



Food and Agriculture
Organization of the
United Nations



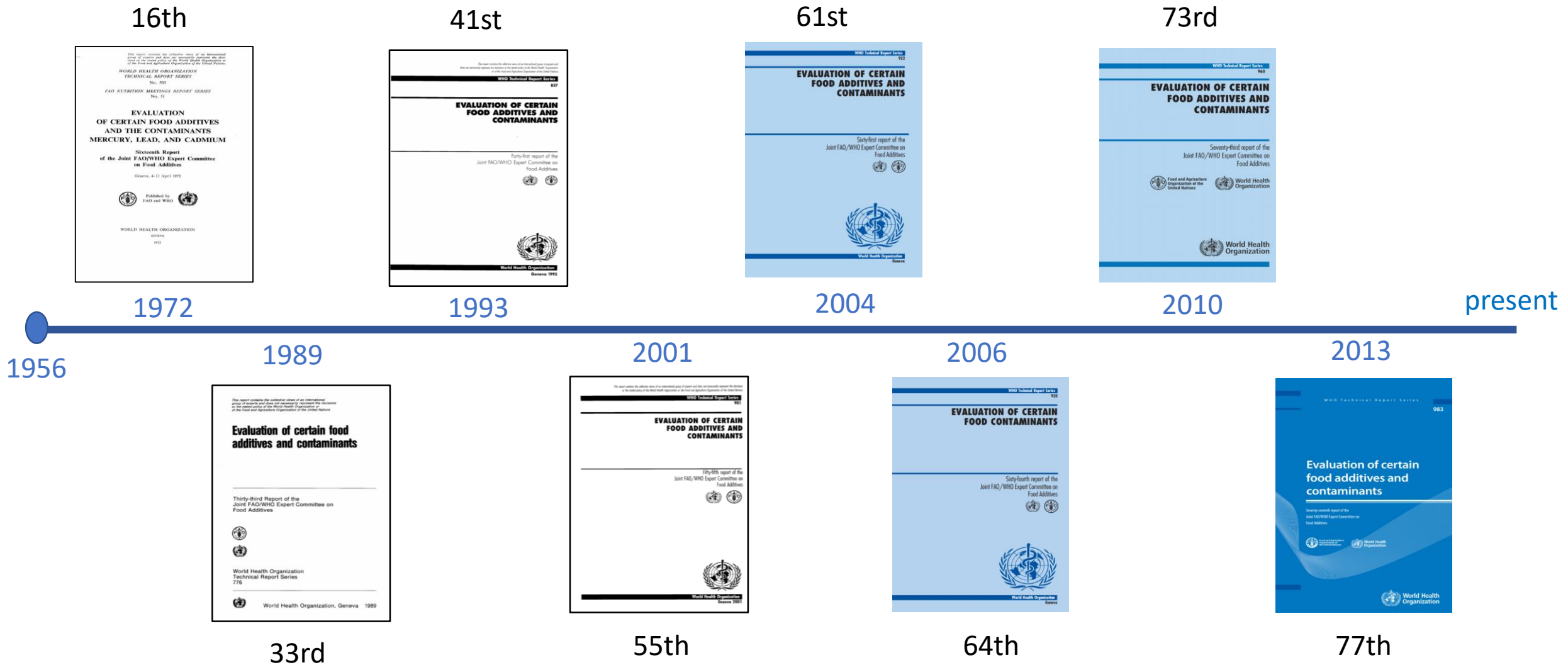
World Health
Organization



Joint FAO/WHO Expert Committee on Food Additives (JECFA)

An Overview of JECFA 91st Evaluation on Cadmium

JECFA has evaluated cadmium several times in the past



Why was cadmium on the agenda of JECFA 91?

- At the request of the 13th CCCF for more comprehensive occurrence data for cadmium in food, the JECFA Secretariat issued a call for data on cadmium in chocolate and cocoa-derived products in 2019.
- The submitted data included a wider geographical range of occurrence data for cadmium in cocoa products than considered at 77th JECFA meeting. The occurrence data also showed a higher mean concentration for cadmium in cocoa products than previously noted by the Committee.
- As a result, the JECFA Secretariat considered it appropriate to revise the dietary exposure assessment of cadmium to include not only chocolate and cocoa products but the contribution from all food sources.

Procedures for nominating compounds for evaluation by JECFA

- Codex Committees: Codex Committee on Food Additives (CCFA), Codex Committee on Contaminants in Food (CCCF), Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDF)
- FAO and WHO Member States
- JECFA itself

JECFA Working Procedures

**Joint FAO/WHO Expert Committee on Food Additives (JECFA) -
Working Procedures**

Geneva, February 2017

- FAO/WHO JECFA Secretariat: *The FAO/WHO JECFA secretariat may place a substance on the agenda for re-evaluation even though no outside request has been received, if it becomes aware of significant new data being available that may impact the previous assessment.*

SCOPE OF ASSESSMENT

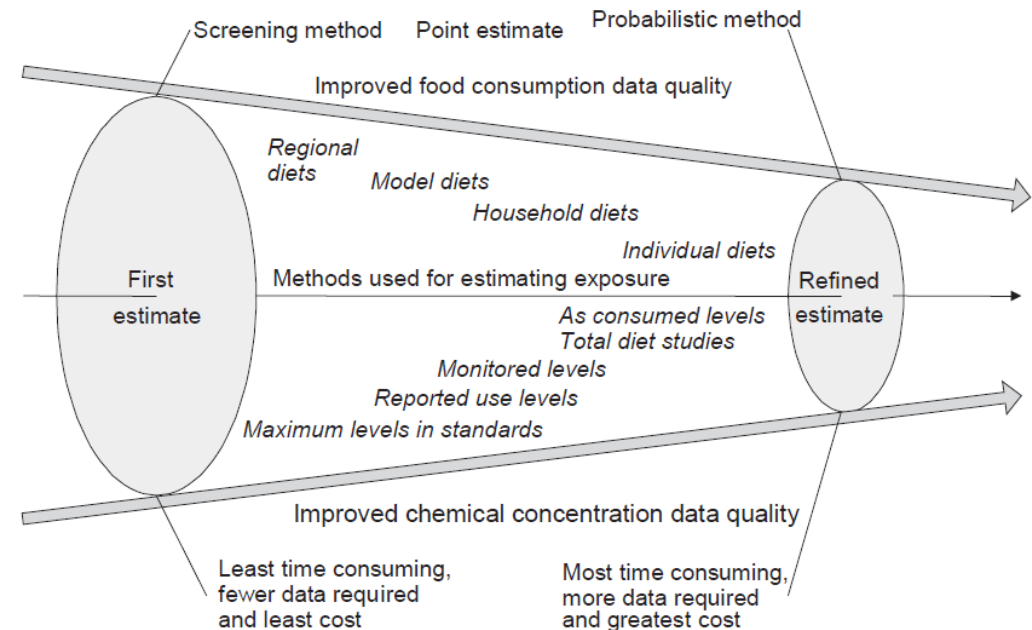
Update of information related to exposure from all food sources, particularly cocoa products including chocolate

What are the issues?

- Cadmium mean dietary exposure is often 20 – 60% of the HBGV. Estimates of dietary exposure need to be well defined
- Cadmium is ubiquitous in food – dietary exposure estimates need to consider as many food types as possible
- Only limited information on cadmium in cocoa products from some regions

Data submitted or available to the Committee

- New data submitted since 2011 originated from 27 countries or country groups representing 10 of the 17 GEMS/Food cluster diets.
- The final data set contained 277 292 records. The majority of data were from the European Region. A considerable body of data was also available for cluster G10, submitted by Canada, Japan and the USA.
- Different food types, including edible pig offal (7.3%), marine fish (6.9%) and cattle meat (3.7%), cocoa and cocoa products (2.5%)
- Since in 2011, a number of national evaluations of chronic dietary exposure have been published. The Committee evaluated 44 national studies conducted worldwide, as reported in the literature.
- Given the large number of national estimates of dietary cadmium exposure available from the literature, their coverage of countries across the world, and their consistency, JECFA considered that deriving less refined international estimates of dietary exposure was inappropriate.



National estimates of dietary exposure

- The mean dietary exposure to cadmium from the total diet at a national level ranged from 0.6 µg/kg bw per month for adults (2.4% of the PTMI) up to 24 µg/kg bw per month in children aged 4–11 years (96% of the PTMI).
- High percentile estimates of adult dietary cadmium exposure were only occasionally above the PTMI and were typically 20–60% of the PTMI.
- The main sources of cadmium exposure were grain and grain-based products, vegetables, and fish and seafood

Temporal trends in dietary cadmium exposure

- Owing to differences in study design and study location, it is not possible to identify any trends in dietary exposure to cadmium across the Committee evaluations.
- The major foods contributing to dietary cadmium exposure have not changed, with cereals, vegetables and seafood, especially molluscs, being consistent major contributors across evaluations.
- None of the Committee evaluations have identified cocoa products as major contributors to dietary cadmium exposure. The contribution of cocoa products to dietary cadmium exposure was minor (0.1–9.4% for national studies and estimates based on GEMS/Food cluster diets), even in countries in which the consumption of cocoa products is relatively high.

Contribution of cocoa products to dietary exposure

- Estimates of the contribution of cocoa products to dietary cadmium exposure were derived using the GEMS/Food cluster diets and global estimates of mean concentrations of cadmium derived from all extracted data in the GEMS/Food contaminants database.
- Across cluster diets, cocoa products contributed 0.1–5.9% of dietary cadmium exposure.
- Clusters with the highest contributions to dietary cadmium exposure from cocoa products were the “westernized” clusters (G07, G08, G10 and G15)*, including predominantly European and North American countries.
- Contributions for these clusters ranged from 3.4–5.9%, with the greatest contribution for G07. These contributions reflect the higher consumption of chocolate and, more particularly, cocoa powder in the countries within these clusters, as the cadmium concentrations in foods were assumed not to differ between clusters.
- The Committee conducted a more detailed analysis of the impact of consumption of cocoa products from a single geographical region on dietary cadmium exposure for different age groups in Europe. Analysis suggests that there are potential scenarios under which cocoa products would be the main contributor to dietary cadmium exposure.

*G07: mainly northern European countries, Australia, Bermuda and Uruguay; G08: Austria, Germany, Poland, Spain; G10: Balkans, Baltic states, Canada, Italy, Malta, New Zealand, Republic of Korea, Russian Federation, United States of America; G15: Europe/Scandinavia

Impact of established and proposed maximum limits for cadmium on cocoa product rejection rates and dietary cadmium exposure

Source of cocoa products ^a	Potential rejection rate (%) for cocoa powder samples from application of ML ^b	Mean contribution (range) of cocoa products to dietary cadmium exposure, GEMS/Food cluster diets (%)		Mean reduction (range) in dietary cadmium exposure due to application of MLs, GEMS/Food cluster diets ^c (%)
		Without MLs applied	With MLs applied	
All ^d	16.3	2.2 (0.1–6.6)	1.5 (0.1–4.3)	0.7 (0.0–2.4)
Cluster G03	0.0	1.1 (0.0–2.9)	1.1 (0.0–2.6)	0.1 (0.0–0.3)
Cluster G05	30.1	2.9 (0.2–9.3)	1.9 (0.1–5.7)	1.1 (0.0–3.8)
Cluster G09	0.0	1.7 (0.1–5.0)	1.6 (0.1–4.8)	0.1 (0.0–0.3)

ML: maximum limit, both proposed and established MLs were applied in this analysis; G03: mainly African countries; G05: mainly South/Central American countries; G09: mainly South-East Asian countries

^a Cocoa products included in the GEMS/Food cluster diets are cocoa beans, cocoa butter, cocoa mass, cocoa powder and chocolate

^b Potential rejection rates for chocolate are not given, as submitted data with sufficient information to allow application of MLs were only received from countries in cluster G05. The total rejection rate for chocolate samples was 4.9%

^c The percentages in this column are the percentage decreases in the estimated dietary cadmium exposure due to application of the MLs, rather than the difference in the contribution from cocoa products

^d “All” refers to the total data set on cadmium concentrations in cocoa products submitted to the GEMS/Food contaminants database with sufficient information to apply the MLs

Conclusions

- JECFA 73rd established a PTMI of 25 µg/kg bw, reflecting the long half-life of cadmium in humans. The PTMI was not reviewed at the current meeting.
- The mean dietary exposure to cadmium from the whole diet ranged from 0.6 µg/kg bw per month (2.4% of the PTMI) for adults in the Sikasso region of Mali up to 24 µg/kg bw per month (96% of the PTMI) in children aged 4–11 years in China. These children from China also had the highest high percentile estimate of dietary cadmium of 48.2 µg/kg bw per month (190% of the PTMI).
- High percentile estimates of adult dietary cadmium exposure were only occasionally above the PTMI and were typically 20–60% of the PTMI .
- Current JECFA PTMI for cadmium is based on long-term bioaccumulation in the kidney, with steady-state not achieved until after 45–60 years of exposure. Dietary exposure above the PTMI for limited periods may be of lesser concern in younger age groups. However, there may be a health concern in areas where the cadmium exposure during adulthood exceeds the PTMI.

Conclusions

- Consistent with the previous JECFA evaluations, the present assessment identified the main sources of dietary cadmium exposure in these national studies as cereals and cereal-based products, vegetables, and fish and seafood. The contribution of cocoa products to dietary cadmium exposure was minor (0.1–9.4% for national studies and estimates based on GEMS/Food cluster diets), even in countries in which the consumption of cocoa products is relatively high.
- Comparing the cadmium concentrations in chocolate and cocoa powder in the GEMS/Food contaminants database to the existing and proposed MLs showed that 2.1–10.7% of the chocolate samples and 16.3% of the cocoa powder samples had concentrations higher than the MLs and could potentially be rejected by importing countries through application of the MLs.
- Application of both established and proposed MLs for chocolate and cocoa powder may result in substantial rejection rates (up to 30%) for products from some regions, but has only a minor impact (mean decrease across clusters of 0.7%, range 0.0–2.4%) on total dietary cadmium exposure.