

# 中国居民补碘指南

2018 5



20 70

3500  
1778

25 [1] 20 90  
776

USI  
18.8 [2]

[3, 4]

18 50

5 1985 29  
90%

1991

2000 1993 “ 2000  
” 2000

2000

2010 28  
2015

“ ”

94.2%

100µg/L

5% [5]

150µg/L 2/3

2005

110

3100 [6]

2017

30

39366

172

300.0 µg/L

878

100.0~300.0 µg/L

5529

10.0~100.0 µg/L

32787

10.0 µg/L

[7]

“

”

..... 1

- 1.
- 2.
- 3.
- 4.

..... 2

..... 2

- 1.
- 2.

..... 5

- 1.
- 2.

..... 6

- 1.
- 2.

..... 8

- 1
- 2
- 3
- 4
- 5

—  
—  
—  
—  
—

TSH

..... 11

- 1.
- 2.
- 3.

..... 13

- 1.
- 2.

..... 15

- 1.
- 2.

..... 15

- 1.
- 2.
- 3.
- 4.
- 5.

..... 17

- 1.
- 2.
- 3.
- 4.

?

..... 20

..... 24

..... 27



80%

10%~20%

0~5%

1

3

24

15% 45%

80%

90%

10%

[2]

2 3

**1.**



1.8

[9]

**2.**

[10]

$1^{[11]}$

“ ” “ ” “ ”

1

2



1

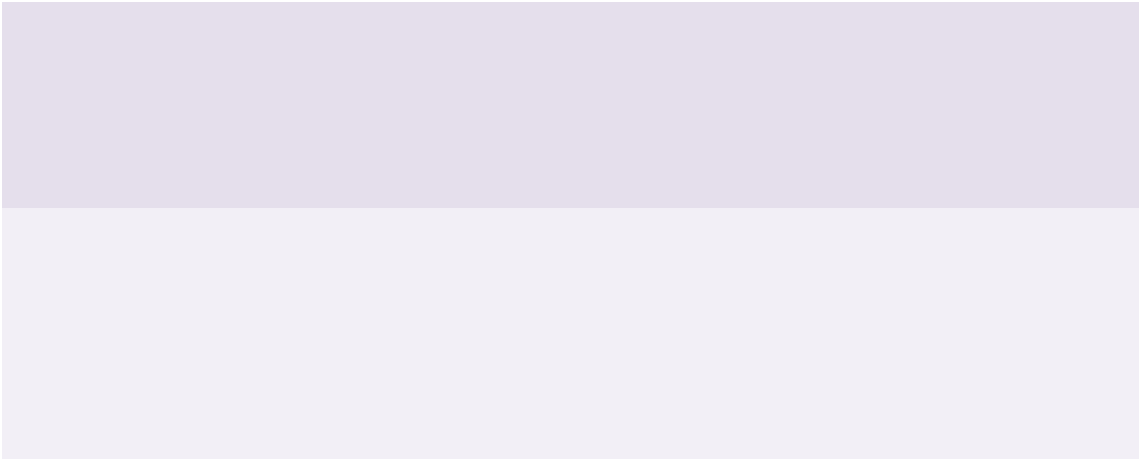


2

1

表1 不同生命时期碘缺乏的主要表现

表1 不同生命时期碘缺乏的主要表现	



**1.**

100µg/L

20 70

[12]

[6]

20 80

[13]

[14]

2.

Wolff-Chaikoff

[15-18]

Thyroid stimulating hormone, TSH)

[19]

250µg/L

500µg/L

[20, 21]

[22, 23]

[24-28]

[29]

6 24

7%<sup>[30]</sup>

1.

Dietary reference intakes DRIs

recommended

dietary allowance RDA

estimated average requirement EAR  
 recommended nutrient intake RNI adequate intake  
 AI tolerable upper intake level UL EAR  
 50% RNI  
 97% 98%  
 RNI  
 AI EAR RNI  
 AI RNI AI  
 2<sup>[31]</sup>

表 2 中国居民膳食碘参考摄入量 (μg/d)

	EAR	RNI	UL
<b>0</b>	-	85 AI	--
<b>0.5 ~</b>	-	115 AI	--
<b>1 ~</b>	65	90	--
<b>4 ~</b>	65	90	200
<b>7 ~</b>	65	90	300
<b>11 ~</b>	75	110	400
<b>14 ~</b>	85	120	500
<b>18</b>	85	120	600
	160	230	600
	170	240	600

UL EAR  
 RNI 2  
 UL 4 UL UL

3 UL

2.

$$= \Sigma \times + \times 1- \text{WHO}$$

20%<sup>[32]</sup>

EAR RNI UL 2 EAR  
EAR 50%

EAR 50%

RNI

3%

RNI

2% 3%

RNI UL

"

"

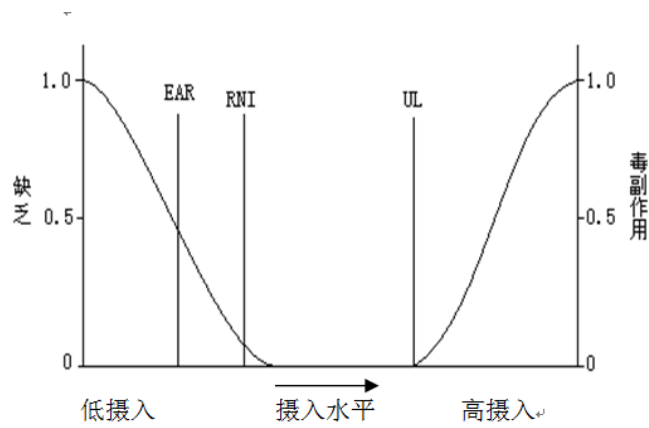
UL

UL

UL

UL

3 [33]



3

TSH

<b>1</b>	—	
2007	WHO	UNICEF
	ICCIDD	IGN
	[11] 3	
100~199μg/L		

表3 WHO/UNICEF/ICCIDD 推荐的人群碘营养状况评价标准

μg/L	
<20	
20-49	
50-99	
100-199	
200-299	
≥300	
<150	
150-249	
250-499	
≥500	
≥100	
<2	≥100

[34]

[11]

<b>2</b>	—					
			GB16005-2009	[35]		
		10μg/L	8~10		100μg/L	
50μg/L	20%	8~10			5%	
			50μg/L	100μg/L	50μg/L	
	20%		5%	20%		
	20μg/L	50μg/L		20%	30%	
		20μg/L			30%	
		8~10				
<b>3</b>	—	<b>TSH</b>				
			2007	WHO/UNICEF/ICCIDD		
5mU/L	TSH			TSH>5mU/L		3%
			[11]			
<b>4</b>	—					
				2007	12	1
						WS
276-2007	[36]	B		B		
				WS 276-2007	6-17	
						4

表 4 甲状腺容积的正常值

**ml**



6	≤3.5
7	≤4.0
8	≤4.5
9	≤5.0
10	≤6.0
11	≤7.0
12	≤8.0
13	≤9.0
14	≤10.5
15	≤12.0
16	≤14.0
17	≤16.0
	≤18.0
	≤25.0

5

—

45~90μg/L 52~109μg/L 40~92μg/L<sup>[37]</sup>

[38]

WHO

WHO

1.

[39, 40]

120

97

2012

GB26878-2011

20mg/kg~30mg/kg

±30%<sup>[41]</sup>

14

25mg/kg 12

30mg/kg 5

25mg/kg

30mg/kg

25mg/kg

30mg/kg

5

表 5 各省份选择的盐碘浓度

mg/kg
25
30
25/30

[42, 43]

[43]

2.

[44]

36240μg/100g

983μg/100g

162μg/100g

45.4μg/100g

40.8μg/100g

233μg/100g

59.7μg/100g

22.5μg/100g

1.9 $\mu$ g/100g 4.5 $\mu$ g/100g

**3.**

**1.**

WHO 20% 25mg/kg 25~50 $\mu$ g 5g 10 $\mu$ g  
100 $\mu$ g  
120 $\mu$ g/d

**2.**

36

120 $\mu$ g/d

230 $\mu$ g/d

RNI

240 $\mu$ g/d

2

**1**

**2**

200μg/L                      500 800ml                      100

**3**

36

7 12

13 24

0 6

GB10765-2010

100kJ

2.5

14.0 $\mu$ g    100kcal    10.5    58.6 $\mu$ g<sup>[45]</sup>

**4**

**1.**

2009

2012~2017

90%

**2.**

2009

4

100~250 $\mu$ g/L

131 $\mu$ g/L    140 $\mu$ g/L    130 $\mu$ g/L    109 $\mu$ g/L

150 $\mu$ g/L

**1.**

7 [46]

**2.**

**3.**

/

[47]

**4.**

[48]

[49]

**5.**

10

12

24

[50, 51]

3

[51]

**1.**

2.

3.

1995

86.5%

13.2%

99.7%

6

C

120

1

C

C

1.2

100

C

IGN

[52]

4.

?



**B**

[49, 53]

1.0

[54-56]

μ

	36240
	15982
	4323
	3830
	2950
	2427
	983
	394
	373
	36.1
	16.1
	45.4
	33.2
	27.8
	162
	102
[ ]	91.4
	66.0
	65.4
	48.5
	43.1
	39.3
	37.9
	40.8
	36.9
	33.4
	28.5
	15.6
	14.9
	12.3
	11.3
	10.9
	9.1
	7.9
[ ]	7.7

	5.8
[ ]	3.5
	10.1
[ ]	6.4
	6.7
	6.6
[ ]	4.7
	28.1
	233
	59.7
	34.2
	22.5
	14.5
	7.0
	6.8
	4.0
	3.9
	2.0
	1.6
	1.5
	1.4
	1.4
	1.1

	3.8
	3.6
	3.5
	3.4
	3.1
	3.0
	2.4
	2.2
	1.8
	1.7
	1.7
[ ]	1.4
	1.4
	1.3
[ ]	1.3
	1.3
	1.2
	1.2
	1.2
[ ]	1.1
	1.0
	0.8
	0.8
	0.8
	0.7
	0.7
	0.6
[ ]	0.4
	Tr
[ ]	Tr
	Tr
	10.4
	8.4
	2.7
	1.2
[ ]	10.1
	3.0
	2.1
	2.0
	1.9
	1.6
	1.3

	1.2
	0.6
	0.4
	4.1
	2.9
	1.9
	4.5
	3.2
	3.0
	35.4
	32.4
( )	1.9
	0.9

- [1] . . . . . 10 . 2006 .
- [2] . . . . . : . 2007.
- [3] Bougma K, Aboud FE, Harding KB, *et al.* Iodine and mental development of children 5 years old and under: a systematic review and meta-analysis. *Nutrients*. 2013. 5(4): 1384-1416.
- [4] Qian M, Wang D, Watkins WE, *et al.* The effects of iodine on intelligence in children: a meta-analysis of studies conducted in China. *Asia Pac J Clin Nutr*. 2005. 14(1): 32-42.
- [5] . 2014 . : . 2017.
- [6] Shen H, Liu S, Sun D, *et al.* Geographical distribution of drinking-water with high iodine level and association between high iodine level in drinking-water and goitre: a Chinese national investigation. *Br J Nutr*. 2011. 106(2): 243-247.
- [7] . 2017 . 2018 .
- [8] , . : . 2012 : 354-357.
- [9] , . - . : . 2009 .
- [10] , . : . 2016.
- [11] WHO/UNICEF/ICCIDD. Assessment of iodine deficiency disorders and monitoring their elimination, A GUIDE FOR PROGRAMME MANAGERS. Third edition. 2007 .
- [12] , . . 1984. (11): 26-27.
- [13] , , . . . . . 1984. (04): 44-48.
- [14] . . . . . 1984. (03): 120-125.
- [15] Teng W, Shan Z, Teng X, *et al.* Effect of iodine intake on thyroid diseases in China. *N Engl J Med*. 2006. 354(26): 2783-2793.
- [16] Roti E, Uberti ED. Iodine excess and hyperthyroidism. *Thyroid*. 2001. 11(5): 493-500.
- [17] Liu L, Wang D, Liu P, *et al.* The relationship between iodine nutrition and thyroid disease in lactating women with different iodine intakes. *Br J Nutr*. 2015. 114(9): 1487-1495.
- [18] Du Y, Gao Y, Meng F, *et al.* Iodine deficiency and excess coexist in China and induce thyroid dysfunction and disease: a cross-sectional study. *PLoS One*. 2014. 9(11): e111937.
- [19] Leung AM, Braverman LE. Consequences of excess iodine. *Nat Rev Endocrinol*. 2014. 10(3): 136-142.
- [20] Sang Z, Wei W, Zhao N, *et al.* Thyroid dysfunction during late gestation is associated with excessive iodine intake in pregnant women. *J Clin Endocrinol Metab*. 2012. 97(8): E1363-1369.
- [21] Shi X, Han C, Li C, *et al.* 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. *J Clin Endocrinol Metab*. 2015. 100(4): 1630-1638.
- [22] . . . . . 2005. (03): 85-87.
- [23] , . . . . . 2008. 43(10): 787-790.
- [24] Connelly KJ, Boston BA, Pearce EN, *et al.* Congenital hypothyroidism caused by excess prenatal maternal iodine ingestion. *J Pediatr*. 2012. 161(4): 760-762.
- [25] Weber G, Vigone MC, Rapa A, *et al.* Neonatal transient hypothyroidism: aetiological study. Italian Collaborative Study on Transient Hypothyroidism. *Arch Dis Child Fetal Neonatal Ed*. 1998. 79(1): F70-72.

- [26] Nishiyama S, Mikeda T, Okada T, *et al.* Transient hypothyroidism or persistent hyperthyrotropinemia in neonates born to mothers with excessive iodine intake. *Thyroid*. 2004. 14(12): 1077-1083.
- [27] Thomas JV, Collett-Solberg PF. Perinatal goiter with increased iodine uptake and hypothyroidism due to excess maternal iodine ingestion. *Horm Res*. 2009. 72(6): 344-347.
- [28] Kurtoğlu S, Akın L, Akın MA, *et al.* Iodine overload and severe hypothyroidism in two neonates. *J Clin Res Pediatr Endocrinol*. 2009. 1(6): 275-277.
- [29] Theodoropoulos T, Braverman LE, Vagenakis AG. Iodide-induced hypothyroidism: a potential hazard during perinatal life. *Science*. 1979. 205(4405): 502-503.
- [30] Nepal AK, Suwal R, Gautam S, *et al.* Subclinical Hypothyroidism and Elevated Thyroglobulin in Infants with Chronic Excess Iodine Intake. *Thyroid*. 2015. 25(7): 851-859.
- [31] . (2013 ). : . 2014 .
- [32] WHO. Recommended iodine levels in salt and guidelines for monitoring their adequacy and effectiveness. 1996 .
- [33] . : . 2004.
- [34] Sun D, Codling K, Chang S, *et al.* Eliminating Iodine Deficiency in China: Achievements, Challenges and Global Implications. *Nutrients*. 2017. 9(4):361.
- [35] . , , . GB16005-2009.2009.
- [36] . .WS276-2007. : . 2007 .
- [37] van den Briel T, West CE, Hautvast JG, *et al.* Serum thyroglobulin and urinary iodine concentration are the most appropriate indicators of iodine status and thyroid function under conditions of increasing iodine supply in schoolchildren in Benin. *J Nutr*. 2001. 131(10): 2701-2706.
- [38] Brug J, Löwik MR, van Binsbergen JJ, *et al.* Indicators of iodine status among adults. Dutch Nutrition Surveillance System. *Ann Nutr Metab*. 1992. 36(3): 129-34.
- [39] Pandav CS, Yadav K, Kumar R, *et al.* Sustainable elimination of iodine deficiency disorders: an essential maternal and child health intervention. *Natl Med J India*. 2014. 27(1): 1-3.
- [40] UNICEF-WHO. World Summit for Children: Mid-decade goal-Iodine deficiency disorders', report from UNICEF and WHO Joint Committee on Health Policy Special Session. Geneva. 1994 .
- [41] . . GB 26878-2011.2011.
- [42] , , . . 2006. (06): 364-366.
- [43] , , . . 2006. (04): 261-263.
- [44] . 2009 .
- [45] . (GB10765-2010). 2010 .
- [46] Ross DS, Burch HB, Cooper DS, *et al.* 2016 American Thyroid Association Guidelines for Diagnosis and Management of Hyperthyroidism and Other Causes of Thyrotoxicosis. *Thyroid*. 2016. 26(10): 1343-1421.
- [47] . 2007 .
- [48] Chen W, Zheng R, Baade PD, *et al.* Cancer statistics in China, 2015. *CA Cancer J Clin*. 2016. 66(2): 115-32.
- [49] Zimmermann MB, Galetti V. Iodine intake as a risk factor for thyroid cancer: a comprehensive review of animal and human studies. *Thyroid Res*. 2015. 8: 8.
- [50] . . 2012 .
- [51] Alexander EK, Pearce EN, Brent GA, *et al.* 2017 Guidelines of the American Thyroid Association for the Diagnosis and Management of Thyroid Disease During Pregnancy and the Postpartum. *Thyroid*. 2017. 27(3): 315-389.

- [52] WHO. Guideline: fortification of food-grade salt with iodine for the prevention and control of iodine deficiency disorders. Geneva: World Health Organization; 2014 .
- [53] Aburto NJ, Abudou M, Candeias V, *et al.* Effect and safety of salt iodization to prevent iodine deficiency disorders: a systematic review with meta-analyses. WHO eLibrary of Evidence for Nutrition Actions (eLENA). Geneva: World Health Organization. 2014 .
- [54] La Vecchia C, Negri E. Thyroid cancer: The thyroid cancer epidemic - overdiagnosis or a real increase. *Nat Rev Endocrinol.* 2017. 13(6): 318-319.
- [55] Franceschi S, Vaccarella S. Thyroid cancer: an epidemic of disease or an epidemic of diagnosis. *Int J Cancer.* 2015. 136(11): 2738-2739.
- [56] Udelsman R, Zhang Y. The epidemic of thyroid cancer in the United States: the role of endocrinologists and ultrasounds. *Thyroid.* 2014. 24(3): 472-479.



USI	universal salt iodization
T <sub>3</sub>	triiodotyronine
T <sub>4</sub>	tetraiodothyronine
Tg	thyroglobulin
	Wolff-Chaikoff
TSH	thyroid stimulating hormone
DRI	Dietary reference intakes
RDA	recommended dietary allowance
EAR	estimated average requirement
RNI	recommended nutrient intake
AI	adequate intake
UL	tolerable upper intake
WHO	world health organization
UNICEF	
ICCIDD	
IGN	iodine global network
TPOAb	thyroperoxidase antibodies
TgAb	thyroglobulin antibodies