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The nutritional value of potatoes and potato products in the UK diet

S. Gibson* and A. C. Kurilich†

*Sig-Nurture Ltd., Surrey, UK;
†McCain Foods Limited, Illinois, USA

Summary

Total potato consumption has been declining slowly in the UK at a rate of about 1–2% per year, in tandem with an increase in consumption of other starchy staples such as pasta and rice. Consumers and even health professionals often have a negative perception of potatoes and of chips in particular. We have evaluated the nutritional contribution of potatoes and potato products to the British diet by a secondary analysis of four-day dietary records from the National Diet and Nutrition Survey 2008–2011, and distinguished between consumption of fried chips and oven chips. We also calculated portion sizes of six different types of potato dishes [oven chips, fried chips, boiled potatoes, mashed potatoes, roast potatoes and jacket (baked) potatoes].

Over 92% of respondents consumed potatoes during the four-day survey, 27% consumed oven chips and 41% consumed fried chips. Potatoes (including chips) contributed 7% of total energy, but greater proportions of potassium and vitamin B_6 (15%), vitamin C (14%), fibre (13%), folate (10%) and magnesium (9%). On the other hand, they contributed only 4% of saturated fatty acids. *Per capita* consumption of potatoes averaged 85 g/day, of which, fried chips contributed 20 g/day and oven chips 10 g/day. For fried chips, mean portion size per occasion was 149 g among adults, 138 g among teenagers and 94 g among 4- to 10-year-olds, while portion sizes for oven chips were slightly smaller.

Potatoes can increase the nutrient density of the diet by providing a relatively high micronutrient contribution, compared with energy content, while delivering only modest amounts of saturated fatty acid and sodium. Reformulation to remove *trans* fatty acids and reduce saturated fatty acid and salt has improved the nutritional profile of some potato products. Still, there may be scope in catering establishments to offer smaller portions, thicker chips and more oven-baked potato products. Nutritionally, potatoes and potato products should be seen as a white vegetable, whose consumption should be encouraged alongside other, coloured, vegetables.

Keywords: four-day dietary survey, National Diet and Nutrition Survey, nutritional value, potato products, potatoes, UK diet

Correspondence: Dr. Sigrid Gibson, Director, Sig-Nurture Ltd., 11 Woodway, Guildford, Surrey GU1 2TF, UK.
E-mail: sigrid@sig-nurture.com

Introduction

First introduced to Europe from South America in the 16th century, the potato (*Solanum tuberosum L.*) is the third most important food crop in the world, after rice and wheat, in terms of human consumption. Potatoes provide more food, more quickly and on less land, than any other major crop (FAO 2008). Consumption *per capita* is on the increase in Asia, but is still relatively low compared with Europe or North America (Camire *et al.* 2009). In the UK, potato consumption declined between 1942 and 2000 (Defra 2000), and this trend has continued since 2000, although at a slower rate (Riley 2010). More than half of all potatoes consumed in the UK are 'chips (fried and oven baked), fried and roast potatoes or processed potato products', especially among older children and young adults. Chips are often demonised as 'junk food', and claimed to contribute to obesity, while many consumers perceive potatoes as high in calories and carbohydrates. The reality is that potatoes have relatively low energy density and can contribute significant amounts of fibre and micronutrients, such as potassium, which are shortfall nutrients in the Western diet (Freedman & Keast 2011). Against this background, we assessed the contribution of potatoes and potato products to the current British diet using original data from the first three years of the (UK) National Diet and Nutrition Survey (2008–2011) rolling programme (NDNS_RP). Additionally, we separated the consumption of oven chips from fried chips, and calculated mean portion sizes (per occasion) of six common types of potato dishes consumed (oven chips, fried chips, roast potatoes, boiled potatoes, jacket potatoes and mashed potatoes) for consumers of different ages.

Background to the survey

The data source used for this investigation is the most authoritative source of quantitative information on the food habits and nutrient intake of the UK population. The NDNS_RP is jointly funded by the Department of Health in England (now Public Health England) and the Food Standards Agency, which is designed to assess the diet, nutrient intake and nutritional status of the general population aged 18 months upwards, living in private households in the UK. Results are used by the government to develop policy and monitor diet and nutrient intakes. The NDNS_RP is now conducted annually and the first three years of data (2008–2011) have been released to researchers via the UK Data Service, which can be accessed via this link: www.esds.ac.uk/findingData/snDescription.asp?sn=6533. Headline results from years 1, 2 and 3 can be accessed at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/207708/NDNS-Y3-report_All-TEXT-docs-combined.pdf

NDNS sampling and survey methods

Households are sampled from the UK Postcode Address File, and either one adult and one child, or one child, is selected for inclusion. Background information on dietary habits, socio-demographic status and lifestyle is collected during a detailed interview. All respondents are asked to complete a dietary record of all foods and drinks consumed over four consecutive days, with a detailed description of the item, method of preparation and amount (using household measures and photographs). Full details of the dietary assessment methods are given in the survey documentation (www.webarchive.nationalarchives.gov.uk/20130402145952; www.transparency.dh.gov.uk/2012/07/25/ndns-3-years-report/). In the three years of the RP to date, 3073 respondents (55% of eligible households) completed the four-day food diary; weighting factors are used to adjust for sampling and non-response bias. Each food item is subsequently coded from the description in the food record and additional information on brand, source or recipe, to allow it to be matched with food composition tables specially designed for the survey. The integrated nutrient databank contains compositional data on over 7000 foods. It was derived from the UK food tables known as the Composition of Foods (www.food.gov.uk/science/dietarysurveys/dietsurveys), but is expanded for the NDNS to include more manufacturers' data, household recipes and new analytical data as these become available. Analytical data for the 125 codes for potatoes, potato products and potato dishes are several years old, although some new information on fatty acids in chips and potato products was added for year 3 of the NDNS. However, the data for years 1 and 2 (2008–2010) likely overestimate the true content of saturated fatty acids, *trans* fatty acids (TFA) and *n*-3 polyunsaturated fatty acid in chips, as they do not account for all of the product reformulations over the last 8–10 years (Stender *et al.* 2012).

Methods

Data files were obtained under licence from the UK Data Archive (www.esds.ac.uk). We identified all occasions of consuming potatoes, as far as these could be identified from the detailed dietary records. Items were first identified at the main food group level: group 38 includes all chips, fried and roast potatoes and potato products such as wedges and waffles; group 39 includes all other potatoes, including boiled, baked, and mashed potatoes, and potato dishes (see Appendix 1 for full list of foods). The new NDNS_RP now enables disaggregation of most recipe dishes, so that boiled potatoes added to a stew or

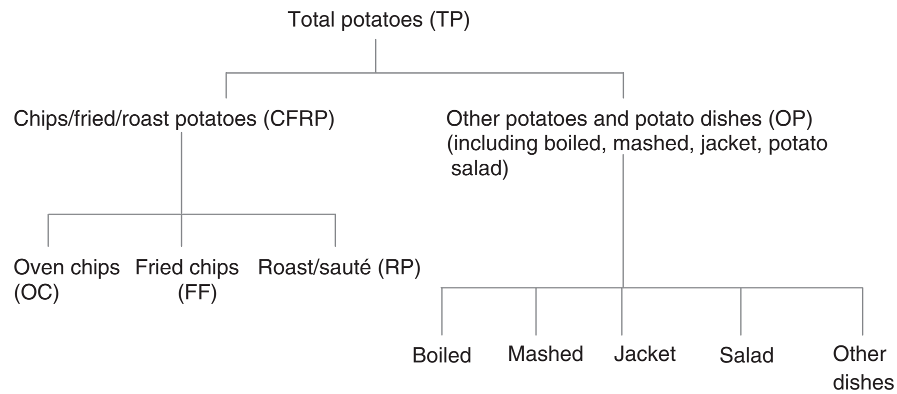


Figure 1 Classification diagram.

mashed potato topping on a pie are coded as boiled or mashed potato, respectively. However, some manufactured composite dishes remain coded according to the main component. Thus, potatoes in a beef casserole would be omitted (counted with beef dishes), but conversely, potato dishes such as potato curry, which included other ingredients, would be included within 'other potato/potato dishes'. However, the vast majority of potatoes are consumed as a side dish or snack, and therefore the inability to account for potatoes in some ready meals would not have biased the results significantly.

Within the main food group 38 (chips, fried and roast potatoes and potato products), there were 78 separate food codes representing different items. Similarly for group 39 (other potatoes), there were 47 separate items. By 'drilling down' to the individual food item level in the diaries, and then aggregating consumption across defined products, we were able to separate subtypes of potatoes/potato dishes using the food name or description and the fat content (see Appendix 1). Items in group 38 were classified into: (1) oven chips; (2) fried chips; and (3) other fried/sauté/roast potatoes (not chips). Items in group 39 were classified into boiled, mashed, jacket (baked), potato salad and other potato dishes. A breakdown of the different types of potatoes/potato products in the analysis is shown in Figure 1.

Statistical analyses

Statistical analyses were performed using IBM SPSS Statistics version 20 (SPSS Inc., Chicago, IL, USA). Descriptive data are presented as means and standard error. Standard *t*-tests (two-tailed) and analysis of variance were used to compare differences in consumption of potatoes between groups with Bonferroni correction for multiple comparisons. Univariate general linear modelling was used to compare mean portion size of different types of potato products/dishes, adjusted for age group and sex as fixed factors in the model.

Results

Over 92% of the population consumed potatoes at least once during the four days of survey. *Per capita* consumption of total potatoes averaged 85 g/day, and was highest among older men (mean 116 g/day) (Table 1). Adult men consumed more potatoes than adult women ($P < 0.01$), but there was no significant difference in consumption between boys and girls.

Consumption of chips/fried/roast potatoes was highest among teenagers ($P < 0.001$ compared with adults), while consumption of other types of potatoes was highest among adults and especially those aged over 65 years ($P < 0.001$).

Contribution of potatoes to the total diet

The contribution of potatoes to nutrient intakes is shown in Figures 2 and 3; sexes have been combined as results were essentially the same. On average, potatoes provided 7% of dietary energy, 6% of fat intake and 4% of saturated fatty acid. Compared with their energy contribution, potatoes provided more fibre (13% of total intake), potassium (15%), vitamin C (14%), folate (10%) and magnesium (9%). Potatoes also provided modest amounts of iron (6%) but contributed only 2% of total sodium intake (excluding discretionary salt). Teenagers derived a higher proportion of their energy and nutrient intakes from potatoes compared with other age groups ($P < 0.05$).

Separate analysis of oven chips vs. fried chips

Overall, 27% of the total sample ate *oven chips* at least once during the four days of survey (defined as

Table 1 Mean consumption of potatoes (g/day) according to age group and sex

		Age group					
		1.5–3 years	4–10 years	11–18 years	19–64 years	65+ years	Total
Men:	*n*	161	311	342	519	131	1464
Total potatoes	Mean	44	73	96	101*	116*	91*
	SE	3	3	3	3	6	2
of which							
Chips/fried/roast	Mean	21	41	61†	49	46	48
	SE	2	2	3	2	4	1
Other potatoes	Mean	23	32	36	52	71†	43
	SE	2	2	2	2	5	1
Women:	*n*	142	302	324	667	174	1609
Total potatoes	Mean	45	69	92	80	88	79
	SE	3	3	4	2	4	2
of which							
Chips/fried/roast	Mean	19	38	56†	35	26	38
	SE	2	2	3	2	2	1
Other potatoes	Mean	25	31	36	45	62†	41
	SE	2	2	2	2	3	1
Total population:	*n*	303	613	666	1186	305	3073
Total potatoes	Mean	44	71	94	91	100	85
	SE	2	2	2	2	4	1
of which							
Chips/fried/roast	Mean	20	40	58†	42	35	43
	SE	1	1	2	1	2	1
Other potatoes	Mean	24	31	36	49	66†	42
	SE	2	1	2	2	3	1

*Significantly higher in men than in women in the same age group ($P < 0.01$).
†Significantly higher than other age groups ($P < 0.01$).
SE, standard error; *n*, number of respondents.

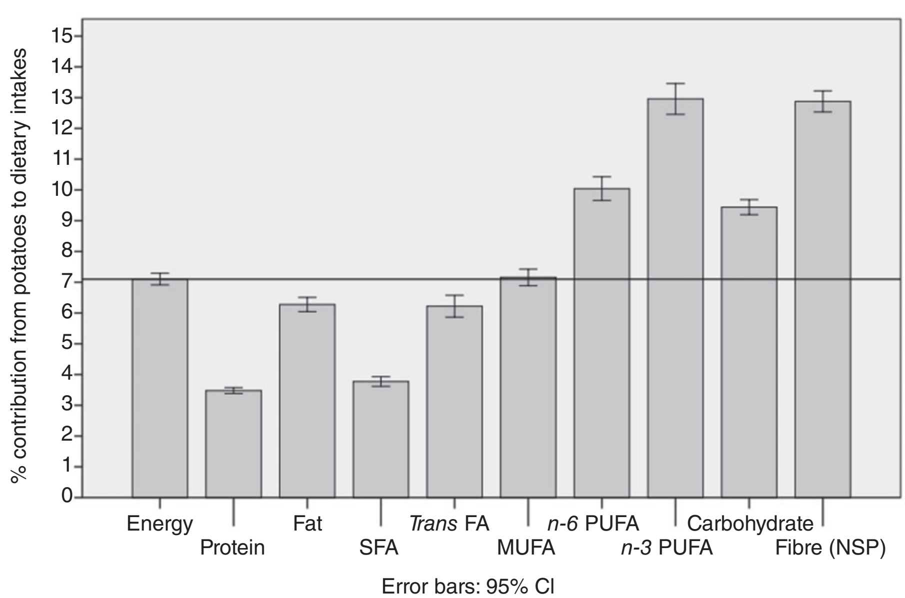


Figure 2 Percentage contribution of potatoes to total dietary intakes of energy and macronutrients (total sample, $n = 3073$). FA, fatty acids; MUFA, monounsaturated fatty acids; NSP, non-starch polyunsaccharides; PUFA, polyunsaturated fatty acids; SFA, saturated fatty acids.

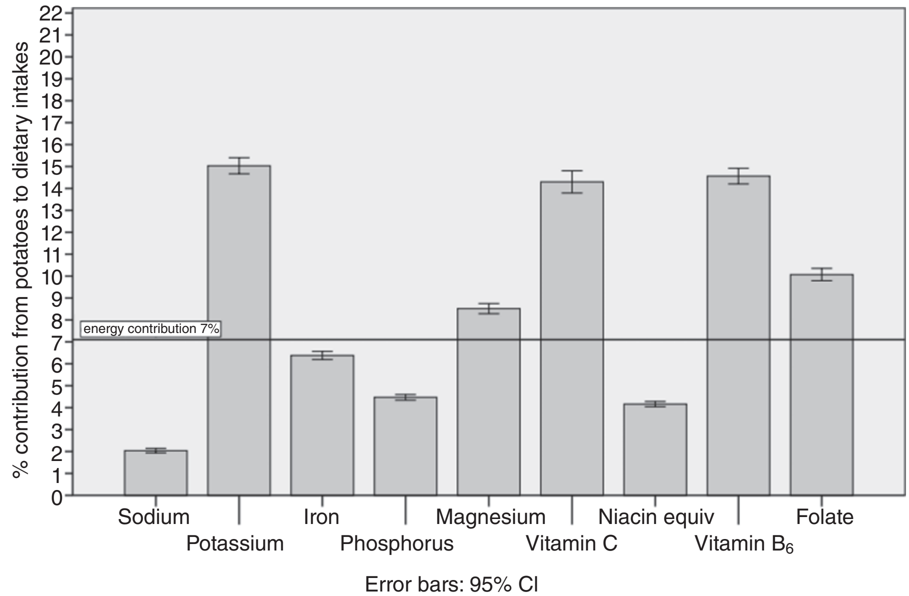


Figure 3 Percentage contribution of potatoes to total dietary intakes of micronutrients.

Table 2 Consumption statistics for oven chips vs. fried chips

Total population (including non-consumers)		1.5–3 years	4–10 years	11–18 years	19–64 years	65+ years	Total
	n	303	613	666	1186	305	3073
Oven chips g/day	Mean	6	12	13	9	6	10
	SE	1	1	1	1	1	0
Fried chips g/day	Mean	8	16	29	20	12	20
	SE	1	1	1	1	1	1
Consumers only							
Oven chips g/day	% consuming	30%	38%	31%	21%	17%	27%
	n	91	223	199	254	47	814
	Mean	21	32	43	42	33	37
	SE	1	1	2	2	2	1
Fried chips g/day	% consuming	32%	48%	51%	38%	26%	41%
	n	97	295	337	424	78	1231
	Mean	25	33	57	53	49	48
	SE	2	1	2	2	3	1

SE, standard error.

consumers). Mean daily consumption of oven chips was 10 g/day over the total sample, or 37 g/day among consumers only (Table 2).

Fried chips were more popular than oven chips, being consumed by 41% of the total sample and half of all teenagers. Mean daily consumption was 20 g/day over the whole sample, or 48 g/day among consumers.

Contribution of oven chips and fried chips to nutrient intake

Over the total population, oven chips contributed only 18 kcal (76 kJ) to the daily diet, or around 1% of total energy. Children aged 4–18 years obtained a higher proportion of energy and nutrients from oven chips than adults. By contrast, fried chips contributed 2.6% of

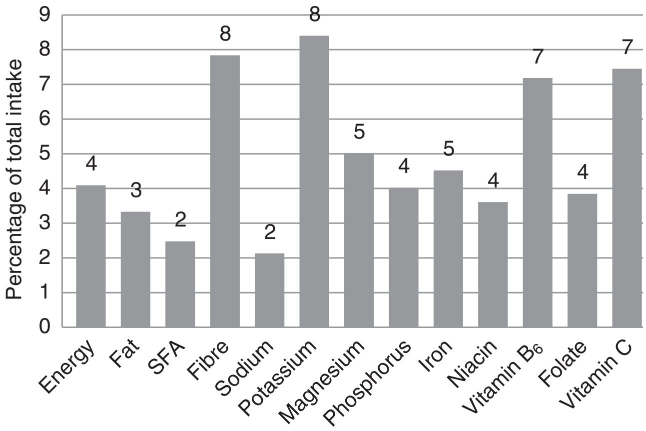


Figure 4 Percentage contribution of oven chips to energy and nutrient intake (consumers, all ages). SFA, saturated fatty acids.

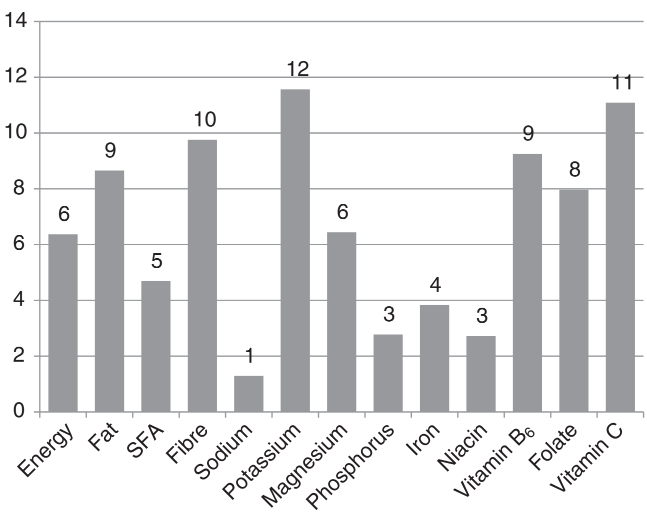


Figure 5 Percentage contribution of fried chips to energy and nutrient intake (consumers, all ages). SFA, saturated fatty acids.

total energy and teenagers obtained a significantly higher proportion of energy and nutrients from this source than other age groups.

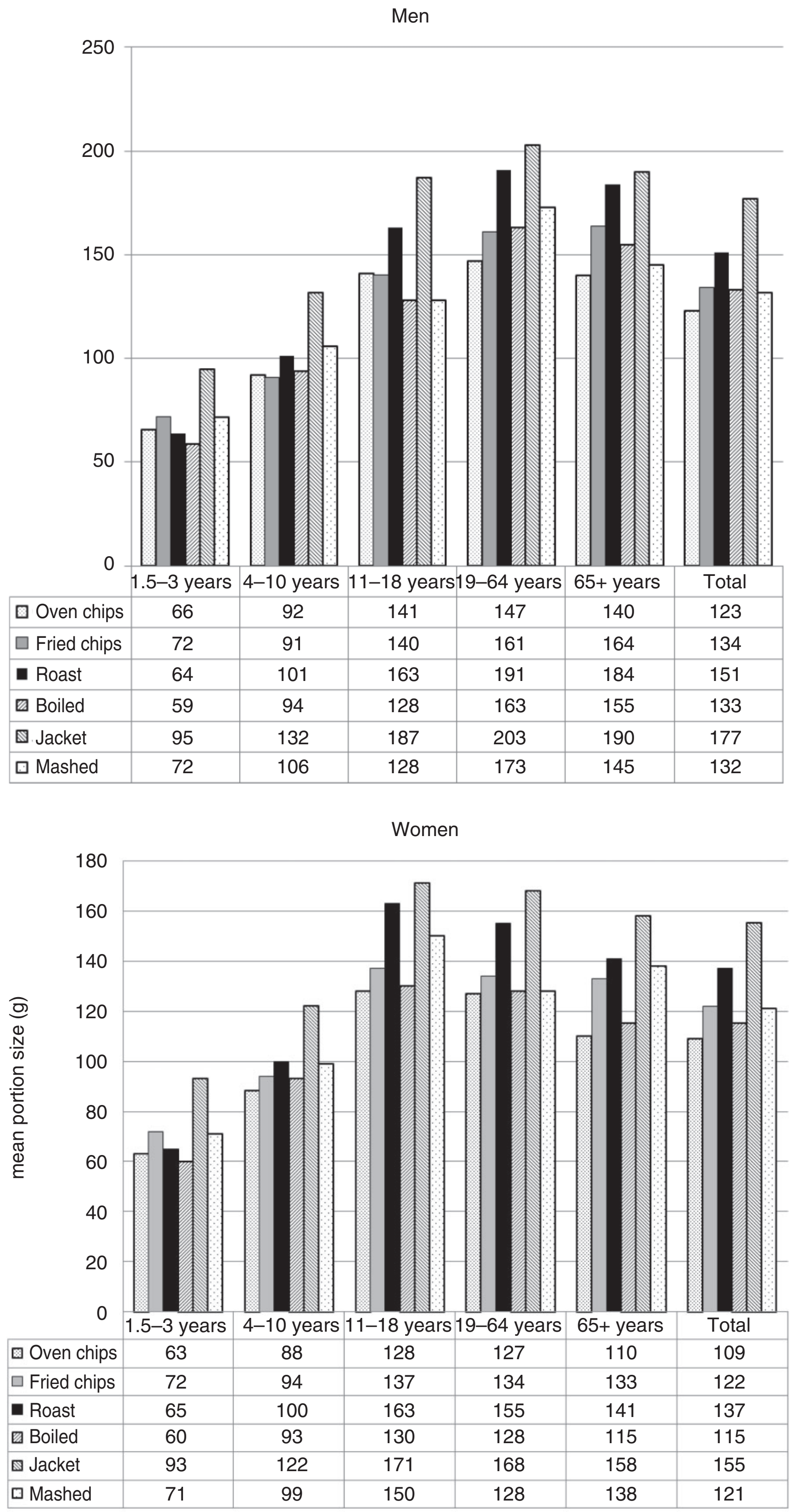
For individuals who consumed oven chips during the survey, the average intake of 37 g/day provided 4% of total energy (67 kcal/day) and more than 4% of fibre, potassium, magnesium, iron, vitamin B_6 and vitamin C (Fig. 4). Consumers of fried chips (mean 48 g/day) obtained 113 kcal/day from this source, or just over 6% of total energy (Fig. 5). Like oven chips, fried chips were a good source of fibre, potassium, vitamin B_6, folate and vitamin C, but contributed more fat (9% of total for consumers).

Portion sizes (g per occasion)

Mean portion sizes for six main types of potato (oven chips and fried chips, and for roast, boiled, jacket and mashed potatoes) were calculated from consumption occasions in the food records. In general, adults and teenagers consumed larger portions than children under 11 years, and adult men consumed larger portions than women (Fig. 6). Portion sizes were largest for jacket potatoes, smallest for oven chips and intermediate for roast potatoes. The average portion size of oven chips was significantly smaller than for fried chips in models adjusted for age group and sex ($P < 0.01$).

Discussion

This study provides a snapshot of current consumption of potatoes and potato products in the UK (2008–2011) and their contribution to energy and nutrient intakes. Although the quality of the British diet has improved in some ways over the past 20–30 years (*e.g.* increased consumption of fruits and vegetables, wholegrain foods, and low-fat dairy products, as well as a reduction in saturated fat intakes) (Defra 2000; Defra 2012), progress towards some targets has been slow since 2000 and inequalities are a cause for concern. Average fat intakes have declined and are now close to the Dietary Reference Value (DH 1991) and TFAs are within the acceptable range; however, saturated fatty acid intakes remain too high (mean 12.8% of energy) (Appendix Table A1). Among UK adults, potatoes provided in total 7%, 10% and 13% of monounsaturated fatty acid, *n*-6 polyunsaturated fatty acid and *n*-3 polyunsaturated fatty acid in the diet, respectively, compared with only 4% of saturated fatty acid and 6% of TFA. Furthermore, this overestimates the contribution to saturated fatty acid and TFA intakes because the food composition database used for the two years 2008/2010 did not take into account the widespread reformulation of cooking oils that occurred in Western Europe after 2005 (Stender *et al.* 2012). For example, the majority of oven chips consumed in the first two years of the NDNS (code number 1878) were ascribed compositional values for saturated fatty acid, TFA and *n*-3 polyunsaturated fatty acid of 1.5, 0.33 and 0.73 g (per 100 g), respectively; for year 3, the new code for oven chips (code number 10561) used values of 0.82, 0.01 and 0.02 g (per 100 g) for these three nutrients. We conclude that for the three-year period, the contribution of oven chips to SFA, TFA and *n*-3 may be overestimated, although the amounts were already quite small. In the NDNS, most of the contribution of potatoes to saturated fatty acid intakes



Men

	1.5–3 years	4–10 years	11–18 years	19–64 years	65+ years	Total
Oven chips	66	92	141	147	140	123
Fried chips	72	91	140	161	164	134
Roast	64	101	163	191	184	151
Boiled	59	94	128	163	155	133
Jacket	95	132	187	203	190	177
Mashed	72	106	128	173	145	132

Women

	1.5–3 years	4–10 years	11–18 years	19–64 years	65+ years	Total
Oven chips	63	88	128	127	110	109
Fried chips	72	94	137	134	133	122
Roast	65	100	163	155	141	137
Boiled	60	93	130	128	115	115
Jacket	93	122	171	168	158	155
Mashed	71	99	150	128	138	121

Figure 6 Mean portion size for potatoes consumed by men and women, by age group (mean g/day).

(4%) came from mashed potatoes (*i.e.* from additional butter/margarine/milk) and from potato dishes and roast potatoes.

While the relationship of salt intake to high blood pressure is widely known, and pressure from the public health community to reduce sodium intake continues, until recently, very little attention has been paid to the balancing effect of potassium and the potential application of a sodium : potassium ratio as a tool for dietary planning to prevent or manage hypertension and cardiovascular disease (CVD). In the UK, a coordinated salt reduction strategy since 2006 has succeeded in reducing the sodium content of processed foods, largely via reformulation (Wyness *et al*. 2012). Between 2000/2001 and 2011, mean salt intakes (as determined from sodium excretion) among adults aged 19–64 years fell from 9.5 to 8.1 g/day (DH 2012). Nonetheless, salt intakes remain above target levels, especially among children. Since 2012, many manufacturers and food service companies have committed to new pledges on salt and calorie reduction through the *Public Health Responsibility Deal* (www.responsibilitydeal.dh.gov.uk). Recently, the balancing role of potassium in regulating blood pressure has been recognised as being just as important as reduction of salt intake for preventing hypertension and reducing CVD risk and all-cause mortality (Yang *et al*. 2011). The World Health Organization (WHO) Nutrition Guidance Expert Advisory Group recently completed a major review of the evidence for the effects of potassium on non-communicable diseases. It recommended that potassium intake in adults should be increased to at least 3510 mg/day to reduce blood pressure and risk of CVD (WHO 2012). Subsequently, a systematic review and meta-analysis of 22 randomised trials and 11 prospective studies has concluded that increased potassium intake reduces blood pressure in hypertensive subjects by approximately 3.5 mmHg and has no adverse effects in normotensive subjects. Furthermore, it was associated with a 24% reduction in risk of stroke (Aburto *et al*. 2013). Currently, mean intakes among adults in the NDNS (2810 mg/day) are about 20% below the level recommended by WHO (3089 mg/day for men, 2546 mg/day for women; data not shown). Potatoes could make a significant contribution towards meeting this recommendation and rebalancing the dietary sodium : potassium ratio provided to consumers to avoid adding discretionary salt.

Dietary fibre is another nutrient of public health concern as mean intakes among adults in the UK are less than 80% of the recommended level of 18 g/day of non-starch polysaccharide (NSP) (Appendix Table A1). Potatoes contributed 13% of total NSP intake and thus make a valuable contribution to this shortfall nutrient, which could be enhanced by consuming more potatoes with their skins (*e.g.* as jacket potatoes or jacket wedges). Technologies are also being developed to enhance the fibre and resistant starch content of potato products, including the use of potato skins and cooling after processing. These and other approaches offer the potential to further enhance the nutritional profile of potato products (Decker & Ferruzzi 2013).

As energy intakes have been falling slowly but steadily in tandem with more sedentary lifestyles, micronutrient intakes have also come under pressure. In the NDNS, intakes of several micronutrients fell short of recommended levels in some groups, and for some minerals, intakes averaged less than 80% of the Reference Nutrient Intake (RNI) (Appendix Table A2). Low intakes of iron, magnesium, zinc, calcium and selenium were observed in the NDNS, although it should be noted that RNIs for some nutrients such as selenium are based on limited information (SACN 2013). Women and teenage girls would appear to be at higher risk of inadequacy for many nutrients, but especially iron, because of their higher requirements and lower intakes compared with men. Although potatoes are not rich in iron, they do contain a modest amount; furthermore, they are rich in vitamin C, which enhances absorption of non-*haem* iron, and low in phytate (which forms insoluble complexes with calcium, zinc and iron, thus inhibiting absorption) (Camire *et al*. 2009). Therefore, the bioavailability of iron and zinc in potatoes is higher than in similar plant foods such as wheat and maize (King & Slavin 2013). By providing some micronutrients, such as potassium, magnesium, vitamin B_6, folate and vitamin C in greater proportion than energy, potatoes can increase the nutrient density of the diet.

The NDNS is intended to provide data on average intakes of population groups, rather than to estimate the usual intakes of individuals, which cannot be adequately captured in a four-day record. However, four days of data clearly provide more information than a single 24-hour recall, and allow the possibility of looking at day-to-day variation in consumption if required. We have determined four measures of consumption: the overall (*per capita*) contribution of potatoes to the UK diet, the percentage of the population who can be regarded as regular consumers (at least once every four days), the average daily consumption by these consumers, and average portion size consumed per occasion. In comparing results with other datasets with different days of recording, such as the National Health and Nutrition Examination Survey (NHANES) (24 hours), mean consumption values (total sample, including non-consumers) and portion sizes can be directly compared, but the proportion of consumers will differ depending on the survey timescale and whether the item is consumed daily. In this study, *per capita* consumption for the total population was 85 g/day, compared with 36 g/day in the US (NHANES 2009–2010) (Storey & Anderson 2013). In the NDNS, 92.6% of the sample were consumers of potatoes (defined as at least one occasion over four days), but 65% consumed them in any one day, compared with only 35% of adults and children in NHANES (Freedman & Keast 2011, 2012). Thus, it appears that potatoes are more significant in the UK diet than in the American diet, while both datasets show that potatoes including chips/French fries contribute important nutrients to the diet. While most health professionals would agree that fried chips should be occasional rather than frequent items in most people's diets, it should be noted that the modest fat contribution from fried chips is mostly in the form of monounsaturated fatty acid and polyunsaturated fatty acid.

Total potato consumption has been declining slowly in the UK at a rate of about 1–2% per year, in tandem with an increase in consumption of other starchy staples such as pasta and rice (Defra 2012). A similar trend has been documented in the national INCA surveys in France over an eight-year period to 2006/2007, with the decline of traditional meal patterns and the adoption of an 'average European diet' (Dubuisson *et al*. 2010). Although food supply statistics provide data on consumption at the national and European Union level, there are relatively little published data on the contribution of potatoes to nutrient intakes for different groups. Given our findings, which highlight the contribution of this important staple to intakes of micronutrients and fibre as well as carbohydrate, more research may be warranted to explore how dietary patterns that include high consumption of potatoes are associated with nutritional outcomes.

In the UK, potatoes are not included within the definition of fruits and vegetables for the purpose of the '*5-A-DAY*' target. According to some nutritionists, this is a mistake, because potatoes contribute critical nutrients and deserve a more prominent position in food guides (King & Slavin 2013). The United States Department of Agriculture (USDA) national food guide '*MyPlate*' includes potatoes as a 'starchy vegetable', and there is a specific dietary recommendation for consumption of 4–6 cups of starchy vegetables per week for adults (~125 g/day) (USDA & HS 2010). Mean consumption of all potatoes among adult groups in the NDNS was between 80 and 116 g/day, and therefore can substantially contribute to meeting the weekly starchy vegetable recommendation.

The public image of potatoes reflects this unidimensional classification of potatoes as 'starch', and possibly also a perception that white or pale-coloured foods are low in nutrients (Weaver & Marr 2013). In fact, although colour may be a guide to certain classes of polyphenols, such as anthocyanins, carotenoids and chlorophylls, it is a poor guide to nutrient content; the human eye cannot judge the vitamin C, potassium or fibre content of foods (Barnes *et al*. 2013). Secondly, the image of potatoes is tarnished with concerns about fried chips and a fast food culture, yet in this UK study, consumption of fried chips averaged only 20 g/day, less than a quarter of all potatoes consumed.

Portion sizes of fried chips (French fries) served in restaurants in Europe are reported to be smaller than in the US (Young & Nestle 2007). In our study, the average portion size for fried chips was 149, 138 and 94 g per occasion among adults, 11–18 and 4–10 years, respectively. There may be scope for offering smaller portion options, using thicker chips and replacing some fried chips with oven-baked potato products. Guidance on appropriate serving sizes for children of different ages may also be warranted. In our study, average portion sizes for oven chips were 147 g for men and 127 g for women aged 19–64 years, and thus are broadly compatible with suggested serving sizes on pack (125 g), while children aged 4–10 years consumed approximately 90 g of oven chips per occasion.

It is concluded that potatoes, as currently consumed in their various forms, enrich the diet in this population in respect of at least five micronutrients, including potassium, magnesium, folate, vitamin C, vitamin B_6, as well as dietary fibre and unsaturated fatty acids, while lowering the dietary concentration of saturated fat. Choosing to consume potatoes in place of more energy-dense foods could have a significant impact to reduce calorie consumption and improve nutrient density, potentially contributing to the avoidance of obesity and better nutritional status. We suggest that potatoes and potato products should be seen as a white vegetable and, provided care is taken over the amount of added fat and salt, their consumption should be encouraged alongside other coloured vegetables as part of a healthy, balanced diet and lifestyle.

Conflict of interest

This secondary analysis of data from the National Diet and Nutrition Survey was funded by McCain Foods Limited. The conclusions are those of the authors, not of the data originators or depositors.

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Appendix 1

Table A1 Mean nutrient intakes compared with Dietary Reference Values

	Age of respondent						
	1.5–3 years Mean	4–10 years Mean	11–18 years Mean	19–64 years Mean	65+ years Mean	Total Mean	DRV
Energy % of EAR	95	89	80	84	83	85	100
Fat % total energy	34	33.6	33.9	32.9	34.8	33.6	33
SFA % total energy	14.8	13.3	12.5	12	13.7	12.8	10
Cis MUFA % total energy	11.3	12	12.7	11.9	11.8	12	12
Cis n-3 PUFA % total energy	0.7	0.8	0.9	1	1.1	0.9	>0.2
Cis n-6 PUFA % total energy	4	4.4	4.7	4.9	4.7	4.6	>1.0
Trans fatty acids % total energy	0.7	0.7	0.7	0.7	0.8	0.7	<2
Carbohydrate % total energy	50.7	51.9	50.3	45.5	44.9	48.2	47
Englyst fibre (g)	8	11	12	14	13	12	18*
Fibre % DRV	46	63	66	77	74	69	100
Protein % total energy	15.3	14.4	14.9	16.5	16.8	15.6	–
Protein % of RNI	296	232	143	150	141	175	100

*Fibre DRV is for adults only; no level has been set for children.

DRV, Dietary Reference Value; EAR, Estimated Average Requirement; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids; RNI, Reference Nutrient Intake.

Table A2 Mean intake of micronutrients in the UK diet, as a percentage of the RNI

	Age of respondent					
	1.5–3 years	4–10 years	11–18 years	19–64 years	65+ years	Total
Men:						
As % of RNI						
Niacin	247	237	221	259	229	242
Vitamin B_6	204	191	175	190	171	186
Folate	222	167	118	149	148	150
Vitamin C	236	290	229	219	210	236
Iron	96	122	95	137	125	119
Calcium	236	166	87	129	135	135
Phosphorus	331	264	158	258	241	238
Magnesium	187	128	79*	96	90	105
Sodium	270	210	158	167	146	180
Potassium	235	150	76*	88	88	109
Zinc	108	99	91	104	97	100
Selenium	167	137	80*	71*	66*	93
Women:						
As % of RNI						
Niacin	238	225	226	249	247	238
Vitamin B_6	196	182	177	160	160	171
Folate	213	154	94	115	120	125
Vitamin C	201	293	208	210	200	223
Iron	91	115	57*	79*	109	85
Calcium	210	156	85*	104	113	118
Phosphorus	308	246	156	198	202	206
Magnesium	178	120	64*	84	82	93
Sodium	267	199	124	126	117	149
Potassium	216	142	64*	72*	74*	94
Zinc	100	93	84	109	109	99
Selenium	161	128	69*	71*	67*	88

*Major nutrient gaps are shown.

RNI, Reference Nutrient Intake.

