



12º CONGRESSO DE ENDOCRINOLOGIA E METABOLOGIA DA REGIÃO SUL  
CONGRESSO CATARINENSE DE ENDOCRINOLOGIA E METABOLOGIA 2018

# iodo



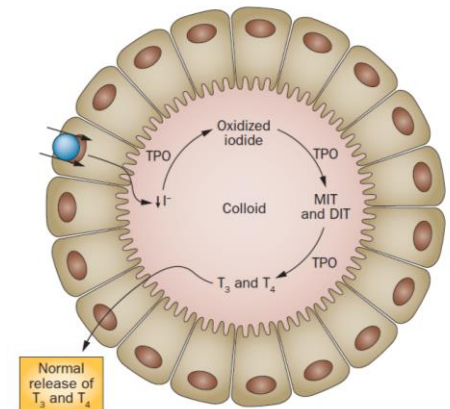
Lireda Meneses Silva

# IMPORTÂNCIA DDI

- Substrato para a produção de hormônios tireoidianos
  - 65% peso de T4 e 58% do peso de T3
- Regulação da função tireoidiana

## DEFICIÊNCIA

- Hipotireoidismo → cretinismo / retardo mental
- Abortamento / anomalias congêntas / prematuridade / mortalidade perinatal / bócio neonatal
- Hipotireoidismo
- Retardo do desenvolvimento físico e mental
- Bócio (endêmico) - difuso ou nodular
- Doença tireoidiana autoimune
- Carcinoma de tireoide
- Aumento da susceptibilidade à radiação nuclear



# Avaliação do grau de suficiência de I

Mediana CUI (mcg/L)	Ingesta I	Suficiência I
<b>&gt; 6 anos e adultos</b>		
<20	Insuficiente	Deficiência severa
20-49	Insuficiente	Deficiência moderada
50-99	Insuficiente	Deficiência discreta
100-199	Adequada	Adequada
200-299	Acima	Mais do que adequada
≥ 300	Excessiva	Excessiva – risco Ht

<b>Gestantes</b>		
<50	Insuficiente	Deficiência severa
50-99	Insuficiente	Deficiência moderada
100-149	Insuficiente	Deficiência discreta
150-249	Adequada	Adequada
250-499	Acima	Mais do que adequada
≥ 500	Excessiva	Excessiva

<b>Lactantes</b>		
<100	Insuficiente	
>150	Adequada	

**INGESTA**

**RECOMENDADA:**

0-5 anos: 90 µg/d

6-12 anos: 120 µg/d

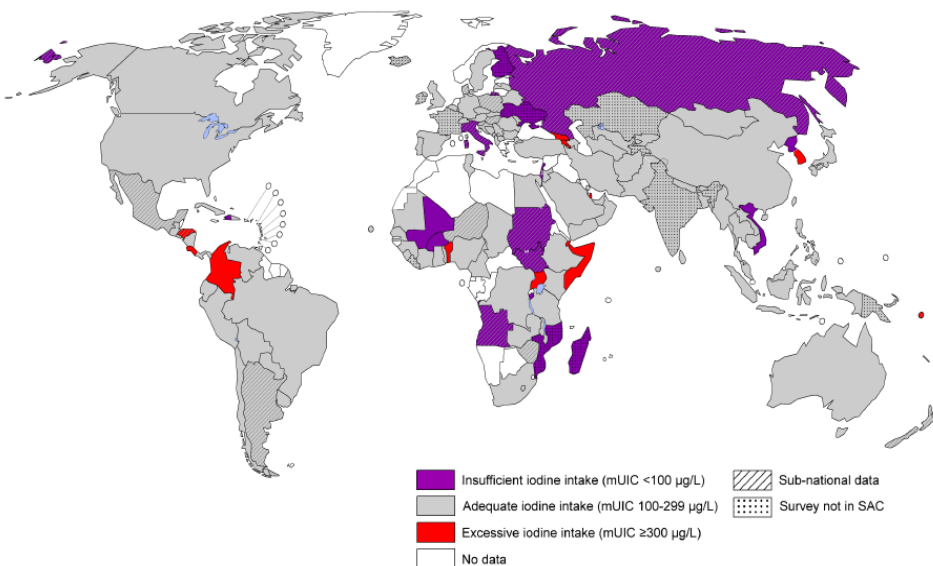
>12 anos: 150 µg/d

Gestante: 250 µg/d

Lactante: 250 µg/d

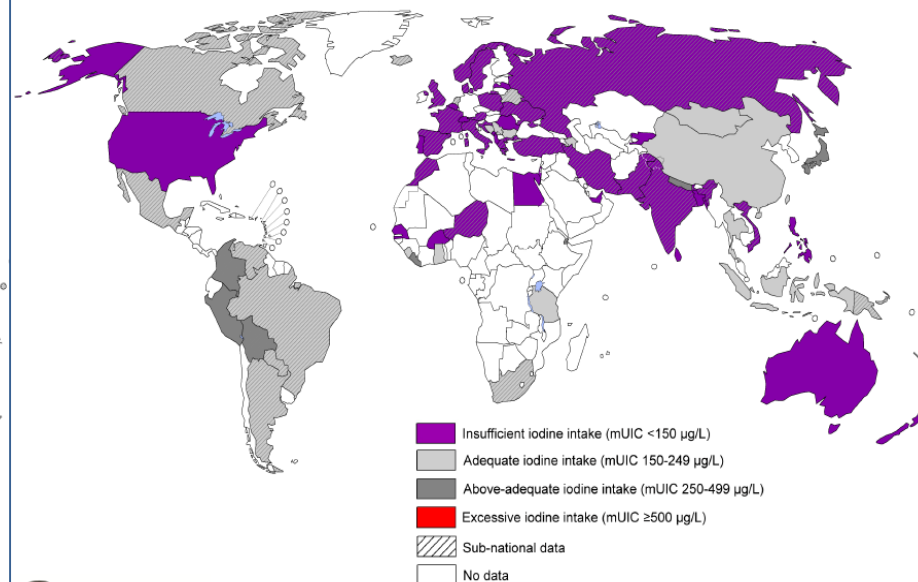
## Global Scorecard of Iodine Nutrition 2017

Based on median urinary iodine concentration (mUIC) in school-age children (SAC) and adults



## Global Scorecard of Iodine Nutrition 2017

Based on median urinary iodine concentration (mUIC) in pregnant women





ICCID

INTERNATIONAL COUNCIL FOR CONTROL OF IODINE DEFICIENCY

# PANORAMA MUNDIAL



IODINE  
globalnetwork

## Global Scorecard of Iodine Nutrition in 2017 in the general population and in pregnant women (PW)

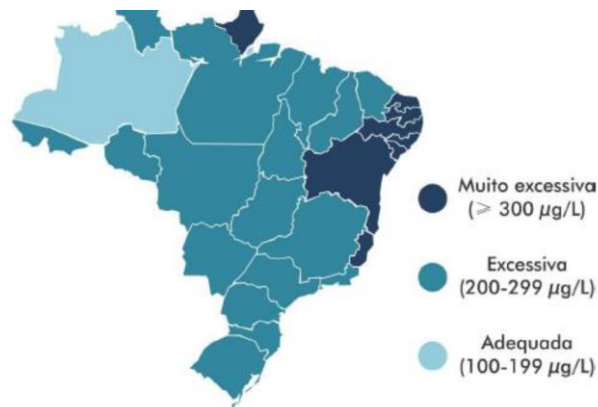
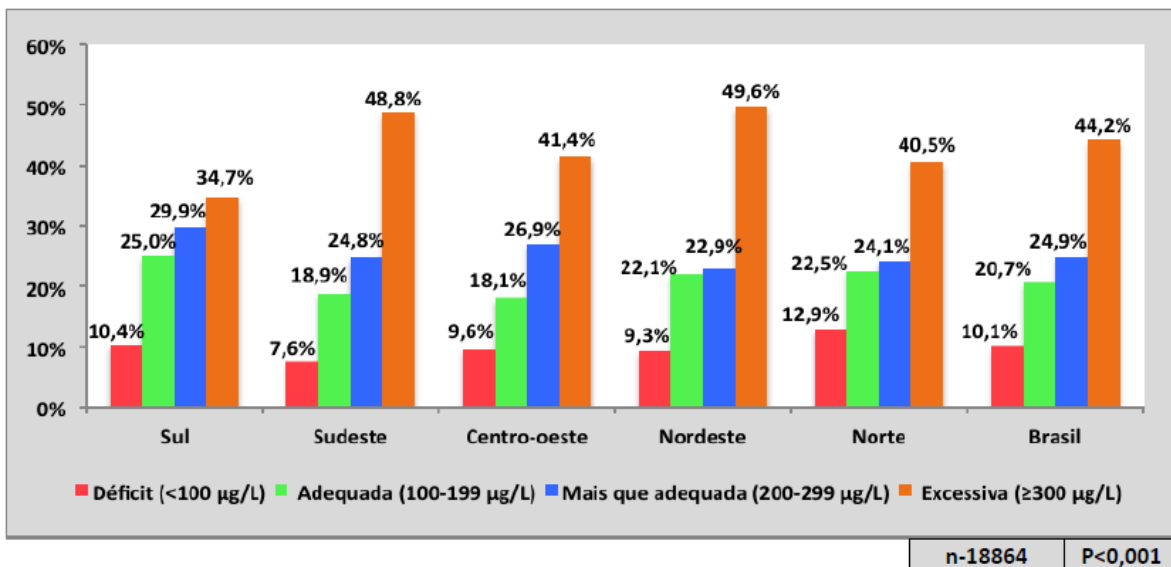
\*non WHO member states

### General population<sup>1,2</sup>

### Pregnant women (PW)

Country or territory	Total population (2015)	ALL: Median UIC (µg/L)	Date of survey	Admin	Population	Population iodine intake <sup>3</sup>	PW: Median UIC (µg/L)	Date of survey	Admin	Population iodine intake <sup>4</sup>
Afghanistan	32'526'562	171	2013	N	SAC (7-12)	Adequate				
Albania	2'896'679	100	2012	N	SAC (6-13)	Adequate	85	2006	N	Insufficient
Algeria	39'666'519									
Andorra	70'473									
Angola	25'021'974	29	2006	S	SAC (8-10)	Insufficient				
Antigua and Barbuda	91'818									
Argentina	43'416'755	123	2002-12	S	SAC (5-14)	Adequate	151	2004-13	S	Adequate
Armenia	3'017'712	313	2005	N	SAC (8-10)	Excessive				
Australia	23'968'973	177	2011-12	N	SAC (5-11)	Adequate	116	2011-12	N	Insufficient
Austria	8'544'586	111	2012	N	SAC (7-14)	Adequate	87	2009-11	S	Insufficient
Azerbaijan	9'753'968	204	2007	N	SAC (8-10)	Adequate	196	2007	N	Adequate
Bahamas	388'019									
Bahrain	1'377'237	247	2012-13	N	SAC (6-12)	Adequate				
Bangladesh	160'995'642	146	2011-12	N	SAC (6-12)	Adequate	133	2004-05	N	Insufficient
Barbados	284'215									
Bhutan	774'830	183	2010	N	SAC (6-11)	Adequate				
Bolivia	10'724'705	191	2005	N	SAC	Adequate	261	N/A	S	More than adequate
Bosnia and Herzegovina	3'810'416	157	2005	N	SAC (8-10)	Adequate	157	2008	N	Adequate
Botswana	2'262'485									
Brazil	207'847'528	276	2016	N	SAC	Adequate	175	2008-09	S	Adequate
Brunei Darussalam	423'188									
Bulgaria	7'149'787	182	2008	N	SAC (7-11)	Adequate	165	2003	N	Adequate
Burkina Faso	18'105'570	84	2014	N	SAC	Insufficient	74	2014	N	Insufficient

# PANORAMA NACIONAL - PNAISAL



- Mediana CUI: 276,7 µg/L (>100 µg/L)
- Mais que adequada (200-299 µg/L)
- 44,2% excesso (>300 µg/L)

In **1953** iodization of salt for human use is made mandatory, but only in areas with endemic goiter.

An amendment in **1956** extends iodization to include all salt for human use. The Ministry of Health is tasked with importing and distributing potassium iodate.

In **1974** salt iodization is set at 10 mg iodine (I)/kg, and the salt industry is responsible for the purchase and fortification of salt at their own expense. Surveillance is to be performed by the individual States and districts.

In **1975**, Quality Standards are established for salt for human use.

In **1984**, the Ministry of Health mandates the addition of 10–30 mg I/kg of salt.

In **1994**, the amount of iodine in salt is changed to 40–60 mg I/kg of salt.

In **1995**, the amount of iodine for fortification of salt for human use is established by the Ministry of Health, which is to import and distribute potassium iodate to the salt industry without charge.

In **1999**, the Ministry of Health increases the amount of iodine in salt for human use to 40–100 mg I/kg salt.

In **1999**, the Government creates a coalition Committee for the Prevention and Control of IDD.

In **2003**, the Ministry of Health reduces the amount of iodine in salt for human use to 20–60 mg I/kg salt.

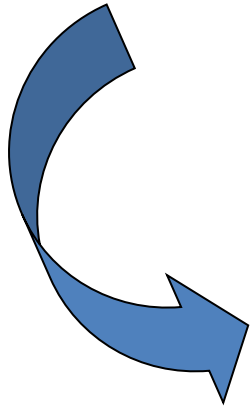
In **2013**, the Ministry of Health reduces the amount of iodine in salt for human use to 15–45 mg I/kg salt.

# EXCESSO DE IODO

## CAUSAS

- Suplementação “oficial” de I / dieta
- Vitaminas e suplementos
- Medicamentos (Amiodarona)
- Contrastes iodados
- Iodo tópico

Pode haver indicação de uso de dose supra-fisiológica



- Hipotireoidismo
  - DTAI; hx prévia de cirurgia /  $^{131}\text{I}$  / DAT; tireoidite subaguda; tireoidite pós-parto; tireotoxicose por amiodarona; Interferon; uso concomitante de bociogênico (Li)
  - Fetos e neonatos → hipotireoidismo congênito
  - Idosos
- Hipertireoidismo
  - BDA / BNA / BMNA
  - D. Graves latente
  - Deficiência de I de longa data – eutireoidiano com BN em áreas suficientes quando a reposição é excessiva
- Doença tireoidiana autoimune (?)
- Ca tireoide – papilífero (?)

Katagiri R, Yuan X, Kobayashi S, Sasaki S PLoS ONE 12(3): e0173722. (2017)

Leung, A. M. & Braverman, L. E. *Nat. Rev. Endocrinol.* 10, 136–142 (2014)

Kassim, I. A. *et al. Matern. Child. Nutr.* 8, 49–56 (2012)

Sang, Z. *et al. Am. J. Clin. Nutr.* 95, 367–373 (2012)

Dong, W. *et al. Med. Sci. Monit.* 19, 49–53 (2013)

Blomberg, M., Feldt-Rasmussen, U., Andersen, K. K. & Kjaer, S. K.. *Int. J. Cancer* 131, 2360–2366 (2012)



# SUPLEMENTAÇÃO → GESTAÇÃO / LACTAÇÃO



## 2017 Guidelines of the American Thyroid Association for the Diagnosis and Management of Thyroid Disease During Pregnancy and the Postpartum

### RECOMMENDATION 5

All pregnant women should ingest approximately 250  $\mu\text{g}$  iodine daily. To achieve a total of 250  $\mu\text{g}$  iodine ingestion daily, strategies may need to be varied based on country of origin.

### RECOMMENDATION 8

There is no need to initiate iodine supplementation in pregnant women who are being treated for hyperthyroidism or who are taking LT4.

### RECOMMENDATION 10

Sustained iodine intake from diet and dietary supplements exceeding 500  $\mu\text{g}$  daily should be avoided during pregnancy due to concerns about the potential for fetal thyroid dysfunction.

### RECOMMENDATION 6

In most regions, including the United States, women who are planning pregnancy or currently pregnant, should supplement their diet with a daily oral supplement that contains 150  $\mu\text{g}$  of iodine in the form of potassium iodide. This is optimally started 3 months in advance of planned pregnancy.

**Strong recommendation, moderate-quality evidence.**

### RECOMMENDATION 81

All breastfeeding women should ingest approximately 250  $\mu\text{g}$  of dietary iodine daily.

### RECOMMENDATION 82

Breastfeeding women should supplement their diet with a daily oral supplement that contains 150  $\mu\text{g}$  of iodine. This is optimally delivered in the form of potassium iodide (present in a multivitamin) because kelp and other forms of seaweed do not provide a consistent delivery of daily iodine.

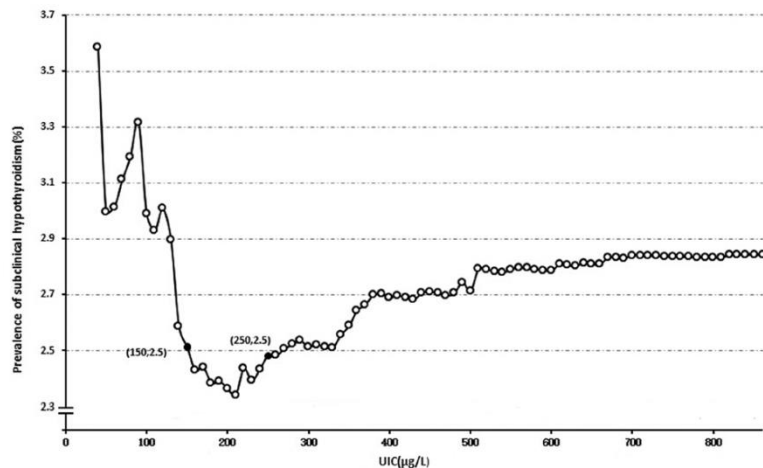


# SUPLEMENTAÇÃO → GESTAÇÃO / LACTAÇÃO

## Optimal and Safe Upper Limits of Iodine Intake for Early Pregnancy in Iodine-Sufficient Regions: A Cross-Sectional Study of 7190 Pregnant Women in China

Xiaoguang Shi, Cheng Han, Chenyan Li, Jinyuan Mao, Weiwei Wang, Xiaochen Xie, Chenyang Li, Bin Xu, Tao Meng, Jianling Du, Shaowei Zhang, Zhengnan Gao, Xiaomei Zhang, Chenling Fan, Zhongyan Shan, and Weiping Teng

J Clin Endocrinol Metab, April 2015, 100(4):1630–1638



Iodine status of pregnant women from a coastal Brazilian state after the reduction in recommended iodine concentration in table salt according to governmental requirements

Débora Ayres Saraiva, M.D., Nathalie Anne de Oliveira e Silva de Moraes, M.D., M.Sc., Carolina Martins Corcino, M.D., Tatiana Martins Benvenuto Louro Barbara, M.D., Annie Schtscherbyna, Ph.D., Michelle Santos, M.Sc., Heron Botelho, M.D., Mario Vaisman, Ph.D., Patricia de Fátima dos Santos Teixeira, Ph.D.

September 2018 Volume 53, Pages 109–114

## Effect of Iodine Supplementation During Pregnancy on Infant Neurodevelopment at 1 Year of Age

Mario Murcia\*, Marisa Rebagliato, Carmen Iñiguez, Maria-Jose Lopez-Espinosa, Marisa Estarlich, Belén Plaza, Carmen Barona-Vilar, Mercedes Espada, Jesús Vioque, and Ferran Ballester  
Am J Epidemiol. 2011;173(7):804–812

Iodine is the main constituent of thyroid hormones, which in turn are required for fetal brain development. However, the relation between iodine intake during pregnancy, thyroid function, and child neurodevelopment needs further evaluation. The authors assessed the association of maternal iodine intake from diet and supplements during pregnancy and of maternal and neonatal thyroid function with infant neurodevelopment. The Mental Development Index and Psychomotor Development Index (PDI) for 691 children were obtained between 2005 and 2007 using the Bayley Scales of Infant Development at age 1 year in a prebirth cohort in Valencia, Spain. In multivariate analyses, a maternal thyrotropin level >4 µU/mL was associated with an increased risk of a PDI <85 (odds ratio = 3.5, P = 0.02). Maternal intake of ≥150 µg/day, compared with <100 µg/day, of iodine from supplements was associated with a 5.2-point decrease in PDI (95% confidence interval: -8.1, -2.2) and a 1.8-fold increase in the odds of a PDI <85 (95% confidence interval: 1.0, 3.3). When analyses were stratified by sex, this association was intensified for girls but was not observed for boys. Further evidence on the safety and effectiveness of iodine supplementation during pregnancy is needed before it is systematically recommended in iodine-sufficient or mildly deficient areas.

TABLE 4 - Factors independently associated with insufficient or excessive UIC: analyses were done considering any abnormal UIC from all collected samples (A) and considering each pregnant presenting any abnormal UIC (B).

	A Considering any abnormal UIC from collected samples (n=829)			B Considering each pregnant presenting any abnormal UIC (n=244)			
	OR	CI	p.value	OR	CI	p.value	
UIC<150µg/L	Age> 30 yr	2.0	1.2; 3.2	0.004	2.4	1.1; 5.2	0.026
	Obesity <sup>a</sup>	0.2	0.2; 0.7	0.017	0.2	0.03; 0.8	0.028
	Multiparity <sup>b</sup>	0.6	0.3; 1.1	0.088	0.4	0.2; 1.1	0.067
UIC≥500µg/L	Age> 30 yr	0.2	0.04; 0.8	0.020			
	Obesity <sup>a</sup>	2.7	0.9; 3.6	0.070	5.0	0.8; 31.8	0.080
	Multiparity <sup>b</sup>	2.5	1.0; 6.0	0.040			
	SCH	5.6	1.0; 30.2	0.040	29.2	1.4; 603.6	0.040

# SUPLEMENTAÇÃO



V C B Mioto et al.

Iodine deficiency in pregnant women

7:5

762-767

RESEARCH

## High prevalence of iodine deficiency in pregnant women living in adequate iodine area

Verônica Carneiro Borges Mioto<sup>1</sup>, Ana Carolina de Castro Nassif Gomes Monteiro<sup>2</sup>, Rosalinda Yossie Asato de Camargo<sup>1</sup>, Andréia Rodrigues Borel<sup>3</sup>, Regina Maria Catarino<sup>4</sup>, Sergio Kobayashi<sup>2</sup>, Maria Cristina Chammas<sup>2</sup> and Suemi Marui<sup>1</sup>  
*Endocrine Connections* (2018) **7**, 762-767

In conclusion, iodine deficiency was found in 52% of pregnant women living in iodine-adequate areas. The sTg concentration and TV were not feasible to use as iodine status markers.

Estado nutricional parece adequado

Impacto da suplementação em DI discreta / moderada

Identificar subgrupos de risco para EI e DI: desnutrição, veganos, intolerância à lactose...

OBES SURG (2018) 28:349-357  
DOI 10.1007/s11695-017-2833-0



ORIGINAL CONTRIBUTIONS

## Iodine Status After Bariatric Surgery—a Prospective 10-Year Report from the Swedish Obese Subjects (SOS) Study

Sofia Manousou<sup>1,2,3</sup> • Lena M. S. Carlsson<sup>2</sup> • Robert Eggertsen<sup>2,4</sup> • Lena Hulthén<sup>2,5</sup> • Peter Jacobson<sup>2</sup> • Kerstin Landin-Wilhelmsen<sup>2,6</sup> • Penelope Trimpou<sup>2,6</sup> • Per-Arne Svensson<sup>2</sup> • Helena Filipsson Nyström<sup>2,6</sup>

Urina 24h B, 2 anos e 10 anos → valor em 10 anos <B, mas = controles.

Em regiões suficientes não há necessidade de reposição



33 mcg



100 mcg



100 mcg



30 mcg



65 mcg



100-200 mcg



150 mcg



150 mcg



150 mcg



# MORTALIDADE

## Urinary Iodine Concentrations and Mortality Among U.S. Adults

Kosuke Inoue, MD<sup>1,2</sup>, Angela M. Leung, MD, MSc<sup>3,4</sup>, Takehiro Sugiyama, MD, MSHS, PhD<sup>5</sup>,  
<sup>6</sup>, Tetsuro Tsujimoto, MD, PhD<sup>7</sup>, Noriko Makita, MD, PhD<sup>2</sup>, Masaomi Nangaku, MD, PhD<sup>2</sup>,  
Beate R. Ritz, MD, PhD<sup>1</sup>

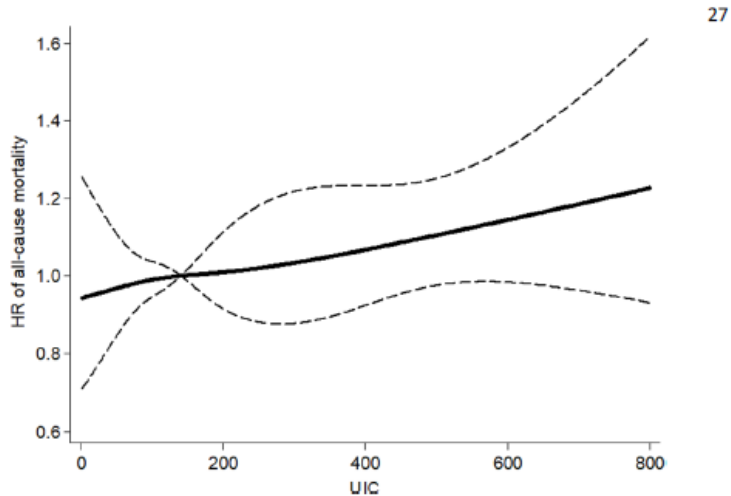


Figure 1. Association between UIC and all-cause mortality using a restricted cubic spline regression model with four knots at 5<sup>th</sup>, 35<sup>th</sup>, 65<sup>th</sup>, and 95<sup>th</sup> percentile of UIC (30, 102, 182 and 450  $\mu\text{g/L}$ ). The dashed lines represent the 95% CIs for the spline model (reference is the median i.e. 140  $\mu\text{g/L}$ ). We restricted the range of UICs to 0 to 800  $\mu\text{g/L}$  because predictions above 800  $\mu\text{g/L}$  are based on too few data points.

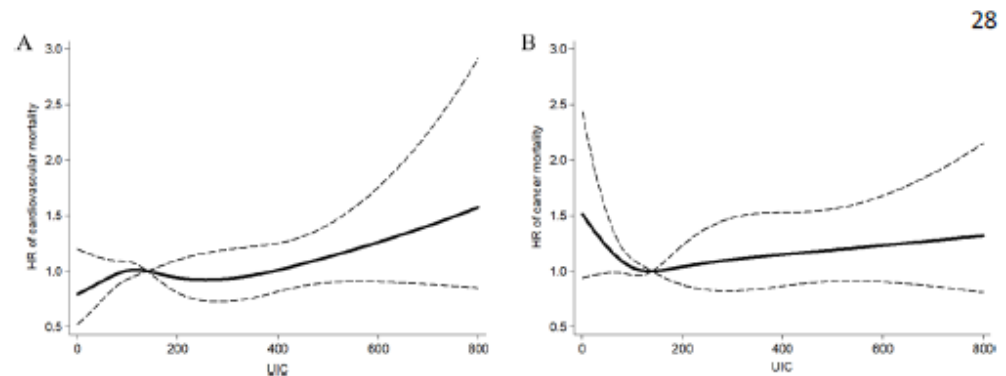


Figure 2. Association between UIC and cardiovascular (A) and cancer (B) mortality using a restricted cubic spline regression model with four knots at 5<sup>th</sup>, 35<sup>th</sup>, 65<sup>th</sup>, and 95<sup>th</sup> percentile of UIC (30, 102, 182 and 450  $\mu\text{g/L}$ ). The dashed lines represent the 95% CIs for the spline model (reference is the median i.e. 140  $\mu\text{g/L}$ ). We restricted the range of UICs to 0 to 800  $\mu\text{g/L}$  because predictions above 800  $\mu\text{g/L}$  are based on too few data points.

OBRIGADA!!!