Overcoming calorie calculation challenges for fried foods within MenuCal©

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The estimation of oil/fat absorption by foods during deep or shallow frying is a major challenge when calculating the calorie content of some recipes. The aim of this study was to develop and validate a method within MenuCal©[1] for calculating calories, within a tolerance of ±30% accuracy, for recipes necessitating estimation of oil/fat absorption during frying.

The amount of oil/fat absorbed during shallow and deep fat frying has been directly estimated for a variety of foods grouped into 39 categories[2]. This data was used to apply fat absorption factors to all foods in MenuCal©. A 'fat absorption' process was integrated into the MenuCal© software which prompts users to choose a method of frying, the type of fat/oil being used and, if necessary, the addition of a batter or crumb. For validation, foods that have a calorie value for both raw and fried versions were identified from CoF IDS[3] (n93 pairs) and grouped into four food types. Calorie values for the fried versions of these foods were calculated using the MenuCal© process. This is based on CoF IDS calorie values for 100 g of the raw foods plus the calorie estimation for oil/fat absorbed during frying using the fat absorption factors. The resulting calorie values were compared with calorie values for the fried versions of these food in CoF IDS (amounts equivalent to 100 g raw weight adjusted for weight yield during cooking)[2,4]. Pearson's correlation co-efficient was used to assess the relationship between the proportional variation in calorie values obtained using the two methods (% difference in values estimated by MenuCal© compared with CoF IDS values – see table) and the CoF IDS calorie values of the fried foods.

Fried Food Groups (n)	kcal using MenuCal©§ median (range)	kcal using CoF IDS¥ median (range)	% difference* median (range)
1. Total (*93*)	186 (22–358)	188 (34–426)	−23 (−148–82)
2. Bread, Potatoes and Pasta (*5*)	125 (115–298)	153 (121–357)	−16 (−1–−18)
3. Vegetables (*21*)	27 (22–195)	61 (34–222)	−45 (−80–−12)
4. Meat, Fish and Poultry (*39*)	168 (95–291)	168 (88–320)	4 (−53–37)
5. Processed Meat and Fish Products (*28*)	241(180–358)	214 (173–426)	3 (−36–39)

§ A calorie calculator for use by food businesses to enable calorie menu labeling.
¥ The UK Composition of Foods Integrated Dataset (CoF IDS).
* The % difference in kcal values estimated by MenuCal© compared with CoF IDS kcal values.

As shown in the table, median calorie values for all of the food groups, estimated using MenuCal©, were comparable with CoF IDS values and, with the exception of the vegetable group, all fell within the ±30% variation tolerance limit. Overall a weak negative correlation was observed between the proportional variation in calorie values and the calorie content of the fried foods (r = − 0.28). However, this correlation was stronger for foods with a lower calorie content (r = − 0.43 for foods below the median CoF IDS calorie value). This indicates that the variation between calorie values estimated using MenuCal© compared with CoF IDS, is greatest for fried foods with a lower calorie content.

The method developed to calculate the calorie content of fried food recipes in MenuCal© was comparable with CoF IDS values, within a ±30% tolerance limit, for most foods tested. As underestimation was greatest for the foods with the lowest calorie content, the impact on variation in amount of calories calculated per serving is low.

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