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A Global Coalition Dedicated to Eliminating Iodine Deficiency:

- **UN Agencies** (WHO, UNICEF & WFP)
- **Scientific Institutes** (ICCIDD, CDC & Emory University)
- **Non-Governmental Organizations** (MI & GAIN)
- **A Philanthropist Group** (Kiwanis International), and
- **Salt Industry Associations** (Americas, Europe, China & India)

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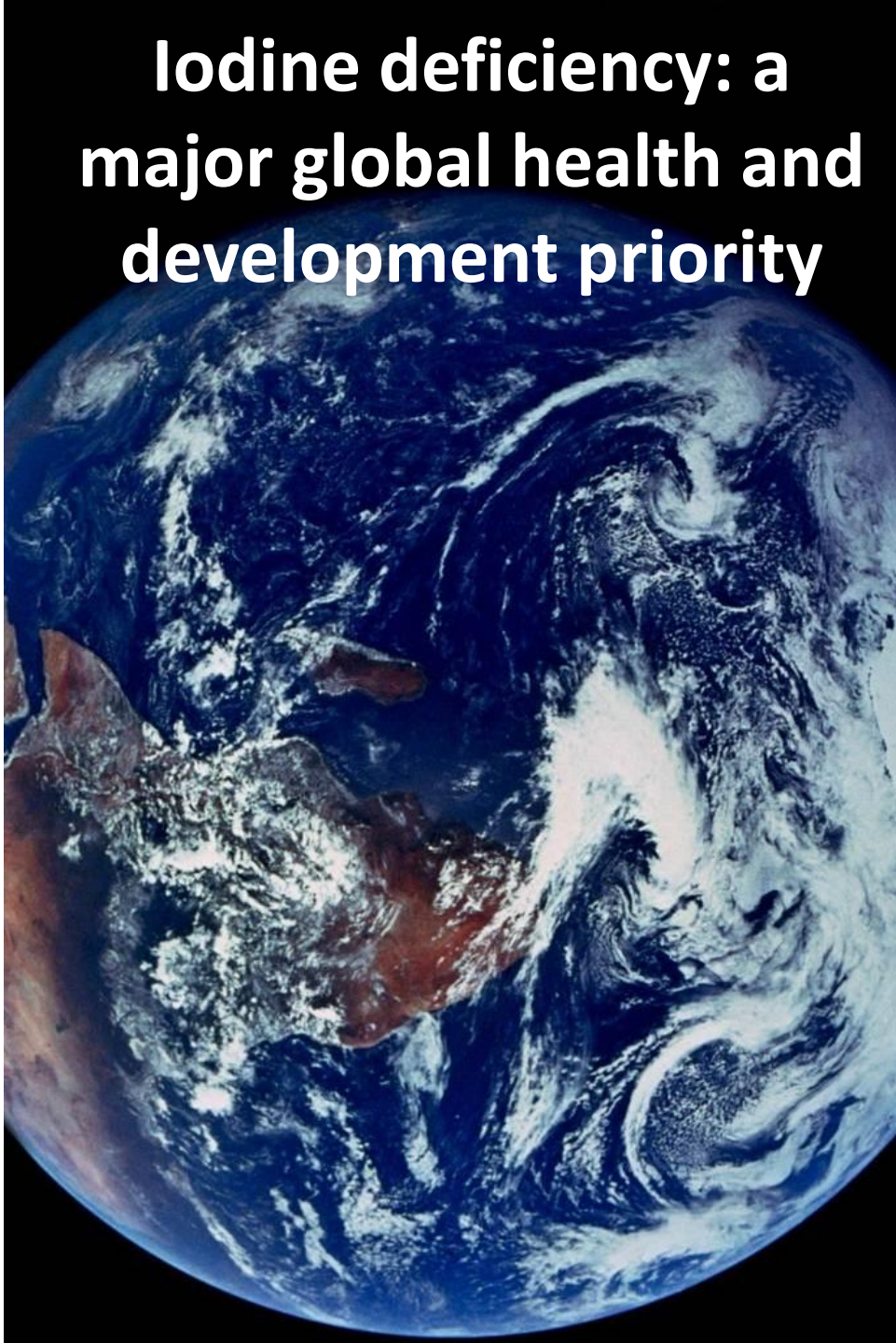
Iodine deficiency: a major global health and development priority

- **Iodine deficiency**: the most common cause of preventable mental retardation in the world (WHO, 1994)
- Cost-effective **salt iodization** can prevent IDD simply, equitably and completely



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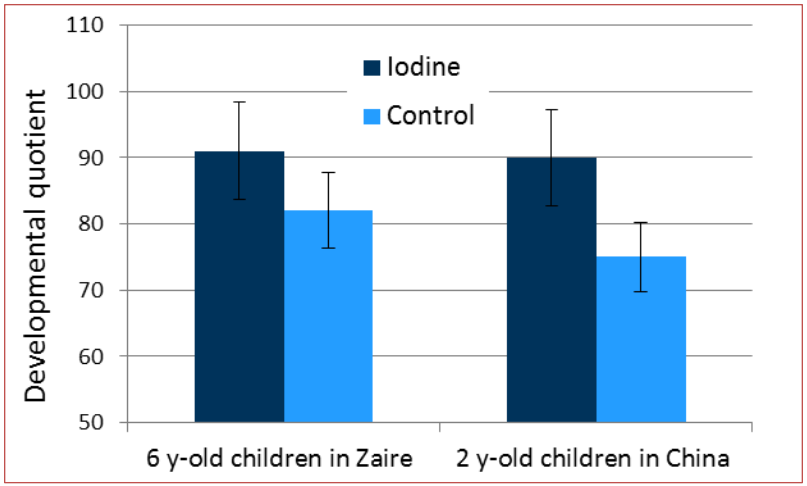
In utero, iodine deficiency damages the developing fetal brain

Iodine repletion can significantly reduce and wipe out endemic cretinism

Age	RR (95%CI) of cretinism
4 y-olds	0.27 (0.12, 0.60)
10 y-olds	0.17 (0.05, 0.58)

Development quotient is 10-15 points higher in children born to iodine supplemented mothers



Pharoah et al, 1971; Thilly et al,1994; Cao et al, 1994

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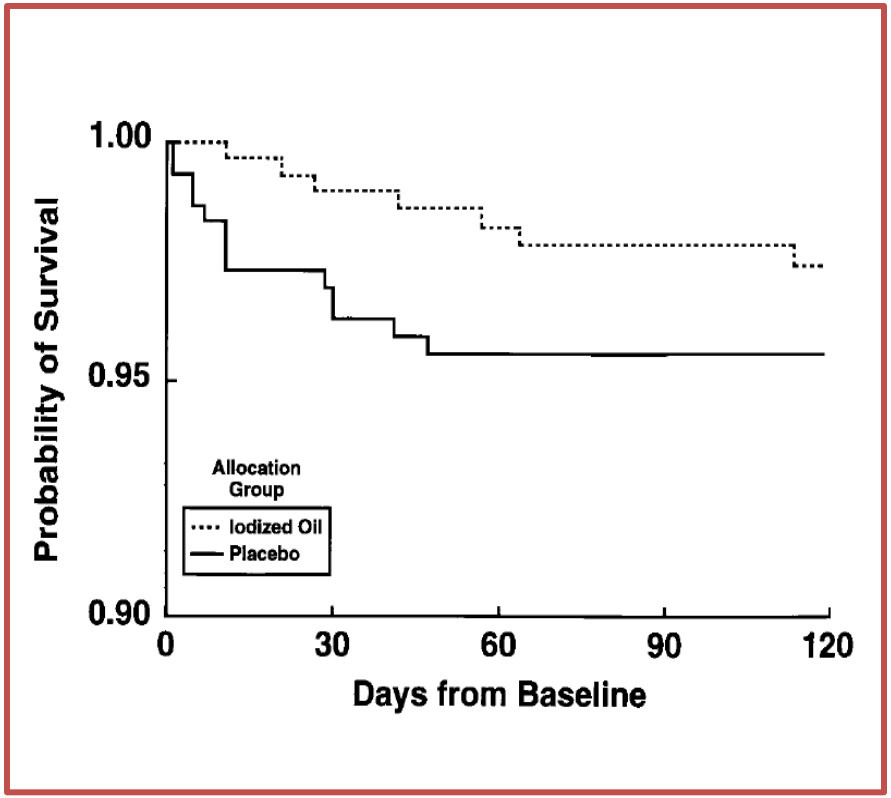
Iodine repletion in newborns sharply improves infant survival

- In Indonesia, iodine-deficient infants (n=617) received placebo or oral iodized oil capsules (100 mg) at 6 w of age
- 72% and 52% reduction in the risk of mortality at 2 and 6 months follow-up ($P < 0.05$)



Cobra et al, 1997

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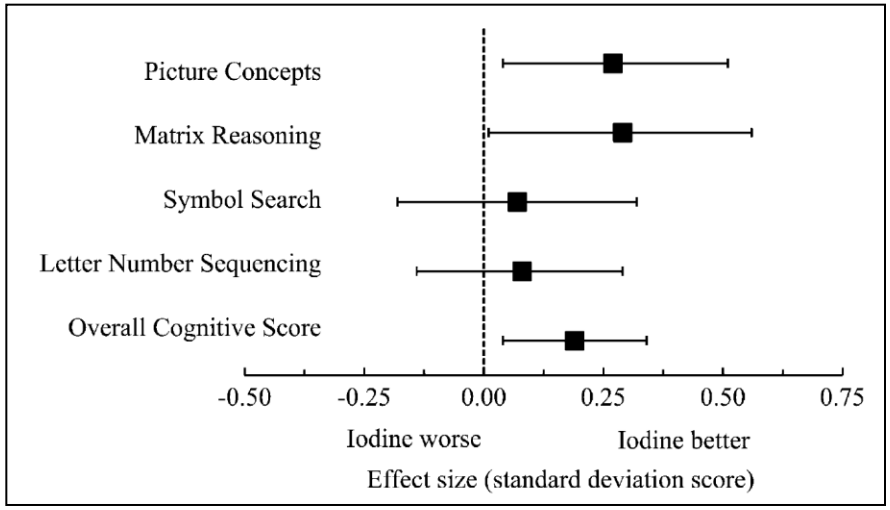
Correction of iodine deficiency at school age can improve cognition and fine motor skills of children

RCT of KI tablets in iodine-deficient New Zealand children (n=184): **improvement in the overall cognitive score of 0.2 SD units** compared to placebo



Mean (95% CI) effect, overall score (p=0.011)

RCT of iodized oil capsules: iodine-deficient Albanian schoolchildren (n=300), improved 4 out of 7 tests: an **IQ increase of 2-3 points**

Test	Time (wk)	Iodine (n=159)	Placebo (n=151)	Adjusted treatment effect
Ravens Matrices	0	17.0 ± 5.4	19.9 ± 6.3	**4.7***
	24	24.0 ± 6.3	20.5 ± 5.6	
Target marking	0	37.0 ± 12.6	34.2 ± 10.8	**2.8***
	24	29.5 ± 6.6	31.0 ± 7.2	
Symbol search	0	17.3 ± 5.2	19.7 ± 4.8	**2.8***
	24	21.8 ± 4.5	20.5 ± 5.2	
Rapid naming	0	52.9 ± 15.1	49.9 ± 16.6	**4.5***
	24	42.5 ± 10.6	45.2 ± 13.5	

*p<0.0001

Zimmermann et al, 2006; Gordon et al, 2009

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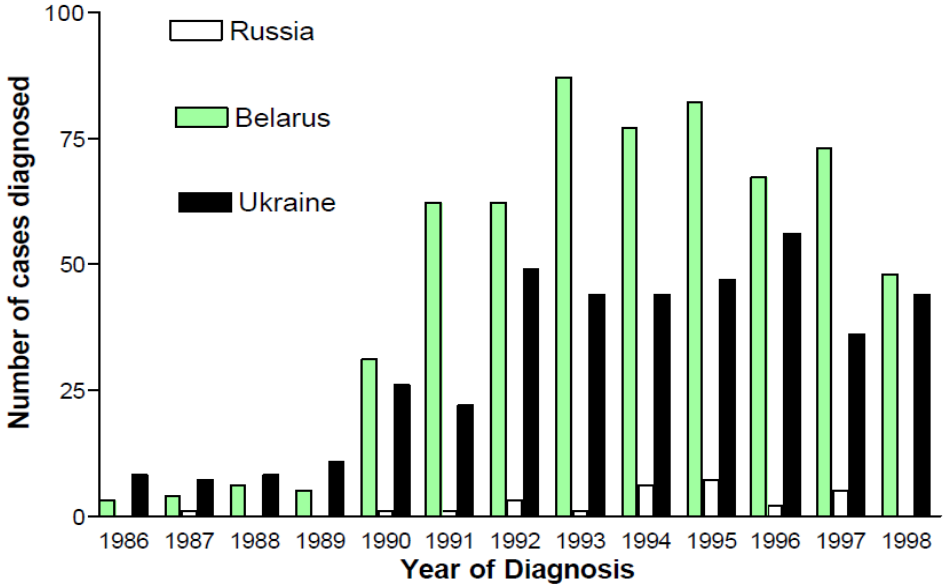
Iodine deficiency sharply increases the risk of thyroid cancer in children from nuclear fallout

>4,000 cases of thyroid cancer in children of the ‘Chernobyl generation‘, most were iodine deficient

Number **likely >50% lower if children had been iodine sufficient**

Thyroid cancer, children<15y at diagnosis



> 400 nuclear reactors operating globally

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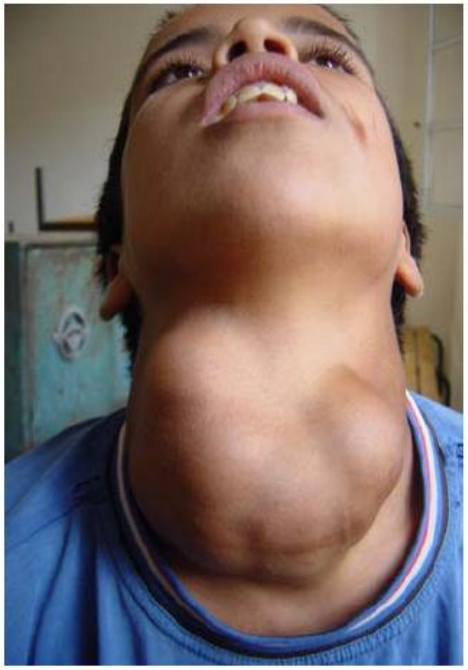
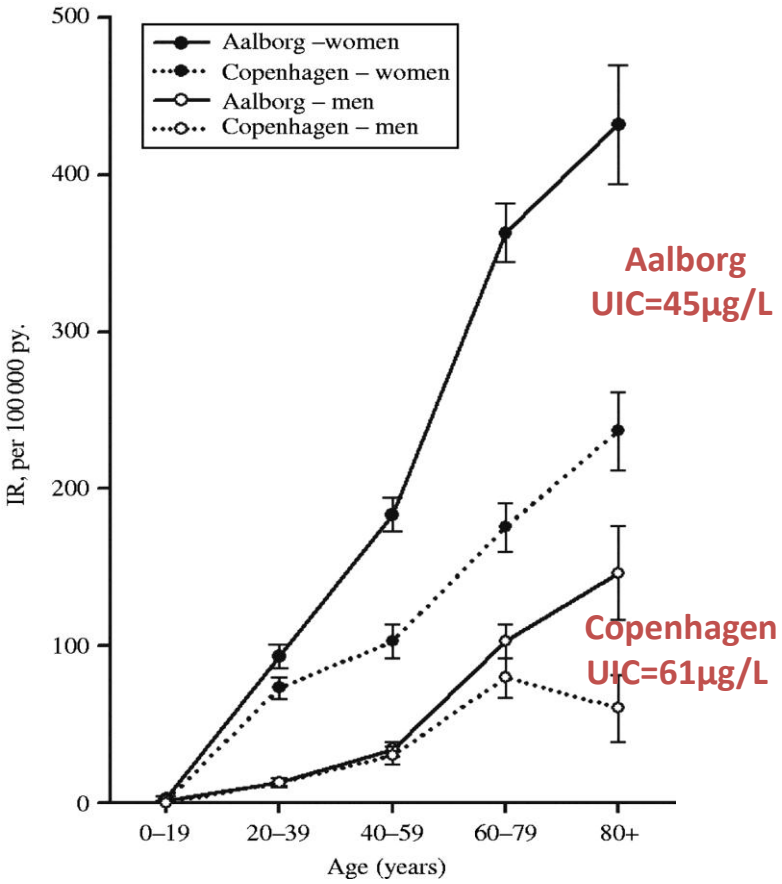
Long-standing iodine deficiency causes multinodular goiter, which is disfiguring and often leads to hyperthyroidism in the elderly



12 y-old boy and his 58 y-old grandmother, Morocco

Incidence of hyperthyroidism in Denmark before salt iodization: RR of toxic goiter=1.9 (1.6, 2.2) with increasing iodine deficiency



Carlé A et al, 2011

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UNICEF-WHO Joint Committee on Health Policy
Special Session
Geneva, 27-28 January 1994
Agenda Item 2.2.7
JCHPSS/94/2.7

WORLD SUMMIT FOR CHILDREN - MID-DECADE GOAL:
IODINE DEFICIENCY DISORDERS (IDD)

"Iodize all salt for human and animal consumption (including salt for food processing) (Universal Salt Iodization) in all countries where iodine deficiency disorders (IDD) are a public health problem; where full salt iodization is not possible in areas where IDD are a severe public health problem, supplementation with oral or injected iodized oil will be recommended as a temporary measure."[1]

Recommended Strategy:
Universal Salt Iodization (USI)

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Salt is the preferred food vehicle for delivering additional iodine in the common diet:

- One of the few foods consumed by everyone
- Consumption stable throughout the year
- Import and production often limited to few companies
- Iodization technology easy and at reasonable cost
- Adding iodine in salt and using iodized salt in food processing does not affect the color, taste or smell of the finished product or the diet
- Quality of salt iodization can be effectively assured

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Salt Iodization Priority Strategy

- **Iodizing salt is not only an effective choice for added dietary iodine but often the only choice available for rural poor populations**
- **50% of DALYs lost due to iodine deficiency in the world are in regions where salt is the only food vehicle that reaches most of the rural poor**
- **Very few food vehicles are similarly widespread; e.g. fish sauce and boullion cubes (which can be manufactured with iodized salt), and MSG (which can be fortified)**

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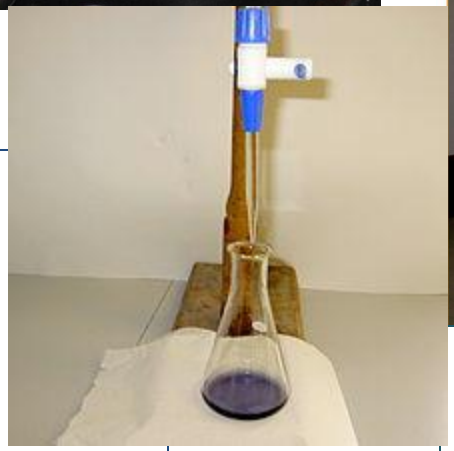
Other Foods are difficult to Analyze

Monitoring iodine content *at ppm levels:* the challenges of complex substance matrices

Salt: WYD titration



Wheat flour: ICP-MS

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Cost-effectiveness of salt iodization

"Iodine deficiencies are widespread but the cost of iodizing salt is cheap, $0.05 per person per year. ***An investment of $100 million per year would eliminate IDD affecting 1.8 billion people***."

2012 Copenhagen Consensus Background Paper

"Salt iodization remains the most cost-effective way to deliver iodine and improve cognition in children"

ICDSG, Lancet 2007

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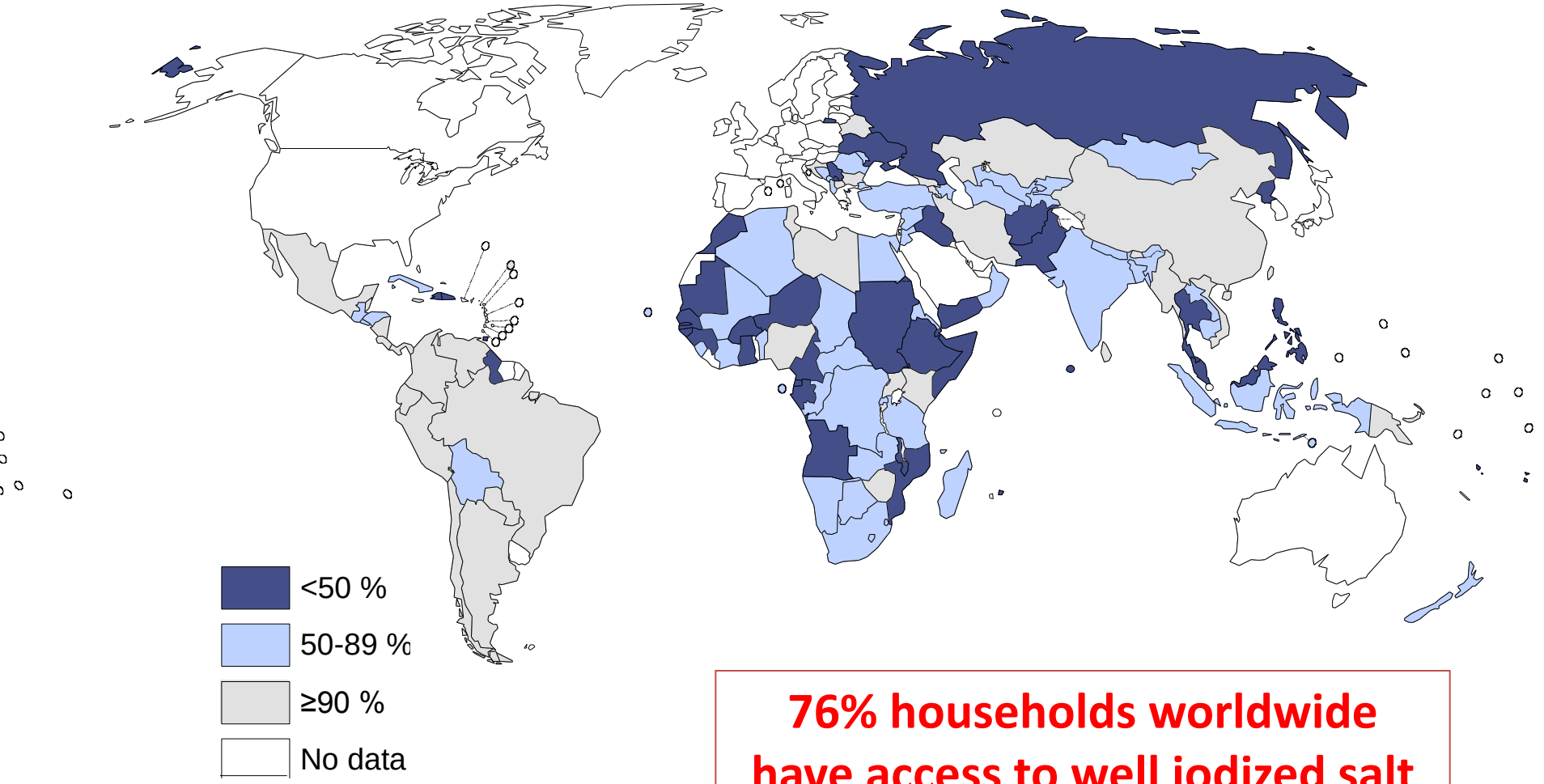
Progress in salt iodization



76% households worldwide have access to well iodized salt

128 countries, UNICEF, SOWC 2013

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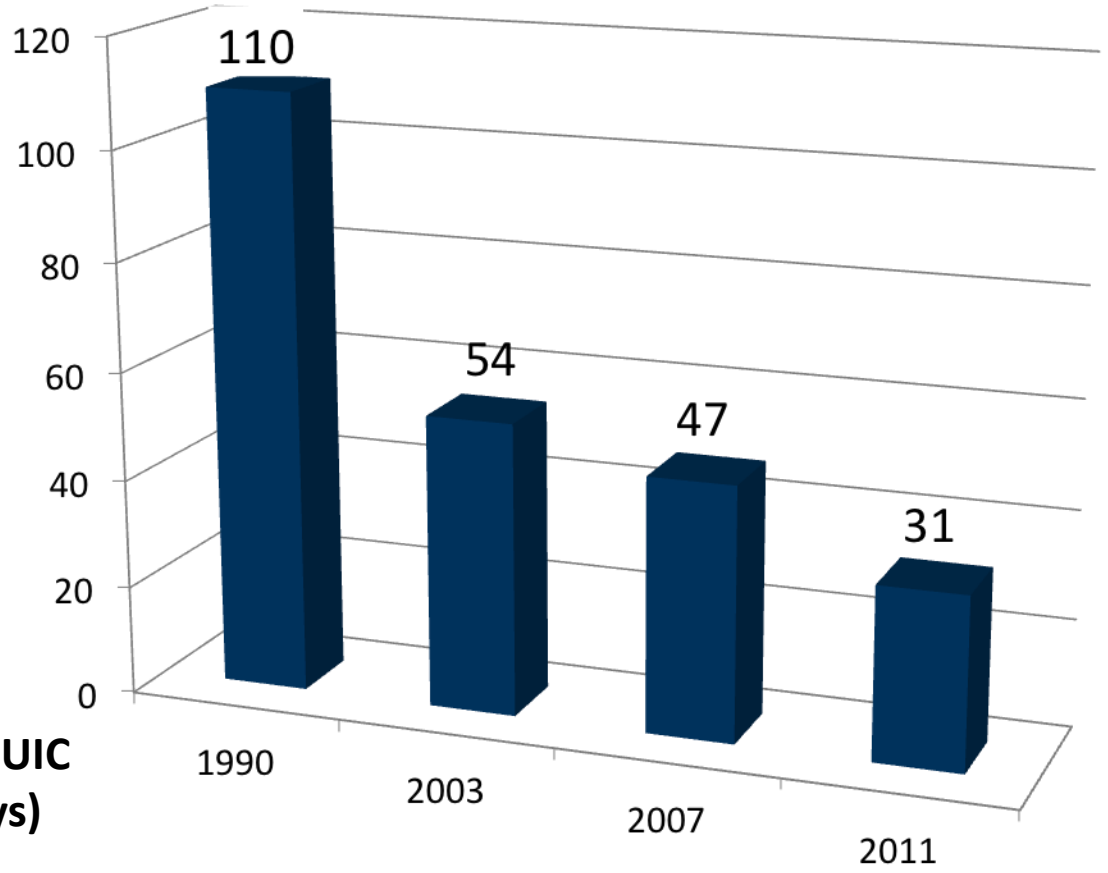
Global progress against iodine deficiency:

The number of iodine deficient countries has fallen dramatically during the past two decades



Based on median UIC (national surveys)

From: ICCIDD GN

IDD Prevention in Uzbekistan

- **Since Independence, strong and steady development of the domestic salt industry**
- **Few primary sources, but number of firms involved in processing and packaging is increasing rapidly**
- **2007 Law on Prevention of Iodine Deficiency Diseases**
- **2011: Two-third of households are using adequately iodized salt**
- **Surveys show adequate urinary iodine levels in 62% of school children**
- **Uzbekistan has reliable capacity for research, monitoring and evaluation in the National Endocrinology Institute**

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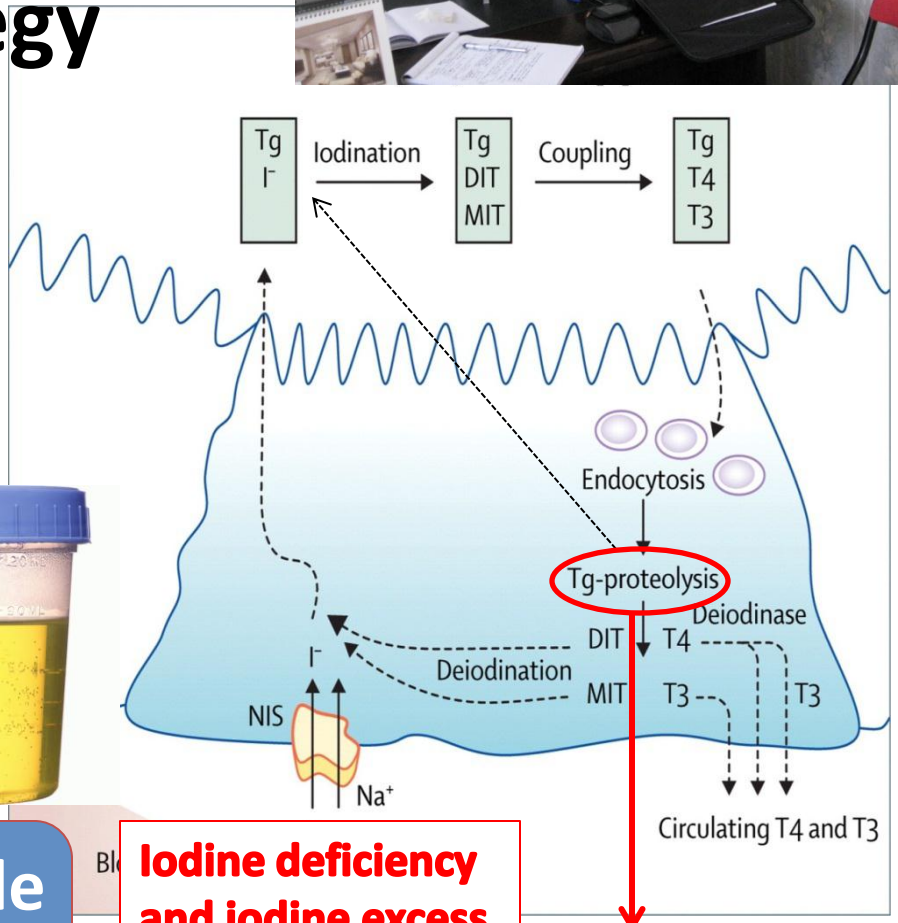
Monitoring is paramount for improving and refining a salt iodization strategy

1. **Iodine supplies**
   Consumer & Food Industry Salt
2. **Iodine & salt intake**
   Urine collections
3. **Functional effects in most vulnerable group**
   DBS-Thyroglobulin

Urine sample 3 ml



Iodine deficiency and iodine excess

↑Serum Tg

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Which group is most vulnerable?

Survey groups	number	Weight (kg)	UIC (95% CI)
Infants			
3-4 days	368	3.4 ± 0.4	91 (82 - 99)
6 months	279	7.6 ± 0.9	91 (79 - 103)
12 months	228	9.6 ± 1.1	103 (92 - 116)
Mothers of infants	507	64.9 ± 11.8	75 (69 - 81)
School age children	916	35.4 ± 10.2	120 (112 - 128)
Pregnant women *	648	73.5 ± 30.3	162 (140 - 177)

* 65% of PW take an iodine supplement

Findings of a Swiss Survey, 2009

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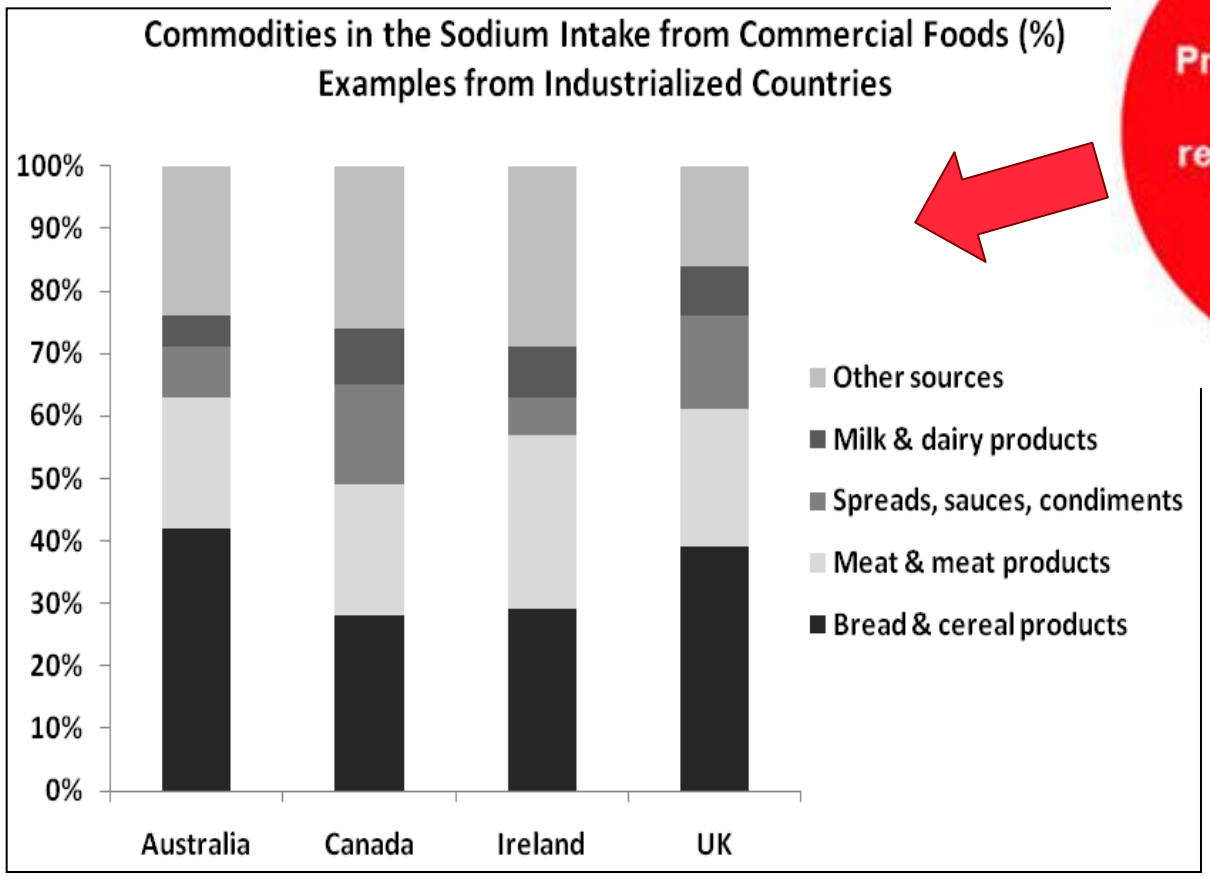
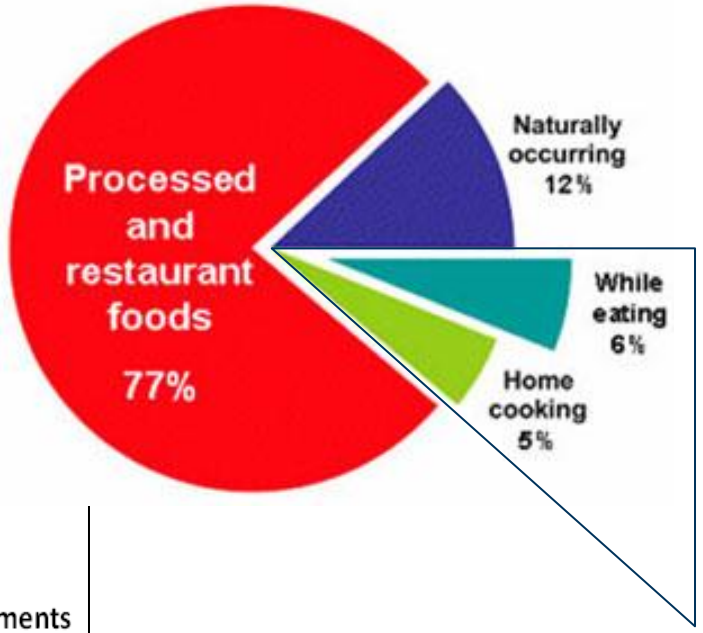
With industrialization, iodizing table salt only is not enough, also processed foods must contain iodized salt

Salt sources in the diet





Iodizing only household salt will have too little impact

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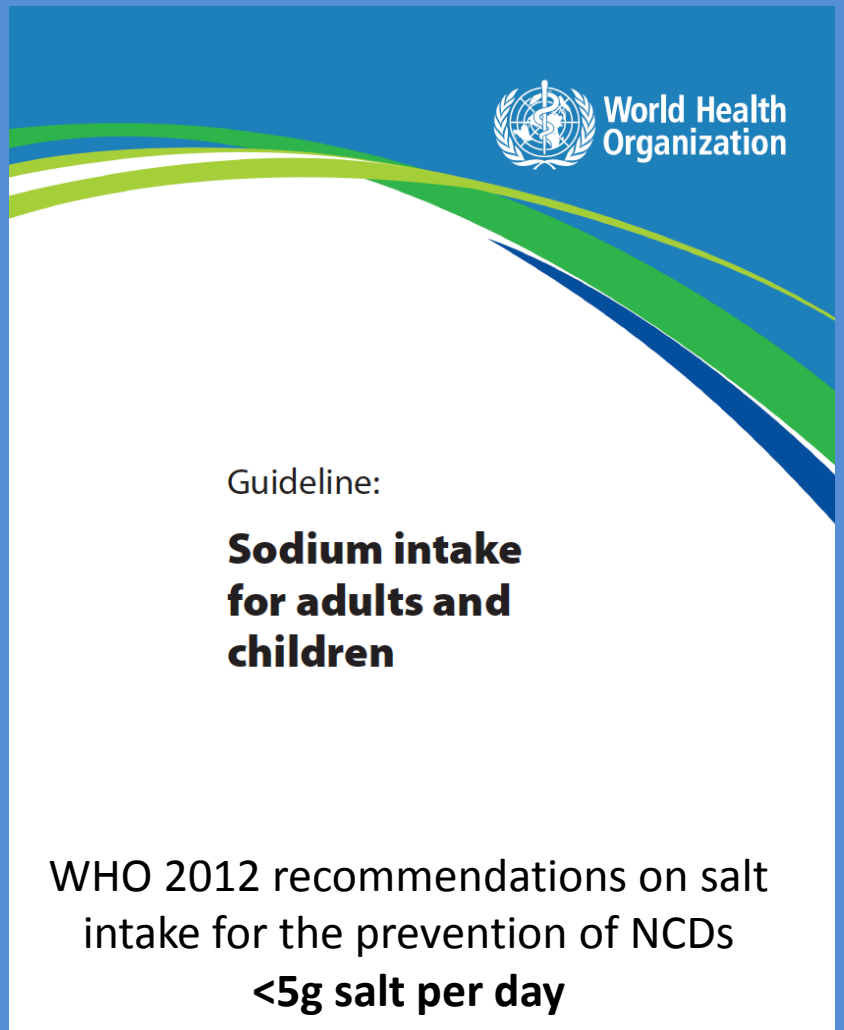
Dietary Sodium Reduction: Emerging Key Public Health Priority



WHO 2012 recommendations on salt intake for the prevention of NCDs

<5g salt per day

As salt intakes fall, can we maintain adequate iodine supply in the diet?

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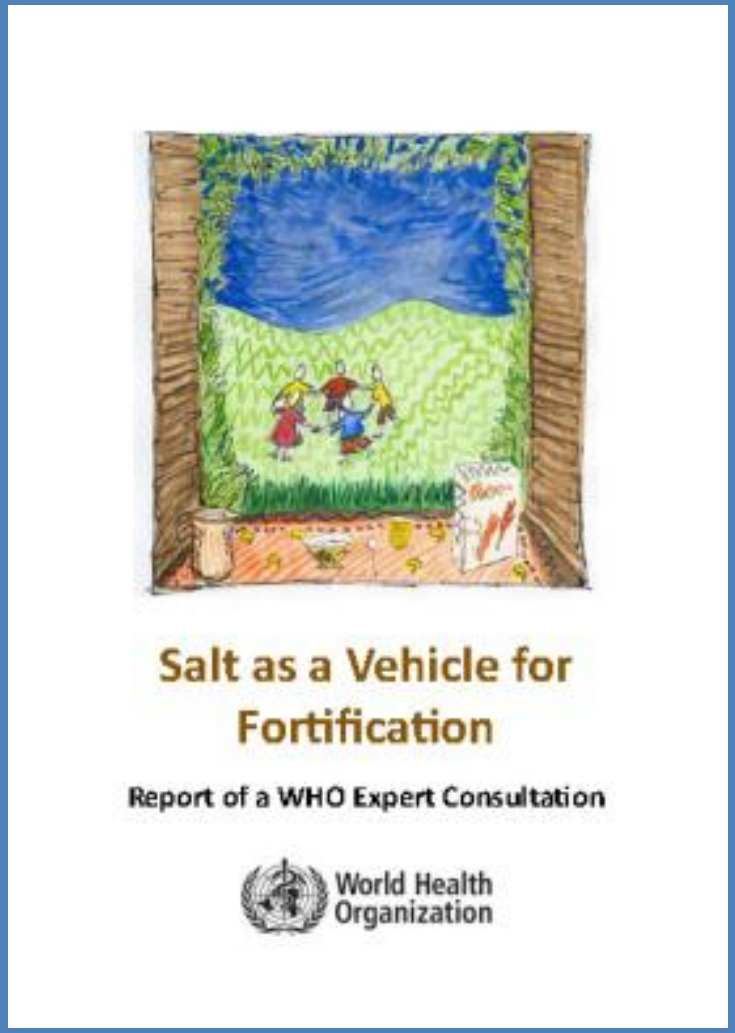
WHO Expert Consultation 2007

Salt as a Vehicle for Fortification

"At the country level, close collaboration between salt iodization and salt reduction programming … is urgently required so that their aims are congruent."



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Sydney Technical Consultation March 2013

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Salt Iodization & Salt Intake Reduction

Commonalities of the two strategies

- Both are geared towards improving public health through a population-wide approach
- Both adopt a multi-stakeholder model that encompasses advocacy, health promotion and communications
- Both involve working closely with the food industry

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Salt Iodization & Salt Intake Reduction

Can be made coherent through a process of

- **Full implementation of universal salt iodization (All salt for human consumption)**
- **Effective salt reduction efforts, emphasizing reduced salt levels in processed foods**
- **Increase of salt iodine standards as salt intake levels are decreased**

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Salt Iodization & Salt Intake Reduction

Ensure complementarity at national level through

- **Preventive health policy development**
- **Research, monitoring and evaluation systems**
- **Coordinated multi-stakeholder implementation**
- **Advocacy, communication and messaging**