

Caffeine consumption in Iceland in 2002



Table of Contents

Introduction	3
Background	3
Method	6
Results	7
Conclusion	9
Acknowledgement	9
References	10

Introduction

Caffeine can be found in many food items either as a food additive or as a natural component. Addition of caffeine to food items other than those naturally containing caffeine makes it difficult for consumers to regulate their caffeine intake. In a report from the Nordic Council of Ministers (NCM, 2002) where risk analysis is made for caffeine there are two management options mentioned which many countries follow today. These are:

- To issue specific legislation setting maximum levels for food
- To give guideline to producers, consumers, etc.

Beverages and food containing caffeine are coffee, tea, guarana, cola nuts, cocoa, chocolate and some other plants. As for cola beverages, they are made from cola nuts but most of their caffeine is added using purified or synthesized caffeine. It is also allowed to add caffeine to energy drinks although some of them also contain guarana.

In addition, caffeine is used in many medicinal drugs for example in the treatment of migraine headaches and overweight. Within the Nordic countries, at least 50 different drugs contain caffeine. The per capita intake of caffeine from pharmaceuticals was found to be 35.53 mg/day in Iceland in 1998 (NCM, 2002). It should also be noted that caffeine is found in many anti-cellulite cream.

In Iceland the maximum content of caffeine allowed in cola drinks and caffeinated soft drinks, including energy drinks, is 135 mg/liters and this limit is set in the regulation of food additives. Caffeine in Denmark and Norway is regulated under regulation on flavorings with a permitted maximum level of 150 mg/kg. In Sweden caffeine is also regulated under the flavoring regulation with a limit of 135 mg/kg. For energy drinks Sweden accepts a level of 320 mg/kg with special labeling requirements (NCM, 2002). In Finland, when the caffeine content exceeds 135 mg/L, an exemption permit to exceed the content is required. In practice, exemption permits are granted e.g. energy drink with caffeine levels usually of 240 mg/l and 320 mg/l.

It is important to know the level of caffeine intake among populations when setting maximum levels for caffeine in beverages. The Environment and Food Agency of Iceland has calculated the consumption of caffeine from coffee, tea, soft drinks and energy drinks using data from nutritional survey conducted by the Icelandic Nutrition Council in 2002.

Background

The Science Committee of Food (SCF) evaluated possible harm to health from the consumption of caffeine in 1983. It was concluded that there was no apparent reason for concern at normal levels of intake. In a report issued in 1999 the SCF gave opinion on caffeine, taurine and D-glucurono- γ -lactone as constituents of energy drinks. In conclusion, it was considered that the contribution of energy drinks to the overall caffeine intake would not appear to be a matter of concern for non-pregnant adults. However for children energy drinks could increase their daily intake of caffeine compare with when not drinking energy drinks. High doses such as 5.3 mg/kg bw/day for a 10-year old could result in temporary behavioural changes, such as increased arousal, irritability, nervousness or anxiety (SCF, 1999).

When studying caffeine intake many things have to be taken into consideration, such as reliability of self-reporting, methodology of the study, different concentrations of caffeine in the same type of beverage and volume variation of cups/glasses that are used by the consumers.

In Canada, Australia, Brazil, Sweden and Denmark the average daily caffeine intake is estimated to be 238 mg, 240 mg, 171 mg, 425 mg and 490 mg, respectively (NCM, 2002). The two Nordic countries have much higher caffeine intake than the other countries. Nawrot et al. reviewed effects of caffeine on human health and concluded for the healthy adult population that moderate daily caffeine intake at a dose level up to 400 mg/day was not associated with adverse effects such as general toxicity, cardiovascular effects, effects on bone health, changes in adult behaviour, increased incidence of cancer nor with effects on male fertility. But subgroups, like women in reproductive age and children, should get specific advice, suggesting that based on available evidence women in reproductive age should not consume more than 300 mg/day while children should not consume more than 2.5 mg/kg bw/day (Nawrot et al. 2003).

There have been some recommendations in different countries regarding caffeine intake among pregnant women. Already in 1980 the American Food and Drug Administration (FDA) issued recommendation to women to limit their intake of caffeine during pregnancy based on research done on pregnant rats (FDA, 1980). Many epidemiological studies have been conducted since then in this field and in 2001 the Food Standard Agency (FSA) in UK advised pregnant women to limit their intake of caffeine to less than 300 mg/day, which should be equivalent to four average cups of coffee a day. This advice was based on a review done by the Committee on Toxicity of Chemicals in Food (COT) (FSA, 2001). In a statement from COT it was announced that the risk of low birth weight and spontaneous abortion increased with increased maternal caffeine intake during pregnancy although it was not possible to determine a threshold level. However based on an intake of 150-300 mg/day, which showed less evidence for these associations than results of epidemiological studies for intakes above 300 mg/day, the above limit was set (COT, 2001).

The advice on caffeine for pregnant women was followed by information on the number of different beverages that would give 300 mg of caffeine. Three years later FSA published results of a survey of caffeine levels in hot beverages. This survey was conducted to gather data on the level of caffeine in tea and coffee made by consumers following their usual procedures as the advice to pregnant women was based on caffeine levels in these beverages prepared under laboratory conditions. Samples of prepared teas and coffees were collected in the UK from homes, workplaces, cafés, and restaurants. The results showed that there was a wide range of caffeine levels in tea (range = <1 mg – 90 mg, mean = 40 mg per serving), instant coffee (range = 21 mg – 120 mg, mean = 54 mg per serving) and ground coffee (range = 15 mg – 254 mg, mean = 105 mg per serving). The survey showed that the Agency's advice to pregnant women was appropriate although it was stated that pregnant women preferring stronger tea or coffee or larger servings should drink fewer cups or mugs (FSA, 2004).

In 1999 caffeine content of a number of coffee samples, cola beverages and energy drinks was determined in Iceland. The average caffeine content in coffees was 550 mg/L (Verheijen, 1999). Using the same serving size as the average serving size in the

FSA study, which was 219 g, showed an average caffeine level of 120.5 mg per serving in the Icelandic study.

Finally it should be mentioned that in 2002, Commission Directive 2002/67/EC was published on the labelling of foodstuffs containing quinine and those containing caffeine. Prior to that, the legislation only required the declaration "flavouring", although many manufacturers had already voluntarily indicated when caffeine or quinine was added. The new rules require that drinks containing caffeine in excess of 150 milligrams per litre to carry a declaration in the same field of vision as the name of the food. The declaration is "High caffeine content", together with the amount of caffeine expressed in milligrams per 100 ml. This should alert consumers to unexpectedly high levels of caffeine in some drinks. This however does not apply to drinks based on tea or coffee, or coffee or tea extracts if the name of the food already makes that fact clear to consumers that it contains high level of caffeine (Food Law News –UK- 2003). Regulation on that matter was implemented in Iceland in November 2003.

Method

Data on the consumption of coffee, tea, soft drinks and energy drinks were collected from a national nutrition survey, carried out by the Icelandic Nutrition Council in 2002. Participants (N= 1242) were in the age range of 15 to 80 years and the method used for the survey was a 24-hours recall.

The figures for caffeine levels in different beverages are listed in table 1. These figures were used for the calculation of caffeine consumption. Information on the amount of caffeine in cola drinks and energy drinks were given by two of the main soft drink production companies, both located in Reykjavík; the Coca-Cola Company and Egill Skallagrímsson ehf. It was assumed that different types of soft drinks were consumed in equal amounts. All the energy drinks contain the maximum level allowed for caffeine (table 1).

The average caffeine content in coffee was taken from study done in Iceland on caffeine content of common beverages in the Icelandic diet (Verheijen, 1999) and caffeine level for tea was taken from a survey made in UK in 2004 where the average caffeine level in tea was found to be 40 mg per serving and the average serving size was 230 ml (FSA, 2004).

Table 1. Caffeine level in coffee, tea, dark soft drinks and energy drinks.

Type of beverage	Caffeine (mg/L)
Coffee	550
Tea	174
Dark soft drinks ¹	108
Energy drinks ²	135

¹ Coca-cola, Diet-Coke, Tab, Pepsi Max, Pepsi, and Diet-Pepsi

² Magic, Pús Battery, Orka etc.

Results

The daily average consumption of coffee in the survey was 368 ± 434 ml/day and the maximum consumption was reported to be 2250 ml/day. The consumption of coffee related to age is shown in figure 1 where it can be seen that men in the age range of 40-59 years had the highest intake of coffee consuming on average 632 ± 469 ml/day.

The daily average consumption of tea in the survey was 61 ± 178 ml/day and the maximum consumption was reported to be 2100 ml/day. Women in the age range of 60-80 years had the highest intake of tea, which was on average 111 ± 251 ml/day (figure 2).

The daily average consumption of dark soft drinks and energy drinks was 199 ± 388 ml/day and 4 ± 40 ml/day respectively with a maximum consumption of 2500 ml for dark soft drinks and 500 ml for energy drinks. Figures 3 and 4 shows that boys in the age range of 15-19 years had the highest consumption of these drinks i.e. for dark soft drinks it was on average 689 ± 643 ml/day and for energy drinks on average 8 ± 63 ml/day.

Figure 1.

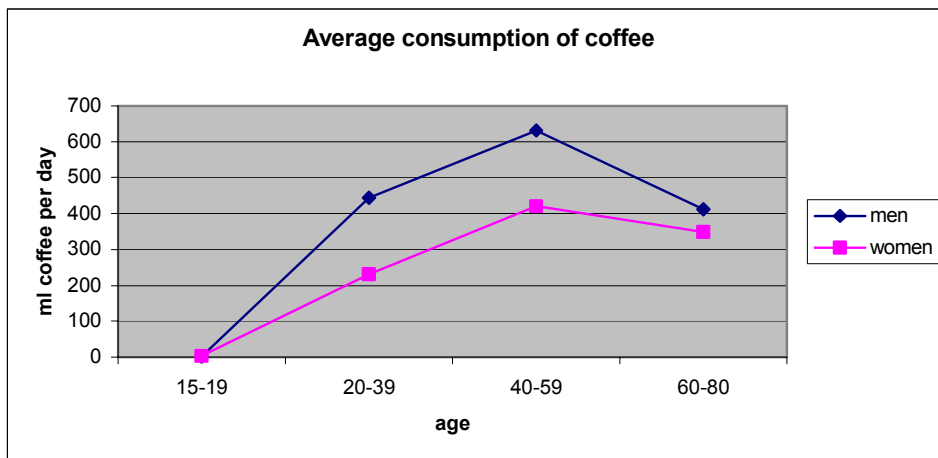


Figure 2.

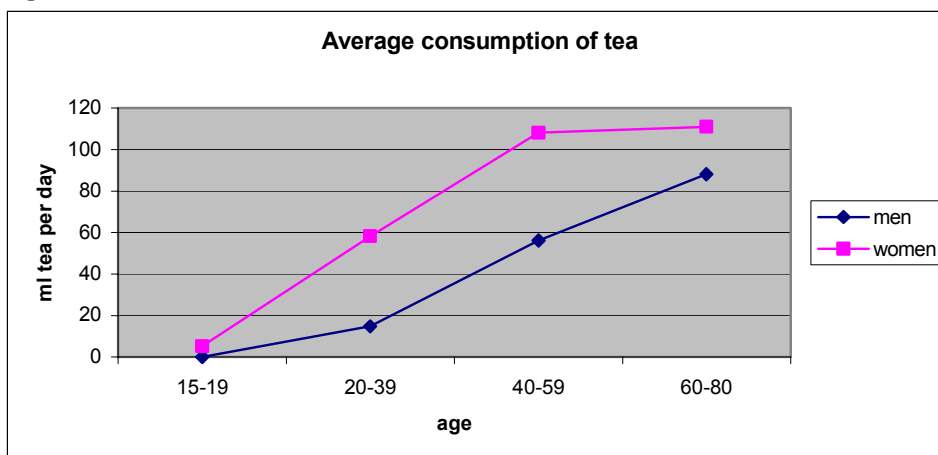


Figure 3.

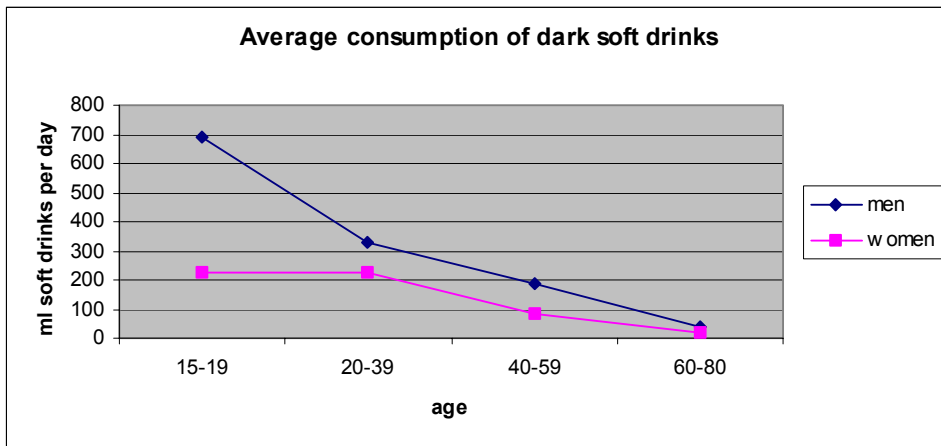
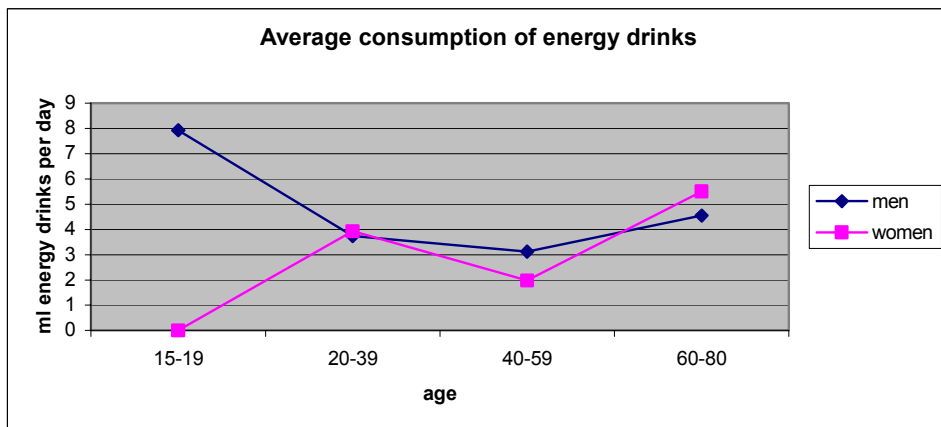
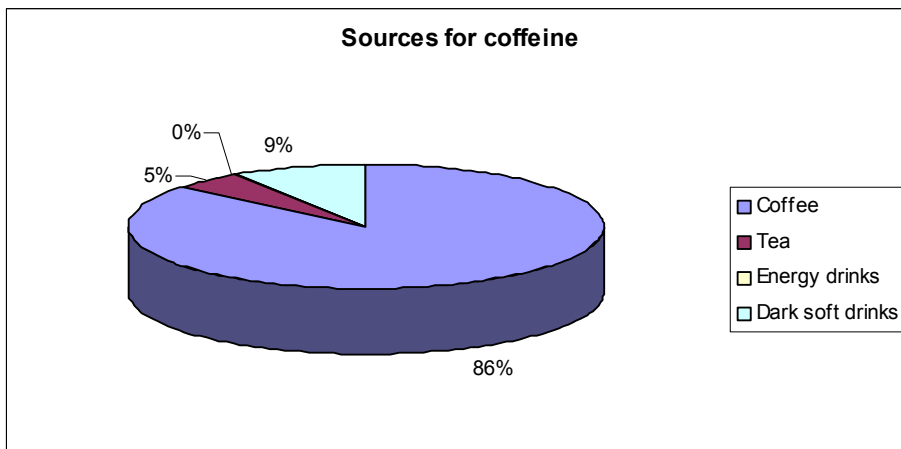


Figure 4.



Amount consumed of beverages containing caffeine was on average 632 ± 524 ml/day. Figure 5 shows how much caffeine comes from each type of beverages.

Figure 5.



As previously mentioned, there were 1242 participants in the survey and 85% of them consumed caffeine from one or more of the beverages mentioned in figure 5. Average consumption of caffeine among 85% of the participants was 275 ± 228 mg/day (range 1-1238 mg/day). Per capita intake was on average 235 ± 232 mg/day and the 90 percentiles show 574 mg/day (table 2).

Table 2.

Percentiles	Caffeine intake (mg/day)
25	54
50	165
75	351
90	574
95	694

Conclusion

Data from the Icelandic nutrition survey showed that the average consumption of caffeine (235 ± 232 mg/d) from coffee, tea, dark soft drinks and energy drinks is within the limits of 400 mg/day found by Nawrot et al not to be associated with adverse effects such as general toxicity, cardiovascular effects, effects on bone health, changes in adult behaviour, increased incidence of cancer or with effects on male fertility. This figure is also considerably lower than has been found in Sweden and Denmark, i.e. 425 mg and 490 mg respectively. However, it is of concern that 10% of the participants had equal or higher intake than 574 mg caffeine/day. It should also be noted that the average figure for the caffeine intake in this study came only from beverages but not from chocolate and cocoa products or from medicinal drugs containing caffeine.

Most of the caffeine consumed came from coffee or 86% (figure 5) and the data showed that men in the age range of 40-59 years had the highest intake of coffee.

This survey also showed that the energy drinks contributes almost nothing to the average daily caffeine intake among the Icelandic population. However in certain age and gender group it can be a popular drink as was seen in this survey where energy drinks were most popular among boys (15-19 years old).

Acknowledgement

The Environment and Food Agency wish to express gratitude to the Icelandic Nutrition Council/Public Health Institute for supplying the data from the national nutrition survey

References

COT statement on the reproductive effects of caffeine. Available at <http://www.foodstandards.gov.uk/science/ouradvisors/toxicity/statements/cotstatements2001/caffeine>

FDA (1989) US Food and Drug Administration. Statement by Jere E. Govan. Commissioner of Food & Drugs. HHS News; Sept. 5, 1980. Washington: US Department of Health and Human Services (no. p.80-36).

Food Law News –UK- 2003. Available at <http://www.fst.rdg.ac.uk/foodlaw/index.htm>

FSA (2001). Agency issues caffeine advice to pregnant women. Available at <http://www.foodstandards.gov.uk/news/pressreleases/caffeinepregnant>

FSA (2004). Survey of caffeine levels in hot beverages. Available at <http://www.foodstandards.gov.uk/multimedia/pdfs/fsis5304.pdf>

Nawrot P, Jordan S, Eastwood J, Rotstein J, Hugenholtz A and Feeley M (2003). Effects of caffeine on human health. *Food Additives & Contaminants*, Vol. 20, No.1, 1-30.

Nordic Council of Ministers (2002). A Practical Approach to the Application of the Risk Analysis process-illustrated with two models Caffeine and *Campylobacter*. TemaNord 2002:510.

Scientific Committee on Food (1999). Opinion on Caffeine, Taurine and D-Glucorono- γ -Lactone as constituents of so-called “energy drinks”.