FOOD STANDARDS Australia New Zealand
Te Mana Kounga Kai – Ahitereiria me Aotearoa

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Supporting document 2 - Dietary intake assessment

P1056 – Caffeine review

Executive summary

The objectives of this dietary intake assessment are to:

1. estimate the usual intakes of caffeine from foods and beverages for Australian and New Zealand population groups and determine if intakes exceed recommended maximum levels
2. estimate the intakes of caffeine from sports foods and beverages, and dietary supplements for relevant Australian and New Zealand consumers
3. identify the major food group contributors to caffeine intakes for Australian and New Zealand population groups.

Methodology and approach

Food consumption data used for the dietary intake assessment came from the 2011-12 Australian National Nutrition and Physical Activity Survey (2011-12 NNPAS) and the 2008-09 New Zealand Adult Nutrition Survey (2008 NZANS).

Caffeine concentration data were from the databases used in the 2011-12 NNPAS and 2008 NZANS. Where relevant, these data were updated to reflect more recent data from Australian and New Zealand food composition databases, food labels and product websites.

Usual intakes of caffeine from foods and beverages for all respondents were estimated using the National Cancer Institute (NCI) Method (National Cancer Institute 2021) for Australian population groups, and the “2nd day adjusted” (or within-person variability adjustment) method (Sempos et al. 1991) for New Zealand population groups. Usual caffeine intakes were calculated to better estimate the proportion of Australian and New Zealand population groups who exceed the recommended maximum levels for chronic (or habitual) intake identified in the Supporting document 1 - Safety assessment of caffeine.

One day caffeine intakes for Australian and New Zealand sports food and beverage consumers, and the contribution of different food groups to the caffeine intake of all consumers were estimated using FSANZ’s dietary modelling computer program Harvest. An evaluation of caffeine intakes from dietary supplements for Australians was also conducted.

The Australian population groups included in the assessment were children (2-4 years, 5-8 years, 9-12 years), adolescents (13-19 years), adults (20 years and above) and women of childbearing age (16-44 years). The New Zealand population groups included in the assessment were adults (15 years and above) and women of childbearing age (16-44 years). Subpopulation groups of sports food / beverage consumers, and dietary supplement consumers were also included.

Results and discussion

Caffeine was consumed by 87% of Australians and 93% of New Zealand adults on day one of the national nutrition surveys.

Mean usual intakes of caffeine across all population groups assessed were 3-172 mg/day for Australians aged 2 years and above, and 97-142 mg/day for New Zealand adults. Estimated usual intakes for the population groups assessed indicated that no or few children and adolescents, and up to 6% of adults, had a caffeine intake that exceeded the recommended maximum levels. A larger proportion of women of child-bearing age had usual caffeine intakes greater than the recommended maximum level for pregnant women, however this is likely an overestimation as there is evidence that pregnant women may reduce their caffeine intake during pregnancy.

Non-alcoholic beverages was the highest contributor to day one caffeine intakes for all population groups assessed. Within this group, coffee, tea and soft drinks were major (>5%) contributors of caffeine for different population groups. Other major contributors to caffeine intakes for different population groups included sweet biscuits, cakes and muffins, flavoured milk and milkshakes, chocolate and chocolate-based confectionery, and sports foods and beverages.

Less than 5% of adolescent and adult respondents to the Australian and New Zealand national nutrition surveys reported consuming a sports food or beverage, with sports foods and beverages contributing up to 6% of total caffeine for these consumers.

Only a small proportion of respondents to the 2011-12 NNPAS reported consuming a dietary supplement containing caffeine (4%), and caffeine intakes from dietary supplements were minimal in comparison to the usual intakes from food.

Although caffeine concentrations were updated where possible, a limitation of this dietary intake assessment is that these data do not reflect changes in the consumption of caffeinated food and beverages over the past 10 to 12 years. Changes in Australian and New Zealand food and beverage consumption patterns and caffeine intakes resulting from changes to the food supply will be reflected in future national nutrition surveys.

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1. Objectives

The objectives of this dietary intake assessment were to:

1. estimate the usual intakes of caffeine from foods and beverages for Australian and New Zealand population groups
2. estimate the proportion of Australians and New Zealanders whose usual caffeine intake exceeds recommended maximum levels
3. estimate the intakes of caffeine from sports foods and beverages for Australian and New Zealand consumers
4. estimate the intakes of caffeine from dietary supplements for Australians
5. identify the major food group contributors to caffeine intakes for Australian and New Zealand population groups.

2. Methodology and approach for the dietary intake assessment

Dietary intake assessments require data on the concentrations of the chemical of interest in the food, including any naturally occurring sources and any current permissions for additions to food; and consumption data for the foods that have been collected through a national nutrition survey.

Usual intakes of caffeine from foods and beverages for all respondents were estimated using the National Cancer Institute (NCI) Method (National Cancer Institute 2021) for Australian population groups, and the "2nd day adjusted" (or within-person variability adjustment) method (Sempos et al. 1991) for New Zealand population groups. Usual caffeine intakes were calculated to better estimate the proportion of Australian and New Zealand population groups who exceed the recommended maximum levels for chronic (or habitual) intake identified in the Supporting document 1 - Safety assessment of caffeine.

One day caffeine intakes for Australian and New Zealand sports food and beverage consumers, and the contribution of different food groups to the caffeine intake of all consumers were estimated using FSANZ's dietary modelling computer program Harvest. An evaluation of caffeine intakes from dietary supplements was also conducted.

A summary of the general FSANZ approach to conducting dietary intake assessments is on the FSANZ website. A detailed discussion of the FSANZ methodology and approach to conducting dietary intake assessments is set out in Principles and Practices of Dietary Exposure Assessment for Food Regulatory Purposes (FSANZ 2024).

The permissions contained in the *Australia New Zealand Food Standards Code* (the Code) apply to foods sold in both Australia and New Zealand, therefore dietary intake assessments were undertaken for both countries.

2.1 Food consumption data

Food consumption data used for the dietary intake assessments were:

- 2011-12 Australian National Nutrition and Physical Activity Survey (2011-12 NNPAS), a one 24 hour food recall survey of 12,153 Australians aged 2 years and above, with a second 24-hour recall undertaken for 64% of respondents (Australian Bureau of Statistics (ABS) 2014a).

- 2008-09 New Zealand Adult Nutrition Survey (2008 NZANS), a one day 24- hour recall covering 4,721 New Zealanders aged 15 years and above, with a second 24-hour recall undertaken for 25% of respondents (New Zealand Ministry of Health 2011a, b).

The design of these nutrition surveys vary and the key attributes of each, including survey limitations are in the Principles and Practices of Dietary Exposure Assessment for Food Regulatory Purposes (FSANZ 2024).

Day one intakes and usual daily intakes of caffeine from foods have previously been published for the 2011-12 NNPAS (ABS 2014b, ABS and FSANZ 2015). This assessment updated the concentration data used for the national nutrition survey, and re-calculated usual intakes for different age and population groups.

Consumption data for dietary supplements were collected from respondents in the 2011-12 NNPAS on both days of the survey. In the 2011-12 NNPAS dietary supplements referred to products defined as Complementary Medicines under the Therapeutic Goods Regulation 1990 (ABS 2015) and included tablets and capsules. Two days of consumption data were averaged to represent longer term intakes.

2.2 Population groups assessed

The Supporting document 1- Safety assessment of caffeine identified children, adolescents, and pregnant women as population groups for whom there are specific safety considerations. The population groups and corresponding age groups used in the dietary intake assessment are listed in Table 1. The number of respondents is reported as the weighted[1] number of respondents for both surveys. Children were further divided into two age groups (5-8 years and 9-12 years) corresponding with the age groups used in FSANZ's application of the NCI model. For the 2008 NZANS, all respondents were included in the assessment for adults as it was identified in the Supporting document 1- Safety assessment of caffeine that the recommended maximum level for adults is also applicable to adolescents.

Women of childbearing age (16-44 years) were used as a proxy for pregnant women because the data in the national nutrition surveys on pregnant women is not sufficient enough to use for making robust estimates of dietary intake for this population group. However, it should be noted that many pregnant women modify their consumption of caffeinated beverages during pregnancy (Crozier et al. 2009, Peacock et al. 2018) and therefore calculated caffeine intakes for women of childbearing age may be an overestimate.

Estimated usual intakes of caffeine from foods and beverages were calculated for all *respondents* to the 2011-12 NNPAS and 2008 NZANS. Caffeine intakes were also estimated

[1] Survey sample weighting factors are used to adjust the results of surveys to better reflect the results that would have been obtained if a truly representative sample had been able to be obtained, and to make population based estimations of results.

for the following three sub-groups of *consumers*:

1. Respondents who reported consuming a sports food or beverage as listed in Table 3 on day one of the surveys were classified as sports food / beverage consumers. The population groups reported in this assessment are Australian adolescents aged 13-19 years, Australian adults aged 20 years and above, and New Zealand adults aged 15 years and above. Australian children were not included in this part of the assessment due to there being insufficient numbers of consumers of sport foods and beverages to provide robust data.
2. Respondents who participated in both days of the 2011-12 NNPAS and reported consuming a dietary supplement on either or both days were classified as *dietary supplement consumers.* Results are reported for the total survey population of Australians 2 years and above.
3. Respondents who reported consuming a food containing caffeine on day one of the surveys were classified as *day one consumers*. Data from these consumers were used to identify the major food group contributors to caffeine intakes for Australian and New Zealand population groups. In this assessment, 87% of 2011-12 NNPAS respondents and 93% of 2008 NZANS respondents were classified as *day one consumers* (Table 1).

Table 1: Population groups used in the dietary intake assessment

Country	Survey	Population group	Age group	No. respondents (Day 1 only)	No. consumers (Day 1 only)	No. respondents (Day 1 and 2)
Australia	2011-12 NNPAS	Children	2-4 years	495	262	301
		Children	5–8 years	596	398	391
		Children	9–12 years	694	536	421
		Adolescents	13–19 years	1091	872	749
		Adults	20 years and above	9276	8536	5874
		Women of child bearing age	Females 16–44 years	2537	2290	1595
New Zealand	2008 NZANS	Adults	15 years and above	4721	4381	1180
		Women of child bearing age	Females 16– 44 years	1248	1150	322

FSANZ would ordinarily undertake dietary intake assessments for New Zealand children aged 5-14 years using the 2002 National Children’s Nutrition Survey data. Caffeine intakes were not estimated for this population group in this assessment because there is no dataset for caffeine for this nutrition survey in Harvest. An analysis of the estimated caffeine intakes for children aged 5-12 years from the 2002 National Children’s Nutrition Survey (Thomson and Schiess 2010) is included in the Discussion section of this document.

2.3 Caffeine concentration data

The dietary intake assessment included both naturally occurring and added sources of caffeine in the diet in order to determine a total estimated usual dietary intake for Australian and New Zealand populations. Caffeine intakes from dietary supplements were not included in the estimation of usual intakes.

The caffeine concentration data used in the dietary intake assessment were those used for the 2011-12 NNPAS (AUSNUT 2011-2013 (FSANZ 2014)) and the 2008 NZANS (New Zealand Ministry of Health 2011a). To ensure the assessment was inclusive of the latest products available on the market the most recent updated concentration data (at the time of this assessment) were sourced from the Australian Food Composition Database (FSANZ 2022), the 2018 New Zealand FOODfiles (New Zealand Food Composition Database 2019), food labels and product websites. Where updated concentration data were available, these were used to create an updated caffeine concentration dataset for single ingredient foods and mixed foods or dishes using a recipe approach in Harvest. For example, for the 2011-12 NNPAS an updated concentration from the Australian Food Composition Database (FSANZ 2022) was used for espresso style black coffee, therefore the concentrations of caffeine for coffees made with milk, other drinks, desserts etc. that contained espresso style black coffee as an ingredient were also all updated. The range of caffeine concentrations used in this assessment for major food group contributors to caffeine intakes for general population groups as identified in Section 3.4 are shown in Table 2.

Table 2: Caffeine concentration ranges for major food group contributors to caffeine intakes

Country	Food group	Caffeine concentration (mg/100 g)
Australia	Tea	0 - 90
	Coffee and coffee substitutes	0 - 3490
	Soft drinks, and flavoured mineral waters	0 - 11
	Other beverage flavourings and prepared beverages	0 - 15
	Sweet biscuits	0 - 18
	Cakes, muffins, scones, cake-type desserts	0 - 27
	Flavoured milks and milkshakes	0 - 77
	Chocolate and chocolate-based confectionery	0 - 745
New Zealand	Tea	0 - 114
	Coffee	0 - 4590

2.4 Estimating usual intakes of caffeine: NCI method implementation

Usual intakes of caffeine for Australian population groups were estimated using the National Cancer Institute (NCI) Method (National Cancer Institute 2021). The implementation of the method was consistent with the approach taken by the ABS and Food Standards Australia New Zealand (FSANZ) in estimating usual nutrient intakes for the 2011-12 NNPAS. Further information about this approach is available in the Australian Health Survey User Guide, 2011-13 (ABS 2013). The only variation from the NNPAS implementation in estimating usual intakes of caffeine was that the model was run in the statistical programming software R, rather than in SAS using the original code available from the NCI Method website. FSANZ previously translated the SAS code for the NCI Method into R (for version 3.0.3). At the time of translation FSANZ undertook testing to validate the R code. The outputs from R were compared to those from SAS and the outputs were consistent between the two programs.

The NCI method assumes that “usual intake is equal to the probability of consumption on a given day times the average amount consumed on a consumption day” (National Cancer Institute 2021). In order to run the NCI method, dietary intakes for each survey respondent are required. The day 1 and day 2 caffeine intake for each respondent from the 2011-12 NNPAS was calculated using Harvest and then used as the input for the NCI method. The intake of caffeine from dietary supplements was not included in the calculations as a limitation of the NCI method is that it cannot estimate usual intakes from multimodal distributions (ABS 2013).

The correlated two-part model type was used to estimate usual intakes, as greater than 5% of respondents had a zero caffeine intake on both days of the survey, and there is a correlation between the probability of caffeine intake and the amount consumed. The first part of the model estimated the probability of caffeine intake, and the second part of the model estimated the amount consumed on a consumption day (National Cancer Institute 2021). The covariates used in the model were sex, age, weekend vs weekday and sequence effect (which considers the potential reporting differences between day 1 and day 2 of the nutrition survey). The default of 100 simulations for each respondent was used in the Monte Carlo simulation component of the model. The model was run separately for three sub-population groups: children up to 8 years, males 9 years and over and females 9 years and over. This ensures the model fitting is done more specifically using respondents with similar food consumption patterns. Results were then extracted and the distribution of caffeine intakes were reported for the population groups identified in Table 1.

2.5 Estimating usual intakes of caffeine: 2nd day adjusted method implementation

Usual intakes of caffeine for New Zealand population groups were estimated using the 2nd day adjusted (or within-person variance adjustment) method (Sempos et al. 1991) in Harvest. The implementation of the method was consistent with the approach taken by ABS in estimating usual nutrient intakes for the 1995 Australian National Nutrition Survey (Rutishauser 2000). The 2nd day adjustment method works on the assumption that total variance in the outcomes of a survey reflect the sum of between person (the true difference between people in what they eat) and within person (the difference from day to day in one person) variance. Therefore it estimates total variance and between person variance and adjusts each person’s day 1 intake by a factor that is the ratio of these two standard deviations (noting that standard deviation is the square root of variance). This adjustment to day 1 intakes reduces the within-person variance (Sempos et al. 1991) and a distribution curve of ‘usual’ intakes can be produced.

The 2nd day adjusted method was run in Harvest using the formula in Equation 1.

Equation 1: 2nd Day adjustment equation

Adjusted value = $x + (x_1 - x) * (S_b/S_{obs})$

Where:
x is the group mean nutrient intake for the total weighted Day 1 sample
x_1 is an individual’s day 1 nutrient intake
Sb is the between person standard deviation calculated using day 1 and day 2 intakes for those respondents surveyed twice
S_{obs} is the group standard deviation for the Day 1 sample

Sempos et al. 1991

The 2nd day adjusted method requires a minimum number of respondents to have completed 2 days of the 24-hour recall. In the 2008 NZANS, 25% of respondents completed a second 24 hour recall which is sufficient. Different age groups were then used to calculate the two standard variation values (S_b and S_{obs}) used in the equation above for males and females separately. For the 2008 NZANS these age groups were 15-30 years, 31-50 years, 51-70 years and 71 years and above. Results were then extracted and reported for the population groups identified in Table 1.

The 2nd day adjusted method assumes that intakes are normally distributed. As caffeine intakes in the 2008 NZANS were not normally distributed, intakes were log-transformed and then back-transformed after the 2nd day adjusted calculations were completed.

2.6 Assumptions and limitations of the dietary intake assessment

The aim of the dietary intake assessment was to make the best estimate of caffeine intake possible. However, where significant uncertainties in the data existed, conservative assumptions were generally used to ensure that the estimated dietary intake was not an underestimate of intake.

Assumptions made in the dietary intake assessment included:

- as caffeine intakes for New Zealanders were not available in the 2002 New Zealand National Children's Nutrition Survey (2002 NZCNS), it is assumed that the intake of caffeine by New Zealand children is the same as by Australian children
- as caffeine intakes from dietary supplements were not available in the 2008 NZANS or 2002 NZCNS, it is assumed that the intake of caffeine from dietary supplements by New Zealanders is the same as by Australians
- where a food was not included in the intake assessment (i.e. not consumed in the nutrition survey), it was assumed to contain a caffeine concentration of zero
- where a food was assigned a caffeine concentration, this concentration was carried over to mixed foods where the food had been used as an ingredient (e.g. coffee used in desserts, chocolate used in homemade cakes etc.)
- the foods and beverages consumed in the national nutrition surveys that contain caffeine have a caffeine concentration as per the dataset used in this assessment
- for the purposes of the caffeine dietary intake assessment, sports foods / beverages are considered to be those foods listed in Table 3.
- sports food / beverage consumers are those who reported consuming a food listed in Table 3.

Table 3: Foods considered to be "sports foods / beverages", for the purposes of the caffeine dietary intake assessment

Amino acid or creatine drinks	Protein drinks, including powders
Energy gels	Sports drink, ready to drink (including "sugar-free")
High protein bars	Sports drink, powder

Limitations of this dietary intake assessment include:

- the range and composition of caffeinated foods and beverages, specifically sports foods and beverages have changed since the 2011-12 NNPAS and 2008 NZANS. Caffeine concentration data were updated where available, however the data does not reflect the breadth of products currently available for consumption.
- consumption patterns of caffeinated foods and beverages may have changed since the 2011-12 NNPAS and 2008 NZANS and are not reflected in this assessment. This

may in particular be relevant to foods such as sports foods and beverages, and formulated caffeinated beverages (e.g. energy drinks). A discussion of current caffeine consumption behaviours is included in the Supporting document Consumer Literature Review for P1056.

In addition to the specific assumptions made and limitations identified in relation to this dietary intake assessment, there are a number of limitations associated with the nutrition surveys from which the food consumption data used for the assessment are based. A discussion of these limitations is included in Section 6 of the Principles and Practices of Dietary Exposure Assessment for Food Regulatory Purposes (FSANZ 2024).

3. Results

3.1 Estimated usual dietary intakes of caffeine from general foods and beverages

The estimated usual dietary intakes of caffeine were calculated for all *respondents* to the Australian and New Zealand national nutrition surveys. Data are reported for mean, median (50th percentile) and 95th percentile (P95) intakes in two ways:

- in milligrams per day, derived from each individual's daily intake (all population groups)
- in milligrams per kilogram of body weight (bw) per day, derived from each individual's daily intake (Australian population groups) and their own body weight as recorded for the nutrition survey.

3.1.1. Australia

For children aged 2-4 years the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 3 mg/day, 2 mg/day and 8 mg/day respectively. On a per kilogram of body weight basis, the estimated mean, median and P95 usual intakes are 0.2 mg/kg bw/day, 0.1 mg/kg bw/day and 0.4 mg/kg bw/day, respectively.

For children aged 5-8 years the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 7 mg/day, 6 mg/day and 16 mg/day respectively. On a per kilogram body weight basis, the estimated mean, median and P95 usual intakes are 0.3 mg/kg bw/day, 0.2 mg/kg bw/day and 0.6 mg/kg bw/day respectively.

For male children aged 9-12 years the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 24 mg/day, 13 mg/day and 85 mg/day respectively. On a per kilogram body weight basis, the estimated mean, median and P95 usual intakes are 0.5 mg/kg bw/day, 0.3 mg/kg bw/day and 1.5 mg/kg bw/day respectively.

For female children aged 9-12 years the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 19 mg/day, 10 mg/day and 67 mg/day respectively. On a per kilogram body weight basis, the estimated mean, median and P95 usual intakes are 0.4 mg/kg bw/day, 0.2 mg/kg bw/day and 1.3 mg/kg bw/day respectively.

For male adolescents aged 13-19 years the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 52 mg/day, 34 mg/day and 161 mg/day respectively. On a per kilogram body weight basis, the estimated mean, median and P95 usual intakes are 0.7 mg/kg bw/day, 0.5 mg/kg bw/day and 2.2 mg/kg bw/day respectively.

For female adolescents aged 13-19 years the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 42 mg/day, 27 mg/day and 132 mg/day respectively. On a per kilogram body weight basis, the estimated mean, median and P95 usual intakes are 0.7 mg/kg bw/day, 0.4 mg/kg bw/day and 2.2 mg/kg bw/day respectively.

For male adults aged 20 years and above the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 172 mg/day, 143 mg/day and 420 mg/day respectively. On a per kilogram body weight basis, the estimated mean, median and P95 usual intakes are 2.0 mg/kg bw/day, 1.7 mg/kg bw/day and 5.0 mg/kg bw/day respectively.

For female adults aged 20 years and above the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 162 mg/day, 134 mg/day and 393 mg/day respectively. On a per kilogram body weight basis, the estimated mean, median and P95 usual intakes are 2.4 mg/kg bw/day, 1.9 mg/kg bw/day and 5.8 mg/kg bw/day respectively.

For female adults of child bearing age 16-44 years the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 127 mg/day, 101 mg/day and 326 mg/day respectively. On a per kilogram body weight basis, the estimated mean, median and P95 usual intakes are 1.9 mg/kg bw/day, 1.5 mg/kg bw/day and 4.9 mg/kg bw/day respectively.

Results are shown in Table 4 and Figure 1.

3.1.2 New Zealand

For male adults 15 years and above the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 142 mg/day, 134 mg/day and 323 mg/day, respectively. On a per kilogram, body weight basis, the estimated mean, median and P95 usual intakes are 1.7 mg/kg bw/day, 1.6 mg/kg bw/day and 4.0 mg/kg bw/day.

For female adults aged 15 years and above the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 124 mg/day, 118 mg/day and 282 mg/day respectively. On a per kilogram, body weight basis, the estimated mean, median and P95 usual intakes are 1.8 mg/kg bw/day, 1.6 mg/kg bw/day and 4.0 mg/kg bw/day.

For females of child-bearing age aged 16-44 years the estimated mean, median and P95 usual intakes of caffeine from foods and beverages are 97 mg/day, 88 mg/day and 231 mg/day respectively. On a per kilogram, body weight basis, the estimated mean, median and P95 usual intakes are 1.4 mg/kg bw/day, 1.2 mg/kg bw/day and 3.5 mg/kg bw/day.

Results are shown in Table 4 and Figure 2.

Table 4: Estimated usual mean, median and P95 dietary caffeine intakes for all respondents*

Country	Age group	Sex	Estimated dietary intake of caffeine (mg/day)			Estimated dietary intake of caffeine (mg/kg bw/day)		
			Mean	Median	P95	Mean	Median	P95
Australia**	2-4 years	Male	3	2	8	0.2	0.1	0.4
		Female	3	2	8	0.2	0.1	0.4
	5-8 years	Male	7	6	16	0.3	0.2	0.6
		Female	7	6	16	0.3	0.2	0.6
	9–12 years	Male	24	13	85	0.5	0.3	1.5
		Female	19	10	67	0.4	0.2	1.3
	13-19 years	Male	52	34	161	0.7	0.5	2.2
		Female	42	27	132	0.7	0.4	2.2
	20 years and above	Male	172	143	420	2.0	1.7	5.0
		Female	162	134	393	2.4	1.9	5.8
	16-44 years	Female	127	101	326	1.9	1.5	4.9
New Zealand¥	15 years and above	Male	142	134	323	1.7	1.6	4.0
		Female	124	118	282	1.8	1.6	4.0
	16-44 years	Female	97	88	231	1.4	1.2	3.5

*For all respondents. Respondent numbers are shown in Table 1.
**Usual intakes for Australian population groups estimated using the National Cancer Institute (NCI) Method.
¥Usual intakes for New Zealand population groups estimated using the 2nd day adjusted method.

3.1.3 Estimated proportions of Australians and New Zealanders whose usual intake exceeds the recommended maximum levels of caffeine intake

Recommended maximum levels of chronic (or habitual) caffeine intake were identified in the Supporting document 1- Safety assessment of caffeine as 400 mg/day (5.7 mg/kg bw/day) for adults and athletes, 200 mg/day for pregnant women, 5.7 mg/kg bw/day for adolescents, and 3.0 mg/kg bw/day for children (as associated with adverse effects on affective states in children).

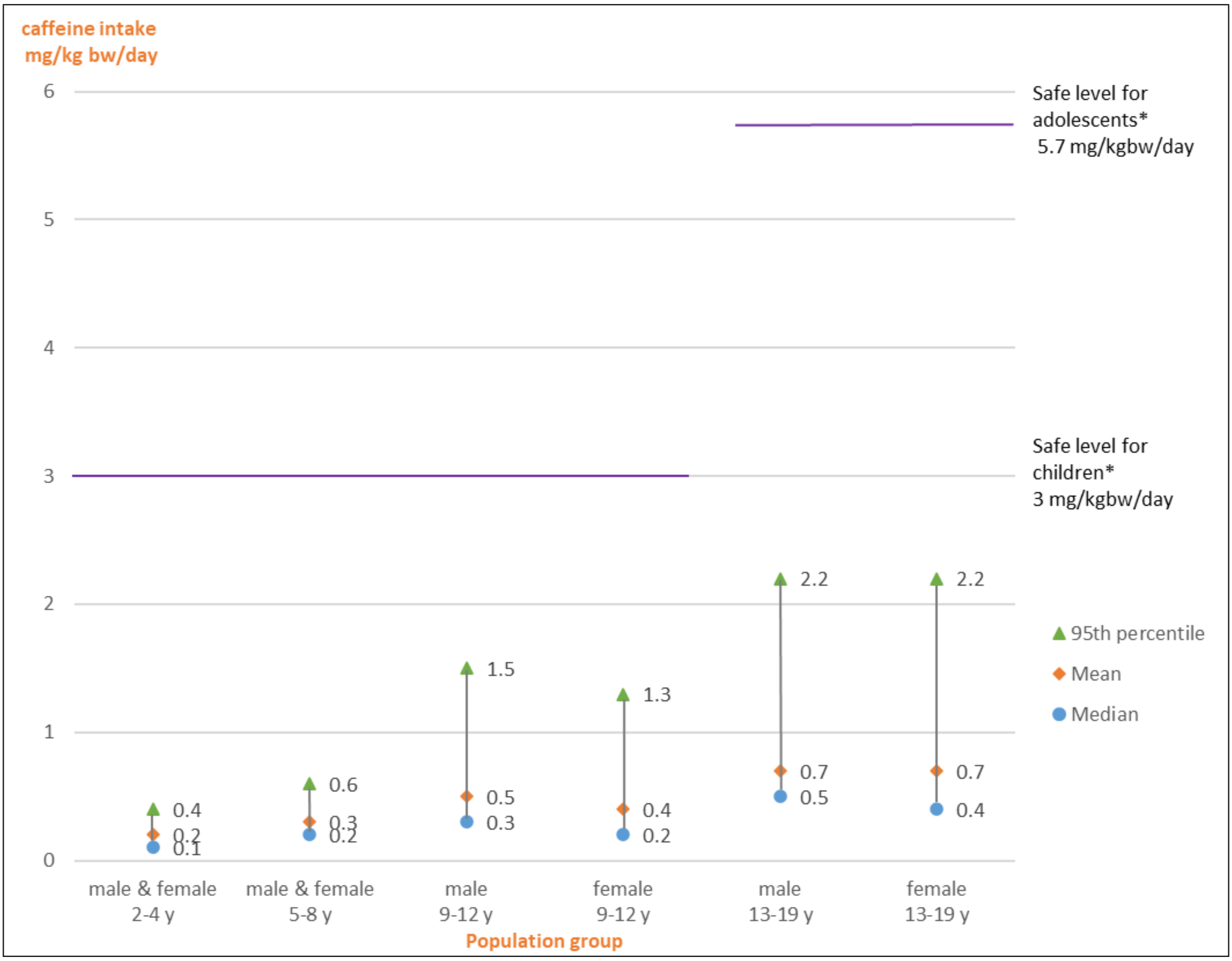
Up to 6% of Australian and 2% of New Zealand population groups (except females 16-44 years), had usual caffeine intakes in excess of the recommended maximum levels. No children aged 2-4 years and 5-8 years had usual intakes greater than the recommended maximum level of 3 mg/kg bw/day. A greater proportion of Australian and New Zealand females aged 16-44 years (11%-19%) had usual caffeine intakes greater than the recommended maximum level for pregnant women of 200 mg/day, however this is likely an overestimation of actual usual intake (Table 5).

Table 5: Proportions of population groups with a usual caffeine intake greater than the recommended maximum level

Country	Population group	Respondents with a usual caffeine intake > recommended maximum level* (%)	
		Male	Female
Australia	Children 2-4 years	0	0
	Children 5-8 years	0	0
	Children 9-12 years	<1	<1
	Adolescents 13-19 years	<1	<1
	Adults 20 years and above	6	5
	Females 16-44 years	n/a	19
New Zealand	Adults 15 years and above	2	<1
	Females 16-44 years	n/a	11

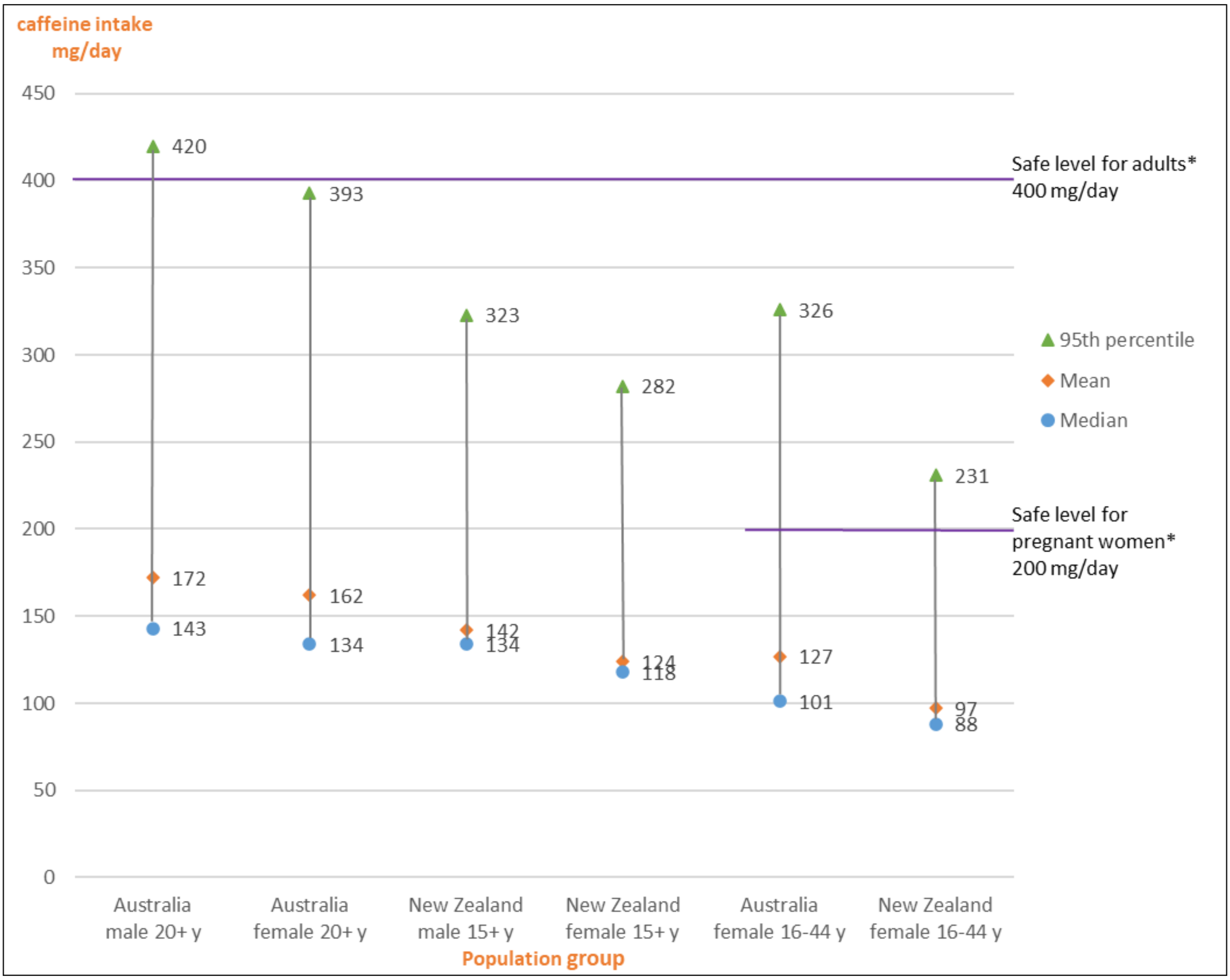
*Recommended maximum levels of chronic caffeine intake from the Supporting document 1- Safety assessment of caffeine: children 3 mg/kg bw/day, adolescents 5.7 mg/kg bw/day, adults 400 mg/day, females 16-44 years 200 mg/day.
n/a = not applicable

Figure 1: Estimated mean usual dietary caffeine intakes for Australian children and adolescent population groups, and comparison with recommended maximum levels of intake



*Recommended maximum levels of chronic caffeine intake from the Supporting document 1- Safety assessment of caffeine

Figure 2: Estimated mean usual dietary caffeine intakes for Australian and New Zealand adult population groups, and comparison with recommended maximum levels of intake



*Recommended maximum levels of chronic caffeine intake from the Supporting document 1- Safety assessment of caffeine

3.2 Estimated dietary intakes of caffeine for Australian and New Zealand sports food / beverage consumers

The estimated dietary intakes of caffeine were calculated for Australian and New Zealand *sports food / beverage consumers*. The proportion of consumers is reported as the weighted[1] proportion of sports food / beverage consumers to respondents for the specific age range reported. Estimated intake data are reported for mean, median and 90th percentile (P90) in milligrams per day, derived from each individual's daily intake. The estimated contribution of caffeine intake that comes from sports foods / beverages are also presented.

3.2.1 Australia

For Australian adolescent sport food / beverage consumers aged 13-19 years (4.6% of respondents), the estimated mean, median and P90 intakes of caffeine from sport foods / beverages only and from all foods and beverages are 11 mg/day, 12 mg/day and 14 mg/day, and 66 mg/day, 49 mg/day and 164 mg/day respectively. Sports foods and beverages contribute 4% of the total caffeine intake from all foods and beverages for this age group (Table 6).

For Australian adult sport food / beverage consumers (20 years and above) (3.6% of respondents), the estimated mean, median and P90 intakes of caffeine from sports foods / beverages only and from all foods and beverages are 22 mg/day, 5 mg/day and 44 mg/day, and 181 mg/day, 131 mg/day and 407 mg/day respectively. Sports foods and beverages contribute 6% of the total caffeine intake from all foods and beverages for this age group (Table 6).

3.2.2 New Zealand

Of all respondents to the 2008 nutrition survey (15 years and above), 2.6% reported consuming a sports food / beverage. For these consumers the estimated mean, median and P90 intakes of caffeine from sport foods / beverages only and all foods and beverages are 3 mg/day, 2 mg/day and 7 mg/day, and 96 mg/day, 67 mg/day and 216 mg/day respectively. Sports foods and beverages contribute 1% of the total caffeine intake from all foods and beverages (Table 6).

3.3 Estimated intakes of caffeine from dietary supplements for Australians

In the 2011-12 NNPAS, consumption data for dietary supplements were collected from respondents aged 2 years and above on both days of the survey. The proportion of consumers is reported as the weighted[1] proportion of consumers to respondents. Estimated caffeine intakes are reported for mean, median and 90th percentile (P90) in milligrams per day, derived from each individual's daily intake and averaged over the two days.

Across both days of the survey, 4% of all respondents aged 2 years and above, and 12% of *dietary supplement consumers* consumed a supplement containing caffeine. For those who consumed a dietary supplement containing caffeine, the estimated mean, median and P90 caffeine intakes from supplements was 7 mg/day, 0.1 mg/day and 10 mg/day respectively.

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Table 6: Estimated day one dietary intakes of caffeine for sports food / beverage consumers

Country	Age Group	No. of sports food / beverage consumers	Proportion sports food / beverage consumers to respondents (%)	Estimated dietary intake of caffeine (mg/day)						Proportion of caffeine intake from sports foods / beverages (%)
				Sports foods / beverages			All foods and beverages			
				Mean	Median	P90	Mean	Median	P90	
Australia	13-19 years	51	4.6	11	12	14	66	49	164	4
	20 years and above	331	3.6	22	5	44	181	131	407	6
New Zealand	15 years and above	121	2.6	3	2	7	96	67	216	1

3.4 Food groups contributing to caffeine intakes

The contribution of food groups to total estimated caffeine intakes was calculated for *day one consumers* and *sports food / beverage consumers* (Australia and New Zealand). Major contributing food groups are those that contribute 5% or greater to total caffeine intakes. All percentages presented in this section are the proportion of total caffeine intake from each specified food group.

3.4.1 Australia

3.4.1.1 Day one consumers

Non-alcoholic beverages was a major contributing food group to caffeine intakes for all population groups assessed (39-96%). Within this food group, tea (13-23%), and soft drinks and flavoured mineral waters (6-33%) were major contributors to caffeine intakes for all population groups assessed. Coffee and coffee substitutes was a major contributor for all population groups (6-66%) except 5-8 year old (0%) and 9-12 year old (3%) children. Other beverage flavourings and prepared beverages was a major contributor for 2-4 year old (9%) and 5-8 year old (5%) children.

Cereal based products and dishes was a major contributing food group to caffeine intakes for 2-4 year old, 5-8 year old and 9-12 year old children (14-26%). Within this food group, cakes, muffins, scones, cake type desserts was a major contributor for all three children population groups (9-17%). Sweet biscuits was a major contributor for 2-4 year old (10%) and 5-8 year old (7%) children.

Milk products and dishes was a major contributing food group to caffeine intakes for 2-4 year old, 5-8 year old and 9-12 year old children, and 13-19 year old adolescents (5-15%). Within this food group, flavoured milk and milkshakes was a major contributor for 9-12 year old children (12%) and 13-19 year old adolescents (8%).

Confectionery and cereal/nut/fruit/seed bars was a major contributing food group to caffeine intakes for 2-4 year old, 5-8 year old and 9-12 year old children (10-27%). Within this major food group, chocolate and chocolate-based confectionery was a major contributor for all three age groups (9-26%).

See Table 7 for further details.

Table 7: Food group* contributors to dietary caffeine intakes for Australia, based on Day 1 of the 2011-12 NNPAS, for general population groups

Major and sub-major food groups	Contribution to dietary caffeine intakes (%)					
	Age groups (male and female)					Female
	2-4 years	5-8 years	9-12 years	13-19 years	20 + years	16-44 years
Non-alcoholic beverages	39	50	60	82	96	95
Tea	13	16	20	15	23	20
Coffee and coffee substitutes	6	0	3	34	66	65
Soft drinks, and flavoured mineral waters	10	29	33	28	6	8
Electrolyte, energy and fortified drinks	0	0	1	4	1	2
Other beverage flavourings and prepared beverages	9	5	3	1	<1	<1
Cereals and cereal products	2	2	1	<1	<1	<1
Cereal based products and dishes	23	26	14	3	<1	1
Sweet biscuits	10	7	4	1	<1	<1
Cakes, muffins, scones, cake-type desserts	12	17	9	2	<1	<1
Pastries	0	<1	<1	<1	<1	<1
Mixed dishes where cereal is the major ingredient	<1	2	0	0	0	0
Batter-based products	<1	<1	<1	<1	<1	<1
Egg products and dishes	0	0	0	<1	<1	<1
Milk products and dishes	7	5	15	9	2	2
Frozen milk products	3	3	2	<1	<1	<1
Custards	<1	<1	<1	0	0	0
Other dishes where milk or a milk product is the major component	1	1	1	<1	<1	<1
Flavoured milks and milkshakes	2	1	12	8	2	2
Dairy and meat substitutes	<1	0	0	0	<1	<1
Sugar products and dishes	3	2	1	<1	<1	<1
Confectionery and cereal/nut/fruit/seed bars	27	15	10	3	1	1
Chocolate and chocolate-based confectionery	26	14	9	3	1	1
Muesli or cereal style bars	1	1	<1	<1	<1	<1
Other confectionery	<1	<1	<1	<1	<1	0
Alcoholic beverages	0	0	0	3	1	<1
Special dietary foods	<1	<1	<1	<1	<1	<1

Note: Shading indicates that the food group is a major contributor to dietary caffeine intakes.

* Food groups for which there is no contribution to caffeine intakes for any population group are not included in the table.

3.4.1.2 Sports food / beverage consumers

Non-alcoholic beverages was a major contributing food group to caffeine intakes for adolescent (60%) and adult (90%) sport food / beverage consumers. Within this food group, tea, coffee and coffee substitutes, and soft drinks and flavoured mineral waters were major contributors to caffeine intakes for both age groups. For adolescent sport food / beverage consumers a greater proportion of caffeine intake was contributed by soft drinks and flavoured mineral waters, and for adult sport food / beverage consumers a greater proportion of caffeine intake was contributed by coffee and coffee substitutes.

Milk products and dishes was a major contributing food group to caffeine intakes for adolescent sport food / beverage consumers (26%). Within this food group, flavoured milk and milkshakes was a major contributor (24%).

Special dietary foods (6%) was a major contributing food group to caffeine intakes for adult sport food / beverage consumers. Within this group, formula dietary foods (6%), which includes some sports foods and beverages, was a major contributor. See Table 8 for further details.

Table 8: Food group* contributors to dietary caffeine intakes for Australia, based on Day 1 of the 2011-12 NNPAS, for sports food / beverage consumers

Major and sub-major food groups	Contribution to dietary caffeine intakes (%)	
	Age groups (male and female)	
	13-19 years	20 + years
Non-alcoholic beverages	60	90
Tea	10	12
Coffee and coffee substitutes	21	70
Soft drinks, and flavoured mineral waters	28	6
Electrolyte, energy and fortified drinks	2	2
Other beverage flavourings and prepared beverages	<1	<1
Cereals and cereal products	<1	<1
Cereal based products and dishes	4	<1
Milk products and dishes	26	2
Frozen milk products	<1	<1
Other dishes where milk or a milk product is the major component	<1	<1
Flavoured milks and milkshakes	24	2
Sugar products and dishes	<1	<1
Confectionery and cereal/nut/fruit/seed bars	2	1
Alcoholic beverages	4	1
Special dietary foods	4	6
Formula dietary foods	4	6

Note: Shading indicates that the food group is a major contributor to dietary caffeine intakes.

* Food groups for which there is no contribution to caffeine intakes for any population group are not included in the table.

3.4.2 New Zealand

For New Zealand general population groups aged 15 years and above *Non-alcoholic beverages* was the major contributing food group (96-98%). Within this food group, tea (28-33%) and coffee (59-60%) were the major contributing food groups.

Non-alcoholic beverages was also a major contributing food group to caffeine intakes for *sports food / beverage consumers* (87%). Within this group, tea (15%), coffee (52%), soft drinks (9%) and energy drinks (10%) were major contributing food groups.

Sugar/sweets was a major contributing food groups to caffeine intakes for sports food / beverage consumers (5%). Within this group, chocolate and chocolate-based confectionery was the major contributing food group (5%).

See Table 9 for further details.

Table 9: Food contributors* to dietary caffeine intakes for New Zealand, based on Day 1 of the 2008 NZANS, for general population groups and sports food / beverage consumers

Major and sub-major food groups	Contribution to dietary caffeine intakes (%)		
	General population groups		Sports food / beverage consumers
	15 years and above	Female 16-44 years	15 years and above
Breakfast cereals	<1	<1	0
Biscuits	<1	<1	1
Cakes and muffins	<1	<1	<1
Puddings/desserts	<1	<1	0
Milk	<1	<1	1
Dairy products	<1	<1	1
Sugar/sweets	1	1	5
Chocolate and chocolate-based confectionery	1	1	5
Lollies	0	<1	0
Sugar based toppings, sauces and icings	0	0	<1
Non-alcoholic beverages	98	96	87
Tea	33	28	15
Coffee	59	60	52
Hot drinks	<1	<1	<1
Fruit juices	<1	0	0
Soft drinks	3	4	9
Energy drinks	3	4	10
Alcoholic beverages	1	2	3
Dietary supplements	<1	<1	1
Snack bars	<1	<1	<1

Shading indicates that the food group is a major contributor to dietary caffeine intakes.
*Food groups for which there is no contribution to caffeine intakes for any population group are not included in the table.

4. Discussion

Most Australians and New Zealanders consume caffeine, with 87% and 93% of respondents respectively reporting consuming a food or beverage containing caffeine on day one of the national nutrition surveys. These data are comparable to that from other nationally representative population based studies from New Zealand, the United States of America (USA) the United Kingdom (UK) and Ireland. In the 2002 New Zealand National Children's Nutrition Survey (2002 NZCNS), 73% of respondents aged 5-12 years (n=2579) consumed caffeine (Thomson and Schiess 2010). In separate analyses of two (2009-2010) and ten (2001-2010) years of data from the National Health and Nutrition examination Survey (NHANES) (USA), it was reported that 71% of children aged 2-19 years (n= 3280) and 89% of adults (n= 24,808) respectively consumed caffeine on any given day (Ahluwalia et al. 2014, Fulgoni et al. 2015). In the National Diet and Nutrition Survey (NDNS) 2008-2010 (UK), 94% of respondents aged 18 months and above (n= 2126) consumed a food or beverage containing caffeine (Fitt et al. 2013), as did almost 97% of Irish adults aged 18-64 years (n= 1274) in the National Adult Nutrition Survey (NANS) 2008-2010 (Evans et al. 2016).

In this assessment, Australian children had lower estimated usual caffeine intakes than adolescents and adults, with no or few children having usual intakes greater than the recommended maximum level of 3 mg/kg bw/day. Mean usual caffeine intakes ranged from 3 mg/day or 0.2 mg/kg bw/day for 2-4 year old children, to 24 mg/day or 0.5 mg/kg bw/day for 9-12 year old children. These estimated usual intakes of caffeine in mg/day are similar to those for Australian children previously published by the ABS and FSANZ (2015), with data reported for slightly different age groups.

Mean caffeine intakes for young caffeine consumers have been reported for New Zealand, UK, and Korean population groups, with respondent intakes reported also for Korean and USA population groups. For New Zealand consumers aged 5-12 years in the 2002 CNS, mean caffeine intake was 20 mg/day (0.6 mg/kg bw/day), with an estimated 2% of consumers having a caffeine intake which exceeded the adverse effect level of 3.0 mg/kg bw/day (Thomson and Schiess 2010). For children in the UK NDNS 2008-2010, mean caffeine intakes ranged from 6 mg/day for consumers aged 1.5-3 years to 12 mg/day and 13 mg/day for female and male consumers aged 4-10 years respectively (Fitt et al. 2013). In the Korea National Health and Nutrition Examination Survey (KHANES) 2010-2012, mean caffeine intakes for consumers ranged from 6.5 mg/day for children aged <3 years to 18.6 mg/day for children aged 9-11 years, with respondent mean intakes for the same age groups being 1.4 mg/day and 7.5 mg/day (Lim et al 2015). Respondent intakes were also reported for the US NHANES 2011-2012 where mean caffeine intakes for all children aged 4-8 years and 9-13 years were 15 mg/day and 26 mg/day respectively (Drewnowski and Rehm 2016). Although these data are not directly comparable with the data for Australian children in this assessment due to different methodologies, results from the NHANES 2011-2012, the NDNS 2008-2010 and the KHANES 2010-2012 all display a trend similar to the 2011-12 NNPAS of caffeine intakes increasing with age.

In this assessment, major food group contributors to caffeine intakes for all child age groups were tea, soft drinks and flavoured mineral waters, cakes, muffins, scones and cake type desserts, and chocolate confectionery. Sweet biscuits was a major contributor to caffeine intakes for younger age groups (2-4 years and 5-8 years), other beverage flavourings and prepared beverages was a major contributor for the youngest age group (2-4 years), and flavoured milk and milk shakes was a major contributor for the older age group (9-12 years). These contributors are similar to those published for day one of the 2011-12 NNPAS (ABS 2014b), however the use of different age groups and updated concentration data have contributed to slightly different percentages. For example, unexpectedly in this assessment, coffee and coffee substitutes was a major contributor (6%) to caffeine intakes for Australian children aged 2-4 years. However, as the mean usual caffeine intake for this age group is 3 mg/day, this proportion is not indicative of higher coffee consumption by 2-4 year old children generally, rather it is reflective of the higher caffeine concentrations for some coffee beverages used in this assessment. When the first results were released from the 2011-12 NNPAS by the ABS (2014b) a mean intake of 2 mg/day for 2-3 year olds from day one of the nutrition survey was reported. Of this, 0.3% of caffeine intakes was from coffee and coffee substitutes (day one only).

Consistent with the findings in this assessment, non-alcoholic beverages were major contributors of caffeine for children in other studies of caffeine intake. In the 2002 NZCNS tea, soft drinks, coffee, and biscuits, cakes and pastries were major (≥10%) sources of caffeine with tea (32%) and soft drinks (30%) the highest contributors (Thomson and Schiess 2010). Soft drinks and tea were also the highest contributors of caffeine for children in NHANES 2009-2010 and NHANES 2011-2012 (Ahluwalia and Herrick 2015; Drewnowski and Rehm 2016).

Australian adolescents had higher estimated usual caffeine intakes than children with a mean of 52 mg/day or 0.7 mg/kg bw/day for males and 42 mg/day or 0.7 mg/kg bw/day for females. This estimated usual intake of caffeine for males in mg/day is the same as previously published by the ABS and FSANZ (2015) for adolescents aged 14-18 years, with females aged 13-19 years in this assessment having a slightly higher usual intake than previously reported (39 mg/day) by ABS and FSANZ (2015).

Mean caffeine intakes for adolescents have also been reported for the UK, USA and Korea. In the UK NDNS 2008-2010, mean intakes for male and female consumers aged 11-18 years were 46 mg/day and 44 mg/day respectively (Fitt et al. 2013). In the US NHANES 2011-2012, the mean intake for respondents aged 14-19 years was 61 mg/day (Drewnowski and Rehm 2016) and in the KHANES 2010-2012, mean intakes for 12-14 year old and 15-18 year old respondents were lower at 10 mg/day and 30 mg/day respectively (Lim et al 2015). Similar to the data for children, these international data are not directly comparable with the data for Australian adolescents in this assessment due to different methodologies, however there is some consistency in the mean intakes.

In this assessment less than 1% of adolescents in the 2011-12 NNPAS had usual intakes greater than the recommended maximum level of 5.7 mg/ kg bw/day. Similarly, Fitt et al. (2013) reported no adolescent consumers aged 11 to 18 years exceeded consuming 300 mg/day of caffeine in the UK NDNS 2008-2010. These proportions are lower than those reported in other studies of caffeine intakes in adolescents. In an analysis of data from the US NHANES 2009-2010, it was reported that 10% of respondents aged 12-19 years exceeded the maximum level of 2.5 mg/kg bw/day Ahluwalia et al. 2014, and in the KHANES 2010-2012, 7.6% and 20.8% of respondents aged 12-14 years and 15-18 years respectively also exceeded the maximum recommended daily intake of 2.5 mg/kg bw/day (Lim et al 2015). Although higher, these international proportions are not directly comparable with the findings for Australian adolescents from this assessment due to different methodologies and maximum recommended maximum levels applied.

Similar to all other age groups in this assessment, tea, and soft drinks and flavoured mineral water were major food group contributors to dietary caffeine intakes for adolescents, with coffee and coffee substitutes, and flavoured milks and milkshakes also major sources. These contributors are the same as those published by the ABS (2014b), however as also observed for children, the use of different age groups and updated concentration data contribute to slightly different percentages. In this assessment of the 2011-12 NNPAS, coffee and coffee substitutes was the highest contributor of caffeine for adolescents (34%), followed by soft drinks and flavoured mineral water (28%), and tea (15%). These three contributors were in a different order for adolescents in the NHANES 2009-2010 and NHANES 2011-2012 (Ahluwalia and Herrick 2015; Drewnowski and Rehm 2016), suggesting different dietary patterns.

In this assessment, the estimated mean usual intakes of caffeine for Australian and New Zealand adults ranged from 124 mg/day for New Zealand females to 172 mg/day for Australian males. These usual intakes are within the range previously reported for Australian adult population groups 19 years and above of between 95 mg/day to 193 mg/day (ABS and FSANZ 2015). Apparent consumption data from the Australian Bureau of Statistics also supports these usual intakes for Australian and New Zealand adults, with the mean amount of caffeine available per person per day ranging from 162.5 mg in 2018-19 to 184.1 mg in 2021-22 and 172.8 mg in 2022-23 (ABS 2024).

Caffeine intakes for adults have also been reported for the USA, Hungary, UK, Korea and Ireland. In an estimation of usual caffeine intake from the USA NHANES 2001-2010, mean intakes for respondents were 161 mg/day for females and 211 mg/day for males (Fulgoni et al. 2015). In Hungary, estimates of mean caffeine intakes for respondents aged 18 years and above (n=1131) collected as part of the National Nutrition and Nutritional Status Survey (OTAP2009) were reported as 147 mg/day for males and 138 mg/day for females (Lugasi et al. 2015). In the UK NDNS 2008-2010, mean intakes for adult consumers ranged from 122 mg/day for females aged 19-64 years to 143 mg/day for males aged 65 years and above (Fitt et al. 2013), and in the KHANES, mean intakes for adults 19 years and above were 81.9 mg/day for respondents and 113.4 mg/day for consumers (Lim et al 2015). Finally, in the NANS 2008-2010, the mean intake for all Irish respondents aged 18-64 years was 102 mg/day, with the mean intakes for male and female consumers being 108 mg/day and 101 mg/day respectively (Evans et al. 2016). As for the international data for children and adolescents, these data are not directly comparable with the data for Australian and New Zealand adults due to different methodologies, but are reflective of dietary patterns at the time.

The Supporting document 1 - Safety assessment of caffeine identified 400 mg/day as a recommended maximum level of chronic (or habitual) caffeine intake for adults. Using the most recent caffeine concentration data from the Australian Food Composition Database (FSANZ 2022), 400 mg would be equivalent to the caffeine intake from consuming approximately two 300 mL flat white/latte/cappuccino coffees, or four 300 mL black coffees made with instant coffee powder, or five 250 mL cans of energy drink, or seven 300 mL cups of black tea. Of all adult respondents to the Australian and New Zealand national nutrition surveys, 6% or less had usual intakes greater than this recommended maximum level. In their analysis of usual intakes in the NHANES 2001-2010, Fulgoni (et al. 2015) estimated 14% of adult consumers had usual intakes greater than 400 mg/day. This proportion is higher than was estimated in the UK NDNS 2008-2010, where 4.1% of men and 3.8% of consumers aged 19 years and above had caffeine intakes greater than 300 mg/day Fitt et al. (2013).

For both Australia and New Zealand, *non-alcoholic beverages* was the major contributing food group to caffeine intakes for adults (96 and 98%), with coffee being the highest major contributor in both countries (66% and 59%). Tea (Australia and New Zealand), and soft drinks and flavoured mineral waters (Australia only) were also major contributors to caffeine intakes from this food group. Akin to other age groups, these contributors are the same as reported by the ABS (2014b), however the proportions are slightly different. For example the contribution of caffeine from coffee is greater in this assessment compared to 62.5% for Australians aged 19 years and above as reported for day one (ABS 2014b) possibly due to higher caffeine concentrations used for espresso coffee in this assessment. Coffee, followed by tea were also the major sources of caffeine for adults in studies from Ireland, the USA, and Hungary (Evans et al. 2016; Fulgoni et al. 2015; Lugasi et al. 2015).

The recommended maximum level of chronic caffeine intake for pregnant women (200 mg/day) is half that for non-pregnant adults, and in this assessment the population group of females aged 16-44 years in the surveys was used as a proxy for pregnant women. In this assessment based on consumption data from 2011-12 NNPAS and 2008 NZANS, 19% and 11% respectively of this group had estimated usual caffeine intakes greater than the recommended maximum level for pregnant women. However as pregnant women may decrease their consumption of caffeinated beverages during pregnancy (Crozier et al. 2009, Peacock et al. 2018), the estimated usual intakes and the proportions of females aged 16-44 years exceeding the recommended maximum level may be an overestimation for pregnant women. For females aged 16-44 years, the major contributors to caffeine intakes were the same as for all adults.

Less than 5% of adolescent and adult respondents to the Australian and New Zealand national nutrition surveys reported consuming a sports food or beverage. For those who did, sports foods and beverages contributed 3-22 mg of the 66-181 mg/day consumed from all foods and beverages at the mean. At the 90th percentile for Australian adolescent and New Zealand adult sports food and beverage consumers, day one caffeine intakes from all foods and beverages were below the recommended maximum level of 400 mg/day, with the intake for Australian adult consumers just exceeding the recommended maximum level at 407 mg/day.

Non-alcoholic beverages (tea, coffee, soft drinks, and energy drinks (New Zealand only)) were major contributors to caffeine intakes for sports food / beverage consumers. Other major contributors to caffeine intakes for sports food and beverage consumers included flavoured milk and milkshakes (Australian adolescents) and chocolate and chocolate-based confectionery (New Zealand adults). Sports foods and beverages were a major contributor (6%) to caffeine intakes for Australian adult sports food / beverage consumers but were not a major contributor for Australian adolescent (4%) or New Zealand adult (1%) sports food / beverage consumers.

Changes in the contribution of sports foods and beverages to total caffeine intakes for consumers are likely to have occurred since nutrition surveys were conducted and are likely to be consumed by a larger proportion of the population, with increased consumption of a greater range of products. In a 2012 FSANZ telephone survey (n=10,003) 10.2% of Australian and 9.3% of New Zealand adults aged 15 years above reported using at least one supplementary food product (including sports foods and beverages) in the preceding 4 weeks (FSANZ 2013). These proportions of consumers are greater than what was found in this assessment. More recent Australian apparent consumption data also shows that the purchase of electrolyte or sports drinks has increased 48% over time, from 6.3 mL per person per day in 2018-19 to 9.3 mL per person per day in 2022-2023 (ABS 2024). From 2012/13 to 2016/17, sales of sports nutrition products (including sports related supplements) in Australia grew by 7%, with an estimated value of $495 million in 2016/17 (Office for Sport-

Department of Health 2020). Although it is not known what proportion of the sports foods and beverages reported in these studies contained caffeine, these and other such changes in consumption will be reflected in future national nutrition surveys.

Only a small proportion of respondents to the 2011-12 NNPAS aged 2 years and above reported consuming a dietary supplement containing caffeine. Among those who did, mean and P90 intakes from dietary supplements (7 mg/day and 10 mg/day) were minimal in comparison to usual mean intakes from the diet depending on the age group.

Whilst there are slight differences in caffeine intakes and food contributions shown from other countries, results provide consistent conclusions compared to the findings from Australia and New Zealand.

5. Conclusions

In conclusion, caffeine is consumed by most Australians and New Zealanders, predominantly from non-alcoholic beverages. Estimated usual intakes for different population groups indicate that only a small proportion of the population groups assessed exceeded chronic recommended maximum levels of caffeine intake based on food consumption data from the most recent national nutrition surveys. Although caffeine concentrations were updated where possible, a limitation of this dietary intake assessment is that the data do not reflect changes in the consumption of caffeinated food and beverages over the past 10 to 12 years. Changes in Australian and New Zealand food and beverage consumption patterns and caffeine intakes resulting from changes to the food supply will be reflected in future national nutrition surveys.

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