



British Heart  
Foundation



# PORTION DISTORTION

HOW MUCH ARE WE  
REALLY EATING?

**FIGHT  
FOR EVERY  
HEARTBEAT**

bhf.org.uk

# FOREWORD

**Nearly two-thirds of UK adults are overweight or obese. So are a third of our children. It's a problem that isn't going away and it has severe consequences for the health of millions across the UK. So we need new approaches to tackling the causes of obesity.**

Choosing a healthy, balanced diet is a key way of protecting and promoting our heart health. Everyone needs to take responsibility for the foods they eat but the British Heart Foundation recognises that people need support and the right information to make informed choices about what, and how much, they do eat.

This report is about the "how much" and about the difficulties people can face when confronted by ever growing portion sizes in supermarket meals – and the lack of guidance from government.

Fantastic progress has been made recently on getting agreement on front-of-pack food labelling, but portion sizes remain varied and confusing. This is unsurprising, perhaps, given that official government information on portion sizes hasn't been substantially updated in 20 years.

Our research shows there is no meaningful understanding of what is an appropriate portion size. The size of some portions has doubled, while others are so varied between different suppliers and manufacturers that trying to make comparisons is nigh on impossible.

The new front-of-pack labelling system presents calorie and Reference Intake information – formerly known as Guideline Daily Amounts – based on portion size. To help shoppers make the best use of nutritional labelling, the stated portion sizes need to be appropriate and consistent.

We know that portion sizes influence how much we eat. Put simply, larger portions encourage us to eat more – and shape our view of what is a normal amount to eat.

Obesity, high blood pressure and high cholesterol are all major risk factors for heart disease. The role played by poor diets in the ill-health of the nation make it essential that governments and administrations around the UK prioritise this issue and establish new guidance.

We are calling on supermarkets and manufacturers to take their share of responsibility for how much we eat. We are calling for action from all to provide clearer information to consumers to help them take control of their health.

**Simon Gillespie**  
Chief Executive



# OUR RESEARCH

We commissioned research to assess how portion sizes in the UK's main retailers compare to the information provided in the 1993 government publication, *Food Portion Sizes*. A portion size is the amount of a food that is recommended to be eaten in one sitting.

We compared like-for-like on-pack portion sizes for own-brand food in Sainsbury's, Tesco, Asda and Morrisons, as well as the market leading brand, against the portion size information from 1993.



# THE SWEET STUFF

Across most of the 12 products compared there was a clear trend towards an increase in the on-pack portion size compared with the portion stated in *Food Portion Sizes*. While some products were relatively consistent with the old information, such as the cherry bakewell cake and sponge cake, other types of cake and biscuit showed marked increases.

For plain sweetmeal biscuits, for example, the stated on-pack portion was higher in each of the brands – around 17 per cent on average compared to a 1993 portion. Assuming the biscuits have the same energy (calorie) content gram for gram, this would mean that eating one biscuit per day now, compared to in 1993, adds another 3300kcal to your diet per year.

Our research highlights both the growth and inconsistency in portion size. In 1993 an average portion of American muffins was 85g – today, these portion sizes vary from 72g to 130g. As a result, the different brands had ranges in calories between 280-475kcal.



# BIG BREAKFASTS

In our research, we found variety in size across products – with bread a prime example. For medium sliced bread, both white and wholemeal, two of the brands continued to provide a portion of 36g, but two including the market leader were marginally higher at 40g. For breakfast cereal, there was consistency across all brands of cornflakes which also all matched the 1993 average, with a 30g uniform portion size. For muesli, there was similarly little departure from the government information – two of the five brands had marginally smaller portion sizes, with the rest holding to the portion in *Food Portion Sizes of 50g*.

However, for other bread products we found some inconsistency and growth in size. Plain bagels were on average 24 per cent larger than the 70g suggested in the 1993 information. Putting this into real terms, if you eat one bagel a day, opting for the smallest size could save over 19,500kcal a year, and avoid a potential weight gain of 5½lbs. Crumpets and garlic bread similarly have current portion sizes 20 per cent and 30 per cent higher on average respectively to the information provided 20 years ago. In addition, there was considerable variance for plain naan bread. On average, the portion size was lower than the 1993 size of 160g, but portion size ranged from 82g to 140g across the brands. This range equates to 224-411kcal.

1993

70G



NOW

86G



||

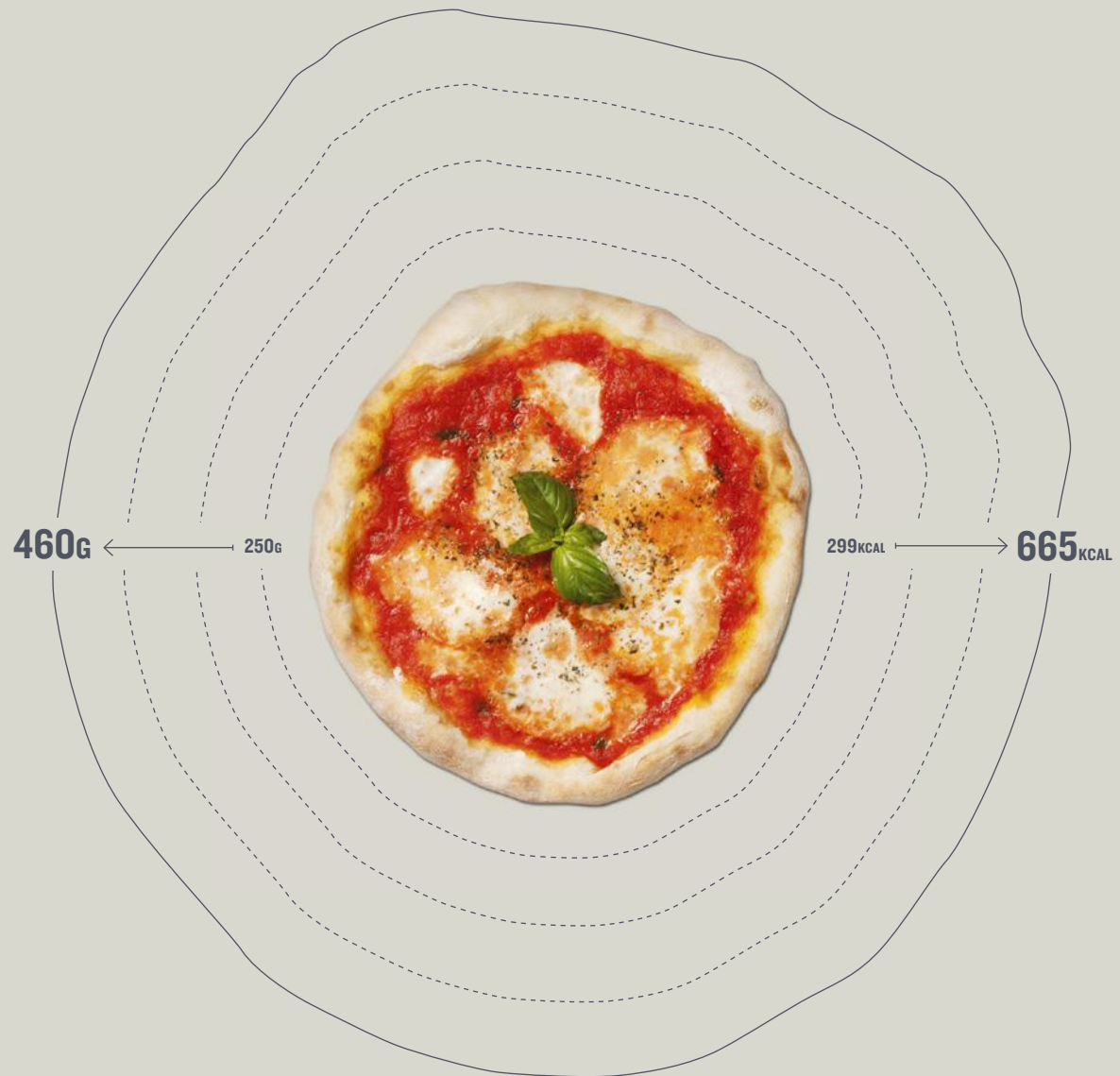
19,500KCAL  
EXTRA  
PER YEAR

# HOLD THE CHEESE

**Today's portion of cheddar cheese remained consistent with the 1993 portion size – a matchbox sized piece of 30g. All five brands examined provided the same guidance.**

However, the opposite was true for the other products considered. Cauliflower cheese ready meals for one (frozen) varied around the 235g 1993 portion, with several offering portions lower than this. One product, however, had a 400g portion size double that of the other brands.

For chilled margherita pizza, there was substantial variance from the 200g 1993 portion size for a medium sized 9-10" pizza. Nearly all products analysed fell below this information, with portion sizes varying between 125.5g and 230g for half a pizza. This has resultant effects on the calorie content of the brands, varying from 299-655kcal. Variation in size meant that, in some cases, half a pizza serving was now the same size as a whole pizza in 1993.



# SUPERSIZED READY MEALS

**A large proportion of ready meals had portion sizes higher than the 1993 portion information. For example, a fish and pasta bake ready meal had a portion size on average consistently 45 per cent larger than in 1993. And a meat lasagne ready meal for one (purchased frozen) had an average portion size 39 per cent higher.**

Other meat ready meals showed similar trends. Individual chicken pies were 40 per cent larger than compared to 1993 portion, with a portion from a large chicken pie being 49 per cent higher than a 1993 suggestion of a medium portion of chicken pie. These portions also differed greatly from the sizes of the individual pies.

The largest portion size growth was found for chicken curry with rice ready meals (purchased frozen), which had portion sizes on average 53 per cent higher. The largest curry

in our survey would provide an extra 420kcal today. The additional calories are equivalent to a 1993 portion of a burger and chips. The increases were higher still for shepherd's pie ready meals for one, showing portions nearly double the size of (98 per cent larger) 1993 information of 210g.

For ready meals for one both products considered had portion sizes higher than featured in *Food Portion Sizes* – 39 per cent higher for macaroni cheese and 25 per cent higher for spaghetti bolognese.

In contrast, the average portion for tortellini on the products analysed overall reduced by 49 per cent, with portion sizes varying between 150-200g.

**MEDIUM PORTION SIZES  
INCREASED BY 49% FROM 1993**

**INDIVIDUAL PIES  
40% LARGER FROM 1993**



# NOT SO LITTLE TREATS

**Standard small packets of ready salted crisps showed no change in portion size from the 1993 size, with all single serve packs 25g.**

However, for a family pack of crisps, the overall size of the bags have increased by 50 per cent from the 100g in 1993. The serving size on these packs have remained similar to the portion of a single pack, though one product had a portion size double that of its single serve pack equivalent.

The portion of peanuts from a large bag in 1993 was suggested as 25g, though many of the products analysed had portions that were double this. Overall, these were 80 per cent larger.

For milk chocolate, the size of a standard bar appeared to be slightly smaller than the 1993 portion size of 54g. Also, the suggested portion from a larger sized bar appeared to vary from 6.3g to 25g.

For ice cream, the portion size of an average vanilla serving was around 28 per cent lower than the 1993 information.





# OVERALL TRENDS AND IMPLICATIONS

The portion size of several products – including single serve packets of crisps, portions of corn flakes, and cheddar cheese – are all identical to the information provided twenty years ago. Some products have portion sizes that are in fact lower now than in 1993 – including ice creams.

However, this pattern is not reflected across the products analysed as a whole, with some showing considerable growth since 1993. In particular, certain bread products and all of the ready meals analysed showed substantial growth in portion size – as much as 98 per cent for one ready meal.

Our research shows that manufacturers have moved away from the Government's 1993 publication to the extent that this is no longer fit for purpose in helping retailers to size portions appropriately to reflect a 2013 portion size. As a result, this is making it difficult for consumers to compare products across different brands and control their portion sizes.

Recent academic research supports these findings. One study of the UK market found that often the range of portions was highly variable, and that as a result this could lead to consumer confusion and subsequent distrust in on-pack portion size messages.<sup>1</sup> This suggested that there is a need for greater consistency in the portion sizes communicated to the public is needed.

# THE PORTION PROBLEM IN THE UK

Cardiovascular disease (CVD) causes more than a quarter of all deaths in the UK, more than 159,000 deaths each year.<sup>2</sup> Poor diets can contribute significantly to the onset of heart disease – with diets that are high in fat, salt and sugar and low in fruit and vegetables accounting for 31 per cent of all deaths from CHD in developed countries.<sup>3</sup>

Several major risk factors for CVD can be prevented or improved through a healthy diet – including obesity, high cholesterol and high blood pressure. Eating too much saturated fat can raise levels of LDL (bad) cholesterol in the body, which can lead to fatty material building up on the walls of the coronary arteries (atherosclerosis). While eating too much salt is associated with high blood pressure.

In the UK 63 per cent of adults are either overweight or obese<sup>4</sup> and around a third of children and young people are overweight or obese.<sup>5</sup> We all need to take personal responsibility for what we eat. But we need support to do so, and creating an environment that promotes informed, healthy choices is an essential factor.

Research shows portion sizes can influence how much we eat, with larger portions encouraging us to eat more.<sup>6</sup> The Government's Foresight report<sup>7</sup> recognises portion size as playing a role in the complex system that influences what we eat. Decreasing portion sizes has been suggested as an intervention to help combat the obesity crisis, and along with other variables, portion size has been identified as a 'prime target for potential policy interventions'.

However, the UK Government has not updated their information on typical portion sizes consumed in the UK for over 20 years. In this time food retailers have used numerous sets of separate information, including from industry, non-government organisations and healthcare professionals.

This is problematic as the calorie, fat, salt and sugar information that will be presented on the new front-of-pack labelling is determined by portion size. It is therefore vital that this calculation is based on realistic portion sizes appropriate for today. It is also important that the 'portion playing field' is levelled out, with industry standardising portion sizes for like-for-like foods, enabling consumers to compare across products. Therefore providing consumers with accurate information, empowering them to make their own healthy choices about the food they eat.

# PORTION SIZE INFLUENCES HOW MUCH WE EAT

Research conducted across six European countries<sup>8</sup>, involving 13,000 respondents found that portion information was considered to be relevant to nearly half of respondents, who said that it helps them determine the amount to buy, eat or prepare, and it helps them monitor their food and nutritional intake.

Research examining the effects of portion sizes shows that when people are presented with more food, they eat more. Larger portion sizes tend to increase the total amount of food eaten over the day as people do not compensate by eating smaller portions at other times, as a way of managing their overall intake.<sup>9,10</sup> Often, participants in studies can also be unaware of gradual increases in portion size while continuing to eat more.<sup>11,12,13</sup>

The amount of food available helps to set consumption norms.<sup>14</sup> The trend towards larger portions being perceived as appropriate to eat in a single sitting has been described as 'portion distortion', and appears to affect the portion sizes selected by young adults for some foods.<sup>15</sup>

The link between portion size and energy intake has led to calls for action and greater control over the food industry around portion sizes. As part of the Public Health Responsibility Deal, the Department of Health in England has issued a challenge to reduce the total energy intake of the population by 5 billion calories a day.<sup>16</sup> As a result, a voluntary pledge on calorie reduction was launched in March 2012, which 36 companies have signed.<sup>17</sup> Several companies are seeking to contribute to this by reducing portion sizes.

For example, Mars aimed to make all of their chocolate products no more than 250 kilocalories per portion by 2013, which will see a further 12-16 per cent reduction in calories to their two best-selling bars.<sup>18</sup> In addition over half of Nestlé's confectionery now contain less than 110 calories per serving.<sup>19</sup>

The Scottish Government has recently published a food product reformulation strategy, which includes targets to reduce the portion sizes of key food products, such as soft drinks, as well as other proposals to assist in the fulfilment of reductions in the consumption of high calorie food and drink.<sup>20</sup>

# UK GUIDANCE FOR PORTION SIZING IS OUT OF DATE

There is currently no legislation within the UK or EU relating to requirements in food portion size. Recent EU regulation on the provision of food information to consumers only requires that the food portion be easily recognisable and quantified on food labelling. There is no detailed accompanying guidance on how a portion should be quantified on food labelling.

This means that retailers and other organisations draw on a number of different sources that offer guidance on appropriate portion sizes. A 2008 report from the Institute of Grocery Distribution highlighted that there are as many as 38 such schemes, most of which are derived from a small set of criteria from government publications.<sup>21</sup>

At the heart of these sources sits a 1988 publication from the Ministry of Agriculture, Food and Fisheries – *Food Portion Sizes*. Revised in 1993 and 2002 (under the Food Standards Agency, but with the data unchanged from 1993), it sought to provide up-to-date information on “typical weights and portion sizes of foods eaten in Britain” therefore providing a snapshot picture of what an average realistic portion size was. This information is important for industry use, as it provides manufacturers with direction on what portion sizes they could use in their products.

In this way *Food Portion Sizes* has helped shape guidance for industry and other organisations over the past twenty years. The BHF has used it in the development of our own information on nutrition and in the nutritional assessment of recipes.<sup>22</sup>

As front-of-pack food labelling becomes more prominent in the UK, having realistic portion size information is even more important. This is because **Under the new front-of-pack scheme the UK Government has recommended to industry portion sizes will be used to determine the amount of energy – presented in kilocalories (kcal) and what percentage the portion contains of Reference Intakes (formerly known as Guideline Daily Amounts) of fat, saturated fat, salt and sugar.<sup>23</sup> It is therefore vital that this is based on realistic portion sizes and communicated clearly, in order to provide consumers with meaningful information.**

This would arm consumers with every tool to help them make informed, quick choices about the products they buy.

# UK GUIDANCE FOR PORTION SIZING IS OUT OF DATE

Recent academic research considering some of the portion sizes on offer and the advice provided has also highlighted that there is a lack of consistency in the portion sizes communicated to the UK public.

Within the US there is research evidence suggesting that portion sizes across the last 40 years have significantly increased.<sup>24, 25, 26</sup> Recent evidence in the UK has also suggested that some food types portion size no longer reflects the Government information on portion sizes from 1993, with some portions now varying dramatically.

In 2008, the Food Standards Agency commissioned an independent review of trends in portion sizes in the UK to assess whether there had been changes in portion sizes of foods since the 1990s.<sup>27</sup> The review made a number of findings:

- Portion sizes for white bread slices have increased, particularly for medium sized bread
- While traditional biscuits have not significantly changed, premium/luxury cookies are now available and likely to be larger and more energy dense
- There was considerable variation sizes of pizzas, meat products, and potato products/savoury snacks
- There has been a clear increase in individual servings for ready meals
- Weights of commercial sandwiches vary widely

- There is a wide variation in portion sizes for chips and roast potatoes, with smaller crisp packets only available in multipack – while larger sharing packs have also been introduced
- There is a wider choice of pack size for chocolate – for example, ‘treat size’, ‘snack size’, and sharing packs. Multipacks tend to contain smaller pack sizes.

This research was followed up by a workshop with academic experts. Within this discussion there was general agreement that consumers find it difficult to estimate how much food they have consumed and that this is particularly the case for larger portion sizes. Also, while portion sizes had not increased across all foods, the strength of the evidence led the workshop to conclude that there was a need for action in this area.

Recent academic research considering some of the portion sizes on offer and the advice provided has also highlighted that there is a lack of consistency in the portion sizes communicated to the UK public.<sup>28</sup> Both the sizing of portions themselves and how they are communicated to people are both important in helping people to make healthy choices.

# WHAT THE PUBLIC TOLD US

We conducted 140 interviews with members of the public in Southend in Essex and Erdington in Birmingham in January 2013 to explore perceptions and understanding of portion sizes and related nutritional labelling. The sample contained a greater number of people from lower socioeconomic groups than the general population, who tend to be at greater risk of heart disease.

The research was split into two sections. Firstly, participants were asked to pour the amount of cornflakes that they would normally serve themselves for breakfast. We then weighed this and compared it to the recommended portion size.

Participants were then presented with a sponge cake, pizza, bar of chocolate and a large bag of crisps, and asked to state how many adults they thought each product would serve.

Secondly, we interviewed participants to explore attitudes towards portion sizes and nutritional information.

“They need to make it simpler because it can be very confusing. We haven’t got time to work out what 80 grams is... when you’re shopping, you don’t take scales with you.”

Research participant

# PORTIONS IN PRACTICE

For the **cornflakes** activity, 78 per cent of respondents stated that they had no idea of the on-pack recommended adult portion size on a box of cornflakes was. Those that stated that they did know tended to be correct, with the majority estimating between 25-35g. Those that were more 'portion-aware' highlighted the influence of community slimming groups in raising awareness of appropriate portion sizes. In the exercise where participants poured out what they considered to be a normal portion, 88 per cent served themselves portions weighing more than the 30g suggested on the pack. The average portion served was 44g, nearly 50 per cent higher than suggested.

**88%**  
POURED OUT LARGER  
PORTION THAN THE  
SUGGESTED 30G



**44g**  
THE AVERAGE PORTION  
SERVED, NEARLY 50%  
HIGHER THAN SUGGESTED

For the **chicken pie** presented, only 17 per cent stated that this would serve three people as guided on the pack. 83 per cent of respondents did not correctly state how many people the on pack portion guidance said the pie would serve.



**17%**  
STATED THE  
CORRECT THREE  
PORTION GUIDE

For the **sponge cake** provided, even fewer people stated a number of portions from it that was in keeping with the on-pack guidance of six portions. 86 per cent stated that this would provide four portions or fewer.



**86%**  
ESTIMATED THE CAKE  
WOULD PROVIDE FOUR  
PORTIONS RATHER  
THAN SUGGESTED SIX

# PORTIONS IN PRACTICE

The **margherita pizza** provided had on-pack guidance that suggested a portion was half the pizza. When the group was asked how many people they thought this would serve, the majority felt this would serve at least two people, though several in this category stated that this would be alongside chips or other foods. A quarter of respondents indicated that the pizza would serve only one person.



**25%**  
INDICATED THIS  
WOULD SERVE  
ONLY ONE PERSON  
RATHER THAN  
TWO AS PER PACK  
RECOMMENDATION

The **bar of chocolate** suggested through its on-pack guidance that it would provide eight portions. However, the answers provided by the consumers interviewed suggested that this was unrealistic. 73 per cent estimated that it would provide four portions or fewer, with 16 per cent suggesting they would consume the whole bar.



**16%**  
INDICATED THEY  
WOULD CONSUME  
THE WHOLE BAR

**73%**  
ESTIMATED THE BAR  
WOULD PROVIDE FOUR  
PORTIONS OR FEWER

Similarly, the **large bag of crisps** had on-pack portion guidance suggesting it would serve five people. However, this was not reflected in the estimated number of portions suggested by the group. 85 per cent of respondents said that the pack would feed four people or fewer, with 1 in 5 stating that they would consume the whole pack.



**85%**  
ESTIMATED THE  
BAG WOULD PROVIDE  
FOUR PORTIONS

**1 IN 5**  
INDICATED THEY  
WOULD CONSUME  
THE WHOLE BAG



# VIEWS ON PORTION SIZES

**Over a quarter of people surveyed in our focus groups indicated that they always read nutritional information on the front of food packaging, with a further 39 per cent stating they sometimes read the information. In interview, several consumers suggested that whether they looked at the information depended on the type of food – for example, one stated:**

**“If it’s a proper meal I’ll check the portion sizes, but not if it’s cakes or chocolate.”**

As mentioned above, several also highlighted that they have only started to look at on-pack nutritional information after they became involved with community slimming groups, with calories, fat and saturated fat content given the most attention, and with colour-coding through, for example, traffic light food labelling being quick and easy to understand.

However, many consumers, including those that are more motivated to look at the information, commented that they have difficulty reading and/or interpreting nutritional information on packs:

**“Some of them are really difficult to work out. Some are grams, some are portions, some per unit. You need a calculator...sometimes I just give up.”**

When asked whether they thought the nutritional information corresponded to the amount of food they ate, around a third thought it did with a similar number believing the opposite. In interview, several showed signs that they had often misunderstood what the information referred to, with many assuming the on-pack nutritional information referred to the whole pack:

**“I always thought the calorie and fat content corresponded to the whole packet. I didn’t realise it was only for a portion...it’s a bit misleading.”**

**“On the wheels, I hate it when they put it’s for half a pack in tiny writing.”**

One of the main suggestions in interview to improve the clarity was that the print size of what the nutritional information corresponded to should be bigger and more prominent. In addition, participants suggested that a simpler, consistent system would help make it easier for people to understand what the information in the pack corresponds to:

**“They should make it much clearer what the portion size is that the nutritional information refers to.”**

**“They need to make it simpler because it can be very confusing. We haven’t got time to work out what 80 grams is... when you’re shopping, you don’t take scales with you.”**

**“It’s too complicated at the moment. There are too many different systems. There should be a single standard to make it easier to understand.”**

Additional aids such as colour coding or visual icons to represent portion sizes were also suggested by participants as a means to improve understanding.

## THE NEED FOR ACTION

When asked whether the Government and food industry should be doing more to make it easier for people to understand portion sizes, two-thirds of the participants we interviewed believed they should.

**66%**  
**OF PARTICIPANTS WANTED CHANGE**

## THE SOLUTION

Research shows that people eat more when presented with larger food portions. This can contribute to over-eating, and weight gain.

Our findings in this report add to existing evidence suggesting that portion sizes for certain foods in the UK have grown since the government last analysed portion sizes 20 years ago. In addition, we found wide variation in portion sizes, which can make it difficult to compare like-for-like foods across different brands.

While large portions can contribute to over-eating, unrealistically small portion sizes mean that on-pack nutritional information does not correspond to what a person is actually eating – limiting its use to consumers.



# THE SOLUTION

**Our research also found that consumers are confused about portion sizes. There is a tendency to eat larger portions and overestimate the amount we should be eating. People also told us that the information on front-of-pack is unclear and confusing.**

Our research has highlighted discrepancies between the portion size information on products and what a consumer really eats now. Therefore, on pack portion information may not be providing consumers with the information they need to understand what is in the food on their plate. The great variance between like-for-like products is confusing consumers, further impeding their efforts to eat a balanced diet, at a time when concerns about lifestyle related ill health have never been higher.

We urgently need a review of portion sizes in the UK and a single, reliable source of information to guide food manufacturers, retailers, and other organisations. Alongside this, the rise in portion sizes needs to be addressed. It is of prime importance that the government review a realistic portion size to provide consumers with the correct information.

However as research shows some portions of food have super-sized dramatically over the past 20 years, even more so thanks to so called 'portion distortion,' these large portions are becoming increasingly normalised. Therefore the government, as part of their review must consider what constitutes a healthy average portion and provide this information to both industry and consumers.

## **Immediate action is needed**

The Departments of Health in England and Wales and the Food Standards Agencies in Scotland and Northern Ireland should commission a full review of portion sizes in the UK to assess what an average 2013 portion looks like. These findings should be used to develop accompanying guidance for industry and assist people to make informed choices to help reduce the burden of diet-related ill-health. This review should as a result of its findings provide:

- guidance for industry to enable standardisation of portion sizes
- guidance on what constitutes a healthy portion, working alongside health experts to produce this information.

## **Food companies should:**

- stop increasing the portion size of single unit foods and, in some cases, look to reducing sizes in adherence to new guidance
- adopt the new front-of-pack food labelling scheme
- ensure that portion sizes are standardised, clearly labelled and easy to understand – empowering consumers to make healthy choices.

Governments and administrations in the UK, the food industry, and non-governmental organisations, should all work to communicate what constitutes healthy portion sizes to consumers.

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# ENDNOTES

1. Lewis HB, Ahern AL, Jebb SA. (2012) 'How much should I eat? A comparison of suggested portion sizes in the UK.' *Public Health Nutrition*. 2012 November; 15(11):210-2117. Available at: <http://europepmc.org/articles/PMC3477828>
2. British Heart Foundation observation based upon National Statistical Agency, mortality statistics (2013)
3. World Health Organisation report (2002). *Reducing Risk, Promoting Healthier Lives*. Available at: [http://www.who.int/whr/2002/en/whr02\\_en.pdf](http://www.who.int/whr/2002/en/whr02_en.pdf) Pg. 60
4. British Heart Foundation calculations based upon latest National Health Surveys (2013)
5. British Heart Foundation (2013) '*Children and Young People Statistics*'. Available at: <http://www.bhf.org.uk/publications/view-publication.aspx?ps=1002326>
6. Faulkner GP, Pourshahidi LK, Wallace JM, Kerr MA, McCrorie TA, Livingstone MB. (2012) 'Serving size guidance for consumers: is it effective?' *Proceedings of the Nutrition Society*. Nov;71(4):610-21. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22877767>
7. Butland B, Jebb S, Kopelman P McPherson K, Thomas S, Mardell J, Parry V. (2007) *Foresight Tackling Obesities: Future Choices – Project Report*, 2nd ed London: Government Office for Science.
8. European Food Information Council. (2011) '*Consumer response to portion information on food and drink packaging – A pan-European study*'. EUFIC Forum No.5; Available at: <http://www.eufic.org/article/en/expid/forum5-Consumer-response-portion-information-food-drink-packaging/>
9. Kral TV, Roe LS, Rolls BJ. (2004) 'Combined effects of energy density and portion size on energy intake in women.' *American Journal of Clinical Nutrition*. Jun;79(6):962-8. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15159224>
10. Young LR, Nestle M. (2002) 'The contribution of expanding portion sizes to the U.S. obesity epidemic.' *American Journal of Public Health*. 2002;92(2):246-249. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11818300>
11. Rolls BJ, Morris EL, Roe LS. (2002) 'Portion size of food affects energy intake in normal-weight and overweight men and women.' *The American Journal of Clinical Nutrition*. 76:1207-1213. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/12450884>
12. Rolls BJ, Roe LS, Meengs JS, Wall DE. (2004) 'Increasing the portion size of a sandwich increases energy intake.' *Journal of the American Diet Association*. 104:367-372. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/14993858>
13. Rolls BJ, Roe LS, Kral TVE, Meengs JS, Wall DE. (2004) 'Increasing the portion size of a packaged snack increases energy intake in men and women.' *Appetite* 42(1):63-69. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15036784>
14. Raynor H, Wing R. (2007) 'Package Unit Size and Amount of Food: Do Both Influence Intake?' *Obesity* Vol 15 No.9. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/17890500>
15. Schwartz J, Byrd-Bredbenner C. (2006) 'Portion distortion: typical portion sizes selected by young adults.' *Journal of the American Dietetic Association*. 106(9):1412-1418. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16963346>
16. Department of Health. '*Healthy Lives, Healthy People: A Call to Action on Obesity in England; 2011*.'
17. At the time of writing, October 2013.
18. Department of Health. (2013) Delivery plans for F4. Calorie Reduction. Available at: <http://responsibilitydeal2.dh.gov.uk/render.php?r=1480>
19. Department of Health (2013) Progress on reducing calories Available at: <https://responsibilitydeal.dh.gov.uk/reducingcalories/>
20. Scottish Government (2013). Proposed Scottish Reformulation Strategies. Available at: <http://www.scotland.gov.uk/Resource/0042/00422515.pdf>
21. Institute of Grocery Distribution.(2008) '*Portion Size: A Review of Existing Approaches*.'
22. British Heart Foundation. (2009) '*So you want to lose weight... for good: A guide to losing weight for men and women*.'
23. Traffic light colours are based on per 100g of product, not portion. Except where the amount in a portion exceeds 30% of the Reference Intake
24. Nielsen SJ, Popkin BM. (2003) '*Patterns and trends in food portion sizes, 1977-1998*.' *JAMA* 289(4):450-453. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/12533124>
25. Young LR, Nestle M. (2002) 'The contribution of expanding portion sizes to the U.S. obesity epidemic.' *American Journal of Public Health*. 92(2):246-249. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11818300>
26. Duffey K, Popkin B. (2011) '*Energy Density, Portion Size and Eating Occasions: Contributions to Increased Energy Intake in the United States, 1977-2006*'. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/21738451>
27. Food Standards Agency; Church S. (2008) '*Trends in portion sizes in the UK – A preliminary review of published information*.' Available at: <http://www.food.gov.uk/multimedia/pdfs/reviewportions.pdf>
28. Lewis HB, Ahern AL, Jebb SA. (2012) 'How much should I eat? A comparison of suggested portion sizes in the UK.' *Public Health Nutrition*. 2012 November; 15(11):210-2117. Available at: <http://europepmc.org/articles/PMC3477828>



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Coronary heart disease is the UK's single biggest killer.

For over 50 years we've pioneered research that's transformed the lives of people living with heart and circulatory conditions. Our work has been central to the discoveries of vital treatments that are changing the fight against heart disease.

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From babies born with life-threatening heart problems to the many mums, dads and grandparents who survive a heart attack and endure the daily battles of heart failure.

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