Article

Using Popular Foods Consumed to Inform Development of Digital Tools for Dietary Assessment and Monitoring

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Abstract: Knowing the type and quality of the most popular foods consumed by a population can be useful in the design of technologies for monitoring food intake and interventions. The aim of this research was to determine the most frequently consumed foods and beverages among the Australian population and provide recommendations for progressing the design of dietary assessment technologies. Analysis of the first 24 h recall of the most recent Australian National Nutrition and Physical Activity Survey was conducted. The most popular foods and beverages consumed by energy (kJ) and by frequency were calculated. There were 4515 separate foods and beverages reported by 12,153 people. Overall, the top 10 foods that contributed most energy included full fat milk, beer, white rice, white bread, red wine, cola soft drinks, bananas, red apples, wholewheat breakfast cereal and white sugar. The five most frequently reported foods and beverages were tap water, black tea, full fat milk, instant coffee, and sugar. Understanding the most popular foods and beverages consumed can support innovations in the design of digital tools for dietary surveillance and to reduce under-reporting and food omissions. These findings could also guide the development of more tailored and relevant food databases that underpin these technologies.

Keywords: dietary assessment; diet; nutrition; information technology

1. Introduction

Nutrition is a critical modifiable risk factor to prevent chronic diseases, including certain cancers, diabetes, cardiovascular disease and other diseases such as musculoskeletal disorders [1]. Better diet quality is also increasingly linked to mental health, dental health and fertility and can help people look and feel better [2–5]. Better quality diets can be achieved following a range of dietary patterns such as the Mediterranean diet and the dietary approaches to stop hypertension (DASH) diet, but the individual foods consumed will be similar and from recommended food groups such as fruit, vegetables, wholegrains, legumes, nuts, calcium-rich foods such as low fat dairy and other lean proteins [6]. Other foods and beverages high in sodium, saturated fat, alcohol, and added sugars would be consumed in low quantities or not at all.

National nutrition surveys can provide valuable insights into the dietary patterns and specific foods consumed by a population [7]. However, there is more limited exploration of what specific foods and beverages are frequently consumed by the population. One study using data from the NHANES 2007–2012 has explored the 25 most popular foods consumed by US adults and by specific age groups (19–35 years, 36–55 years, ≥56 years) [8].

The detailed information of foods derived from such large cross-sectional dietary surveys are compiled into databases that include the nutritional composition of the foods [9]. Understanding what foods and beverages are commonly consumed by the population could contribute to greater refinement of these food databases while also avoiding loss
of granularity and quality of nutrition information. In turn, these databases can also be incorporated into technologies for monitoring population food intake [10–13].

Advancements in digital dietary assessment methods and tools, such as smartphone applications (apps), 24 h recall platforms, image-based dietary records, sensors and wearable devices provide the opportunity to increase the efficiency and accuracy of dietary surveillance and decrease the burden associated with data collection [14,15]. Nevertheless, the food databases that underpin apps and self-administered 24 h recall technologies in particular often pose challenges to users including difficulties with finding correct food items when a multiplicity of choices must be scrolled through. Food recording can be too time-consuming, particularly the entry of composite foods and mixed dishes [16–19]. Increasing the relevance of search returns from the food databases could reduce participant burden, assist selection of the right food and prevent food omissions and under-reporting [12].

Data on popular foods and beverages can be advantageous in guiding search tools or verifying foods and beverages identified by digital dietary assessment methods [8]. Furthermore, inaccuracies in nutrient outputs from these digital technologies can result when commercially developed food databases are used or when one standard country’s food composition database (e.g., USDA) is chosen and not tailored to the local food supply nor inclusive of ethnicities [16,20]. The design and development of fit-for-purpose country-specific food composition databases also require consideration of the foods most frequently consumed by a given population [10,11].

Therefore, the aim of the study was to determine the most popular foods and beverages (hereinafter referred to as foods) consumed in Australia in order to provide recommendations for ways to progress the design of dietary assessment technologies. The popularity of foods was determined by the frequency they are reported and by the contribution they make to daily energy intakes to ensure daily nutrient intakes are accurately captured.

2. Materials and Methods
2.1. Study Design, Setting and Participants

The Australian National Nutrition and Physical Activity Survey was a cross-sectional survey consisting of a sample from a stratified, multi-staged area of private dwellings covering 97% of the Australian population. It was the largest, most comprehensive health survey ever conducted in Australia and designed to represent the Australian population. Data were collected from Monday through to Sunday from May 2011 to June 2012. The survey was conducted by a government agency called The Australian Bureau of Statistics (ABS), and full details are published on their website [21]. Participants were selected at random from sampling fractions from each state and territory to meet this objective. Participants were aged two years and over and included one adult (aged 18 years and over) and one child (aged 2–17 years) from each household selected. The present analysis included 12,153 participants. Population demographics from this survey, including sex, age, body mass index, education level and country of birth are presented in Table 1.

Table 1. Demographics of the population surveyed in the Australian National Nutrition and Physical Activity Survey (n = 12153).

| Demographics        | n  | %  |
|---------------------|----|----|
| **Sex**             |    |    |
| Male                | 5702 | 49.7 |
| Female              | 6451 | 50.3 |
| **Age (years)**     |    |    |
| 17 and under        | 2718 | 20.8 |
| 18–49               | 5064 | 46.8 |
| 50–69               | 2991 | 23.3 |
| 70 and over         | 1380 | 9.1 |
Table 1. Cont.

| Demographics                              | n   | %   |
|-------------------------------------------|-----|-----|
| **Body Mass Index (BMI)**                 |     |     |
| Underweight <18.5 kg/m²                   | 3310| 27.8|
| Normal ≥18.5 kg/m² to <25.0 kg/m²         | 2356| 18.7|
| Overweight ≥25.0 kg/m² to <30.0 kg/m²     | 239 | 2.2 |
| Obese ≥30 kg/m²                           | 4273| 36.3|
| Missing                                   | 1975| 15.1|
| **Level of highest non-school qualification** | | |
| Not applicable                            | 2180| 17.2|
| Postgraduate degree, graduate diploma/graduate certificate | 770 | 6.1 |
| Bachelor’s degree                         | 1615| 13.7|
| Advanced diploma/diploma                  | 989 | 8.1 |
| Certificate III/IV                        | 1717| 13.7|
| Certificate I/II                          | 472 | 3.8 |
| Certificate not further defined            | 74  | 0.6 |
| No non-school qualification               | 4190| 34.1|
| Level not determined                      | 146 | 1.2 |

| Socio-economic index for area             |     |     |
| Low (quintile 1)                          | 2238| 17.9|
| Middle (quintile 2–4)                     | 7073| 59.4|
| High (quintile 5)                         | 2842| 22.7|

| Country of birth                           |     |     |
| Australia                                  | 9157| 73.7|
| Main English-speaking countries (Canada, Ireland, NZ, South Africa, UK, USA) | 1275| 10.0 |
| Other                                      | 1721| 16.3|

2.2. Variables and Data Sources

The most frequently reported foods and the foods that made the largest contribution to dietary energy were the outcomes of interest. Foods were classified as discretionary or five food group. Discretionary foods were identified using the ABS discretionary food list [22] and are foods that are high in saturated fats, added sugars, salt and/or alcohol, for example, sugar sweetened beverages, cakes, sweet and savoury pastries, processed meat, sandwiches, burgers and pizzas high in saturated fat, confectionary or alcoholic beverages (e.g., beer and wine) [23]. Five food group includes: (1) grain foods (e.g., bread, breakfast cereals, rice, pasta, quinoa or barley); (2) dairy products and alternatives (e.g., milk, yoghurt, cheese, soy milk or flavoured milks); (3) fruits including whole, dried and juiced (e.g., banana, apple); (4) vegetables including legumes and 100% juices (e.g., tomato, lettuce); and (5) lean meats and alternatives (e.g., beef, pork, poultry, seafood, fish, tofu, nuts, soy beans and legumes) [23]. Five food group foods were classified as higher quality or lower quality in accordance with clarifying information regarding the quality of five food group foods by the Australian Dietary Guidelines [23]. Lower quality five food group foods included foods that fit within the five food groups but have some added sugars, salt, or are refined or processed thereby removing fibre or are otherwise higher in saturated fat. Examples include refined or low fibre grains (e.g., white bread or rice), dried and juiced fruits (e.g., sultanas and orange juice, which should only be selected sometimes), nuts and vegetables with added salt that did not otherwise classify as discretionary food in the ABS list (e.g., salted peanuts), full fat dairy products (e.g., full cream milk) or those with added sugars (e.g., flavoured milks).

Diets were assessed with two multiple pass 24 h recalls. As the second recall was only collected for a subset of the population, only the first day of the survey was used. The five-pass protocol was originally developed by the United States Department of Agriculture (USDA) and modified by the ABS and the Food Standards Australia New Zealand (FSANZ) to reflect the Australian food supply. The interview was conducted by trained ABS staff
who asked participants to recall all foods consumed from midnight to midnight in the 24 h prior to the day of the interview. The AUSNUT nutrient composition was compiled from Australian nutrient composition to reflect the available foods consumed during the survey.

2.3. Data Analysis

Proc SURVEYFREQ was used to calculate the frequency each food that was reported and proc SURVEYMEANS was used to sum the energy for each food reported using eight-digit food codes provided by the ABS to identify individual foods. FIVDIGC food codes (minor food groups) developed by the ABS were used to further reduce the number of foods reported by the participants of the survey. Survey weights derived by the ABS were applied to ensure a representative sample of the population. Full details of the survey weights are available elsewhere (ABS User Guide [21]). All data cleaning was conducted in SAS software version 9.4 for Windows, Cary, NC: SAS Institute; 2013.

3. Results

A total of 4515 foods were reported as being consumed from the first day of NNPAS data. Full fat cow’s milk, beer, white rice, white bread, red wine, cola soft drink and banana were among the top 10 food and beverage sources of energy in Australians’ diets and contributed to a cumulative 10.8% of energy intake (Table 2). Dietary staples were rice, bread, breakfast cereals and milk while most other popular choices contributing to energy included were discretionary foods such as hot potato chips, sausages, ice cream and pies. The most popular mixed dish by energy contribution was pasta with beef and vegetable Bolognese, followed by lasagne.

Table 2. The 100 most popular foods consumed in Australia by energy contribution.

| # | Food Description                                                                 | Observations (n) | Energy (%) | Cumulative Energy (%) |
|---|----------------------------------------------------------------------------------|------------------|------------|-----------------------|
| 1 | Milk, cow, fluid, regular fat (~3.5%)                                            | 2771             | 1.6        | 1.6                   |
| 2 | Beer, lager or ale style (alcohol 4.6% v/v)                                      | 844              | 1.2        | 2.8                   |
| 3 | Milk, cow, fluid, regular fat (~3.5%), not further defined                       | 5819             | 1.2        | 4                     |
| 4 | Rice, white, steamed or rice cooker, no added salt                               | 920              | 1.1        | 5.1                   |
| 5 | Bread, from white flour, for homemade sandwiches                                 | 1442             | 1          | 6.1                   |
| 6 | Wine, red                                                                        | 846              | 1          | 7.1                   |
| 7 | Bread, from white flour, commercial, toasted                                     | 1603             | 1          | 8.1                   |
| 8 | Soft drink, cola flavour, regular                                                 | 1292             | 0.9        | 9                     |
| 9 | Banana, cavendish, peeled, raw                                                   | 2439             | 0.9        | 9.9                   |
| 10| Rice, white, boiled, no added salt                                               | 700              | 0.9        | 10.8                  |
| 11| Apple, red skin, unpeeled, raw                                                   | 2023             | 0.8        | 11.6                  |
| 12| Breakfast cereal, whole wheat, biscuit, added vitamins B1, B2, B3 and folate, Fe and Zn | 1025             | 0.7        | 12.2                  |
| 13| Sugar, white, granulated or lump                                                  | 4863             | 0.6        | 12.9                  |
| 14| Wine, white, dry style (sugars content <1%)                                      | 499              | 0.6        | 13.5                  |
| 15| Bread roll, from white flour, commercial                                           | 810              | 0.6        | 14.1                  |
| 16| Chocolate, milk                                                                  | 643              | 0.5        | 14.6                  |
Table 2. Cont.

| #  | Food Description                                                                 | Observations (n) | Energy (%) | Cumulative Energy (%) |
|----|----------------------------------------------------------------------------------|------------------|------------|------------------------|
| 17 | Milk, cow, fluid, reduced fat (1–2%), not further defined                        | 3703             | 0.5        | 15.2                   |
| 18 | Potato, chips, regular, independent takeaway outlet, cafe or restaurant, deep fried, blended oil, salted | 597              | 0.5        | 15.7                   |
| 19 | Butter, plain, salted                                                            | 2020             | 0.5        | 16.2                   |
| 20 | Bread, mixed grain, for homemade sandwiches                                       | 570              | 0.5        | 16.7                   |
| 21 | Bread, from white flour, commercial                                              | 758              | 0.5        | 17.2                   |
| 22 | Bread, from wholemeal flour, for homemade sandwiches                             | 635              | 0.5        | 17.6                   |
| 23 | Milk, cow, fluid, reduced fat (1%)                                               | 1366             | 0.4        | 18                     |
| 24 | Ice cream, vanilla flavour, regular fat                                           | 570              | 0.4        | 18.5                   |
| 25 | Bread, from wholemeal flour, commercial, toasted                                  | 758              | 0.4        | 18.9                   |
| 26 | Sausage, beef, grilled, BBQed or baked                                            | 264              | 0.4        | 19.3                   |
| 27 | Bread, mixed grain, commercial, toasted                                           | 656              | 0.4        | 19.7                   |
| 28 | Cheese, cheddar, natural, plain, regular fat                                     | 766              | 0.4        | 20.2                   |
| 29 | Pasta dish, homemade, cooked unfilled pasta, homemade beef Bolognese sauce and added vegetables | 184              | 0.4        | 20.6                   |
| 30 | Muesli, commercial, untoasted or natural style, added dried fruit, unfortified    | 276              | 0.4        | 20.9                   |
| 31 | Cheese, for use on sandwiches, not further defined                               | 735              | 0.4        | 21.3                   |
| 32 | Pie, savoury, meat, commercial                                                   | 233              | 0.3        | 21.6                   |
| 33 | Cheese, cheddar, natural, plain, not further defined                             | 706              | 0.3        | 22                     |
| 34 | Pasta dish, homemade, cooked unfilled pasta, commercial beef Bolognese sauce     | 163              | 0.3        | 22.3                   |
| 35 | Sausage, beef, fried                                                             | 213              | 0.3        | 22.6                   |
| 36 | Chicken, barbecued, with skin, commercial                                        | 230              | 0.3        | 23                     |
| 37 | Fruit drink, orange juice, commercial                                            | 568              | 0.3        | 23.3                   |
| 38 | Juice, orange, commercial                                                        | 896              | 0.3        | 23.6                   |
| 39 | Potato, peeled, boiled, microwaved or steamed, drained                           | 710              | 0.3        | 23.9                   |
| 40 | Lasagne, beef, with added vegetables, homemade                                  | 118              | 0.3        | 24.2                   |
| 41 | Sugar, raw                                                                       | 2384             | 0.3        | 24.4                   |
| 42 | Bread, from white flour, for homemade sandwiches, toasted                        | 350              | 0.3        | 24.7                   |
| 43 | Porridge, rolled oats, prepared with regular fat cow’s milk                      | 193              | 0.3        | 25                     |
| 44 | Beer, lager or ale style, mid strength (alcohol 3.5% v/v)                       | 195              | 0.3        | 25.2                   |
| #  | Food Description                                                                 | Observations (n) | Energy (%) | Cumulative Energy (%) |
|----|---------------------------------------------------------------------------------|------------------|------------|-----------------------|
| 45 | Coffee, flat white or latte, from ground coffee beans, with regular fat cow’s milk | 439              | 0.3        | 25.5                  |
| 46 | Honey                                                                           | 1137             | 0.2        | 25.8                  |
| 47 | Biscuit, savoury, from white wheat flour, other flavours                         | 231              | 0.2        | 26                    |
| 48 | Potato crisps or chips, plain, salted                                           | 300              | 0.2        | 26.3                  |
| 49 | Pie, savoury, meat, from frozen, baked or microwaved                             | 171              | 0.2        | 26.5                  |
| 50 | Noodle, wheat, instant, flavoured, boiled, drained                               | 134              | 0.2        | 26.7                  |
| 51 | Biscuit, sweet, chocolate chip, commercial                                       | 298              | 0.2        | 27                    |
| 52 | Bread, garlic or herb, commercial, cooked                                       | 222              | 0.2        | 27.2                  |
| 53 | Bread, from wheat flour, commercial, added dried fruit, toasted                  | 252              | 0.2        | 27.4                  |
| 54 | Pizza, supreme, thick base, takeaway style and homemade                           | 77               | 0.2        | 27.7                  |
| 55 | Pasta dish, homemade, cooked unfilled pasta, homemade beef Bolognese sauce       | 100              | 0.2        | 27.9                  |
| 56 | Sausage roll, commercial, ready to eat                                          | 146              | 0.2        | 28.1                  |
| 57 | Nut, almond, with or without skin, raw, unsalted                                 | 350              | 0.2        | 28.3                  |
| 58 | Chicken, whole, flesh, skin and fat, baked, roasted, fried, grilled or BBQed, no added fat | 113              | 0.2        | 28.6                  |
| 59 | Porridge, rolled oats, prepared with water                                       | 292              | 0.2        | 28.8                  |
| 60 | Orange, peeled, raw, not further defined                                        | 780              | 0.2        | 29                    |
| 61 | Pear, unpeeled, raw, not further defined                                        | 467              | 0.2        | 29.2                  |
| 62 | Wine, white, not further defined                                                | 207              | 0.2        | 29.4                  |
| 63 | Avocado, raw                                                                    | 539              | 0.2        | 29.6                  |
| 64 | Biscuit, sweet, plain, commercial                                               | 576              | 0.2        | 29.8                  |
| 65 | Lolly, jelly varieties                                                          | 514              | 0.2        | 30                    |
| 66 | Soft drink, lemonade, regular                                                   | 441              | 0.2        | 30.2                  |
| 67 | Milk, cow, fluid, unflavoured, not further defined                               | 607              | 0.2        | 30.4                  |
| 68 | Chicken burger, white roll, crumbed chicken breast, with lettuce and mayonnaise, fast food chain | 112              | 0.2        | 30.6                  |
| 69 | Milk, cow, fluid, flavoured, coffee, regular fat                                 | 114              | 0.2        | 30.9                  |
| 70 | Potato, fries, fast food outlet, deep fried, monounsaturated oil, salted         | 194              | 0.2        | 31                    |
| 71 | Bacon, middle rasher, semi-trimmed, fried or stir-fried, no added fat            | 260              | 0.2        | 31.2                  |
| 72 | Casserole, homemade, beef and vegetables, homemade gravy                         | 71               | 0.2        | 31.4                  |
| #   | Food Description                                                                 | Observations (n) | Energy (%) | Cumulative Energy (%) |
|-----|----------------------------------------------------------------------------------|------------------|------------|-----------------------|
| 73  | Mayonnaise, commercial, regular fat                                              | 343              | 0.2        | 31.6                  |
| 74  | Whisky or scotch                                                                  | 170              | 0.2        | 31.8                  |
| 75  | Cheese, cheddar, processed, regular fat                                           | 479              | 0.2        | 32                    |
| 76  | Bread, from wholemeal flour, commercial                                          | 306              | 0.2        | 32.2                  |
| 77  | Mixed drink, whisky or scotch and regular cola, commercial, pre-mixed             | 70               | 0.2        | 32.3                  |
| 78  | Potato crisps or chips, other flavours                                            | 210              | 0.2        | 32.5                  |
| 79  | Ham, leg, lean                                                                    | 1488             | 0.2        | 32.7                  |
| 80  | Peanut butter, smooth and crunchy, added sugar and salt                            | 452              | 0.2        | 32.9                  |
| 81  | Curry, homemade, chicken & vegetable, homemade coconut milk sauce                 | 97               | 0.2        | 33                    |
| 82  | Coffee, cappuccino, from ground coffee beans, with regular fat cow’s milk         | 310              | 0.2        | 33.2                  |
| 83  | Chicken, for use as a sandwich filling, not further defined                       | 507              | 0.2        | 33.4                  |
| 84  | Potato crisps or chips, not further defined                                       | 231              | 0.2        | 33.5                  |
| 85  | Oil, olive                                                                        | 310              | 0.2        | 33.7                  |
| 86  | Potato, chips, regular, fast-food outlet, deep fried, blended oil, salted          | 167              | 0.2        | 33.9                  |
| 87  | Porridge, rolled oats, prepared with reduced fat cow’s milk                       | 147              | 0.2        | 34                    |
| 88  | Beer, lager or ale style (alcohol 5% v/v & above)                                  | 143              | 0.2        | 34.2                  |
| 89  | Biscuit, sweet, shortbread style, commercial                                      | 260              | 0.2        | 34.4                  |
| 90  | Breakfast cereal, mixed grain (wheat and oat), flakes, apricot and sultana, added vitamins B1, B2, B3 and folate and Fe | 174              | 0.2        | 34.5                  |
| 91  | Nut, peanut, without skin, roasted, with oil, salted                              | 141              | 0.2        | 34.7                  |
| 92  | Milk, cow, fluid, skim (~0.15% fat), not further defined                          | 1733             | 0.2        | 34.9                  |
| 93  | Margarine spread, monounsaturated (65% fat)                                       | 787              | 0.2        | 35                    |
| 94  | Egg, chicken, whole, hard-boiled                                                  | 443              | 0.2        | 35.2                  |
| 95  | Egg, chicken, whole, fried, oil not further defined                               | 320              | 0.2        | 35.3                  |
| 96  | Rice, white, fried with bacon or ham, egg, prawns & vegetables                    | 76               | 0.1        | 35.5                  |
| 97  | Salad, garden, added cheese, no added dressing                                    | 344              | 0.1        | 35.6                  |
| 98  | Breakfast cereal, mixed grain (wheat, oat and corn), extruded, added vitamins B1, B2, B3, B6 and C, Ca and Fe | 246              | 0.1        | 35.8                  |
| 99  | Mandarin, peeled, raw                                                             | 925              | 0.1        | 35.9                  |
| 100 | Cake or cupcake, chocolate, commercial, sugar-based icing                        | 86               | 0.1        | 36.1                  |
The top 10 most frequently consumed foods and beverages were tap water, plain black tea, full fat cow’s milk, instant coffee, white sugar, reduced fat milk, banana, raw sugar and red apples, which contributed to 23% of the foods consumed by the Australian population on the day of the survey. The most frequently consumed foods and beverages classified by food group is shown in Table 4. Different types of bread and rice were the only two grain foods reported in the top 100 foods. Common sandwich and bread toppings were also reported including vegemite, peanut butter, jam, ham, and chicken. Regarding vegetable intake, tomatoes were ranked 19th place for popularity, followed by carrots and lettuce, ranked 26th and 34th, respectively. The most popular fruits were bananas (8th), followed by apples (10th), and mandarins (28th). Dairy mainly consisted of milk and cheese. The largest category of foods was discretionary accounting for 25% of the top 100 most frequently reported foods. The most-consumed discretionary foods were sugar (5th), butter (11th), vegemite (14th), ham (15th) and cola (18th).

According to the minor food group hierarchical system (Table S1), the 10 most popular foods and beverages by energy contribution were savoury pasta or noodle dishes, full fat milk, white bread and bread rolls, rice, chicken, beef, potato products and savoury pastries such as pies and rolls, beer and battered or crumbed poultry. These foods contributed to 20.9% of total energy intake for the day of the survey. Of these 10 most popular foods, seven were either lower quality five food group foods or discretionary in nature. The 100 most popular foods, as categorised by minor food groups, contributed to 77.9% of total energy intake for Australians.

Figure 1 depicts how discretionary foods contributed to 39 of the 100 most popular foods by energy contribution to the diet. An additional 24 foods were lower quality five food group foods, including refined grains such as white rice, white bread, full fat milk, full fat cheddar cheese and juiced fruit. Discretionary foods contributed 24 of the top 100 foods by frequency (Figure 2). The top most frequently reported discretionary foods included alcohol, sugar, butter, vegemite, ham, soft drinks, honey, biscuits, tomato sauce, potato chips, orange fruit drink, lollies, soy sauce and jam (Table 3). Based on the minor food group hierarchical system, 41% of the most popular foods were discretionary foods and an additional 11% of foods were lower quality five food group foods (Figure 3). Five food groups were more frequently reported foods (Figure 1), but discretionary foods contributed more to energy (Figure 2).

Figure 1. Number of the 100 most popular foods by energy contribution that were classified as five food group, lower quality five food group and discretionary foods, with a selection of the foods in each category listed.
| #  | Food Description                                                                                     | Weighted Frequency a | Frequency b | Weighted Percent (SE) c |
|----|-----------------------------------------------------------------------------------------------------|----------------------|-------------|------------------------|
| 1  | Water, tap                                                                                          | 21,333,275           | 12,333      | 5.7 (0.08)             |
| 2  | Tea, regular, black, brewed from leaf or teabags, plain, without milk                               | 11,183,560           | 6791        | 3.0 (0.07)             |
| 3  | Milk, cow, fluid, regular fat (~3.5%), not further defined                                         | 10,065,318           | 5819        | 2.7 (0.07)             |
| 4  | Coffee, black, from instant coffee powder, without milk                                             | 9,398,347            | 5716        | 2.5 (0.06)             |
| 5  | Sugar, white, granulated or lump                                                                    | 8,570,397            | 4863        | 2.3 (0.07)             |
| 6  | Milk, cow, fluid, reduced fat (1–2%), not further defined                                          | 6,187,801            | 3703        | 1.7 (0.06)             |
| 7  | Milk, cow, fluid, regular fat (~3.5%)                                                               | 4,645,020            | 2771        | 1.2 (0.04)             |
| 8  | Banana, cavendish, peeled, raw                                                                     | 4,067,173            | 2439        | 1.1 (0.03)             |
| 9  | Sugar, raw                                                                                          | 4,005,327            | 2384        | 1.1 (0.04)             |
| 10 | Apple, red skin, unpeeled, raw                                                                     | 3,717,265            | 2023        | 1.0 (0.03)             |
| 11 | Butter, plain, salted                                                                               | 3,341,194            | 2020        | 0.9 (0.03)             |
| 12 | Milk, cow, fluid, skim (~0.15% fat), not further defined                                           | 2,876,131            | 1733        | 0.8 (0.03)             |
| 13 | Bread, from white flour, commercial, toasted                                                       | 2,813,117            | 1603        | 0.8 (0.04)             |
| 14 | Spread, yeast, vegemite, regular                                                                   | 2,696,279            | 1542        | 0.7 (0.03)             |
| 15 | Ham, leg, lean                                                                                      | 2,655,824            | 1488        | 0.7 (0.03)             |
| 16 | Bread, from white flour, for homemade sandwiches                                                   | 2,519,940            | 1442        | 0.7 (0.03)             |
| 17 | Milk, cow, fluid, reduced fat (1%)                                                                  | 2,455,733            | 1366        | 0.7 (0.03)             |
| 18 | Soft drink, cola flavour, regular                                                                  | 2,289,550            | 1292        | 0.6 (0.04)             |
| 19 | Tomato, common, raw                                                                                 | 2,287,021            | 1225        | 0.6 (0.02)             |
| 20 | Water, filtered                                                                                    | 2,213,582            | 1180        | 0.6 (0.02)             |
| 21 | Water, bottled, still                                                                              | 2,127,360            | 1137        | 0.6 (0.03)             |
| 22 | Honey                                                                                               | 2,028,067            | 1137        | 0.5 (0.03)             |
| 23 | Breakfast cereal, whole wheat, biscuit, added vitamins B1, B2, B3 and folate, Fe and Zn              | 1,983,984            | 1025        | 0.5 (0.03)             |
| 24 | Water, rainwater or tank water                                                                     | 1,914,018            | 1015        | 0.5 (0.04)             |
| 25 | Soft drink, cola flavour, intense sweetened or diet                                                 | 1,883,886            | 1010        | 0.5 (0.04)             |
| 26 | Carrot, mature, peeled or unpeeled, fresh or frozen, boiled, microwaved or steamed, drained         | 1,852,147            | 958         | 0.5 (0.03)             |
| 27 | Coffee, long black style, from ground coffee beans, without milk                                   | 1,732,645            | 938         | 0.5 (0.02)             |
| 28 | Mandarin, peeled, raw                                                                              | 1,633,673            | 925         | 0.4 (0.02)             |
| 29 | Rice, white, steamed or rice cooker, no added salt                                                 | 1,602,897            | 920         | 0.4 (0.02)             |
| 30 | Sauce, tomato, commercial, regular                                                                  | 1,585,307            | 905         | 0.4 (0.02)             |
Table 3. Cont.

| #  | Food Description                                           | Weighted Frequency a   | Frequency b | Weighted Percent (SE) c |
|----|------------------------------------------------------------|------------------------|-------------|-------------------------|
| 31 | Juice, orange, commercial                                 | 1,556,926              | 896         | 0.4 (0.02)              |
| 32 | Wine, red                                                 | 1,545,933              | 846         | 0.4 (0.02)              |
| 33 | Beer, lager or ale style (alcohol 4.6% v/v)              | 1,505,790              | 844         | 0.4 (0.02)              |
| 34 | Lettuce, raw, not further defined                        | 1,505,360              | 823         | 0.4 (0.02)              |
| 35 | Bread roll, from white flour, commercial                  | 1,462,719              | 810         | 0.4 (0.02)              |
| 36 | Margarine spread, monounsaturated (65% fat)              | 1,446,297              | 787         | 0.4 (0.02)              |
| 37 | Orange, peeled, raw, not further defined                 | 1,421,422              | 780         | 0.4 (0.02)              |
| 38 | Cheese, cheddar, natural, plain, regular fat             | 1,418,381              | 766         | 0.4 (0.02)              |
| 39 | Bread, from white flour, commercial                       | 1,414,205              | 758         | 0.4 (0.02)              |
| 40 | Bread, from wholemeal flour, commercial, toasted         | 1,397,106              | 758         | 0.4 (0.02)              |
| 41 | Pepper, ground, black or white                           | 1,353,441              | 745         | 0.4 (0.02)              |
| 42 | Cheese, for use on sandwiches, not further defined       | 1,340,869              | 735         | 0.4 (0.02)              |
| 43 | Salad, garden, no added dressing                         | 1,315,693              | 724         | 0.4 (0.02)              |
| 44 | Tea, green, plain, without milk                          | 1,261,744              | 723         | 0.3 (0.02)              |
| 45 | Potato, peeled, boiled, microwaved or steamed, drained   | 1,204,823              | 710         | 0.3 (0.03)              |
| 46 | Cheese, cheddar, natural, plain, not further defined     | 1,200,410              | 706         | 0.3 (0.02)              |
| 47 | Rice, white, boiled, no added salt                       | 1,187,232              | 700         | 0.3 (0.02)              |
| 48 | Sugar, brown                                              | 1,153,755              | 696         | 0.3 (0.02)              |
| 49 | Carrot, mature, peeled or unpeeled, fresh or frozen, raw | 1,140,838              | 666         | 0.3 (0.02)              |
| 50 | Bread, mixed grain, commercial, toasted                  | 1,135,784              | 656         | 0.3 (0.01)              |
| 51 | Beverage base, chocolate flavour, added vitamins A, B1, B2, C, D and folate, Ca and Fe (Milo) | 1,128,400              | 654         | 0.3 (0.02)              |
| 52 | Chocolate, milk                                           | 1,101,879              | 643         | 0.3 (0.02)              |
| 53 | Broccoli, fresh, boiled, microwaved or steamed, drained  | 1,093,557              | 636         | 0.3 (0.01)              |
| 54 | Bread, from wholemeal flour, for homemade sandwiches     | 1,056,181              | 635         | 0.3 (0.02)              |
| 55 | Milk, cow, fluid, unflavoured, not further defined       | 1,044,637              | 607         | 0.3 (0.02)              |
| 56 | Potato, chips, regular, independent takeaway outlet, cafe or restaurant, deep fried, blended oil, salted   | 1,043,246              | 597         | 0.3 (0.02)              |
| 57 | Biscuit, sweet, plain, commercial                        | 1,014,815              | 576         | 0.3 (0.02)              |
| 58 | Bread, mixed grain, for homemade sandwiches              | 1,013,282              | 570         | 0.3 (0.02)              |
| 59 | Ice cream, vanilla flavour, regular fat                  | 995,545                | 570         | 0.3 (0.01)              |
| #  | Food Description                                                                 | Weighted Frequency | Frequency | Weighted Percent (SE) |
|----|----------------------------------------------------------------------------------|--------------------|-----------|-----------------------|
| 60 | Fruit drink, orange juice, commercial                                            | 971,074            | 568       | 0.3 (0.02)            |
| 61 | Milk, cow, fluid, skim (~0.15% fat)                                             | 970,448            | 565       | 0.3 (0.03)            |
| 62 | Avocado, raw                                                                      | 970,196            | 539       | 0.3 (0.02)            |
| 63 | Milk, cow, fluid, reduced fat (~1.5%), increased protein (~4%)                    | 964,509            | 531       | 0.3 (0.02)            |
| 64 | Cucumber, peeled or unpeeled, raw, not further defined                            | 949,721            | 518       | 0.3 (0.02)            |
| 65 | Lolly, jelly varieties                                                            | 935,210            | 514       | 0.3 (0.02)            |
| 66 | Chicken, for use as a sandwich filling, not further defined                       | 903,592            | 507       | 0.2 (0.01)            |
| 67 | Wine, white, dry style (sugars content <1%)                                      | 897,583            | 499       | 0.2 (0.02)            |
| 68 | Margarine spread, monounsaturated (65% fat), reduced salt (sodium = 360 mg/100 g)| 885,940            | 498       | 0.2 (0.02)            |
| 69 | Pea, green, frozen, cooked, no added fat                                         | 876,729            | 497       | 0.2 (0.01)            |
| 70 | Strawberry, raw                                                                  | 862,331            | 485       | 0.2 (0.01)            |
| 71 | Cheese, cheddar, processed, regular fat                                          | 846,695            | 479       | 0.2 (0.02)            |
| 72 | Tomato, Roma, raw                                                                | 845,793            | 479       | 0.2 (0.01)            |
| 73 | Pear, unpeeled, raw, not further defined                                         | 842,729            | 467       | 0.2 (0.02)            |
| 74 | Peanut butter, smooth and crunchy, added sugar and salt                           | 814,271            | 452       | 0.2 (0.02)            |
| 75 | Grape, Thompson seedless or sultana, raw                                         | 771,999            | 449       | 0.2 (0.01)            |
| 76 | Egg, chicken, whole, hard-boiled                                                 | 765,887            | 443       | 0.2 (0.01)            |
| 77 | Soft drink, lemonade, regular                                                     | 739,100            | 441       | 0.2 (0.01)            |
| 78 | Coffee, flat white or latte, from ground coffee beans, with regular fat cow’s milk| 736,038            | 439       | 0.2 (0.02)            |
| 79 | Margarine spread, polyunsaturated (70% fat)                                      | 731,355            | 430       | 0.2 (0.02)            |
| 80 | Melon, watermelon, peeled, raw                                                   | 730,323            | 426       | 0.2 (0.02)            |
| 81 | Juice, apple, commercial                                                         | 697,222            | 412       | 0.2 (0.02)            |
| 82 | Intense sweetener, containing saccharin, tablet                                  | 692,685            | 411       | 0.2 (0.01)            |
| 83 | Sauce, soy, commercial, regular                                                  | 678,260            | 392       | 0.2 (0.01)            |
| 84 | Jam, strawberry, regular                                                          | 657,099            | 387       | 0.2 (0.01)            |
| 85 | Lettuce, cos, raw                                                                | 656,369            | 377       | 0.2 (0.01)            |
| 86 | Bread, from white flour, for homemade sandwiches, toasted                         | 644,671            | 350       | 0.2 (0.02)            |
| 87 | Nut, almond, with or without skin, raw, unsalted                                 | 638,842            | 350       | 0.2 (0.02)            |
| 88 | Salad, garden, added cheese, no added dressing                                  | 627,054            | 344       | 0.2 (0.01)            |
| 89 | Mayonnaise, commercial, regular fat                                               | 625,584            | 343       | 0.2 (0.01)            |
| 90 | Bean, green, fresh, boiled, microwaved or steamed, drained                        | 624,961            | 342       | 0.2 (0.01)            |
Table 3. Cont.

| #  | Food Description                                                                 | Weighted Frequency a | Frequency b | Weighted Percent (SE) c |
|----|----------------------------------------------------------------------------------|----------------------|-------------|------------------------|
| 91 | Lettuce, iceberg, raw                                                            | 605,750              | 338         | 0.2 (0.01)             |
| 92 | Mixed vegetables, fresh or frozen, with carrot, pumpkin or sweet potato, cooked, no added fat | 602,185              | 336         | 0.2 (0.01)             |
| 93 | Cauliflower, fresh or frozen, boiled, microwaved or steamed, drained             | 601,030              | 331         | 0.2 (0.01)             |
| 94 | Tomato, raw, not further defined                                                 | 578,807              | 327         | 0.2 (0.01)             |
| 95 | Apple, red skin, peeled, raw                                                     | 572,491              | 323         | 0.2 (0.01)             |
| 96 | Egg, chicken, whole, fried, oil not further defined                              | 569,730              | 320         | 0.2 (0.01)             |
| 97 | Coffee, cappuccino, from ground coffee beans, with regular fat cow’s milk       | 568,643              | 310         | 0.2 (0.01)             |
| 98 | Oil, olive                                                                       | 566,981              | 310         | 0.2 (0.02)             |
| 99 | Apple, green skin, unpeeled, raw                                                 | 554,978              | 308         | 0.1 (0.01)             |
| 100| Biscuit, savoury, from white wheat flour, plain snack cracker style             | 550,432              | 307         | 0.1 (0.01)             |

a—the sum of the estimated weighted frequencies for all type foods or beverages reported in one day of the survey, with survey weights applied; b—the frequency that a food or beverages was reported without dietary weights; c—derived from the weighted frequency of the individual food or beverage divided by the total weighted frequency of all foods and beverages (n = 373,320,769); SE = standard error.

Figure 2. Number of the 100 most popular foods by frequency that were classified as five food group, lower quality five food group and discretionary foods, with a selection of the foods in each category listed.
Figure 3. Number of the 100 most popular foods by minor food groups that were classified as five food group, lower quality five food group and discretionary foods, with a selection of the foods in each category listed.

Differences between popularity by frequency of consumption and percentage energy contribution to the diet were also examined. When comparing the difference between ranking of foods by frequency to percentage energy contribution, tap water, black tea, black coffee and white sugar were ranked 1st, 3rd, 4th and 9th, respectively by frequency, but had a lower ranking by energy contribution of 4508, 167, 208 and 41. For red wine and lager or ale-style beer (alcohol 4.6% v/v), popularity by frequency of consumption was ranked 32nd and 33rd, respectively, but contribution to energy was at 2nd and 6th place. Cola soft drink on the other hand was ranked 8th place by energy contribution but was 18th place for frequency of consumption. White rice was 4th place by energy contribution but by frequency consumed ranked 29th.
Table 4. The 100 most frequently consumed foods by the Australian population by food group.

| Grains                           | Dairy                                      | Meat                                      | Fruit                                      | Vegetables, Herbs and Spices | Discretionary                | Beverages                     | Fats and Oils                  |
|----------------------------------|--------------------------------------------|-------------------------------------------|--------------------------------------------|------------------------------|-------------------------------|-------------------------------|--------------------------------|
| Bread, from white flour, commercial, toasted | Milk, cow, fluid, regular fat (~3.5%), not further defined | Chicken, for use as a sandwich filling | Banana, cavendish, peeled, raw | Tomato, common, raw | Sugar, white, granulated or lump | Water, tap | Margarine spread, monounsaturated (65% fat) |
| Bread, from white flour, for homemade sandwiches | Milk, cow, fluid, reduced fat (1–2%), not further defined | Egg, chicken, whole, hard-boiled | Apple, red skin, unpeeled, raw | Carrot, mature, cooked | Sugar, raw | Tea, regular, black, from leaf or teabags, plain, without milk | Margarine spread, monounsaturated (65% fat), reduced salt |
| Breakfast cereal, whole wheat, biscuit | Milk, cow, fluid, regular fat (~3.5%) | Nut, almond, raw, unsalted | Mandarin, peeled, raw | Lettuce, raw | Butter, plain, salted | Coffee, black, instant powder, without milk | Margarine spread, polyunsaturated (70% fat) |
| Rice, white, steamed or rice cooker | Milk, cow, fluid, skim (~0.15% fat) | Egg, chicken, whole, fried | Juice, orange, commercial | Pepper, ground, black or white | Spread, yeast, vegemite, regular | Water, filtered | Mayonnaise, commercial, regular fat |
| Bread roll, from white flour, commercial | Milk, cow, fluid, reduced fat (1%) | Orange, peeled, raw | Salad, garden, no added dressing | Ham, leg, lean | Water, bottled, still | Oil, olive |
| Bread, from white flour, commercial | Cheese, cheddar, natural, plain, regular fat | Strawberry, raw | Potato, peeled, cooked without fat | Soft drink, cola flavour, regular | Water, rainwater or tank water |
| Bread, from wholemeal flour, commercial, toasted | Cheese, for use on sandwiches, not further defined | Pear, unpeeled, raw | Carrot, mature, raw | Honey | Coffee, long black style, from ground coffee beans, without milk |
| Rice, white, boiled, no added salt | Cheese, cheddar, natural, plain, not further defined | Grape, Thompson seedless or sultana, raw | Broccoli, fresh, boiled, microwaved or steamed, drained | Soft drink, cola flavour, intense sweetened or diet | Tea, green, plain, without milk |
Table 4. Cont.

| Grains | Dairy | Meat | Fruit | Vegetables, Herbs and Spices | Discretionary | Beverages | Fats and Oils |
|--------|-------|------|-------|-----------------------------|---------------|-----------|---------------|
| Bread, mixed grain, commercial, toasted | Chocolate, milk | | Melon, watermelon, peeled, raw | Avocado, raw | Sauce, tomato, commercial, regular | Coffee, flat white or latte, from ground coffee beans, with regular fat cow’s milk |
| Bread, from wholemeal flour, for homemade sandwiches | Milk, cow, fluid, unflavoured, not further defined | | Juice, apple, commercial | Cucumber, peeled or unpeeled, raw, not further defined | Wine, red | Coffee, cappuccino, from ground coffee beans, with regular fat cow’s milk |
| Bread, mixed grain, for homemade sandwiches | Milk, cow, fluid, skim (~0.15% fat) | | Apple, red skin, peeled, raw | Pea, green, frozen, cooked, no added fat | Beer, lager or ale style (alcohol 4.6% v/v) |
| Bread, from white flour, for homemade sandwiches, toasted | Milk, cow, fluid, reduced fat (~1.5%), increased protein (~4%) | | Apple, green skin, unpeeled, raw | Tomato, Roma, raw | Sugar, brown |
| Cheese, cheddar, processed, regular fat | | | Lettuce, cos, raw | | Beverage base, chocolate flavour (Milo) |
| | | | Salad, garden, added cheese, no added dressing | Potato, chips, regular, independent takeaway outlet, cafe or restaurant, salted |
| | | | Bean, green, fresh, boiled, microwaved or steamed, drained | Biscuit, sweet, plain, commercial |
| | | | Lettuce, iceberg, raw | Ice cream, vanilla flavour, regular fat |
| Grains | Dairy | Meat | Fruit | Vegetables, Herbs and Spices | Discretionary | Beverages | Fats and Oils |
|--------|-------|------|-------|-----------------------------|---------------|----------|--------------|
|        |       |      |       | Mixed vegetables, fresh or frozen, with carrot, pumpkin or sweet potato, cooked, no added fat | Fruit drink, orange juice, commercial |          |              |
|        |       |      |       | Cauliflower, fresh or frozen, cooked without fat | Lolly, jelly varieties |          |              |
|        |       |      |       | Tomato, raw | Wine, white, dry style |          |              |
|        |       |      |       | Peanut butter, smooth and crunchy, added sugar and salt | Soft drink, lemonade, regular |          |              |
|        |       |      |       | Intense sweetener | Sauce, soy |          |              |
|        |       |      |       | Jam, strawberry, regular | Biscuit, savoury, from white wheat flour, plain snack cracker style |          |              |
4. Discussion

This analysis of the most-consumed foods by Australians provides data that can be used to inform innovations in digital dietary assessment and monitoring tools, such as improving search functionality or automated identification and analysis of image-based records. Furthermore, the refinement of the food databases that underpin these technologies can also be enhanced by prioritisation of these popular foods. Our data reveal that the top 100 foods (2% of the reported foods) accounted for a large proportion of the total number of foods reported by the Australian population and 53% of the foods reported in the top 100 foods, accounting for 36% of total daily energy.

Foods typifying the Australian population’s diet that require prioritisation in search returns included some five food group foods such as grain foods, apples and bananas, and discretionary foods such as hot potato chips. Our results indicate that white rice and white breads and rolls should also be prioritised in search returns, but wholegrain breads and wholewheat breakfast biscuits were still popular. These findings show similarity to the popular foods consumed in the US, though some differences also exist, for example a greater popularity of condiments (e.g., regular mayonnaise, tomato sauce/ketchup) and corn or cornmeal tortilla chips for American adults [8] compared to Australians, and the popularity of wholewheat breakfast biscuits in Australia. Therefore, these popular foods should clearly be presented as first choices when searching strings of foods within a food group in digital dietary assessment tools. For example, if cereal is searched, wholewheat breakfast biscuits or the food item’s name brand Sanitarium Weet-bix™ should appear at the top of the search.

Currently, there is a degree of complexity to discerning between hot chips and crisps (as chips is commonly used for the latter) in searches and whether to return potato chips or hot chips. Typically, search returns are for potato crisps, and hot potato chips must be discerned. Our data indicates that hot potato chips should be the first search return option. This is important, as hot chips are not only popular but also a leading source of energy in the Australian diet. The search architecture could also be improved so that a system of synonyms or fuzzy string matches should be employed and specific ways that foods are referred to in different countries implemented to enhance searchability. For example, hot chips and crisps are both called chips in Australia, but other countries may use chips, crisps, hot chips or French fries. Thus, developing food composition databases or search tools that integrate information on the frequently consumed food can improve the usability of digital dietary assessment and monitoring tools by increasing specificity for use among a certain population [11]. Moreover, it has been found that differences in gender, poverty–income ratio, race/ethnicity and body mass index status are factors that can impact what foods are most commonly consumed by different age groups [8]. Collecting such demographic and user characteristic information within digital technologies can produce food search returns that are specific to a certain sub-population and with pre-populated popular foods or with a tailored list of frequently consumed foods that can then enhance the ease of using these tools [8].

With foods such as apples, from our findings, the red variety predominates with peel on, then apple juice, red apple with peel off, and green apples. Thus, in dietary assessment technologies, rather than presenting a long list of apple types, selecting the most commonly eaten should ease the burden of recording. The food databases of some researcher-based nutrition apps have been designed so that a single entry of a generic ‘apple’ was created from the different varieties that have similar nutritional value to improve usability and relevancy of search returns [10,11]. Alternatively, search functionality can also be enhanced through modifications to in-app design features, such as the inclusion of a ‘Search-Accelerator’ function which acts as a search filter [12]. The search-accelerator function applies algorithms to assist with narrowing down a search with relevant sub-string entries and keywords [12]. This functionality could be advanced further based on our findings. For example, when a user begins to type in ‘ap’ into the search, apple may appear in the search-accelerator buttons based on prioritisation of popular foods which a
user can then select. From this, the different varieties of apple would then appear in the search-accelerator buttons to which the user could then tap to quickly choose from a shorter list. Such design features would minimize users having to follow a single hierarchical structure of searching that other conventional nutrition apps may utilize. For example, when ‘apple’ is searched in the popular nutrition app MyFitnessPal, from among the first 100 search returns, 73 entries were related to the different cultivars or varieties of apple, and 27 were alternate apple-based food products (e.g., apple juice, apple pie, apple sauce). Having an excessive number of search returns is overwhelming for the user [16,17,20].

Other uses of the most popular foods are to prompt people to add forgotten foods and beverages. Previous literature has noted that up to 60% of participants may recall additional foods and beverages from these lists [24]. Common foods omitted included sweet biscuits; confectionaries and savory snack foods such as potato crisps, crackers; and fruits, vegetables and cheese [25]. These foods are among the most frequently consumed and within the top 100 foods by energy contribution observed in our analysis.

Even though nutrition apps are more convenient and accepted by users when compared to paper-based food diaries [26–29], there are still common food omissions from app records including fats and oils (54% of foods omitted), alcohol (42%) and discretionary foods and beverages (33%) [16]. As these under-reported foods align with those most commonly consumed by the population; administration of additional supplementary tools or technologies to probe or detect these foods or greater training for participants, researchers and dietitians in using these technologies would be beneficial [30]. Using continuous digital imaging methods to objectively document actual food consumption could be one way of identifying food omissions. From image-based records, the three most common foods omitted from a 24 h recall were revealed to be vegetables, fruit and confectionary items [25]. Using a digital entry app, the most commonly omitted foods were the same but confectionary outranked fruit [25].

Despite the advantages of digital imaging-based methods of dietary assessment and monitoring, coding of these images is tedious and automated image recognition is recommended [25]. Automated analysis of food images is advancing through artificial intelligence technologies [31]. Popular food items may support machine learning and identification algorithms and guide targeted search returns of suggested foods to participants or trained analysts when they are reviewing or identifying the foods in images. Having lists of frequently consumed foods might also inform processes for the verification of additions that cannot be visually detected such as types of oils and sauces used, and sugar and salt added and enhance the process of identification.

Beverages comprised five of the ten top foods and beverages consumed and five of ten for energy contribution with full fat cow’s milk topping both rankings. This is consistent with the NHANES findings where beverages, including tap water, cola, coffee, tea and milk, were among the most frequently consumed items [8]. Using digital image technology, milk was most-omitted from 24 h recall and apps but tea, sugar-sweetened beverages and alcohol were also forgotten [25]. It is therefore necessary to ensure that additions to commonly consumed foods and beverages are also prompted for by digital dietary assessment tools, given their popularity from our results. Tools to complete self-administered 24 h recalls such as the US ASA24 [32,33] and UK Intake24 [34,35] also recognise this and prompt for additions to foods and beverages such as butter on bread, milk in cereal and milk and added sugar in tea/coffee, as well as prompting for whether any beverages were consumed with a meal. Clearly prompting for beverages that include sugar in a range of forms, such as white granulated, brown and raw, is also necessary as it is highly consumed and significantly contributes to energy intakes in the population.

4.1. Implications for Dietitians and Public Health Interventions

Dietitians in clinical practice have a key role supporting clients to reduce disease risk and improve health outcomes through dietary changes [36–38]. Individualised nutrition counselling and education is particularly important given that although the most frequently
reported foods were five food group foods, the largest contributors to diet in terms of energy were discretionary foods and lower quality five food group foods. Presently refined grains are selected more frequently than wholegrains. Wholegrain consumption is recommended as it reduces the risk of cardiovascular disease, type 2 diabetes, weight gain and colorectal cancer [39]. Similarly, dairy products, mostly low fat, are recommended to reduce the risk of ischemic heart disease, myocardial infarction, diabetes, hypertension and some cancers [39]. While lower fat milks were popular, full cream milk was the most commonly preferred dairy food.

Nutrition apps are useful to both patients and dietitians in nutrition care [40]. However, the majority of nutrition apps focus on tracking of calorie and nutrient intakes from food [41]. Furthermore, the option for crowd-sourced data within apps reduces accuracy [41], even despite attempts such as by MyFitnessPal to apply a green tick to the foods in the database with complete nutritional information [42]. Only one in five popular nutrition apps provided intake recommendations relating to the five food groups [41]. One integrated nutrition app platform, Easy Diet Diary Connect [43], offers more in-depth analysis and categorizes foods consumed into the five food groups. Basic assessment of variety and quality five food group foods is also present (e.g., refined vs. wholegrains and whether fruit has been consumed as fruit juice) [30]. However, discretionary foods are not directly highlighted by the Easy Diet Diary Connect platform in a clear way such as in the ABS discretionary food list. Instead, the system divides discretionary foods into their constituent ingredients and assigns them into food groups and surrogate discretionary food measures of oil equivalents, solid fat equivalents, added sugars and alcohol [44]. This method of categorization poses limitations as it risks under-representation of discretionary food intake [45]. Discretionary food intake exceeded recommended intakes and accounts for 35% of Australian adults’ energy intake in 2011/12 when it was last assessed [46]. Moreover, alcohol and its popularity has been identified in previous analyses of the NNPAS [47], and one in four people exceed recommendations for alcohol [48]. Beer and red wine were commonly consumed and major energy sources in our study.

Our findings could guide further development of the classification systems in apps so that the subcategories of discretionary foods and lower quality five food group foods can be clearly identified within apps or flagged in their associated health professional platform. This would support dietitians in their practice as they use these outputs to guide personalized nutrition interventions that improve diet quality. Furthermore, feedback algorithms and data mining are advancing and to allow for delivery of automated feedback within apps to support dietary changes [49–51]. These systems could be further refined so that when the most popular foods are selected, particularly if they are discretionary or lower quality five food group foods, there is the triggering of tailored and practical feedback and nutrition recommendations to encourage behaviour change.

Information technology, software and public health nutrition researchers and practitioners can draw upon these data to inform targeted digital public health campaigns and interventions. The World Health Organisation has suggested digital health interventions as a strategy for improving sustainable development goals, including population diet and nutrition [52]. Replacing higher fat dairy products with alternatives, swapping refined grains/cereals for wholegrain and reducing discretionary food consumption are key targets. Systematic reviews have revealed some evidence in support of digital interventions being efficacious for improving diet [53]. However, improving engagement with these digital dietary interventions are important and may require further innovations in intervention design [54]. Creating dietary monitoring tools that have high usability for recording food and simultaneously give targeted feedback on how to modify intake are key.

4.2. Strengths and Limitations

This large cross-sectional survey of the Australian population reflects the most-consumed foods in the Australian food supply. The 24 h recall method employed has been validated to provide a snapshot of what the Australian population usually eats, pro-
viding a useful data source for the most commonly reported foods in the population. The recall method of dietary assessment can also be complemented with use of food frequency questionnaires [55] to develop a more comprehensive list of frequently consumed foods. Simultaneously, these data around popular foods can also assist researchers developing or updating food frequency questionnaires to include those foods that have greatest contribution to energy consumption and that are most commonly consumed by a population [8].

It is acknowledged the data used in this study were collected 10 years ago and that dietary intakes of the population are constantly changing; no more recent population survey has been conducted. Nevertheless, this research serves as a template that may be applied to newer national datasets, and future research could examine trends over time and cross-country similarities and differences in the most popular foods by energy and frequency across populations. Furthermore, having data on the foods commonly consumed by a population can be beneficial in guiding adjustments to food composition databases to focus on these popular foods, recipes and even specific varieties or cultivars of food items over less commonly consumed foods [11]. Understanding of what foods are most popular can also allow for prioritisation of funding for direct chemical analysis of foods in updates to the nutrient values in food composition databases. Misreporting of food intakes is common in dietary surveillance and may reduce or increase the frequency of certain foods and therefore may not represent actual intakes; for example, snacks are commonly omitted from recording [56,57].

5. Conclusions

The findings of the most popular foods and beverages consumed in Australia can guide innovations in the design of digital tools for dietary surveillance by the development of more tailored and relevant food databases that underpin these technologies. With the most popular foods consumed also commonly under-reported or omitted in self-report records using digital dietary assessment methods, probing of these popular foods should be prioritised to improve the validity of these methods. Together with improvements to dietary assessment and monitoring technologies, dietitians and digital public health campaigns and interventions should target popular foods that could improve diet quality to enhance personalised nutrition counselling and population health.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/nu14224822/s1, Table S1: the 100 most popular foods in Australia by energy contribution when categorized by minor food groups.

Author Contributions: Conceptualization, J.C., A.G. and M.A.-F.; methodology, A.G. and M.A.-F.; formal analysis, A.G.; investigation, A.G.; writing—original draft preparation, J.C. and A.G.; writing—review and editing, J.C., A.G. and M.A.-F.; visualization, J.C. and A.G.; supervision, M.A.-F. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Ethical review and approval were waived for this study due to this being secondary analysis of a survey, which was conducted under the Australian Federal Government Census Act, 1905.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are available upon request from the Australian Bureau of Statistics https://www.abs.gov.au/statistics/microdata-tablebuilder/available-microdata-tablebuilder, accessed on 15 May 2018.

Conflicts of Interest: M.A-F. has received grants from the National Health and Medical Research Council (Australia) and NSW Health. She has developed apps for research purposes but has no commercial interest in these apps. J.C. and A.G declare no conflicts of interest.
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