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Methodology for assigning appropriate glycaemic index values to an Australian food composition database

Jimmy Chun Yu Louie [a,b,*], Victoria M. Flood [c,d,e], Fiona S. Atkinson [b], Alan W. Barclay [f], Jennie C. Brand-Miller [b]

[a] School of Medicine, Faculty of Science, Medicine and Health, The University of Wollongong, NSW 2522, Australia
[b] School of Molecular Bioscience and Boden Institute of Obesity, Nutrition, Exercise and Eating Disorders, The University of Sydney, NSW 2006 Australia
[c] Faculty of Social Science, The University of Wollongong, NSW 2522, Australia
[d] Faculty of Health Sciences, Cumberland Campus, The University of Sydney, NSW 2141, Australia
[e] St Vincent's Hospital, Sydney, NSW, Australia
[f] Australian Diabetes Council, Glebe, NSW, Australia

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ABSTRACT

We aimed to produce an updated Australian glycaemic index (GI) database based on a systematic method. GI values were assigned to the 3871 unique foods in an Australian food composition database. Following the method, 1124 (29%) foods had less than 2.5 g of available carbohydrates per 100 g and were assigned a GI of 0, and 416 (11%) foods had a direct match in one of the three data tables used. The GI value of a 'closely related' food was assigned to 1793 (46%) foods; 135 foods (3%) had their GI values calculated using the weighted average GI method; 391 (10%) foods were assigned the median GI of their corresponding food subgroup, and 12 (<1%) foods were assigned a GI of 0 because they were not significant sources of carbohydrates in a typical diet. For the 3634 foods which received a GI value in the 2009 assignment, 1954 (53.8%) had an updated GI value, and the mean ± SD difference between the 2009 and current assigned values was +3.0 ± 16.0 units (paired sample *t*-test $p < 0.001$). Acknowledging some limitations, this database will enhance the utility of the GI concept in research and clinical settings in Australia (199 words).

1. Introduction

The glycaemic index (GI) is a measure of the quality of dietary carbohydrates, where a low GI indicates that the carbohydrates in the food are either digested and absorbed slowly, or contain monosaccharides that are inherently less glycaemic (Brand-Miller et al., 2009). The GI of a food is the mean ratio between the area under the postprandial glycaemic response curve of a serving of that food which provides 50 g available carbohydrate, and that of a reference food, usually 50 g of glucose, and is therefore dimensionless in nature. As the amount of carbohydrate consumed is also a key factor in determining postprandial glycaemic response, the GI was often criticized for not taking the quantity of carbohydrate into account. To address this, the glycaemic load (GL) concept was developed (Salmeron et al., 1997; Salmerón et al., 1997). GL is given by the product of GI (as %) and amount of carbohydrate in the food, and therefore the unit is grams.

The consumption of low GI meals results in lower fluctuations in postprandial blood glucose levels compared with high GI meals with the same amount of available carbohydrate (Solomon et al., 2010). Since chronic postprandial hyperglycaemia and the associated hyperinsulinaemia have been associated with increased risk of several chronic diseases (Ludwig, 2002), a low GI eating pattern is hypothesized to be protective. In recent years, research around the world has provided evidence for the benefits of following a low GI diet. A meta-analysis by Barclay et al. (2008) concluded that a low GI diet was associated with reduced risks of type 2 diabetes, coronary heart disease, gall bladder disease and breast cancer. Recent meta-analyses (Fleming and Godwin, 2013; Greenwood et al., 2013; Livesey et al., 2013; Mirrahimi et al., 2012; Rouhani et al., 2013; Schwingshackl and Hoffmann, 2013) on the

* Corresponding author at: School of Molecular Bioscience, Faculty of Science, The University of Sydney, NSW 2006, Australia. Tel.:+61 2 8627 1691; fax: +61 2 8627 1605.
E-mail addresses: jimmy.louie@sydney.edu.au (J.C.Y. Louie), vicki.flood@sydney.edu.au (V.M. Flood), fiona.atkinson@sydney.edu.au (F.S. Atkinson), awbarclay@optusnet.com.au (A.W. Barclay), jennie.brandmiller@sydney.edu.au (J.C. Brand-Miller).

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topic have reached similar conclusions that a low GI/GL eating pattern is beneficial.

Accurate assignment of GI values to food items is crucial to the validity of the observed relationship between dietary GI and/or GL and health outcomes in observational studies, as well as accurate design and delivery of a low GI/GL diet in intervention studies.

Previously researchers are required to develop their own method of assigning GI values to foods, or adopt methods developed by other researchers which often require slight modification to suit their own purpose. This makes comparison between studies difficult due to different methods used to assign GI values. Because of the subjective nature, the accuracy of the assigned values has also been criticized (Flood et al., 2006; Jenab and Boffetta, 2010).

This issue may be addressed by developing and applying robust methodology to assign GI values to foods in standard/national food composition databases, which can then be utilized by researchers. Although there could still be differences in the methods used between countries, it could at least ensure standardization within countries. The cross-country differences could also be justified due to the differences in food composition and food supply, similar to the differences seen for other nutrients. Research groups in the US (Martin et al., 2008; Schakel et al., 2008), UK (Levis et al., 2011), Malaysia (Shyam et al., 2012), and Finland (Kaartinen et al., 2010) have produced food composition databases completed with GI values.

In addition to the benefits to the research community, producing a standard GI database could also assist health professionals to put the GI concept in practice by allowing easy assessment of the dietary GI of their clients/patients. A nutrition analysis package commonly used by dietitians in Australia, FoodWorks (Xyris Software, Spring Hill, QLD, Australia), has an inbuilt function to analyse dietary GI when appropriate data are available.

Despite the benefits, a food composition database with complete GI data is not available in Australia. We therefore aimed to document the methods we used to assign GI values to food items in an Australian national food composition database, AUSNUT2007 (Food Standards Australia New Zealand, 2008); and provide the resultant database for use by other researchers and health professionals.

2. Materials and method

2.1. Assignment and update of GI values

The current work was largely based on our previous work on the secondary analysis of the 2007 Australian National Children Nutrition and Physical Activity Survey, completed in 2009 (Louie et al., 2011a), where we have assigned GI values to the majority of foods included in AUSNUT2007 ($n = 3634$, 94% of all foods in AUSNUT2007). Since then new analytical values have become available, and a dietitian experienced in the GI assignment process (JCYL) has therefore updated the database with the new values and assigned GI values to the remaining foods without a GI. Based on a modified version of a method previously described by us (Fig. 1) (Louie et al., 2011b), we assigned GI values to all of the 3871 foods included in AUSNUT2007 (Food Standards Australia New Zealand, 2008). AUSNUT2007 is a food composition database compiled by FSANZ for the analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey (Commonwealth, 2008). It contains complete data for 37 common nutrients for 3874 foods, as well as pre-defined linkages of branded items with generic items. Foods in AUSNUT2007 were classified into 23 broad food categories (University of South Australia, 2009a). Percentage change in weight due to cooking is also provided. Nutrient data of 1233 (32%) foods in AUSNUT2007 were based on data from NUTTAB2006 (Food Standards Australia New Zealand, 2006), a food composition database with mainly chemically analysed data. Data for the remaining 2641 foods were derived using a 'recipe approach' based on standard recipes ($n = 2153$); from food labels ($n = 236$); calculated or imputed ($n = 105$); borrowed from the 1995 National Nutrition Survey database ($n = 81$) or similar items in overseas food composition databases ($n = 61$); or obtained from

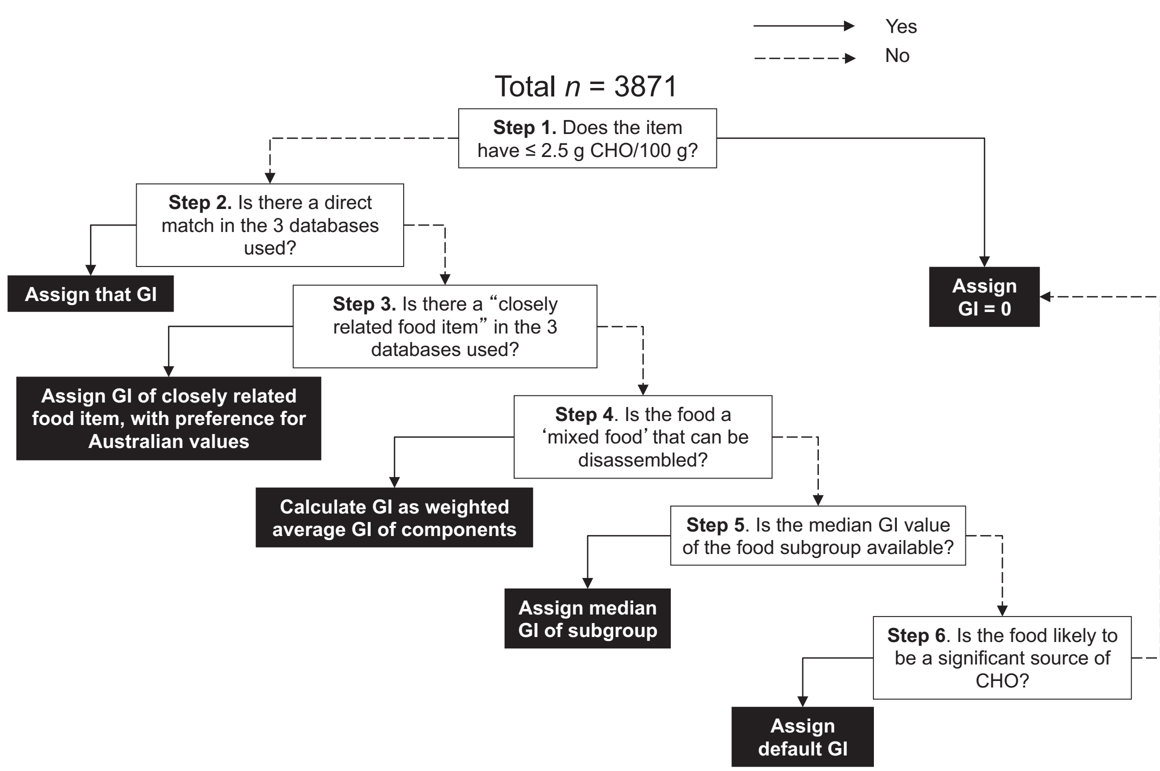

Fig. 1. Decision algorithm for GI value assignment. Boxes in black indicate decision end points. Modified from Fig. 2 in Louie et al. (2011b).

food manufacturers ($n = 5$). Three out of the 3874 food items in AUSNUT2007 had a duplicate entry, which were removed to produce the final database with 3871 foods.

AUSNUT2007 was chosen over the other two recent Australian food composition databases, NUTTAB2006 (Food Standards Australia New Zealand, 2006) or NUTTAB2010 (Food Standards Australia New Zealand, 2011), because it contained more foods with complete data for 37 common nutrients, and provided pre-defined linkage of branded items with generic items (Sobolewski et al., 2010). AUSNUT2007 is the preferred choice of food composition database for many Australian nutrition professionals as it contains a large range of commercially available foods and is the most current complete Australian food composition database.

The following modifications were made to the original method: Step 1 in the original method was omitted because the GI values in the FoodWorks GI database were > 10 years old. To enhance the accuracy, the cut-off used in Step 2 in the original method was also reduced from 5 g available carbohydrates per 100 g to 2.5 g available carbohydrates per 100 g (Step 1 of the method outlined in this paper). We have also added a new step (Step 4) in the decision algorithm to deal with mixed meals, where the weighted average GI (Wolever et al., 2006) of their components were assigned regardless of the availability of a tested value.

For the purpose of this study, whenever possible, only Australian GI values were used to ensure better representation of the characteristics of Australian foods. Values from subjects with diabetes (GI_{diab}) were only used when no values from healthy subjects ($GI_{healthy}$) were available, and the values were converted to $GI_{healthy}$ using the equation: $GI_{healthy} = (GI_{diab} - 9.7)/0.9$ (Atkinson et al., 2008).

2.2. Sources of glycaemic index values

The GI values were sourced from one of the following data tables: (1) The International Table of Glycaemic Index and Glycaemic Load Values (Atkinson et al., 2008) which serves as the primary data source; (2) the Sydney University Glycaemic Index Research Service online database (Sydney University Glycemic Index Research Service, 2012) which contains values tested after the publication of #1; (3) a study of Chinese foods by Chen et al. (2010) published after the publication of #1. If the GI values from the source databases were in the white bread scale, they were converted into the glucose scale by the formula: $GI_{glucose\ scale} = GI_{white\ bread\ scale} \times 0.7$.

2.3. Independent check

The final GI values were independently reviewed by two dietitians experienced in GI testing (FSA and AWB) to ensure accuracy and appropriateness.

2.4. Statistical analysis

All statistical analyses were performed in IBM SPSS (version 19.0, IBM Australia, Lane Cove, NSW, Australia). Paired samples t-test was used to test for difference between the 2009 and the current assigned value, and the mean $\pm$ SD difference was also calculated. The results were further stratified by food groups used in the 2007 Australian National Children's Nutrition and Physical Activity Survey (University of South Australia, 2009b). The proportion of foods in each food group with GI values assigned at each step was also examined.

3. Results

A complete list of GI values of Food Standards Australia New Zealand (2008) is available at http://www.glycemicindex.com/AUSNUT2007_list.html. Following the steps outlined in Fig. 1, 1124 (29%) foods had less than 2.5 g of available carbohydrates per 100 g and were assigned a GI of 0 (Step 1). There were 416 (11%) foods which have a direct match in one of the three data tables used (Step 2), and 1793 (46%) were assigned the GI value of a 'closely related' food item (Step 3). GI values of 135 foods were calculated using the weighted average GI method (Step 4). There were 391 (10%) foods which were assigned the median GI of their corresponding food subgroup (Step 5), and 12 (<1%) foods were assigned a GI of 0 because they were deemed not to be a significant source of carbohydrate in portions normally consumed in Australian diets (Step 6).

Higher proportions of foods in 'Fats and oils' (100%), 'Egg products and dishes' (91.3%), 'Meat, poultry and game products and dishes' (74.1%) and 'Alcoholic beverages' had less than 2.5 g available carbohydrates per 100 g; and most other food groups had the majority of GI values assigned at Step 3 (Table 1). 'Savoury sauces and condiments' had the highest proportion (80%) of GI assigned at Step 5 (i.e. median of subgroup), followed by 'Miscellaneous' (45.9%). Of the 2208 foods with a GI value assigned in Step 2 or Step 3, 1472 (67%) had an Australian specific GI.

Of the 3871 foods in AUSNUT2007 (Food Standards Australia New Zealand, 2008), 240 foods did not receive a GI value when we first assigned GI values to foods in 2009. For the 3634 foods which received a GI value in the 2009 assignment, 1954 (53.8%) had an updated GI value in the current revision. For example 'Milk, oat, fluid' was assign a GI of 0 in the 2009 assignment, which has been updated to 86 in the 2012 revision. Among these 3634 foods, the mean $\pm$ SD difference between the 2009 and current assigned values are +3.0 $\pm$ 16.0 units ($p < 0.001$; Table 2). The GI values of foods in 'Infant formulae and foods' (+30.2 $\pm$ 27.4 units; $p < 0.001$), 'Soups' (+12.7 $\pm$ 23.3 units; $p < 0.001$) and 'Special dietary foods' (-15.3 ± 12.1 units; $p = 0.003$) were found to have the biggest discrepancy between 2009 and the current revision. Values from diabetic subjects were used in 221 food items (6%).

4. Discussion

To our knowledge, this is the first attempt to assign GI values to all foods contained in an Australian national food composition database. In the current revision, more than 50% of the foods have had their GI values updated. This was mainly because we opted to use Australian specific GI values whenever possible as the database is intended for use mainly within Australia. Using national specific GI values allows better representation of the composition of foods of a particular country, and was a standard practice when GI values were added to other national food composition databases (Levis et al., 2011; Martin et al., 2008; Schakel et al., 2008). Variation in food manufacturing practice, cultivars, soil properties and climate are some examples of factors that may cause differences in the GI values of the same foods from different countries as seen in the International Glycaemic Index and Glycaemic Load tables (Atkinson et al., 2008). The differences in the GI assigned in 2009 and the current revision could also be attributed to the reduction in the cut-off used in Step 1 (5 g available carbohydrates per 100 g in 2009 *vs.* 2.5 g available carbohydrates per 100 g in the current revision). Although foods with less than 5 g available carbohydrates per 100 g are unlikely to cause a noticeable increase in postprandial glycaemia, when several of these foods are consumed as part of a mixed meal, the total available carbohydrate from these 'low carbohydrate foods' may increase postprandial blood glucose levels (Schakel et al., 2008). The reduction in the cut-off to 2.5 g available carbohydrate per 100 g allowed more foods to receive a GI value other than 0, which would allow the effect of these 'low carbohydrate foods' when consumed as part of a mixed meal be adequately accounted for. We believe foods with less than 2.5 g available carbohydrates per 100 g are unlikely to be consumed in

Table 1
Number of foods with glycaemic index (GI) assigned at each steps.

Food categories	N	Steps[a]					
		1	2	3	4	5	6
Non-alcoholic beverages	280	30	45	199	0	6	0
Cereals and cereal products	392	0	125	247	14	6	0
Cereal based products and dishes	528	0	36	357	118	17	0
Fats and oils	96	96	0	0	0	0	0
Fish and seafood products and dishes	226	137	8	70	1	10	0
Fruit products and dishes	168	4	50	106	0	8	0
Egg products and dishes	23	21	0	1	0	1	0
Meat, poultry and game products and dishes	868	643	2	180	1	42	0
Milk products and dishes	297	35	46	191	0	25	0
Dairy substitutes	48	1	24	22	0	0	1
Soups	74	4	2	54	0	14	0
Seed and nut products and dishes	46	6	3	23	0	14	0
Savoury sauces and condiments	95	10	0	9	1	75	0
Vegetable products and dishes	350	86	16	137	0	111	0
Legume and pulse products and dishes	50	6	11	27	0	6	0
Snack foods	28	0	9	17	0	2	0
Sugar products and dishes	60	0	18	39	0	3	0
Confectionery and cereal/nut/fruit/seed bars	112	0	14	82	0	16	0
Alcoholic beverages	25	16	0	8	0	1	0
Special dietary foods	10	0	3	7	0	0	0
Miscellaneous	74	29	0	0	0	34	11
Infant formulae and foods	21	0	4	17	0	0	0
All food groups	3871	1124	416	1793	135	391	12

[a] Step 1, assign GI = 0 for foods with ≤2.5 g carbohydrates per 100 g; Step 2, assign GI value of a direct match in the three data sources used; Step 3, assign GI value of a 'closely related food item' in the three data sources used; Step 4, calculate GI as weighed average GI of components; Step 5, assigned median GI of subgroups; Step 6, assign default GI.

sufficient amount to cause any changes to postprandial glycaemia, e.g. if a food contains 2.5 g available carbohydrates per 100 g, 700 g of this food needs to be consumed to provide 15 g of available carbohydrate (equivalent to one carbohydrate exchange).

Unlike a food frequency questionnaire (FFQ), where the analysis is based on a predefined list of food groups rather than individual items, analysing dietary GI/GL of more detailed dietary assessment methods such as 24 h recalls and food records requires much more GI data for accurate assessment. For example, in the analysis of a 122-item FFQ used in a previous study (Gopinath et al., 2012), 243 items were used to translate the FFQ answers into dietary GI and GL; in contrast, in other types of dietary assessment methods, the number and types of foods a participant/client can report could be virtually unlimited. Therefore a complete set of GI data is required to produce valid and reliable assessment of dietary GI and GL.

By producing a standardized GI database for use in Australia, this allows improved cross-study comparison of future Australian studies by reducing errors introduced from different methods used in GI assignment. In addition, because the nutrition analysis package commonly used in Australia already incorporates an inbuilt function to analyse dietary GI and GL, our database will also allow easier and more precise assessment of dietary GI and GL. This has been a challenge for Australian dietitians and health professionals in routine practice due to the lack of reliable tools.

Table 2
Mean (SD) glycaemic index (GI) and difference between the GI values assigned in 2009 and 2012 by major food categories.

Food categories	n	Mean GI 2009	Mean GI 2012	Δ	p-Value
Non-alcoholic beverages	275	41.2 (21.2)	44.8 (20.3)	+3.6 (18.3)	0.001
Cereals and cereal products	377	62.1 (11.3)	61.1 (12.7)	−1.0 (10.1)	0.058
Cereal based products and dishes	515	56.2 (17.2)	59.3 (15.7)	+3.1 (14.8)	<0.001
Fats and oils	88	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	–
Fish and seafood products and dishes	189	7.5 (16.3)	14.0 (16.0)	+6.5 (16.3)	<0.001
Fruit products and dishes	152	43.8 (15.6)	45.8 (14.0)	+2.0 (12.3)	0.046
Egg products and dishes	23	0.0 (0.0)	2.8 (13.6)	+2.8 (13.6)	0.328
Meat, poultry and game products and dishes	813	5.6 (15.1)	9.7 (17.5)	+4.1 (15.2)	<0.001
Milk products and dishes	297	27.6 (15.8)	25.7 (15.6)	−1.8 (12.1)	0.009
Dairy substitutes	46	44.1 (14.8)	40.4 (18.7)	−3.7 (16.4)	0.133
Soups	70	37.5 (20.6)	50.2 (17.2)	+12.7 (23.3)	<0.001
Seed and nut products and dishes	45	7.4 (11.7)	15.9 (9.4)	+8.6 (13.9)	<0.001
Savoury sauces and condiments	94	19.1 (23.8)	23.8 (17.3)	+4.7 (21.2)	0.035
Vegetable products and dishes	311	27.2 (34.2)	33.6 (30.2)	+6.3 (23.2)	<0.001
Legume and pulse products and dishes	47	31.1 (19.1)	31.5 (17.2)	+0.4 (17.5)	0.885
Snack foods	28	57.6 (16.3)	63.6 (11.5)	+6.1 (15.3)	0.045
Sugar products and dishes	44	55.6 (12.9)	56.7 (13.8)	+1.2 (11.6)	0.509
Confectionery and cereal/nut/fruit/seed bars	109	54.7 (13.9)	54.4 (15.1)	−0.3 (12.9)	0.834
Alcoholic beverages	25	16.6 (27.7)	18.5 (28.0)	+1.9 (13.4)	0.491
Special dietary foods	10	48.7 (10.8)	33.5 (5.2)	−15.3 (12.1)	0.003
Miscellaneous	55	0.8 (6.1)	0.0 (0.0)	−0.8 (6.1)	0.322
Infant formulae and foods	21	25.2 (39.3)	55.4 (21.0)	+30.2 (27.4)	<0.001
All food groups	3634	31.0 (28.4)	34.0 (27.2)	+3.0 (16.0)	<0.001

p-Value tested by paired-sample *t*-test.

Similar to other food composition databases in general, there are limitations of this GI database of Australian foods that users should take into account. First, although best effort has been made to select the closest match, around 50% of the foods in this database had assigned GI values based on similar foods. Second, although there are some pre-defined mixed dishes in this database (e.g. sushi, sandwiches, etc.), wherever possible the single component food items should be used to calculate the average GI of a mixed item/meal. For example, the GI of a breakfast containing cereal and milk should be determined by the weighted average GI of individual components, rather than the measured GI of that mixed meal (Wolever and Bhaskaran, 2012; Wolever et al., 2006). As a general rule, if the mixed dish or meal can be 'disassembled' into component foods that have been tested in the same physical state (e.g. the bread roll in a hamburger or the pizza base in a pizza), then the weighted average value of all the component foods should be assigned. This ensures a level playing field for *all* mixed meals that contain varying amounts of protein, fat and carbohydrate. On the other hand, foods such as cakes and biscuits cannot be disassembled and should be assigned a value similar to a previously tested cake or biscuit. If a user enters a cake recipe in a nutrition analysis package that uses the weighted average GI method to calculate the GI of the recipe, this is likely to over-estimate the GI. Software vendors are therefore advised to create prompts to ask user to override the GI of the recipe with a similar item from the database.

Third, about one third of the GI values assigned based on exact match or similar foods in this database were sourced from non-Australian studies, which may not truly reflect the Australian food supply, and ideally these values should be updated once the data become available. Also, this database contains only generically described food items, and therefore the GI values assigned were not brand specific. Data from the International Table of Glycaemic Index and Glycaemic Load (Atkinson et al., 2008) suggests that there could be considerable variability between brands for the same food (e.g. the GI of rye breads ranges from 40 to 86). It is possible to extrapolate the generic nutrient data to create a branded database, and override the GI values with brand specific GIs.

In addition, the limitations of assigning GI values in a food composition database should be noted. The GI value is a characteristic of a single food and not the meal in which it is consumed. It may not be representative of all foods in its class because different manufacturers prepare and process foods, particularly cereal products, in different ways. This variability is not unique to the GI, but true of many nutrients, including saturated fat and fiber. Actual glycaemic responses will vary, depending on the other foods consumed at the time, whether they are high in fat or protein or soluble fibre. GI values also vary because of methodological differences between laboratories (Wolever et al., 2008). For all these reasons, the calculated average dietary GI may not reflect the day-to-day glycaemic experience of a given individual. Although the GI values used in the coding of the AUSNUT2007 database were based on the best available published data for the GI values of foods, the reliability and precision of the published GI data is limited by the quality of the original research and this may impact on our coding. The GI values used in the coding were chosen based on the following criteria: tested in at least 8 healthy subjects, showed acceptable levels of variability (standard error of mean < 12) and were tested using a method consistent with the International methodology (ISO/FDIS:26642:2010). Whilst we believe these criteria ensure only GI values tested based on standardized protocol were used in our assignment, user of this database should take into account the potential limitation(s) of the original data sources, and caution should be applied in interpreting the final analysed GI values of meals and whole diets generated by food composition databases.

Lastly, we acknowledge that no external review of the database was conducted. However, our group is the only group in Australia who has extensive experience in the testing the GI of a variety of food products, and who had previously published three international tables of glycaemic index values (Atkinson et al., 2008; Foster-Powell and Brand-Miller, 1995; Foster-Powell et al., 2002) as well as a methodology paper on how to assign glycaemic index to foods in a 24 h recall database (Louie et al., 2011b). By providing all the GI values as an online database we invite researchers in the field to scrutinize the database and inform us of disagreement.

5. Conclusion

Acknowledging its limitations, this database will enhance the utility of the GI concept in both the research and clinical setting in Australia.

Authors' contribution

All authors were involved in the conception of the study. JCYL was responsible for the early development of the methodology. All authors provided substantial intellectual input into the further development and refinement of the methodology. JCYL assigned glycaemic index to the food items in AUSNUT2007 using the method described, and drafted the manuscript. All authors reviewed the final values in the database, were involved in the subsequent edits of the manuscript, and have read and approved the final manuscript.

Conflict of interest

JCBM, AWB and FSA are co-authors of The New Glucose Revolution and Low GI Diet books (Hachette Livre Australia and Da Capo Press, North America). JCBM and FSA are directors of a not-for-profit GI-based food endorsement program in Australia, and manage the University of Sydney GI testing service. AWB is the Chief Scientific Officer of a not-for-profit GI-based food endorsement program in Australia. All other authors declare they have no conflict of interest.

Supplementary information

Supplementary information is available at http://www.glycemicindex.com/AUSNUT2007_list.html.

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No external funding was applied to this project. Permission has been granted from Food Standards Australia and New Zealand to reproduce the 'food ID' and 'food name' of the foods in AUSNUT2007. The authors are responsible for the accuracy and the reliability of the glycaemic index data presented in the database (available at http://www.glycemicindex.com/AUSNUT2007_list.html). The glycaemic index database is not produced by, or is in anyway associated with or endorsed by Food Standards Australia and New Zealand.

References

Atkinson, F.S., Foster-Powell, K., Brand-Miller, J.C., 2008. International tables of glycemic index and glycemic load values: 2008. Diabetes Care 31 (12), 2281–2283.

Barclay, A.W., Petocz, P., McMillan-Price, J., Flood, V.M., Prvan, T., Mitchell, P., Brand-Miller, J.C., 2008. Glycemic index, glycemic load, and chronic disease risk—a meta-analysis of observational studies. American Journal of Clinical Nutrition 87, 627–637.

Brand-Miller, J.C., Stockmann, K., Atkinson, F., Petocz, P., Denyer, G., 2009. Glycemic index, postprandial glycemia, and the shape of the curve in healthy subjects: analysis of a database of more than 1000 foods. American Journal of Clinical Nutrition 89 (1), 97–105.

Chen, Y.J., Sun, F.H., Wong, S.H., Huang, Y.J., 2010. Glycemic index and glycemic load of selected Chinese traditional foods. World Journal of Gastroenterology: WJG 16 (12), 1512–1517.

Commonwealth Scientific Industrial Research Organisation (Australia), Preventative Health National Research Flagship, The University of South Australia, 2008. 2007 Australian National Children's Nutrition and Physical Activity Surveys—Main Findings. Department of Health and Ageing (Australia), Canberra, Australia.

Fleming, P., Godwin, M., 2013. Low-glycaemic index diets in the management of blood lipids: a systematic review and meta-analysis. Family Practice 30 (5), 485–491.

Flood, A., Subar, A.F., Hull, S.G., Zimmerman, T.P., Jenkins, D.J.A., Schatzkin, A., 2006. Methodology for adding glycemic load values to the National Cancer Institute Diet History Questionnaire Database. Journal of American Dietetic Association 106 (3), 393–402.

Food Standards Australia New Zealand, 2006. NUTTAB2006. FSANZ. Canberra, ACT, Australia.

Food Standards Australia New Zealand, 2008. AUSNUT FSANZ. Canberra, ACT, Australia.

Food Standards Australia New Zealand, 2011. NUTTAB2010. FSANZ. Canberra, ACT, Australia.

Foster-Powell, K., Brand-Miller, J., 1995. International tables of glycemic index. American Journal of Clinical Nutrition 62 (4), 871S–890S.

Foster-Powell, K., Holt, S.H., Brand-Miller, J.C., 2002. International table of glycemic index and glycemic load values: 2002. The American Journal of Clinical Nutrition 76 (1), 5–56.

Gopinath, B., Flood, V.M., Wang, J.J., Smith, W., Rochtchina, E., Louie, J.C., Wong, T.Y., Brand-Miller, J., Mitchell, P., 2012. Carbohydrate nutrition is associated with changes in the retinal vascular structure and branching pattern in children. American Journal of Clinical Nutrition 95 (5), 1215–1222.

Greenwood, D.C., Threapleton, D.E., Evans, C.E., Cleghorn, C.L., Nykjaer, C., Woodhead, C., Burley, V.J., 2013. Glycemic index, glycemic load, carbohydrates, and type 2 diabetes: systematic review and dose-response meta-analysis of prospective studies. Diabetes Care 36 (12), 4166–4171.

Jenab, M., Boffetta, P., 2010. Glycemic index and glycemic load: application in observational studies and association with hepatocellular carcinoma risk. Meaningful or error prone? Annals of Oncology 21 (3), 437–439.

Kaartinen, N.E., Simila, M.E., Pakkala, H., Korhonen, T., Mannisto, S., Valsta, L.M., 2010. Glycaemic index values in the Finnish food composition database: an approach to standardised value documentation. European Journal of Clinical Nutrition 64 (Suppl. 3), S68L 72.

Levis, S.P., McGowan, C.A., McAuliffe, F.M., 2011. Methodology for adding and amending glycaemic index values to a nutrition analysis package. The British Journal of Nutrition 105 (8), 1117–1132.

Livesey, G., Taylor, R., Livesey, H., Liu, S., 2013. Is there a dose–response relation of dietary glycemic load to risk of type 2 diabetes? Meta-analysis of prospective cohort studies. American Journal of Clinical Nutrition 97 (3), 584–596.

Louie, J.C., Buyken, A.E., Heyer, K., Flood, V.M., 2011a. Dietary glycaemic index and glycaemic load among Australian children and adolescents. The British Journal of Nutrition 106 (8), 1273–1282.

Louie, J.C., Flood, V., Turner, N., Everingham, C., Gwynn, J., 2011b. Methodology for adding glycemic index values to 24-hour recalls. Nutrition 27 (1), 59–64.

Ludwig, D.S., 2002. The glycemic index: physiological mechanisms relating to obesity, diabetes, and cardiovascular disease. JAMA: The Journal of the American Medical Association 287 (18), 2414–2423.

Martin, C.L., Murphy, S.P., Au, D.L.M., 2008. Compiling glycemic index and glycemic load values for addition to a food composition database. Journal of Food Composition and Analysis 21 (6), 469–473.

Mirrahimi, A., de Souza, R.J., Chiavaroli, L., Sievenpiper, J.L., Beyene, J., Hanley, A.J., Augustin, L.S., Kendall, C.W., Jenkins, D.J., 2012. Associations of glycemic index and load with coronary heart disease events: a systematic review and meta-analysis of prospective cohorts. Journal of the American Heart Association 1 (5), e000752.

Rouhani, M.H., Salehi-Abargouei, A., Azadbakht, L., 2013. Effect of glycemic index and glycemic load on energy intake in children. Nutrition 29 (9), 1100–1105.

Salmeron, J., Ascherio, A., Rimm, E.B., Colditz, G.A., Spiegelman, D., Jenkins, D.J., Stampfer, M.J., Wing, A.L., Willett, W.C., 1997. Dietary fiber, glycemic load, and risk of NIDDM in men. Diabetes Care 20 (4), 545–550.

Salmerón, J., Manson, J.E., Stampfer, M.J., Colditz, G.A., Wing, A.L., Willett, W.C., 1997. Dietary fiber, glycemic load, and risk of non—insulin-dependent diabetes mellitus in women. JAMA: The Journal of the American Medical Association 277 (6), 472–477.

Schakel, S., Schauer, R., Himes, J., Harnack, L., Van Heel, N., 2008. Development of a glycemic index database for dietary assessment. Journal of Food Composition and Analysis 21 (Supplement(0)), S50–S55.

Schwingshackl, L., Hoffmann, G., 2013. Long-term effects of low glycemic index/load vs. high glycemic index/load diets on parameters of obesity and obesity-associated risks: a systematic review and meta-analysis. Nutrition, Metabolism, and Cardiovascular Diseases: NMCD 23 (8), 699–706.

Shyam, S., Wai, T.N., Arshad, F., 2012. Adding glycaemic index and glycaemic load functionality to DietPLUS, a Malaysian food composition database and diet intake calculator. Asia Pacific Journal of Clinical Nutrition 21 (2), 201–208.

Sobolewski, R., Cunningham, J., Mackerras, D., 2010. Which Australian food composition database should I use? Nutrition & Dietetics 67 (1), 37–40.

Solomon, T.P., Haus, J.M., Kelly, K.R., Cook, M.D., Filion, J., Rocco, M., Kashyap, S.R., Watanabe, R.M., Barkoukis, H., Kirwan, J.P., 2010. A low-glycemic index diet combined with exercise reduces insulin resistance, postprandial hyperinsulinemia, and glucose-dependent insulinotropic polypeptide responses in obese, prediabetic humans. American Journal of Clinical Nutrition 92 (6), 1359–1368.

Sydney University Glycemic Index Research Service, 2012. GlycemicIndex.com.

University of South Australia, 2009. Australian Commonwealth Scientific and Research Organization, i-View Pty Ltd. User Guide - 2007 Australian National Children's Nutrition and Physical Activity Survey. Australian Department of Health and Ageing, Canberra.

University of South Australia, 2009. Australian Commonwealth Scientific and Research Organization, i-View Pty Ltd. User Guide - 2007 Australian National Children's Nutrition and Physical Activity Survey. Australian Department of Health and Ageing, Canberra.

Wolever, T.M., Bhaskaran, K., 2012. Use of glycemic index to estimate mixed-meal glycemic response. American Journal of Clinical Nutrition 95 (1), 257–258, 256-257; author reply.

Wolever, T.M., Brand-Miller, J.C., Abernethy, J., Astrup, A., Atkinson, F., Axelsen, M., Björck, I., Brighenti, F., Brown, R., Brynes, A., Casiraghi, M.C., Cazaubiel, M., Dahlqvist, L., Delport, E., Denyer, G.S., Erba, D., Frost, G., Granfeldt, Y., Hampton, S., Hart, V.A., Hätönen, K.A., Henry, C.J., Hertzler, S., Hull, S., Jerling, J., Johnston, K.L., Lightowler, H., Mann, N., Morgan, L., Panlasigui, L.N., Pelkman, C., Perry, T., Pfeiffer, A.F., Pieters, M., Dan Ramdath, D., Ramsingh, R.T., Robert, S.D., Robinson, C., Sarkkinen, E., Scazzina, F., Sison, D.C.D., Sloth, B., Staniforth, J., Tapola, N., Valsta, L.M., Verkooijen, I., Weickert, M.O., Weseler, A.R., Wilkie, P., Zhang, J., 2008. Measuring the glycemic index of foods: interlaboratory study. The American Journal of Clinical Nutrition 87 (1), 247S–257S.

Wolever, T.M., Yang, M., Zeng, X.Y., Atkinson, F., Brand-Miller, J.C., 2006. Food glycemic index, as given in glycemic index tables, is a significant determinant of glycemic responses elicited by composite breakfast meals. American Journal of Clinical Nutrition 83 (6), 1306–1312.