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China: Research of Iodine Intake

Abstract

During the last few decades, Chinese residents experienced a significant twist from severe iodine deficiency to partly excessive iodine intake. The government mainly reversed iodine deficiency of an entire nation via implementing “Obligatory Iodine Supplement” policy. However, some residents concentrate excessive iodine element in their bodies, enormously imperiling good health. To acknowledge and master history and the current situation of diseases spawned by iodine intake benefit calling on more focus on iodine nutrition level. This paper will contain iodine intake changes; the status quo, reasons and the influence of related diseases; and suggestions towards the subject.

Key words: iodine deficiency, surfeit of iodine, thyroid diseases

Background

Baoding city, where my ancestry situates and located in Hebei province, has suffered from a particular kind of disease—nodular goiter. Regardless the gender and age, patients who are affected by nodular goiter occupy a steadily large portion of the population. Through comparison of medical cases, I discovered that the cause of nodular goiter has largely changed, which is relevant with iodine intake. Thirty years ago, nodular goiter was triggered owing to lack of iodine; while nowadays, patients are primarily afflicted by relatively high iodine intake. Investigating and visiting households in Baoding city, I found that local residents prefer ingredients and relish rich in salt, which is indispensable in their diet representing a salty appetite. People’s taste remains the same as well as salt ingestion except for the mutative pathogen, generating my concern and thinking of this issue.

Current situation of thyroid disease in China stays adverse. There are approximately 10,000,000 patients suffering from Hyperthyroidism; 90,000,000 patients have Hypothyroidism; and 100,000,000 people have nodular goiter and thyroid cancer. Conservative assessment shows that there are more that twenty million patients with thyroid illnesses, covering one seventh of the population in China. Residents with thyroid diseases will continue to grow in the coming decades.

I. Transformation of Iodine Intake and Reasons

Balancing and taking the appropriate dose of trace elements plays a vital role in health maintenance. Iodine, the second trace element unearthed by human which is essential for creatures, is the requisite of synthesizing thyroid hormone and participating in body growth and metabolism[1]. In the 1980s, endemic goiter struck roughly every corner of China quickly. Via clinical experiments and contrast of results, iodine deficiency is considered as the major account. In order to resolve the particular problem effectively, the Chinese government proposed and practiced “Obligatory Iodine Supplement” policy including the adjunction of additional iodine to edible salt nationwide in the 1990s,

aiming to reduce morbidity of thyroid diseases induced by insufficient iodine intake. Nevertheless, after thirty years of replenishment, a new type of thyroid disease emerged and imperiled human health again which is suspected to surface due to superfluous iodine intake. The mentioned issue was put forward on National People's Congress 2002, where representatives discussed and reformulated national standard of iodine absorption for Chinese dwellers, making accord adjustments to the policy. But latest situation still reveals pessimistic outcomes. After analysis, here are several reasons which, personally thinking, could explain the transition:

1. Development of Economy and Improvement of Domestic Living Standard
   With residents' financial income increasing during the last decades, living standard has been apparently enhanced while economy developing. Income and output of inhabitants reached counterpoise; they are more capable to afford expensive seafood products.

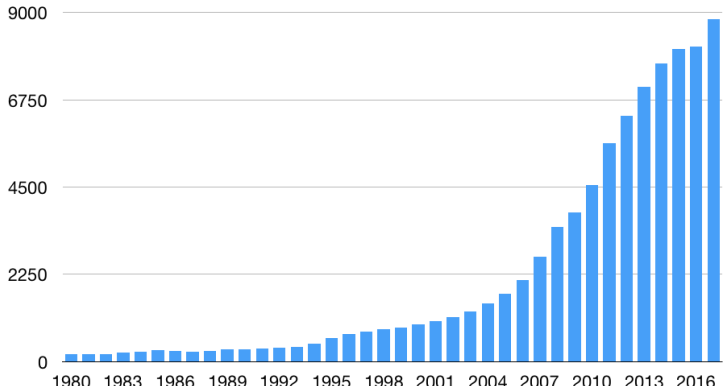


Fig1.1978-2016 Gross Domestic Product in China, https://www.kuaiyilicai.com/stats/global/yearly_per_country/g_gdp_per_capita/chn.html

Figure 1 reveals Gross Domestic Product in China from1978-2016 in dollars. 1990 can be defined as the demarcation line where growth rate differentiates, meaning increase consumption per capita afterwards.

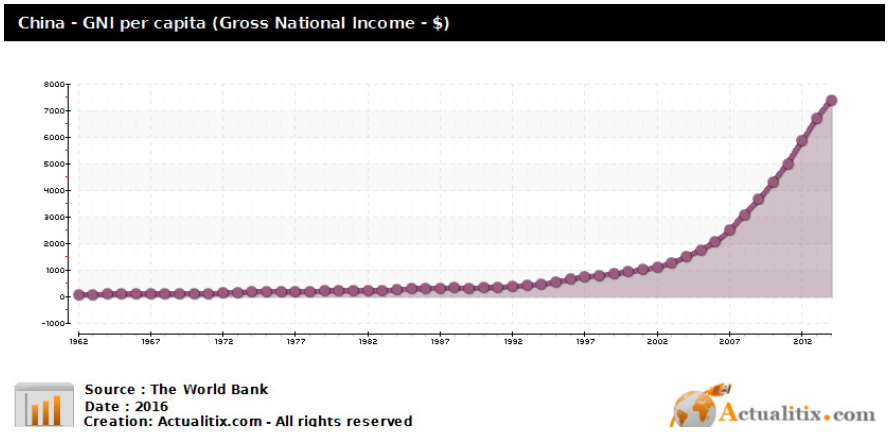


Fig.2 1962-2012 Gross National Income per capita, https://en.actualitix.com/country/chn/china-gross-national-income-per-capita.php

Figure 2 reflects Gross National Income from 1962-2012. Growth rate has mounted

rapidly since the 1990s.

Therefore, financial evolvement is one possible explanation for the dramatic change.

2. Attitude Shift of Daily Food Rich in Iodine Intake
   Rich iodine food underwent an attitude shift from being neglected to valued. Conventional Asian Diet Pyramid only contains optional seafood supplement, leading to fewer ingestion. On the contrary, recently assimilating huge amounts of seafood may also yield potential problems because of inadequate survey and evaluation on element composition, resulting in inappropriate nutrients intake.

Table 1

Selected Sources of Dietary Iodine

Table 2. Selected Sources of Dietary Iodine

Food	Approximate mcg/Serving	Daily Value[a]
Seaweed (nori), whole or sheet, 1 g	16-2,984	11%-1,989%[b]
Cod, baked, 3 oz.	99	66%[b]
Yogurt, plain, low-fat, 1 cup	75	50%[b]
Iodized salt, 1.5 g (about 1/4 tsp)	71	47%[b]
Milk, reduced fat, 1 cup	56	37%[b]
Fish sticks, 3 oz.	54	36%[b]
Bread, white, enriched, 2 slices	45	30%[b]
Fruit cocktail, canned in heavy syrup, 1/2 cup	42	28%[b]
Shrimp, 3 oz.	35	23%[b]
Ice cream, chocolate, 1/2 cup	30	20%[b]
Macaroni, enriched, boiled, 1 cup	27	18%
Egg, 1 large	24	16%
Tuna, canned in oil, drained, 3 oz.	17	11%
Corn, cream style, canned, 1/2 cup	14	9%
Plums, dried (prunes), 5 prunes	13	9%
Cheese, cheddar, 1 oz.	12	8%
Raisin bran cereal, 1 cup	11	7%
Lima beans, mature, boiled, 1/2 cup	8	5%
Apple juice, 1 cup	7	5%

[a] The FDA developed Daily Values to help consumers compare the nutrient content of products within the context of a total diet. The Daily Value for iodine is 150 mcg for adults and children aged ≥4 years. However, the FDA does not require that food labels list iodine content unless a food has been fortified with it.
[b] Foods supplying ≥20% of the Daily Value are considered to be high sources of a nutrient.
Source: Reference 33.

Source: http://www.stack.com/a/iodine

Table 1 listed 19 types of sources rich in iodine and their value, which frequently appear in daily diet. Seafood holds four places in ranking top 10 iodine-rich food(seaweed, cod, fish sticks and shrimp) and each of them seizes 20% even more of iodine humans need everyday, which are commonly known as Iodine Rich Food. Discrepancy of iodine concentration exists among all kinds. For example, iodine content in seaweed is three times higher than that of bread.

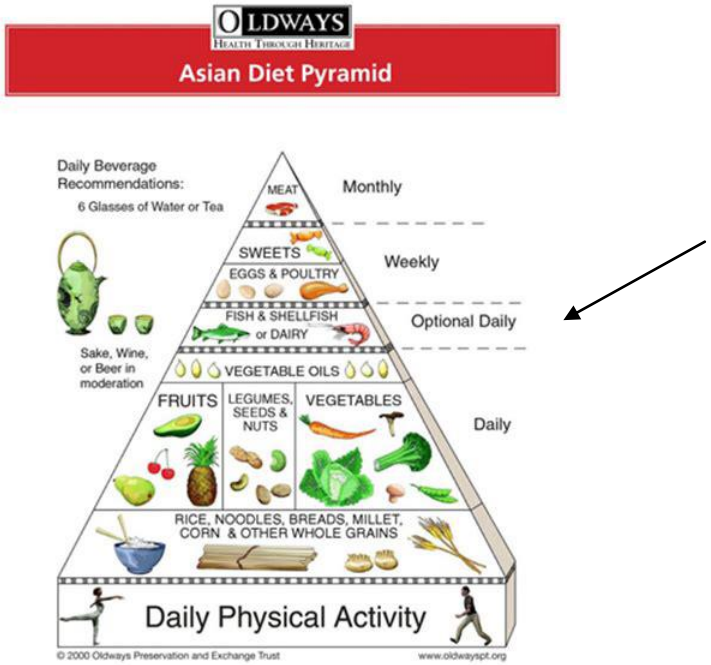


Fig.3 **Asian Diet Pyramid,** https://oldwayspt.org/traditional-diets/asian-diet

Figure 3: Seafood, the main iodine rich food, is supposed to be taken in optional daily.

Combining the analysis of figures and charts above, with revenue increasing, Chinese residents' purchase and consumption of seafood is growing as well, implying iodine contained in seafood will be ingested more into body.

3. Implementation of "Obligatory Iodine Supplement" Policy

   After thyroid diseases which are iodine-deficiency-induced invaded one third of the country in the 1990s, the Chinese government realized the significance of sustaining normal organ functions and having a healthy body by adding iodine. Hence, "Obligatory Iodine Supplement" Policy was applied domestically, including *Regulation on Edible Salt Iodization as a Means to Eliminate Iodine Deficiency Disorders.* Yet the execution covered not only inland places but also cities near coastlines, which ignored disparity of natural iodine concentration. As a matter of fact, metropolises and coastal areas belong to minor iodine deficiency and even iodine abundance regions where extra iodine supplement is not compulsory. Moreover, protein and iodine rich food in daily diet involve more than regular level, leading to severely zonal imbalanced iodine complementary. Under this circumstance, along with 500,000,000 residents' health condition being completely disregarded, the transition from national iodine deficiency to regional excessive iodine intake gradually came into sight.

II. Effect of Iodine on Human Health

Chinese people have encountered transformation from iodine insufficiency to excess. In

this day and age, in pace with medical techniques advancing and clinical operations proceeding, illnesses generated through iodine inadequacy—endemic goiter and endemic cretinism—still occur occasionally but various medical cases unveiled that this kind can be healed, and thus will not greatly jeopardize to human health. Lately, disproportionate-iodine-intake engendered sicknesses such as nodular goiter slowly drew the masses' attention and focus. Both are extremely harmful to human body. As a burgeoning disease, impact and side-effects on human health cannot be underestimated.

1. Iodine Deficiency Disorders

   Lack of iodine element in body may induce Iodine Deficiency Disorders(IDD), which generally influences two kinds of individuals—women and children; and dwellers living near critically iodine under-supplying areas. The chief negative consequence among all should be intellectual development impediment. Regularly excreted thyroid hormones, which composed via iodine ingestion, promote the growth of the brain.

   If iodine dearth occurs during pregnancy, cerebral growth of the embryo could be damaged at varied degrees. In worst case scenarios, abortion and premature birth may take place.

   Medical Case: Endemic Cretinism

   Endemic cretinism, whose symptoms usually include: mental retardation; impaired skeletal development; and short stature, is common among infants. Owing to absorption of inadequate iodine during the womb, human nerve cells are not well-developed and thus the nervous system comprises of congenital defects, leading to mental retardation.

   Sparse secretion of thyroid hormone leads to thyroid gland function hindrance.

   Medical Case: Endemic Goiter

   Endemic goiter, attributes to diseases engendered by meager thyroid hormone secretion, essentially is a kind of compensatory hypertrophy. Due to a lot of patients suffering from a thyroid goiter, it is commonly named as "thick neck disease" in China.

   Iodine deficiency disorders are able to be cured via clinical methods, boosting survival rates and population quality.

2. Excessive-Iodine-Induced Diseases

   Excessive iodine supplements will also generate thyroid diseases. Under most of the circumstances, iodine intake temporarily changes thyroid hormone excretion and function, which gradually goes back to normality after stress. In these cases, only a little enlargement occurs at thyroid gland volume. However, its seriousness is still as grave as Iodine Deficiency Disorder, encouraging iodine-sensitive residents to evaluate their intake amount according to specific state of affairs. Epidemiological surveys display that, excessive iodine complement could raise the possibility of hypothyroidism, hyperthyroidism and nodular goiter occurrence and exacerbation.

First Affiliated Hospital of China Medical University conducted a research in some counties in Hebei province and Shandong province with different iodine content; they analyzed median urinary iodine respectively 103μg/L, 374μg/L, 615μg/L, and 103μg/L. The morbidity of hypothyroidism increases 3.52 and 7.24 times in counties with 374μg/L and 615μg/L while the ratio of subclinical hypothyroidism rises 3.19 and 6.65 times.[2]

When ingesting large amount of iodine, the element moves into digestion procedure along with food and water. Too much iodine decreases activity of oxide and therefore diminishes iodine levels in cells, which causes iodine deficiency disorders. Women who are pregnant tend to get more detriments, enhancing the risks of subclinical hypothyroidism; transformation to hypothyroidism; and abortion. Thyroid function of fetuses will hence be damaged at diverse levels, which may lower growth rate and increase possibility of hypothyroidism.

III. Causes of Improper-Iodine-Intake-Induced Diseases

1. Iodine Deficiency

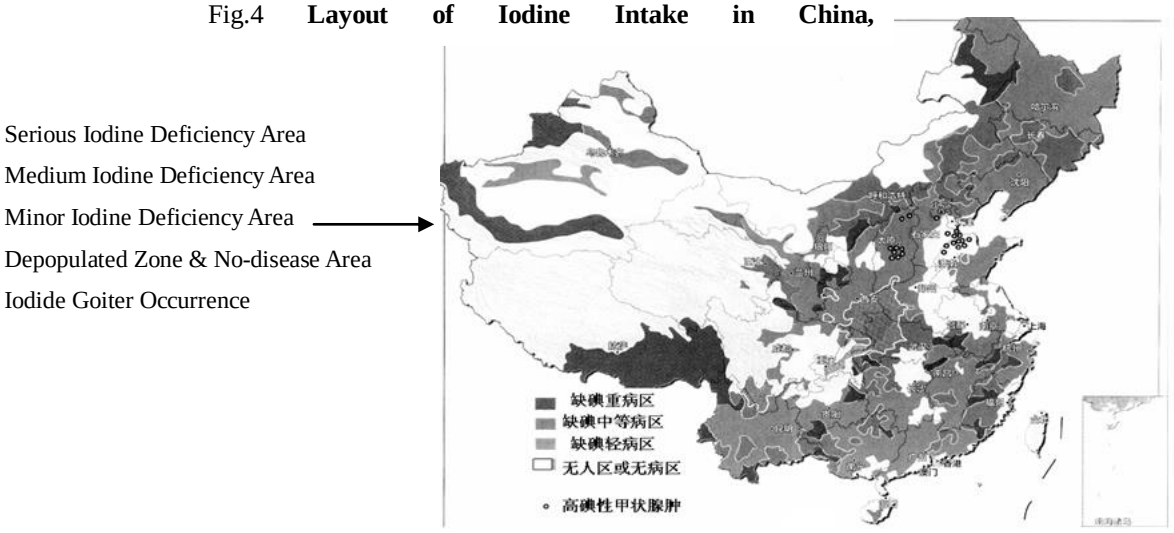
Endemic goiter and endemic cretinism are typical medical samples of iodine deficiency disorders, which are created due to abnormal thyroid hormone secretion with lack of iodine. Endemic goiter, the first and most profound clinical case, along with other similar diseases can rehabilitate eventually through later suitable iodine supplement .

Regarding factors contributed to occurrence of iodine deficiency disorders, there may be several reasons that may have connections with the pathogen:

1.1 Chemical Property of Iodine and Environmental Impact

Iodine is defined as a halogen chemically, conveying comparatively active chemical attributes.

Fig.4 **Layout of Iodine Intake in China,**



Iodine is often hard to discover and collect from the earth crust due to a scattered distribution. After rock weathering, iodine contained inside stones is easily lost while iodine content in crust will continuously diminish. At that time, iodine element dissolve in water and thus flow into the ocean via eluviations. Elevated terrain accounts for higher iodine loss after precipitation, explaining the most frequent and serious iodine deficiency situations among mountains. Reversely, strong capability to retain iodine inside marine animals manifests why majority of sea products are rich in iodine.

Figure 4: A comprehensive distribution of iodine intake in China. The lighter the color, the better local health condition. Besides, there are both categories of thyroid diseases existing nationwide.

1.2 Physical Property of Iodine and Daily Misusage

Boiling point and melting point of iodine are 113 and 184 Celsius degrees respectively, which are quite near so that sublimation is comparatively easy. Iodized salt as one item in “Obligatory Iodine Supplement” policy holds a crucial position in daily diet. Nevertheless, over half of Chinese dishes are cooked under high heat which may spawn iodine loss during cooking process.

“More loss was found in boiling, medium loss in microwave cooking and fewer losses in roasting, and deep frying. Loss of iodine depends upon type of cooking method and cooking time of salt.”[3]

2. Excessive Iodine Supplement

Nodular goiter is a representational illness caused by inordinate iodine ingestion, which basically can be diagnosed among patients having an iodine-rich menu. This sort of illness which is induced via an uneven diet still holds possibility to transit into thyroid cancer, although nodular goiter mostly belongs to benign lesions. Both those who ingest enormous quantities of iodine or take too much iodine for a long time are able to account for nodular goiter and other diseases with analogous pathogen. Here

are a few reasons that may explain attacks of related diseases:

2.1 Increase Seafood Supplement among Residents

Since modern citizens are more likely to purchase seafood products than before owing to their balanced fiscal enhancement, and marine animals tend to concentrate iodine element more, iodine intake of humans are surely rising.

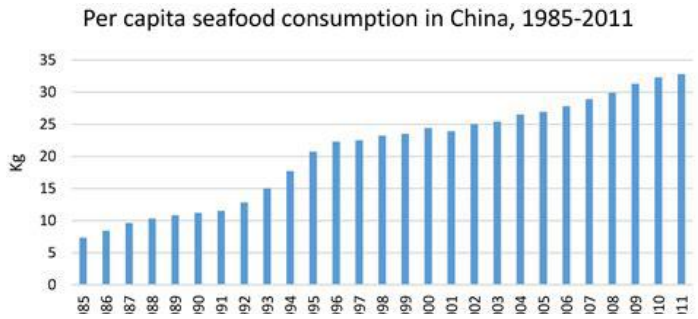


Fig.5 **1985-2011 Seafood Consumption per capita,** https://www.researchgate.net/figure/Apparent-per-capita-seafood-consumption-in-China-1985-2011-Food-balance-s

Figure 5: statistical data demonstrates the divide from 1990, after that seafood consumption keeps growing at a faster pace than before.

Compared with other nations in Asia and Europe:

Table 2

Fish Consumption in Asia and Europe(kg/person/year)

TABLE 15
Per capita fish consumption (kg/person/year) in Asia and Europe

Country	1985	1990	1995	2000	2003	Average growth (%)
Bangladesh	7.0 (6.0)	7.0 (6.0)	8.0 (7.0)	11.0 (10.0)	11.0 (9.0)	57 (83)
China	7.0 (2.0)	11.0 (4.0)	20.0 (7.0)	25.0 (10.0)	25.0 (10.0)	257 (400)
India	3.0 (1.0)	3.0 (1.0)	4.0 (2.0)	4.0 (2.0)	4.0 (2.0)	33 (100)
Indonesia	13.0 (3.0)	14.0 (3.0)	17.0 (4.0)	20.0 (4.0)	20.0 (4.0)	54 (33)
Japan	69.0 (4.0)	71.0 (5.0)	71.0 (5.0)	67.0 (5.0)	66.0 (5.0)	-4 (25)
Myanmar	14.0 (1.0)	15.0 (1.0)	14.0 (2.0)	18.0 (2.0)	18.0 (3.0)	29 (200)
Philippines	33.0 (5.0)	36.0 (5.0)	32.0 (4.0)	29.0 (4.0)	28.0 (5.0)	-15 (0)
Thailand	20.0 (3.0)	20.0 (4.0)	33.0 (6.0)	30.0 (7.0)	30.0 (7.0)	50 (133)
Viet Nam	12.0 (3.0)	13.0 (3.0)	16.0 (5.0)	19.0 (7.0)	17.0 (6.0)	42 (100)
Asia	10.0 (2.0)	12.0 (3.0)	16.0 (4.0)	17.0 (6.0)	17.0 (6.0)	70 (200)
South Asia	3.0 (1.0)	4.0 (2.0)	4.0 (2.0)	5.0 (3.0)	5.0 (3.0)	67 (200)
East and Southeast Asia	21.0 (3.0)	22.0 (3.0)	24.0 (4.0)	25.0 (4.0)	25.0 (5.0)	19 (67)
Europe	18.0 (1.0)	20.0 (1.0)	19.0 (2.0)	19.0 (2.0)	20.0 (2.0)	11 (100)
Western Europe	21.0 (1.0)	24.0 (1.0)	25.0 (2.0)	25.0 (2.0)	26.0 (2.0)	24 (100)
Eastern Europe	8.0 (1.0)	6.0 (1.0)	6.0 (1.0)	7.0 (1.0)	8.0 (1.0)	0 (0)
World	12.0 (2.0)	13.0 (2.0)	15.0 (3.0)	16.0 (4.0)	16.0 (4.0)	33 (100)

The number in parenthesis within the table denote freshwater fish consumption.
Source: Adapted from Laurenti (2007).

Source: https://thefishsite.com/articles/fish-consumption-patterns-in-asia-and-europe

Table 2: Results show that comparing China with other adjacent nations, fish consumption (a kind of seafood intake) of Chinese residents fluctuate the most. From 1985 to 2003, within less than twenty years, fish consumption of China surged 257% which is larger than any other country did on the list above.

Compared within nation:

Table 3

1980-1990 Seafood Consumption by province in China per capita

Table 228--Peasant per capita seafood consumption, by province, China, selected years, 1980-90

Province	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990
					Kilograms					
Northeast:										
Heilongjiang	0.48	0.59	1.46	1.68	1.26	1.14	1.10	1.33	1.31	1.41
Liaoning	1.69	1.71	1.53	1.88	1.96	2.16	1.97	1.78	2.37	2.35
Jilin	0.74	0.87	0.83	1.05	1.61	1.50	1.54	1.60	1.69	1.53
North:										
Shandong	0.98	1.13	1.25	1.27	0.93	1.01	1.00	0.91	0.97	1.00
Hebei	0.22	0.29	0.34	0.36	0.34	0.40	0.50	0.52	0.59	0.66
Beijing	0.76	1.16	1.09	1.21	0.77	1.41	1.39	1.40	1.74	1.93
Tianjin	2.35	2.94	3.55	3.53	2.58	3.67	4.29	4.06	4.07	4.76
Henan	0.28	0.22	0.23	0.26	0.27	0.24	0.22	0.22	0.26	0.22
Shanxi	0.02	0.05	0.03	0.07	0.03	0.03	0.06	0.06	0.06	0.04
Northwest:										
Shaanxi	0.03	0.01	0.02	0.02	0.01	0.03	0.01	0.02	0.02	0.02

Source:http://www.zanran.com/q/per_capita_seafood_consumption_in_china

Table 3: Seafood consumption within China varied as well. Among provinces mentioned above, only that in Shanxi and Henan decreases while others get enhancement more or less.

Overall, seafood consumption within China displays an increased inclination which engaged with boosting mortality.

2.2 Ingestion of Excessive Iodine among Iodine-rich Areas

Various geological structures appeared among different regions in China that led to natural disparity of Iodine content. Yet the “Obligatory Iodine Supplement” policy covered the entire country. Thereby dwellers in parts of iodine-rich districts are greatly influenced through contrived control of iodine intake.

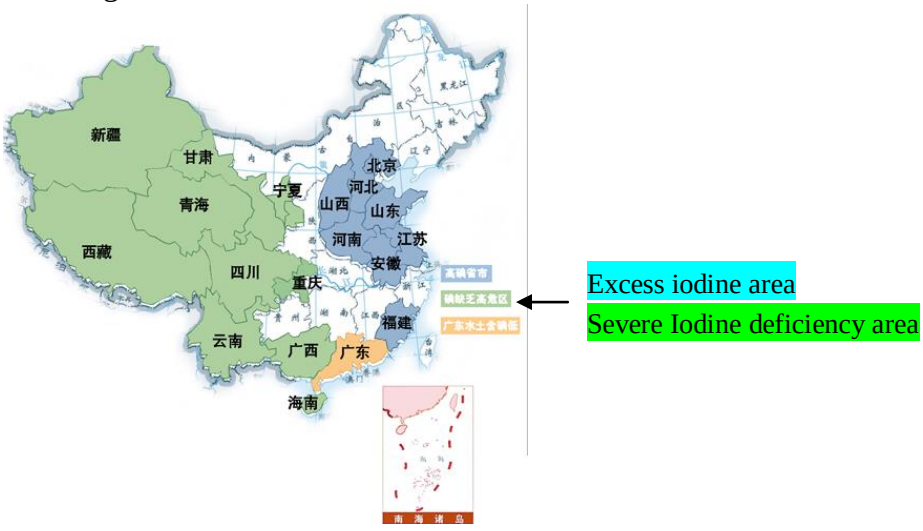


Fig.6 **Map of Iodine Layout in China by province,**

http://image.baidu.com/search/wisepadsearch?tn=wisepadsearch&ie=utf8&fmpage=search&pos=top&active=1&word=缺碘地图&pn=0&spn=0&di=29920&pi=0&is=0,0&cs=1148940655,808982287&os=1411953419,3366802049&simid=4085893037,4813937

Figure 6: cities and counties in middle and northern part of China are where excessive iodine intake takes place.

As statistical data stated by World Health Organization (abbreviated to WHO below) and Ministry of Health in China in 2016, WHO suggested that adults are supposed to ingest no more than 5 grams of salt a day. Nonetheless, according to data indicated by Ministry of Health, average salt intake for Chinese residents is 12 to 14 per day—southern take 10 to 12 grams and northern have 15 to 22 grams daily, which is the top amount all over the world. Most families in China still acquire iodized salt until now; iodine intake increases for certain as iodized salt ingestion increases.

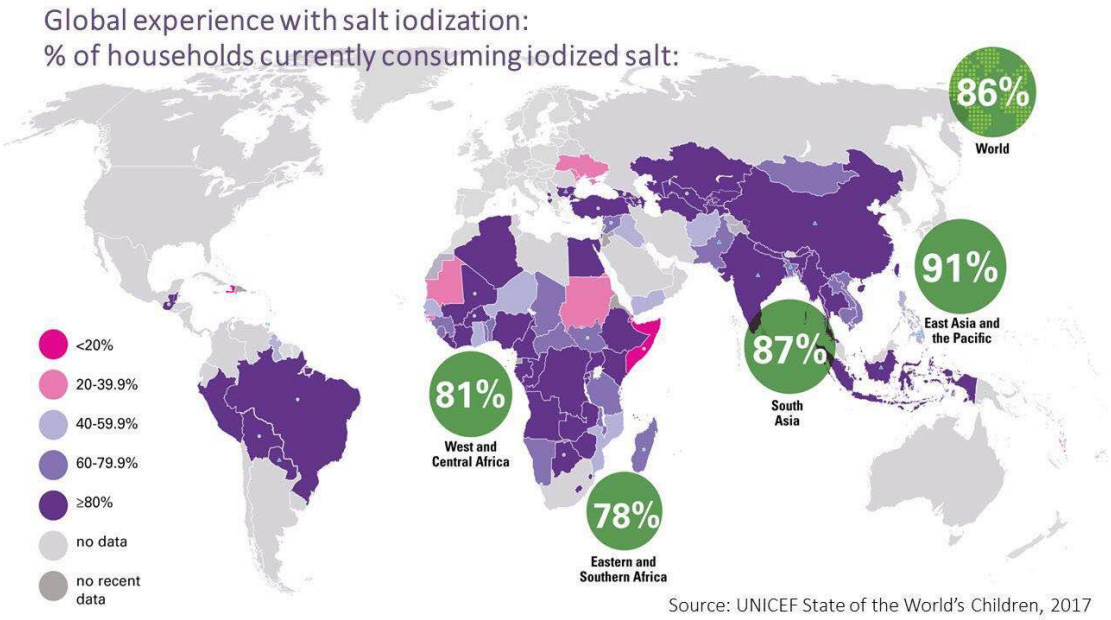


Fig 7. **Percentage of Households Consuming Iodized Salt**

Source: http://www.ign.org/scorecard.htm

A basic daily diet for a healthy person in northern China should encompass 680 grams of rice or staple of the same amount, 510 grams of vegetables, 400 grams of fruits and 9 grams of iodized salt. According to data showed in Table 1(Selected Sources of Dietary Iodine), it can be roughly calculated that the northern person in good health condition take in 540 micrograms of iodine per day, which is far more than international standard conducted by WHO that 200 micrograms of iodine is necessary and enough for a human being every day.

Thus, combination of natural and artificial factors may cause excessive iodine intake for inhabitants in iodine-rich regions.

2.3 High Iodine Content in Water

Under particular natural circumstances like geological and topographical environments, drinking water with excessive iodine content will engender thyroid gland dysfunction. In worse case scenario, iodide goiter may occur.

At County Aspect

Red >300μg/L (64 counties)

Ye 150-300μg/L (44 counties)

Gr <150μg/L (21 counties)

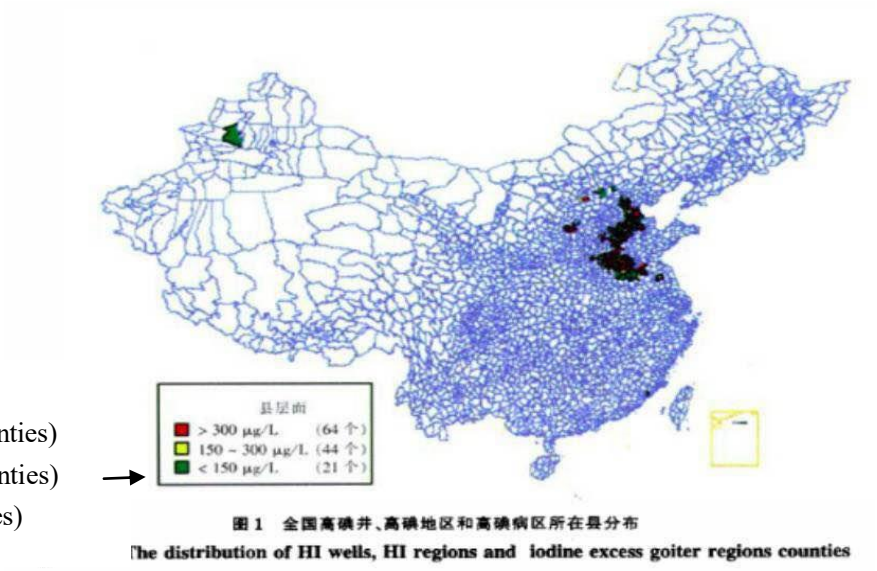


图 1 全国高碘井、高碘地区和高碘病区所在县分布

The distribution of HI wells, HI regions and iodine excess goiter regions counties

Fig 8. **Distribution of High Iodine Wells, Regions and Iodide Goiter Regions**

Source: www. sohu.com/a/110100540_165379

Table 4

The Distribution and Threatened People of High Iodine Regions and Iodine Excess Goiter Regions

表 1 高碘地区及高碘病区的分布情况及受威胁人口

Table 1 The distribution and threatened people of high iodine regions and iodine excess goiter regions

Province	Number of HI Wells	有水碘(中位数) 150 ~ 300 μg/L 乡的县数	有水碘(中位数) > 300 μg/L 乡的县数	有高碘水井乡数	水碘(中位数) 150 ~ 300 μg/L 乡数	乡人口数(万人)	水碘(中位数) > 300 μg/L 乡数	乡人口数(万人)
北京	1	1	0	6	1	3	0	0
天津	2	2	1	19	11	11	4	32
河北	38	26	22	243	108	378	63	202
山西	10	7	6	42	18	47	11	41
内蒙古	2	1	0	18	2	4	0	0
江苏	6	6	5	127	40	152	48	230
安徽	10	3	2	90	15	88	21	109
福建	1	0	0	3	0	0	0	0
山东	40	33	19	442	189	880	58	365
河南	18	17	9	312	104	324	41	232
新疆	1	0	0	2	0	0	0	0
合计	129	96	64	1304	488	1887	246	1211

Beijing

Tianjin

Hebei

Shanxi

Inner Mongolia

Jiangsu

Anhui

Fujian

Shandong

Henan

Xinjiang

Total

Source: http://image.baidu.com/search/wisepadsearch?tn=wisepadsearch&ie=utf8&word=高碘地区及高碘病区的分布情况及受威胁人口表格&wiseps=1&pn=1&spn=0&di=13200&pi=0&is=0,0&cs=1381245879,3524498558&os=61317642,4231062902&simid=4202840764,460960850&objurl=http%3A%2F%2Fs15.sinaimg.cn%2Fmw690%2F54483870gd77d2d79648e%26690#!/searchDisp/1/0/1e

Hebei province, my hometown, is a representative of mentioned iodine-rich districts where many high iodine wells and counties located, affecting 2,000,000 residents. In that case, human health will deteriorate if ceaselessly ingesting a great amount of iodized salt. Moreover, mortality of iodide thyroid disorders is exceedingly likely to go up.

Thereby, iodine content in water will also affect odds of having thyroid diseases

especially those which are caused by disproportionate iodine intake.

IV. Cognition towards Reasonable Iodine Ingestion

Both excessive and sparseness of iodine intake could lead to affliction of thyroid illnesses. Through research and analysis of iodine intake among Chinese residents, I concluded several suggestions and prospect towards this specific issue:

1. Adapt Iodine Supplement Policy to Local Situations
   Implement of "Obligatory Iodine Supplement" policy basically solved the problem of universal iodine deficiency. However, what should be done before supplementing iodine is to previously investigate and take discrepancy of local iodine nutritional status and environmental factors into consideration. Legitimately popularize "Iodine Supplement" policy such as put more salt without or with less extra iodine replenishment to iodine-rich areas, avoiding blindly replenish specific elements that generates body imbalance.
2. Regularly Organize Physical Examinations for Residents
   Organized examinations for dwellers is convenient for individuals to understand their temporary health status; for medical institutions to focus more on clinical experiments for new diseases ; and for governments to catch up with latest health information. Akin to free tests of blood sugar and blood pressure among communities in large portion of places in China, inspections for iodine content in human bodies are supposed to be taken. After classification of those data, committees and medical experts are encouraged to formulate an appropriate standard of iodine intake according to average iodine content in body. In this way, disparity of iodine content minimized, making the policy precise and pragmatic, and ensuring good health via stabilized respectable content of microelements and essential elements.
3. Enhance Dissemination and Education of Scientific and Medical Knowledge
   Citizens are supposed to acquire common scientific knowledge and first-aid process to face unpredictable need in the future, which requires the government and departments to be fully aware of its importance and take actions to draw others' attention;
   If suffering from diseases related to iodine intake, go to see the doctor immediately. Follow doctors' directions when taking medicine and other treatments; have a rational diet collocates with various sorts of food, aiming to reduce huge amount of iodine intake. Individuals should be concerned about and keeping in good health.

V. Acknowledgments

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