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Development of a matching file of Australian food composition databases (AUSNUT 2007 to 2011-13)

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Abstract

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Development of a matching file of Australian food composition databases (AUSNUT 2007 to 2011-13)

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Changes to the food supply and analytical methods necessitate updating food composition databases over time. In Australia, survey-specific databases include AUSNUT 1999, 2007, and 2011-13. There is no standardized method to match AUSNUT 2007 foods to 2011-13 counterparts. This study aimed to develop an AUSNUT 2007 to 2011-13 matching file, and demonstrate its use in the clinical trial context. Food items aligned with AUSNUT 2007 were back-matched to 1999 and then forward to 2011-13 using food identification codes and existing matching files. Any unmatched AUSNUT 2007 foods were manually matched to appropriate 2011-13 foods based on conceptual and nutritional similarities. The file was then applied to clinical trial data originally collected using AUSNUT 2007. Of the n=3874 products in AUSNUT 2007, n=1270 were initially matched to 2011-13 equivalents using existing matching files. Of these foods, n=1070 were deemed to have an acceptable one-to-one match. A total of n=2804 AUSNUT 2007 foods required manual matching. Application to clinical trial data found small differences in nutrient intake between original and converted data. The AUSNUT 2007 to 2011-13 matching file will facilitate conversion of dietary data originally collected using AUSNUT 2007 into 2011-13 foods and groups, and to allow re-coding of intake data.

1. Introduction

Changes in the food supply and improvements in analytical methods necessitate updating food composition databases over time (Cunningham et al., 2010; Duffy and Sobolewski, 2008; Greenfield and Southgate, 2003). In Australia, the food composition program has led to the development of databases including the predominantly analytical NUTTAB (nutrient tables) series of reference databases, and the AUSNUT (Australian food and nutrient database) series of food composition databases designed for analyses of dietary survey data (Probst and Cunningham, 2015; Sobolewski et al., 2010). The AUSNUT series of databases contain complete nutrient information for all foods, as well as generic food items (Sobolewski et al., 2010), and are recommended for analyses of dietary intake data from clinical trials. The AUSNUT series of databases are based on the predominately analytical NUTTAB databases, with the addition of data borrowed from overseas databases, obtained from product labels, or determined by calculation (Probst and Cunningham, 2015). During database development, additional analytical values are also obtained from dedicated analytical programs targeting key foods which are significant contributors to nutrient intakes or those with limited or outdated data (Duffy and Sobolewski, 2008; Food Standards Australia New Zealand, 2012a).

Databases in the AUSNUT series include AUSNUT 1999 (Food Standards Australia New Zealand, 1999), 2007 (Food Standards Australia New Zealand, 2008d), and the recently released 2011-13 (Food Standards Australia New Zealand, 2014d). AUSNUT 1999 and AUSNUT 2011-13 were designed in line with the analysis of representative population-wide national nutrition surveys (Australian Bureau of Statistics, 1998, 2013), whilst AUSNUT 2007 was developed for the analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey (CNPAS), which involved only children aged two to 16 years of age (Australian

Government Department of Health and Ageing, 2008). Until the release of AUSNUT 2011-13, AUSNUT 2007 was the most timely food composition survey database available in Australia, and has been widely applied in nutrition research (Elliott et al., 2014; Golley et al., 2015; Louie et al., 2015; Meng et al., 2010; Neale et al., 2013; Tapsell et al., 2014; Tapsell et al., 2015; Waern et al., 2015; Wood et al., 2014).

Differences in food and nutrient information and data processing requirements, as well as inherent changes in the food supply and consumption patterns, have meant that data collected in earlier food composition databases cannot be automatically updated to a newer version (Cunningham et al., 2010; Probst and Mamet, unpublished data). Furthermore, food classification systems used in these databases (which often include nested hierarchical food groupings) also vary between survey databases, impeding direct comparison of food group consumption patterns between databases. These food groupings often relate to the unique food identification codes given to individual food items within the database. A systematic method for updating food composition data to the most recent survey database (2011-13) is therefore required.

In Australia, food composition database developers have previously released tools to allow dietary data collected with earlier food composition databases to be updated to the most recent database. For this purpose, Food Standards Australia New Zealand (FSANZ) have developed matching files, which match the codes of corresponding foods between databases, to highlight compatible foods in each database (Cunningham et al., 2010). While FSANZ have developed matching files to allow users to convert data between AUSNUT 1999 and 2007 (Food Standards Australia New Zealand, 2008e), and between AUSNUT 1999 and 2011-13 (Food Standards Australia New Zealand, 2014c), there is currently no standardized method to match

AUSNUT 2007 foods to their 2011-13 counterparts. This presents challenges for dietary data collected using AUSNUT 2007 which requires conversion to 2011-13 for the use of updated food classification systems or nutrient information (the number of included nutrients increased from 37 in AUSNUT 2007 to 51 in AUSNUT 2011-13, with new nutrients including vitamin B12, selenium, and eicosapentaenoic, and docosahexaenoic acids (Probst and Cunningham, 2015)). It must also be acknowledged that whilst these food composition databases have been designed for the analysis of specific surveys, in practice they are used in a range of settings, including food-based clinical trials. Therefore, when designing a database conversion tool, database developers need to consider its utility in the nutrition research setting.

The aim of this study was to develop an AUSNUT 2007 to 2011-13 matching file, for the purposes of converting food and nutrient data between food composition databases. We further demonstrated the application of the matching file in the context of a food-based clinical trial.

2. Materials and Methods

2.1 Development of the AUSNUT 2007 to 2011-13 matching file

The AUSNUT 2007 to 2011-13 matching file was developed using a systematic process illustrated in Figure 1. For this process foods matched backward in time (2007 to 1999) are referred to as 'back-matched' while those matched forward in time (1999 to 2007) are referred to as 'forward-matched'. Following the initial development of the matching file, food matches were confirmed by a 100% audit. The audit was conducted twice by Accredited Practising Dietitians of increasing research experience, with inconsistencies discussed between two senior members of the research team (EN and YP).

The process followed a three staged approach as illustrated in Figure 1.

Stage 1: Applying existing FSANZ matching files

Implementation of the existing FSANZ matching files (Food Standards Australia New Zealand, 2008e, 2014c) occurred initially in Stage 1. In brief, food items aligned with AUSNUT 2007 were back-matched to 1999 based on their unique food survey identification codes, using the FSANZ AUSNUT 1999 to 2007 matching file (Food Standards Australia New Zealand, 2008e) (Step 1.1). Once in 1999 form, food items were then forward-matched to 2011-13 using the FSANZ AUSNUT 1999 to 2011-13 matching file (Food Standards Australia New Zealand, 2014c) (Step 1.2). All matching was conducted using the VLOOKUP function in Microsoft Excel (Microsoft Corporation, 2010, Version 14.0.7).

Stage 2: Manual matching

Where foods could not be matched using existing matching files, manual matching was required. This was primarily informed by food descriptions in the AUSNUT 2007 food file (Food Standards Australia New Zealand, 2008b) and 2011-13 food details file (Food Standards Australia New Zealand, 2014a), with reference to the AUSNUT 2007 and 2011-13 recipe files (Food Standards Australia New Zealand, 2008c, 2014b) and where applicable, brand names associated with generic AUSNUT 2007 foods (Food Standards Australia New Zealand, 2008a) (Step 2.1). Matches made using existing FSANZ matching files in Stage 1 were also used to inform decisions made in Stage 2. This resulted in a one-to-one AUSNUT 2011-13 matched food for all 2007 foods (Step 2.2).

Specific considerations in the process of manual matching are outlined in further detail below.

Conceptually similar food matches: AUSNUT 2007 foods which could not be matched using existing FSANZ matching files were manually forward-matched to 2011-13 foods based on conceptual and nutrient similarities. For example the AUSNUT 2007 food: '*Beef, fillet, scotch, lean, fried, olive oil'* was matched to the 2011-13 food: '*Beef, scotch fillet, fully-trimmed, baked, roasted, fried, grilled or BBQ'd, olive oil'*. In order to align with the process used to develop the existing FSANZ matching files, conceptual similarities were prioritized.

Non-descript food items: AUSNUT 2007 *'not further specified'* foods (which were designed to be used when a survey participant did not adequately describe the food reported) were matched to 2011-13 *'not further defined'* foods (the term used for non-descript food items in 2011-13), where possible.

During the process of manual matching, food matches from Stage 1 were also reviewed, as outlined below:

Applying professional judgment to incorrect matches: In some instances the process of back-matching from AUSNUT 2007 to 1999 resulted in a food matched to a generic AUSNUT 1999 food, which could in turn lead to an incorrect 2011-13 food match. For example, using existing matching files, the AUSNUT 2007 food '*Breakfast cereal, flakes of corn, unfortified'* was back-matched to the 1999 food '*Breakfast cereal, flakes, corn, medium sugars'*, which in turn was forward-matched to the 2011-13 food *'Breakfast cereal, flakes of corn, added vitamins B1, B2, B3 & folate'*. In this example, professional judgement was applied and a more appropriate AUSNUT 2011-13 match was: '*Breakfast cereal, flakes of corn, unfortified'* as it was deemed to be conceptually more similar to the original AUSNUT 2007 food.

One to many food match instances: Food matches made using the existing matching files were also reviewed in the case that an AUSNUT 1999 food matched to more than one 2011-13 food item (for example AUSNUT 1999 food '*Tea, black, brewed from leaf or teabags, regular*', matched to both 2011-13 foods: '*Tea, regular, black, brewed from leaf or teabags, plain, without milk*' and '*Tea, jasmine, plain, without milk*'). In this case the most appropriate one-to-one match was chosen using the approach outlined in Step 2.1 (Figure 1).

Stage 3: Identification of "umbrella foods"

"Umbrella foods" were defined as AUSNUT 2007 foods which could be matched to more than one 2011-13 food, for example '*Meat, cooked, not further specified*'. All suitable AUSNUT 2011-13 matches were identified for each umbrella food using the manual matching process of Stage 2. This allows users to select their preferred match depending on the intended use of the file. It should be noted that a one-to-one match for each AUSNUT 2007 food is required for application of classification systems and conversion of nutrient intake, with umbrella foods and all suitable matches indicated in the matching file.

2.2 Application of the matching file in the clinical trial context

In order to demonstrate its use in the clinical trial context, the matching file was applied to baseline dietary data collected during the HealthTrack study, a randomised controlled trial aimed at exploring the effect of an interdisciplinary intervention on weight loss (Tapsell et al., 2015). Dietary data was collected using a paper-based four day food record, and was initially analysed in Foodworks © nutrient analysis software (Version 7, Xyris Software, QLD, Australia, 2012) using the AUSNUT 2007 database, as it was the most recent food composition survey database available at the time of study commencement. Ethics approval for the

HealthTrack study was granted by the University of Wollongong/Illawarra Shoalhaven Local

Health District Human Research Ethics Committee (HE13/189) and the study was registered

with the Australian New Zealand Clinical Trial Registry (ANZCTRN12614000581662).

The AUSNUT 2007 to 2011-13 matching file was applied to all foods reported in the study. The

one-to-one match displayed in the matching file was used for matching umbrella foods. New

foods and recipes created for specific products reported by study participants (not available in

AUSNUT 2007) were systematically matched to AUSNUT 2011-13 foods using the process

outlined in Step 2.1 (Figure 1). After application of the matching file, dietary data were

categorized according to AUSNUT 2011-13 "major food groups" using the first two digits of the

unique food identification codes. HealthTrack nutrient intake data was then updated to AUSNUT

2011-13.

2.3. Statistical analysis

Data analysis was conducted using SPSS (version 21.0, IBM Corp, Chicago IL, 2012).

To explore the effect of converting data on calculated nutrient intakes, macronutrient

consumption calculated using the original AUSNUT 2007 data and after conversion to 2011-13

was determined. Differences between total energy consumption before and after conversion was

also calculated for each "major food group". Wilcoxon signed ranks tests were used to test for

differences between the nutrient intakes obtained from the original AUSNUT 2007 data and after

conversion to 2011-13, for all data and by "major food group".

3. Results

3.1 Development of the AUSNUT 2007 to AUSNUT 2011-13 matching file

The AUSNUT 2007 to 2011-13 matching file is available as Supplementary Table S1. A list of all AUSNUT 2007 "umbrella foods" and their potential 2011-13 matches is provided in Supplementary Table S2.

Of the n=3874 foods and beverages in AUSNUT 2007, n=1270 (32.8%) were initially matched to 2011-13 equivalents using existing matching files (Stage 1) (Table 1). Of these foods, n=1070 were deemed to have an acceptable one-to-one match. A total of n=2804 AUSNUT 2007 foods required manual matching (Stage 2). Following the completion of the one-to-one matches, a total of n=340 AUSNUT 2007 foods were identified as being "umbrella foods" which could be matched to more than one 2011-13 food (Stage 3). Examples of AUSNUT 2007 foods matched to 2011-13 foods at each stage are shown in Table 2.

3.2 Application to the clinical trial context

A total of n=340 food records were available for the HealthTrack study at baseline, and n=259 new foods or recipes created specific to reported foods in the trial required manual matching. When macronutrient consumption was compared between AUSNUT 2007 foods and the 2011-13 matches, dietary data converted to AUSNUT 2011-13 foods was found to be significantly higher in energy, monounsaturated fat, total carbohydrate, and total dietary fibre, and significantly lower in saturated fat, although differences between databases were small (Table 3).

When HealthTrack clinical trial data was examined by food group, significant differences between energy intake calculated using the original AUSNUT 2007 and the converted 2011-13 data were found for 15 of the 21 "major food groups" (Table 4). The largest differences between AUSNUT 2011-13 and 2007 data were found for alcoholic and non-alcoholic beverages.

4. Discussion

To the authors' knowledge, this study is the first to develop an AUSNUT 2007 to 2011-13 matching file via a systematic approach. This addresses a current gap in the suite of available Australian food composition databases and their associated files. This file will enable nutrition researchers to convert dietary data initially collected via AUSNUT 2007 to 2011-13 foods, allowing for categorization of dietary data according to the most up-to-date food classification system, and for the analysis of dietary data using AUSNUT 2011-13 nutrients.

The 2011-13 Australian Health Survey (Australian Bureau of Statistics, 2013) required the development of AUSNUT 2011-13, the first Australian survey specific food composition database in six years and the first in 12 years for the adult population. Prior to the release of the 2011-13 database, AUSNUT 2007 was used widely in the nutrition literature (Elliott et al., 2014; Golley et al., 2015; Louie et al., 2015; Meng et al., 2010; Neale et al., 2013; Tapsell et al., 2014; Waern et al., 2015; Wood et al., 2014), including in recent research such as the HealthTrack study (Tapsell et al., 2015). This was despite the database being developed in line with a survey conducted in children only (Australian Government Department of Health and Ageing, 2008), which likely reflects the large number of new foods and recipes created for the analysis of dietary data reported by adults. Despite this, it is considered advisable to use the *most recent* food composition data and classification systems, as they more accurately reflect the food supply at the time of the study. The AUSNUT 2007 to 2011-13 matching file described here now provides nutrition researchers with a means to systematically update their data to the most current version for Australia.

The number of foods included in Australian food composition databases have fluctuated over time, from 4554 foods in AUSNUT 1999, to 3874 in AUSNUT 2007, and 5740 in AUSNUT 2011-13. As such, what might once have been a single food item may be represented by a number of foods in more recent databases, highlighting a challenge when developing matching files between food composition databases. To allow allocation of dietary data originally collected with AUSNUT 2007 into 2011-13 food groups the matching file created here required one-to-one matches for all AUSNUT 2007 foods. However, this process also identified "umbrella foods", AUSNUT 2007 foods which could be matched to more than one 2011-13 food. As a secondary feature of the matching file described in this paper, all AUSNUT 2011-13 matches for "umbrella foods" have been included. This allows researchers to choose the most appropriate match for their purposes.

Differences in study populations and database development methods present challenges for database developers when creating matching files for serial food composition databases. As AUSNUT 2007 was developed for the analysis of a survey limited to children, there was a high proportion of foods considered to be "children's foods", for example juices and child-specific muesli bars in comparison to other food composition databases developed for analysis of general population surveys. As a result, this presented challenges when finding appropriate matches in the AUSNUT 2011-13 database, which contained a smaller selection of such foods. Furthermore, during the development process outlined in this paper the authors noted the design of AUSNUT 2011-13 involved a greater emphasis on disaggregating mixed dishes into their individual components and a reduction in the use of generic 'not further specified' options than present in previous databases. This resulted in challenges when determining appropriate matches, and

highlights the importance of considering survey objectives and database development methods when designing matching files.

To assess the utility of the matching file in a clinical trial context, we applied the file to nutrient data originally collected using AUSNUT 2007 during the HealthTrack study. Comparison of nutrient intakes from the original AUSNUT 2007 data and that converted to 2011-13 using the matching file indicated that statistically significantly increases in reported energy, monounsaturated fat, total carbohydrate, and total dietary fibre, and decreases in saturated fat were found. However, it should be acknowledged that these differences were small (approximately 160kJ per day for example), and unlikely to be of clinical significance. Additional insights may be gained from the exploration of differences in energy intake by "major food groups". The largest differences were found between the original AUSNUT 2007 and converted energy data for alcoholic and non-alcoholic beverages. Exploration of the data revealed these differences were primarily due to differences between foods available in each database. For example the AUSNUT 2007 food '*Wine, red'* contained 9.57% v/v alcohol (Food Standards Australia New Zealand, 2008b), whereas the 2011-13 equivalent of the same name contained 12.0% v/v alcohol (Food Standards Australia New Zealand, 2014a), resulting in a greater energy contribution from the AUSNUT 2011-13 food. Similarly, the AUSNUT 2007 non-alcoholic beverage '*Coffee, from instant coffee powder, with full fat milk'* and similar products all contained substantially less milk than their AUSNUT 2011-13 matches. Whilst systematic approaches were used to allocate the closest match for all foods, in some cases such as those highlighted above, differences between foods available in the databases may have been responsible for the differences between energy contributions. Furthermore, changes to the food supply between 2007 and 2011-13, such as the addition or removal of products, as well as the

introduction of mandatory food fortification programs such as those for iodine and folate (Food Standards Australia New Zealand, 2012b), and public health campaigns for sodium (Webster et al., 2009) may result in unavoidable differences in the nutrient content of foods between the databases.

The development of the current matching file was strengthened by its systematic approach, which included an emphasis on quality appraisal via a 100% audit. Where possible, the methods used to develop the AUSNUT 2007 to 2011-13 matching file were largely informed by those used by FSANZ to develop existing matching files. Selection of AUSNUT 2011-13 foods for manual matches were also informed by AUSNUT 2007 and 2011-13 food details to ensure matches were conceptually similar.

Whilst the process of developing the matching file was largely designed to be similar to that used by FSANZ to create the existing AUSNUT matching files, in contrast to the FSANZ methods all AUSNUT 2007 foods were assigned a 2011-13 food match. This approach was chosen to facilitate its application in the clinical trial context. As a result of the methodological differences between databases described above, users should exercise caution when selecting matches based on broad '*not further specified*' or child-specific foods. It should also be noted that existing FSANZ matching files were not specifically developed for the purpose of converting nutrient data between databases. Whilst the current matching file can be used for this purpose, users should be aware that differences in definitions and classifications of foods between surveys may result in substantial differences in nutrient composition between matches, as demonstrated here. Further advances in analytical methods may also result in differences between databases. Despite this, the AUSNUT 2007 to 2011-13 matching file is most accurate

when being used to classify foods into "major food groups" (e.g., cereals and cereal products, vegetable products and dishes).

5. Conclusions

An AUSNUT 2007 to 2011-13 matching file was developed based on a systematic approach. This file will facilitate conversion of dietary data originally collected using AUSNUT 2007 into 2011-13 foods and food groups, to utilize the most up-to-date classification systems and allow re-coding of intake data. Development of a matching file requires consideration of design differences between food composition databases, as well as the planned application of the file.

Shari Tompsett (FSANZ) for providing information regarding the existing AUSNUT matching files.

Those interested in accessing the AUSNUT 2007 to AUSNUT 2011-13 matching file in Excel format can contact Elizabeth Neale (elizan@uow.edu.au)

Conflict of interest:

The authors declare that they have no conflict of interest.

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Figures:

Figure 1:
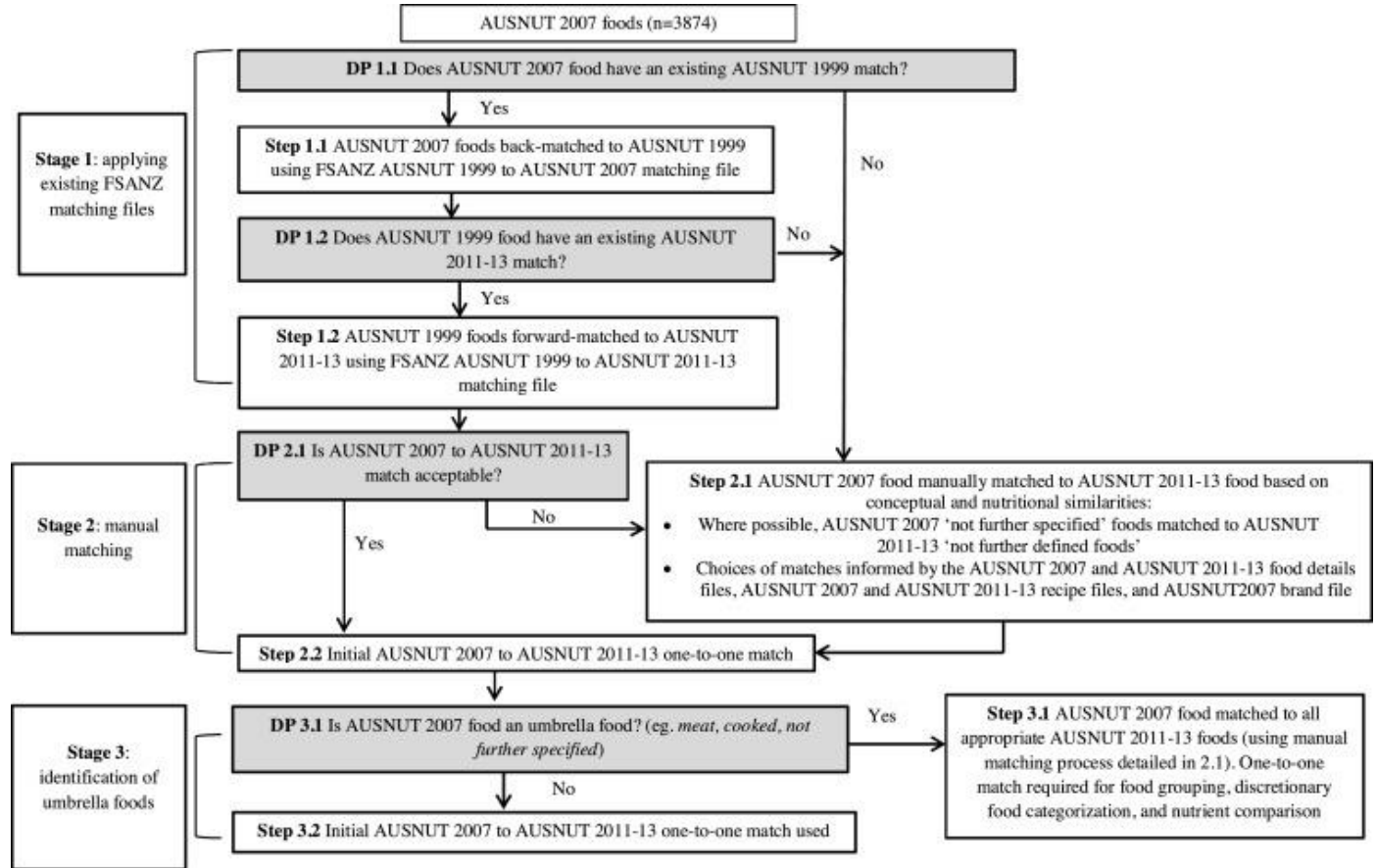
Decision process used in the development of the AUSNUT 2007 (Food Standards Australia New Zealand, 2008a, Food Standards Australia New Zealand, 2008b, Food Standards Australia New Zealand, 2008c, Food Standards Australia New Zealand, 2008d and Food Standards Australia New Zealand, 2008e) to AUSNUT 2011–13 (Food Standards Australia New Zealand, 2014a, Food Standards Australia New Zealand, 2014b, Food Standards Australia New Zealand, 2014c and Food Standards Australia New Zealand, 2014d) matching file (DP = decision point, FSANZ = Food Standards Australia New Zealand).

Tables:

Table 1:

Number of AUSNUT 2007 (Food Standards Australia New Zealand, 2008a, Food Standards Australia New Zealand, 2008b, Food Standards Australia New Zealand, 2008c, Food Standards Australia New Zealand, 2008d and Food Standards Australia New Zealand, 2008e) foods matched at each stage in the decision process.

Stage description	Number of AUSNUT 2007 foods matched
Stage 1: AUSNUT 2007 food matched to AUSNUT 2011–13 (Food Standards Australia New Zealand, 2014a, Food Standards Australia New Zealand, 2014b, Food Standards Australia New Zealand, 2014c and Food Standards Australia New Zealand, 2014d) food using existing matching files	*1270*
- Existing AUSNUT 2007 to 2011–13 match deemed acceptable[a]	1070
- Existing AUSNUT 2007 to 2011–13 match deemed not acceptable[a]	64
- More than one AUSNUT 2011–13 food match available	136
Stage 2: AUSNUT 2007 foods requiring manual matching	*2804*
- AUSNUT 2007 food does not have existing AUSNUT 2011–13 match	2604
- AUSNUT 2007 food required manual check and/or match due to incorrect match[a], or presence of more than one matched AUSNUT 2011–13 match	200
Stage 3: AUSNUT 2007 foods classified as umbrella foods	*340*

a Acceptability/correct match based on professional judgement of conceptual similarities between food matches (refer to 2.1, Stage 2 for details of process).

Table 2:

Example of AUSNUT 2007 (Food Standards Australia New Zealand, 2008a, Food Standards Australia New Zealand, 2008b, Food Standards Australia New Zealand, 2008c, Food Standards Australia New Zealand, 2008d and Food Standards Australia New Zealand, 2008e) foods matched to AUSNUT 2011–13 (Food Standards Australia New Zealand, 2014a, Food Standards Australia New Zealand, 2014b, Food Standards Australia New Zealand, 2014c and Food Standards Australia New Zealand, 2014d) foods at each stage in the decision process.

Stage description	Example AUSNUT 2007 to AUSNUT 2011–13 match
Stage 1: AUSNUT 2007 food matched to AUSNUT 2011–13 food using existing matching files	'Apple, green skin, peeled, raw '[2007] to 'Apple, green skin, peeled, raw '[2011–13]
Stage 2: Manual matching:	
- Manually matched based on conceptual similarities	'Sausage, beef, boiled or casseroled' [2007] to 'Sausage, beef, plain or flavoured, boiled, casseroled, microwaved, poached, steamed, or stewed' [2011–13]
- Non-descript food items matched	'Milk, cow, fluid, skim (~0.15% fat), not further specified' [2007] to 'Milk, cow, fluid, skim (~0.15% fat), not further defined' [2011–13]
- Incorrect match identified	'Breakfast cereal, flakes of corn, unfortified' [2007] to 'Breakfast cereal, flakes, corn, medium sugars' [1999], to 'Breakfast cereal, flakes of corn, added vitamins B1, B2, B3 & folate' [2011–13]. A more appropriate 2011–13 match was: 'Breakfast cereal, flakes of corn, unfortified'
Stage 3: Identification of "umbrella foods"	'Juice, orange, added vitamin C' [2007] is an umbrella food with two potential 2011–13 matches: 'Juice, orange, commercial, fresh, added vitamin C' and 'Juice, orange, commercial, shelf stable, added vitamin C'

Table 3:

Macronutrient median intake (interquartile range) calculated using original AUSNUT 2007 (Food Standards Australia New Zealand, 2008a, Food Standards Australia New Zealand, 2008b, Food Standards Australia New Zealand, 2008c, Food Standards Australia New Zealand, 2008d and Food Standards Australia New Zealand, 2008e) data, and after conversion to AUSNUT 2011–13 (Food Standards Australia New Zealand, 2014a, Food Standards Australia New Zealand, 2014b, Food Standards Australia New Zealand, 2014c and Food Standards Australia New Zealand, 2014d) using matching file process.

Nutrient/day	AUSNUT 2007[a]	AUSNUT 2011–13[b]	p-value
Energy (kJ)	8710 (7290–10400)	8870 (7360–10600)	0.000
Protein (g)	99.4 (81.8–121)	98.2 (83.0–120)	0.067
Total fat (g)	79.2 (65.3–103)	80.2 (65.2–102)	0.453
Saturated fat (g)	32.3 (24.6–42.0)	31.0 (23.7–40.0)	0.000
Monounsaturated fat (g)	29.8 (24.0–38.8)	29.9 (24.4–39.2)	0.006
Polyunsaturated fat (g)	12.2 (9.21–15.3)	12.3 (9.09–15.8)	0.935
Total carbohydrate[c] (g)	210 (174–260)	213 (179–263)	0.000
Total dietary fibre (g)	23.4 (18.4–29.0)	24.2 (19.2–30.2)	0.000

a Original macronutrient data reported by HealthTrack participants (Tapsell et al., 2015), analysed using Foodworks $^{©}$ software (Version 7, Xyris Software, QLD, Australia, 2012).
b Macronutrient data following application of matching file to HealthTrack dietary data.
c Available carbohydrate.

Table 4:

Difference between energy calculated using AUSNUT 2007 (Food Standards Australia New Zealand, 2008a, Food Standards Australia New Zealand, 2008b, Food Standards Australia New Zealand, 2008c, Food Standards Australia New Zealand, 2008d and Food Standards Australia New Zealand, 2008e) and AUSNUT 2011–13 (Food Standards Australia New Zealand, 2014a, Food Standards Australia New Zealand, 2014b, Food Standards Australia New Zealand, 2014c and Food Standards Australia New Zealand, 2014d)[a], by major food group.

AUSNUT 2011–13 major food group	Mean ± standard deviation difference (kJ/day)	p-value
Alcoholic beverages	73.6 ± 145	0.000
Cereal-based products and dishes	9.44 ± 175	0.154
Cereals and cereal products and dishes	23.4 ± 120	0.000
Confectionary and cereal/nut/fruit/seed bars	0.60 ± 38.5	0.006
Dairy and meat substitutes	−12.9 ± 92.0	0.001
Egg products and dishes	−12.0 ± 29.2	0.000
Fats and oils	−2.79 ± 9.45	0.000
Fish and seafood products and dishes	−2.61 ± 85.5	0.926
Fruit products and dishes	11.2 ± 40.7	0.000
Legume and pulse products and dishes	1.88 ± 21.7	0.003
Meat, poultry, and game products and dishes	−6.37 ± 178	0.034
Milk products and dishes	−12.8 ± 52.7	0.000
Miscellaneous	−0.89 ± 3.94	0.001
Non-alcoholic beverages	55.2 ± 140	0.000
Savoury sauces and condiments	11.2 ± 52.0	0.000
Seed and nut products and dishes	3.99 ± 26.9	0.019
Snack foods	0.07 ± 10.9	0.752
Soup	0.90 ± 70.3	0.180
Special dietary foods	−0.72 ± 13.1	0.858
Sugar products and dishes	−0.22 ± 43.5	0.005
Vegetable products and dishes	9.48 ± 89.1	0.946

a Calculated as AUSNUT 2011–13 values minus AUSNUT 2007 values.