GHANA:							
Full service/fast food	20	1412 (392)	–	815 (256)	–	1.82 (0.41)	–
ALL COUNTRIES:							
Full service	136	1317 (442)	–	717 (285)	–	1.98 (0.63)	–
Fast food	87	809 (363)	–	436 (188)	–	1.92 (0.71)	–

*P values calculated by independent samples *t* tests to compare full service with fast food meals within country.

Results

The total energy content of fast food meals was significantly lower than that of meals from full service restaurants in Brazil (34%; P=0.03), China (46%; P<0.001), and the US (29%; P<0.001) (table 1).

Weights of fast food portions in these countries were also significantly lower than for meals from full service restaurants (P=0.002, P<0.001, and P<0.001 for Brazil, China, and the US, respectively), whereas the energy density (kcal/g) of fast food meals was higher in Brazil (P=0.003) and lower in China (P=0.005) than the energy density of meals from full service restaurants. Only China had fast food meals that had less energy than US fast food (by 44%; P<0.001), and similarly only China had full service restaurant meals that had less energy than full service meals in the US (by 21%; P=0.009).

The unadjusted mean energy content for all countries was 1317 (SD 442) kcal for full service meals and 809 (363) kcal for fast food meals (table 1). In addition, when we used country weighed values, 94% of meals from full service restaurants and 72% of fast food meals across all sites contained at least 600 metabolisable kcal, and 3% of meals from full service restaurants (including meals from Ghana, India, and the US) contained at least 2000 kcal/serving.

The figure shows the mean differences in meal energy content, meal weights, and meal energy density across countries, using weighted mean values that incorporate the sample sizes for different meal types.

In the primary study analysis, a comparison of meal energy content from Brazil, China, Ghana, Finland, and India with US data, only China had meal energy contents that were significantly less than the US (719 (95% confidence interval 646 to 799) kcal versus 1088 (1002 to 1181 kcal).

Discussion

The increasing global per capita energy intake, especially from refined carbohydrates and fats,[11] as well as the positive association between rising rates of obesity and increasing energy intake across different countries,[34] highlights the central role that overeating has played in the global obesity epidemic. However, identifying specific aspects of eating behaviour, the food environment, or both that are quantitatively important and can lead to effective public health interventions has been challenging.

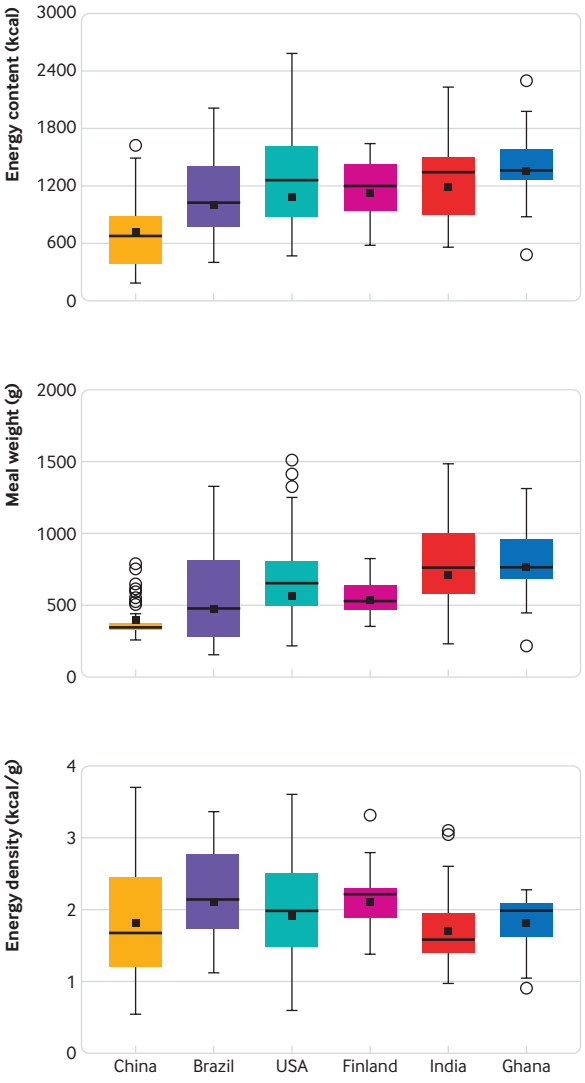
To our knowledge, this is the first study of measured restaurant meal energy contents across countries, allowing us to examine meals from full service and local fast food restaurants that do not routinely provide nutritional information. Notably, given the previous focus on high meal energy content as a particular problem in the US, only China had an average meal energy content that was significantly lower than the US value. In addition, substantial variability existed in meal energy content within countries, and in some cases more than a twofold difference existed in the energy content of the same meals purchased in different restaurants, which would make providing consumers with guidance on how to eat less in restaurants extremely challenging in the absence of uniform menu labelling.

Nevertheless, we observed some patterns—for example, single orders of popular meals ordered in fast food restaurants contained 33% less energy than meals in full service restaurants, in direct contrast to previous suggestions that the problem of excessive meal energy contents is specific to fast food.

Conclusions and future research

The consistency of results obtained here across very diverse countries suggests that the very high energy content of meals prepared away from home generally, rather than of fast food specifically, may be an important contributor to the global obesity epidemic and a potentially impactful target for public health interventions.

Single orders of popular meals ordered in fast food restaurants contained 33% less energy than meals in full service restaurants



Energy content, weight, and energy density of restaurant meals in six countries. Boxplots show unweighted fifths (five number summary) and weighted means (indicated by filled square)

ORIGINAL RESEARCH Randomised controlled trial

Preventing weight gain over the festivities

Frances Mason, Amanda Farley, Miranda Pallan, Alice Sitch, Christina Easter, Amanda J Daley

Objective To test the effectiveness of a brief behavioural intervention to prevent weight gain over the Christmas holiday period.

Design Two group, double blinded randomised controlled trial.

Setting Recruitment from workplaces, social media platforms, and schools pre-Christmas 2016 and 2017 in Birmingham.

Participants 272 adults aged 18 years or more with a body mass index of 20 or more: 136 were randomised to a brief behavioural intervention and 136 to a leaflet on healthy living (comparator). Baseline assessments were conducted in November and December with follow-up assessments in January and February (4-8 weeks after baseline).

Interventions The intervention aimed to increase restraint of eating and drinking through regular self weighing and recording of weight and reflection on weight trajectory; providing information on good weight management strategies over the Christmas period; and pictorial information on the physical activity calorie equivalent (PACE) of regularly consumed festive foods and drinks. The goal was to gain no more than 0.5 kg of baseline weight. The comparator group received a leaflet on healthy living.

Main outcome measures The primary outcome was weight at follow-up. The primary analysis compared weight at follow-up between the intervention and comparator arms, adjusting for baseline weight and the stratification variable of attendance at a commercial weight loss programme. Secondary outcomes (recorded at follow-up) were: weight gain of 0.5 kg or less, self reported frequency of self weighing (at least twice weekly versus less than twice weekly), percentage body fat, and cognitive restraint of eating, emotional eating, and uncontrolled eating.

Results Mean weight change was −0.13 kg (95% confidence interval −0.4 to 0.15) in the intervention group and 0.37 kg (0.12 to 0.62) in the comparator group. The adjusted mean difference in weight (intervention–comparator) was −0.49 kg (95% confidence interval −0.85 to −0.13, P=0.008). The odds ratio for gaining no more than 0.5 kg was non-significant (1.22, 95% confidence interval 0.74 to 2.00, P=0.44).

Conclusion A brief behavioural intervention involving regular self weighing, weight management advice, and information about the amount of physical activity required to expend the calories in festive foods and drinks prevented weight gain over the Christmas holiday period.

Trial registration ISRCTN Registry ISRCTN15071781.

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Cite this as: *BMJ* 2018;363:k4867

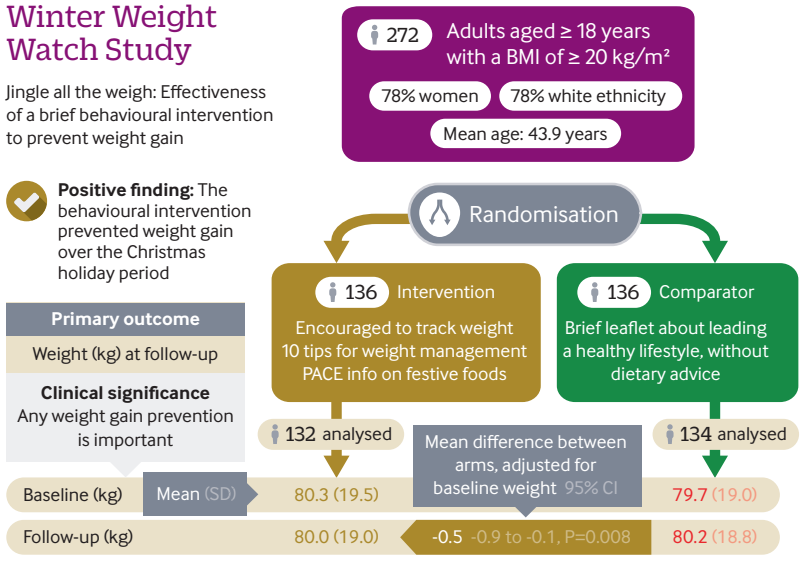
Find the full version with references at http://dx.doi.org/10.1136/bmj.k4867

WHAT IS ALREADY KNOWN ON THIS TOPIC

- Each year people gain a small amount of weight
- Holidays such as Christmas are responsible for most of this annual weight gain
- Studies have shown that weight gained during holiday periods is not lost

WHAT THIS STUDY ADDS

- A brief intervention to increase restraint of eating and drinking through self weighing, information on physical activity calorie equivalents of popular foods and drinks, and tips for weight management prevented weight gain over the Christmas period
- Cognitive restraint of eating was increased in the intervention group



Introduction

Evidence evaluating the effectiveness of interventions for weight gain prevention is limited.[1 2] Reports from weight tracking studies show that each year on average the population gains a small amount of weight (0.4-1 kg),[3] but that weight is gained more rapidly during particular periods, such as the Christmas holiday season.[4 5] Over 10 years these gains would lead to a 5-10 kg increase in body weight.

We conducted the Winter Weight Watch Study to evaluate the effectiveness of a brief intervention over the Christmas holiday period to prevent weight gain.

To expend the calories from one mince pie requires 21 minutes of running

Methods

A two group double blinded randomised controlled trial was undertaken to test the effectiveness of a brief intervention to prevent weight gain over Christmas comprising encouragement to regularly self weigh, tips for weight management, and information on the physical activity calorie equivalent (PACE) of festive foods and drinks.

Participants and data collection

Participants were recruited from workplaces, social media, and local schools (parents). Participants were eligible for inclusion if they were aged 18 years or more and had a body mass index of 20 or more.

Baseline data collection took place pre-Christmas 2016 and 2017 with follow-up post-Christmas 2017 and 2018, respectively.

Interventions

The intervention, informed by self regulation theory[6] and the habit formation model,[7] aimed to promote restraint of energy consumption, and comprised encouragement to self monitor and record weight at least twice weekly, self reflection on weight trajectory, 10 top tips (10TT) for weight management, and pictorial information about the PACE of festive foods and drinks.

The goal of the intervention was for participants to gain no more than 0.5 kg of baseline weight. Regular weighing and recording of weight to check progress against a target (self monitoring) has been shown to be an effective behavioural intervention for weight management.[8-11]

Intervention participants were provided with 10TT[12 13] amended for seasonal appropriateness. We also provided participants with PACE information—for example, to expend the calories from one mince pie requires 21 minutes of running.[14 15] The comparator group received a brief information leaflet about leading a healthy lifestyle.[16]

Outcomes

We compared the primary outcome of weight at follow-up between study groups, adjusted for baseline weight and attendance at a commercial weight loss programme. We compared secondary outcomes between the groups at follow-up: weight gain of 0.5 kg or less, self reported frequency of self weighing, percentage body fat, cognitive restraint of eating, emotional eating, and uncontrolled eating.

We hypothesised that the intervention would prevent weight gain by increasing cognitive restraint of eating and drinking.[17]

For full details of the methods and statistical analysis, see bmj.com.

Results

A total of 272 adults were randomised. Six participants (2%) failed to provide follow-up weight data (figure). Participants were predominantly women (n=213 (78%)) of white ethnicity (n=201 (78%); table 1). Mean time in the study was 45.3 (SD 5.7) days. Participants' baseline characteristics were balanced across study groups (table 1, see bmj.com).

Primary outcome

The unadjusted mean weight change (follow-up–baseline) was −0.13 kg (95% confidence interval −0.4 to 0.15) in the intervention group and 0.37 kg (0.12 to 0.62) in the comparator group. The adjusted mean difference in follow-up weight between groups (intervention–comparator) after adjustment for baseline weight and attendance at a commercial weight loss programme was −0.49 kg (95% confidence interval −0.85 to −0.13, P=0.008). The result was similar in the further adjusted model (−0.48 kg, −0.84 to −0.12, P=0.01) (table 2, see bmj.com).

Secondary outcomes

The estimated reduction in percentage body fat in the intervention compared with comparator group was non-significant (−0.03%, 95% confidence interval −0.53% to 0.47%, P=0.91 in the further adjusted model). The odds of gaining no more than 0.5 kg weight was higher in the intervention group than comparator group, but this was non-significant (1.23, 95% confidence interval 0.75 to 2.04, P=0.41). The intervention group had increased odds of self weighing at least twice weekly (64.96, 95% confidence interval 24.48 to 172.39, P<0.001).

Cognitive restraint scores increased significantly for the intervention group compared with comparator group at follow-up (mean difference in further adjusted model: 0.62, 95% confidence interval 0.06 to 1.19, P=0.03). Differences in emotional eating and uncontrolled eating scores were non-significant (table 2, see bmj.com).

Discussion

Few trials have tested interventions for weight gain prevention in adults. We found that a brief intervention (4-8 weeks) that prompted participants to restrain their eating and drinking during the Christmas holiday period prevented weight gain. Consistent with our hypothesis, the intervention group reported higher cognitive restraint of eating scores at follow-up than the comparator group.

The intervention was novel and designed to be easily implemented at a population level. Loss to follow-up was low (2%). People were recruited from a range of ethnic groups and with varied body mass index and deprivation status. Participants were blinded to the aim of the study, and the researchers collecting outcome data were also blinded to group allocation.

A longer period of follow-up would have been useful to determine if the weight gain that was prevented persisted over time. The amount of weight gain prevented might be considered relatively small (about 0.5 kg), but at a population level it would be important.[18]

A brief intervention underpinned by self regulation theory,[6] consisting of encouragement to regularly self weigh, tips for weight management, and PACE information prevented weight gain in adults over Christmas. Cognitive restraint of eating was increased in the intervention group. These results should be considered by health policy makers to prevent weight gain in the population during high risk periods such as the Christmas holidays.

ORIGINAL RESEARCH Observational study of energy content of main meals

(Over)eating out at major UK restaurant chains

Eric Robinson, Andrew Jones, Victoria Whitelock, Bethan R Mead, Ashleigh Haynes

Objectives To examine the energy content of main meals served in major UK restaurant chains and compare the energy content of meals in fast food and "full service" restaurant chains.

Design Observational study.

Setting Menu and nutritional information provided by major UK restaurant chains.

Main outcome measures Mean energy content of meals, proportion of meals meeting public health recommendations for energy consumption (≤600 kcal), and proportion of meals with excessive energy content (≥1000 kcal).

Results Main meals from 27 restaurant chains (21 full service; 6 fast food) were sampled. The mean energy content of all eligible restaurant meals (13 396 in total) was 977 (95% confidence interval 973 to 983) kcal. The percentage of all meals that met public health recommendations for energy content was low (9%; n=1226) and smaller than the percentage of meals with an excessive energy content (47%; 6251). Compared with fast food restaurants, full service restaurants offered significantly more excessively calorific main meals, fewer main meals meeting public health recommendations, and on average 268 (103 to 433) kcal more in main meals.

Conclusions The energy content of a large number of main meals in major UK restaurant chains is excessive, and only a minority meet public health recommendations. Although the poor nutritional quality of fast food meals has been well documented, the energy content of full service restaurant meals in the UK tends to be higher and is a cause for concern.

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Cite this as: *BMJ* 2018;363:k4982

Find the full version with references at http://dx.doi.org/10.1136/bmj.k4982

WHAT IS ALREADY KNOWN ON THIS TOPIC

- Eating out of the home is common in the UK
- The poor nutritional quality of "fast food" has been well documented
- The energy content of traditional "full service" restaurants has received less attention

WHAT THIS STUDY ADDS

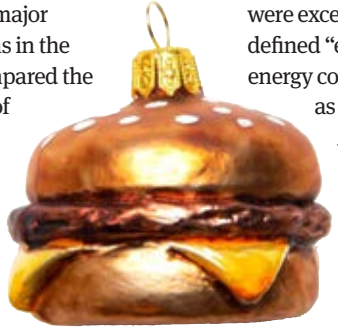
- The average energy content of main meals served in both fast food and full service restaurants in the UK is higher than public health recommendations
- The proportion of main meals in UK restaurant chains that meet public health recommendations for energy content is smaller than the proportion that have an excessive energy content
- Compared with fast food restaurants, full service restaurant meals in the UK contain significantly more kilocalories on average

Introduction

In the UK, meals are regularly consumed out of the home; data collected from 2008-12 showed that a quarter of UK adults ate out once a week or more often.[5] However, a more recent report from the UK Food Standards Agency in 2016 indicates that eating out of the home may be becoming more common, with 39% of UK adults reporting eating out at least once a week.[6] Several studies suggest that people who eat out of the home more often are at increased risk of weight gain and obesity.[7]

Recent public health recommendations made by Public Health England suggest that adults should aim to consume 600 kcal or less for their main lunch and dinner meals to avoid excess daily energy intake and maintain a healthy body weight.[15] This is in part motivated by Public Health England's estimate that the average adult in the UK is consuming an excess of 195 kcal a day.[15] To date, the number of kilocalories in main meals served by major UK restaurant chains has not been examined, so whether consumers can adhere to public health recommendations for meal energy consumption when eating in these establishments is unclear. Moreover, legislation has been passed that will result in kilocalorie labelling of all food products sold by major chain restaurants becoming mandatory in the US.[21] Similar legislation is being considered by the UK government.

We examined the energy content of main meals (lunch and dinner) sold by major restaurant chains in the UK. We also compared the energy content of main meals in fast food and traditional full service restaurant chains.



Methods

Restaurant sampling and characterisation

As our aim was to examine major UK restaurant chains, we included all chains with 50 or more outlets in the UK.

Data sources and identification of main meal menu options

During April-July 2018 we accessed the UK websites of all eligible restaurant chains and identified current menus and nutritional information. We aimed to examine the energy content of all "main meal" menu options. We defined a main meal as being a menu option that would normally be the primary dish in a lunch or dinner meal and typically be found in the "main course" part of a restaurant's menu.

Extraction of meal energy content

A researcher accessed online nutritional information for each restaurant and extracted the number of kilocalories for each eligible meal. A second researcher checked the extraction for accuracy.

Planned analyses

To estimate the mean energy content of meal options, we used multilevel modelling, with individual meal options nested within restaurants and restaurants categorised as being fast food or full service. We also examined the proportion of meals that met UK public health guidelines for recommended energy consumption (≤600 kcal) for a main meal,[15] as well as the proportion of all meals that were excessively high in energy. We defined "excessive" as meals with an energy content of 1000 kcal or more, as this single meal constitutes 50% and 40% of the recommended total number of daily kilocalories for women (2000 kcal) and men (2500 kcal), respectively.

Energy content of meals from eligible restaurant chains included in analyses				
Restaurant chain	**No of meals**	**Mean (SD) kcal/meal**	**No (%) meals ≤600 kcal**	**No (%) meals ≥1000 kcal**
Fast food restaurants (n=6)*:		751 (128)	-	-
Burger King	50	711 (214)	17 (34)	4 (8)
KFC	106	987 (273)	5 (5)	53 (50)
Leon	14	597 (86)	8 (57)	0 (0)
McDonalds	127	726 (242)	35 (28)	14 (11)
Subway†	2436	763 (252)	760 (31)	490 (20)
Wimpy	64	721 (221)	17 (27)	6 (9)
Full service restaurants (n=21)*:		1033 (175)	-	-
All Bar One	33	871 (263)	5 (15)	11 (33)
Ask	44	790 (184)	7 (16)	7 (16)
Bills	16	966 (310)	2 (13)	7 (44)
Chef and Brewer	95	1177 (390)	6 (6)	63 (66)
Ember Inns	75	1085 (334)	5 (7)	45 (60)
Flaming Grill	52	1232 (496)	6 (12)	36 (69)
Harvester	62	1166 (370)	5 (8)	43 (69)
Hungry Horse	333	1358 (472)	19 (6)	261 (78)
JD Wetherspoons	114	1119 (428)	16 (14)	72 (63)
Nando's†	9293	1019 (231)	282 (3)	4911 (53)
Old English Inns	67	1125 (392)	6 (9)	45 (67)
Pizza Express	34	854 (234)	6 (18)	7 (21)
Pizza Hut	33	975 (238)	4 (12)	19 (58)
Sizzling Pubs	87	1269 (575)	7 (8)	56 (64)
Slug and Lettuce	37	963 (243)	2 (5)	15 (41)
Stone House	23	1275 (323)	0 (0)	18 (78)
Table Table	57	869 (273)	9 (16)	17 (30)
Toby Carvery	20	942 (166)	1 (5)	8 (40)
Vintage Inns	40	1064 (414)	6 (15)	21 (53)
Wagamama	40	836 (259)	7 (18)	12 (30)
Zizzi	44	735 (337)	23 (52)	10 (23)

*For descriptive purposes, values in this row represent mean (SD) of individual restaurant values for mean kcal per meal.
†The relatively large number of eligible meals identified in some restaurant chains was due to a large number of meal variants (eg, chicken with choice of any two sides, sandwich meal with choice of bread type, size, and sides) in these restaurants.

Policy levers that result in the food industry reducing the number of kilocalories being sold to consumers are needed

Results

Restaurants The final number of eligible restaurant chains was 27 (6 fast food, 21 full service; table).

Energy content of meals

Of the 13 507 eligible meals identified, we were able to extract information on energy content for 13 396 (99%) meals. Across all meals, the average energy content was 977 (95% confidence interval 973 to 983; SE 2) kcal. Results indicate that meals from full service restaurants had 268 kcal more energy than did meals from fast food restaurants, on average.

Of the 13 396 possible meals identified, 1226 (9%) met UK public health recommendations of 600 kcal or less. The total number of meals that contained 1000 kcal or more was 6251 (47%). Full service restaurants were approximately five times more likely to offer meals of 1000 kcal or more than fast food restaurants

Discussion

Strengths and weakness of study

We were able to sample a large number of restaurant chains and meals. However, our analyses were limited to restaurants that provided nutritional information and sold products consistent with our inclusion criteria (27/52 identified chains).

Reliance on self reported information on energy content from chains is another weakness, but objectively calculated energy content (using laboratory methods) was not feasible. However, previous research suggests that commercially provided nutritional information tends to be accurate but may underestimate the energy content of some products.[30 31]

In addition, we examined the number of kilocalories served, and this does not permit us to make conclusions about consumption. Some customers will order a main meal as well as a drink, starter, and/or dessert, so we assume that on average the number of kilocalories consumed in both full service and fast food restaurants will be higher still.

Meaning of study

A sizeable proportion of main meals were excessive in energy content, and we note that little or no information tended to be provided on menus that would allow consumers to identify menu options that were high in kilocalories versus those that were lower. Consumers tend to underestimate the number of kilocalories in large meals,[36 37] and this in combination with our findings makes recent calls to mandate energy labelling of restaurant food in the UK appropriate. The best available evidence suggests that it is likely to have only a modest effect on consumers' behaviour,[38] so other public health measures to tackle energy intake out of the home will be needed. Policy levers that result in the food industry reducing the number of kilocalories being sold to consumers are needed. If legislation is passed, the results of our study can be used to assess whether the introduction of energy labelling results in restaurants reformulating the nutritional content of meals, as seems to have been the case in the US.[45]

In this vein, characterising the nutritional quality of other parts of the UK food environment will be important, as this study did not examine nutritional quality of other sectors (for example, coffee shops or online ordering).