INTERNATIONAL COUNCIL FOR CONTROL
OF IODINE DEFICIENCY DISORDERS

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Focus on Latin America

Iodine Nutrition in Latin America

In the Latin American Region, about 90% of the population is consuming adequately iodized salt. But sustainability of iodized salt programs and problems of iodine excess remain major challenges.

THE INTERNATIONAL COUNCIL FOR CONTROL OF IODINE DEFICIENCY DISORDERS (ICCIDD) is a nonprofit, nongovernmental organization dedicated to sustained optimal iodine nutrition and the elimination of iodine deficiency throughout the world. Its activities have been supported by the international aid programs of Australia, Canada, Netherlands, USA, and also by funds from UNICEF, the World Bank and others.

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Background

According to the latest report of the WHO to the 60th World Health assembly (WHA) (May 2007), about 31% (1900.9 million) of the world's population still have insufficient iodine intakes As a result, twenty-two million children globally each year are at risk of impaired intellectual function and lower school performance. IDD remains most prevalent in the WHO Regions of South-East Asia and Europe, while the American Region has made the greatest progress.

Iodized salt now protects most people in the Americas from IDD, but it has not always been that way. In the early 20th century, iodine deficiency was recognized as a public health problem in most of the Latin America countries (Mexico in North America, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica and Panama in Central America, and Venezuela, Colombia, Ecuador, Peru, Bolivia, Brazil, Chile, Paraguay, Uruguay, and Argentina in South America). More recently iodine deficiency has also been recognized in three Caribbean countries (Cuba, Dominican Republic and Haiti). Belize and Guyana reported normal urinary iodine (UI) concentrations in their populations more than ten years ago, but there is a lack of more recent data. The iodine nutritional status of twelve other countries in the Caribbean, all islands, has not been investigated.

Historically, the severity of IDD in the Americas Region followed geologic patterns similar to that elsewhere in the world. The worst endemics were in isolated mountain communities. The Andean Regions and Central Mexico were the most severely affected, but no country in mainland Latin America was free of iodine deficiency.

Modern surveys for goiter within individual counties began in the 1930s. Almost all had regions where the goiter prevalence was more than 50% and several countries such as Bolivia, Brazil, Ecuador, Paraguay, Peru, Mexico and Guatemala, suffered from endemic goiter in most of their territory.

In the 1950s to 1970s, most countries with recognized iodine deficiency passed a law mandating iodization of salt, but established somewhat arbitrarily a wide range of iodization levels, mainly due to lack of information on the daily physiologic needs of iodine (Table 1). Some programs of prophylaxis with iodized salt were only transiently successful because often laws were not enforced and monitoring was either absent or inadequate. Moreover, the importance of iodine deficiency and its correction was not adequately communicated to the concerned sectors or the consumer. Hence, about thirty years later, only a few countries were nearing iodine sufficiency and goiter prevalence had not significantly changed (Table 1). In 1999, WHO reported that despite significant regional progress, iodine deficiency remained a public health problem in 19 countries in the region. This example of only transient early success in Latin America provides a valuable lesson on the critical need for building sustainable programs of iodine prophylaxis.

There was renewed interest in the problem in the late 1970's and early 1980's that gained force during the 1990's. The approach to IDD control has varied widely among different countries in the region, reflecting the diversity of their cultural, political, and geographical situations. Twenty Latin American countries reassessed their population's iodine status over the last 20 years and 19 of them have implemented programs for the control of IDD, 18 under the responsibility of the Ministry of Health.

Present situation

Since 1985, remarkable progress in the Region suggests the American Region will be among the first regions to attain the goal of the sustained elimination of iodine deficiency. The virtual elimination of IDD has been declared in seven countries by external evaluations, Bolivia and Peru in 1996, Colombia in 1998, Ecuador and Venezuela in 1999, Panama in 2002, and Cuba in 2004. Bolivia's program relapsed in 1999, but recent data shows an optimistic recovery. The commitment undertaken by governments at the World Summit for Children and the support offered by ICCIDD, UNICEF, and PAHO/WHO, together with other international organizations and countries have been instrumental in the success of these programs.

It should be emphasized, however, that despite the great progress made in the past 20 years, problems remain. These include, in some countries, a low level of governmental support and lack of effective monitoring of salt iodization. These problems have prevented the entire Americas Region from achieving effective and sustained elimination of IDD: some countries have never achieved iodine sufficiency, other countries have been incompletely assessed, and the risk of iodine excess has risen in at least four countries.

The present report summarizes recent information collected principally by:
1) the joint PAHO-ICCIDD survey carried out in 2006; 2) the ICCIDD Regional Coordinator (E Pretell) during consultancies in individual countries;
3) the ICCIDD ThyroMobil project, which visited 13 countries in 1998-2000; and 4) the ICCIDD focal points in many of the countries.

Iodized salt: supply, consumption and quality

Currently all the countries in the region have reinforced their activities to reach the goal of universal salt iodization (USI). Legislation on the level of iodine in salt has been modified during the past decade in nine countries where the level was too low (Mexico, Brazil, Venezuela) or too high (Guatemala, Panama, Chile, Ecuador, Paraguay), as well as in Uruguay where salt iodization was required in only half of the country. With the exception of only three countries (Haiti, Dominican Republic and Guatemala), in all countries in the Region the volume of production/importation of iodized salt is covering the potential human demand, based on an average annual consumption of 4-5 kilos of salt per person. However, no data is available in Argentina. With the exception of Paraguay and Dominican Republic, all countries in the Region are self-sufficient in salt production and the largest proportion of iodized salt is produced in medium- and small-sized plants.

Monitoring of iodized salt is being carried out in nearly all countries. In 16 countries more than 80% of salt at the retail/household level contains ≥15ppm of iodine, but the recommended household coverage of >90% has not yet been achieved in about 50% of countries (Figure 1). It is estimated about 90% of households use adequately iodized salt, but countries of particular concern are Guatemala, Dominican Republic, and Haiti.

Urinary iodine and iodine nutrition

UI surveys are generally recognized as the most important indicators of the impact of salt iodization and of a population's iodine nutrition. However, regular monitoring is carried out in only a few countries in the Region, and in some, the latest data were collected more than eight years ago.

The median UI appears to be adequate in most countries. The median UI is >100µg/L in 19 out of 22 (Figure 2). But in 13 countries the median UI is >200µg/L, and in 5 (Brazil, Colombia, Honduras, Paraguay and Uruguay) the median UI is >300µg/L, indicating risk of iodine excess. Brazil's UI data, however, were collected eight years ago in sentinel sites during the ThyroMobil campaign and is currently being reevaluated at a national level.

The map with the classification of countries according their current iodine nutrition, based on the median UI or neonatal TSH screening in Canada and USA, is shown in Figure 3. The countries classified as likely sufficient are those that had normal UI values eight or more years ago but need to reevaluate their present situation. WHO-UNICEF-ICCIDD recommend that the most recent monitoring data should have been collected within the last five years.

Fig. 1: Iodine content in salt at retail/household level

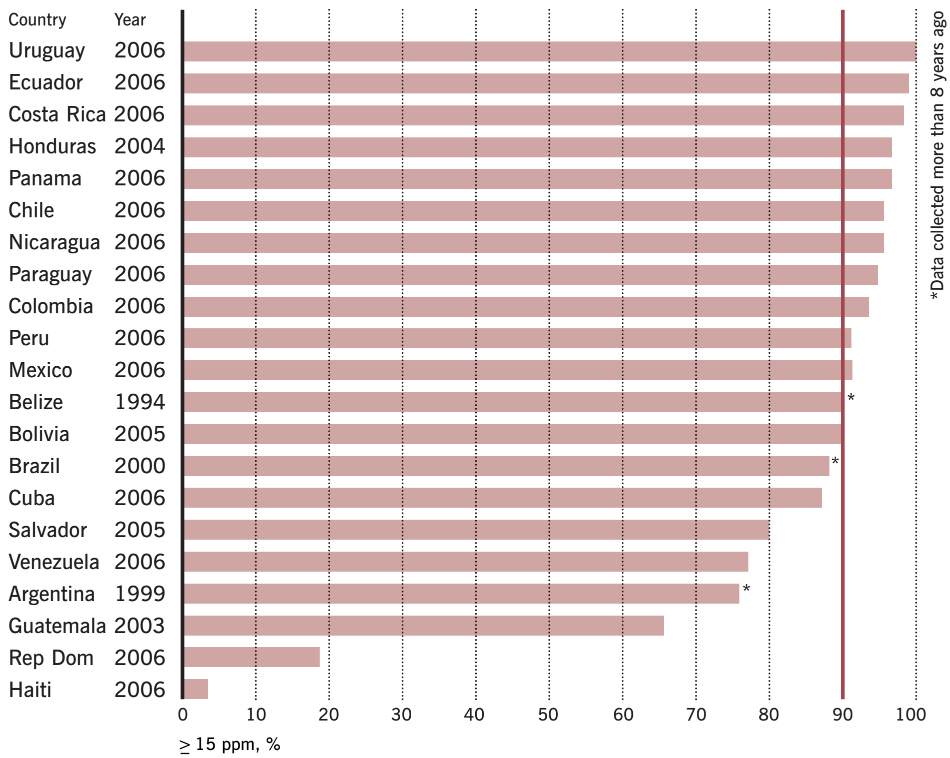
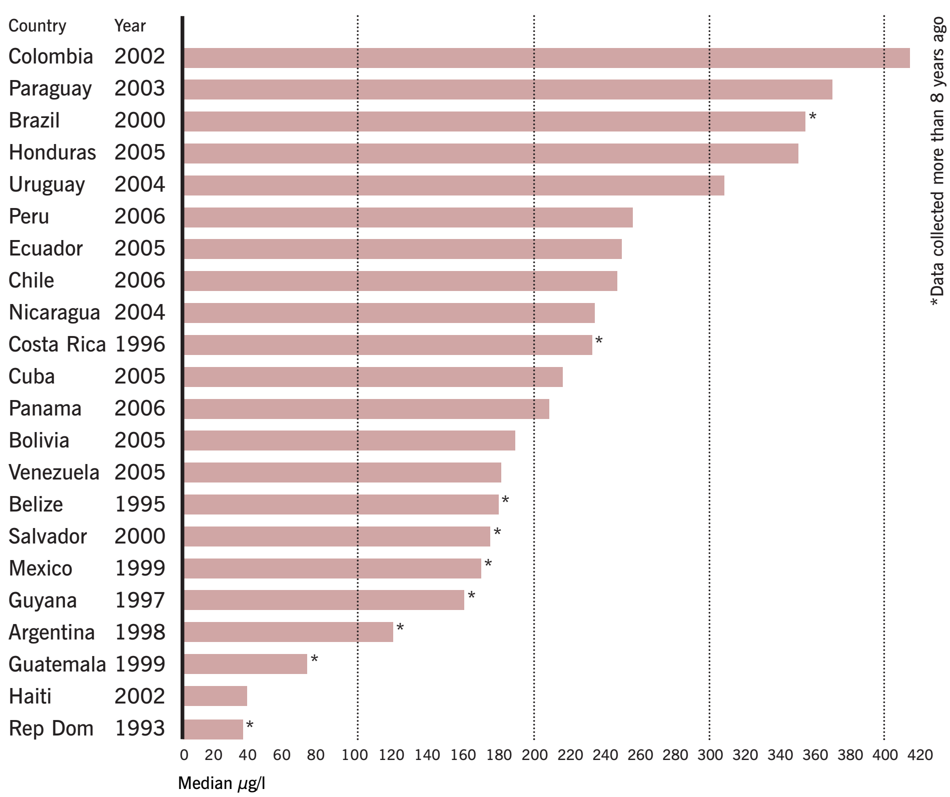


Fig. 2: Urinary Iodine



Goiter prevalence

In 1999-2000, the ThyroMobil Project in Latin America examined schoolchildren in 13 countries and the results showed that prevalence was still above 5% in the majority of countries. This is likely due to the fact that goiter disappearance following iodine prophylaxis often takes many years.

Key factors in the sustained elimination of IDD in Latin America

The presence and role of ICCIDD

There is little doubt that the foundation of ICCIDD in March 1986 was an important and decisive factor in encouraging the Region's countries to abandon their many decades of neglect of IDD.

Fig. 3: **Iodine nutrition in the Americas 1995 - 2006**

Also, an important role was played by ICCIDD in a series of Resolutions passed by the World Health Assembly as well as for the adoption of the goal of virtual elimination of IDD at the UN Summit FOR Children in 1990. Moreover, since 1995, the importance of ICCIDD national representatives to reinforce the presence of ICCIDD in the Region and to provide technical support to national IDD control programs has been emphasized. Voluntary qualified professionals have been hired for this task, which has proven to be of great benefit. Currently, there are ICCIDD national representatives in 15 countries: Argentina, Bolivia, Brazil, Chile, Colombia, Cuba. Ecuador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

Support to laboratories processing iodine

Quality assurance of laboratories processing iodine in salt and urine is critical. In 1998, the Andean Sub- Regional Program began to provide support to the Region's national laboratories. Most recently, the participation of ICCIDD in the International Resource Laboratories for Iodine (IRLI) Network has reinforced the quality and efficiency of the laboratories in the entire Latin American Region. Two laboratories in the region have been selected for the IRLI Network, one in Peru at the Endocrinology and Metabolism Unit, High Altitude Research Institute, Cayetano Heredia Peruvian University, and the other one in Guatemala at the Food Safety and Fortification Area of INCAP.

Salt industry

At a landmark meeting in Quito, Ecuador, in April 1994, attended by high-ranking officials from UNICEF, PAHO/WHO, ICCIDD and governments, a declaration was issued stating government commitment to USI in the Region by the year 1995 as the necessary mid-decade goal. This was to be followed by the final goal of the elimination of iodine deficiency as a public health problem thereafter. Since then, the salt industry has been an important partner in USI progress and a key player in the success of IDD control programs in the Region. The expansion of the iodized salt market has been accelerated by social marketing and awareness campaigns carried out by the national IDD programs.

Oversight committee/coalitions

Currently 14 countries (Brazil, Bolivia, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Honduras, Nicaragua, Panama, Peru, Uruguay, Venezuela) have already implemented oversight committees, and one (Mexico) is in the process of its approval. The composition of these committees includes representatives from the Ministries of Health, Education, Agriculture, Industry, academic and scientific institutions, as well as the salt industry. Although this is an important potential step towards sustainability, many national committees need to be empowered to accomplish their role.

Regional Meeting: Optimal Iodine Nutrition in the Americas, Lima, Peru, May 2004

This meeting, sponsored by PAHO/WHO, UNICEF, ICCIDD and the Iodine Network, was convened to review the current status of iodine nutrition and iodized salt in each of the Latin American and the Caribbean countries. It also attempted to identify obstacles to sustainable optimal iodine nutrition and develop strategies to overcome them. The meeting was attended by twenty countries represented by their Ministers of Health or senior leadership in health and nutrition, representatives of the salt industry, as well as representatives of eight international agencies and organizations (PAHO/WHO, UNICEF, ICCIDD, Kiwanis International, Micronutrient Initiative, Salt Institute, Network for Sustained Elimination of Iodine Deficiency). The Lima Consensus on Optimal Iodine Nutrition in the Americas was approved, stating: 1) the promise to hold meetings in each country to strengthen commitment and accelerate actions toward reaching and sustaining the goal of IDD elimination; 2) to systematically review and make adjustments to the national strategy for IDD elimination; and 3) to establish or strengthen national and sub-regional coalitions.

Conclusions

1) Despite salt iodization being implemented in the majority of the countries in the 60s-70s, its impact was rather poor and 30 years were lost in the battle against IDD. This was mainly because of lack of comprehension of the magnitude of the problem, little governmental support and poor enforcement. This sad experience has led to the concept of sustainability as a very important component of the national IDD control programs.

2) Pioneering studies were done in the Region on iodine deficiency during pregnancy as a cause of brain damage in the fetus. These studies, confirmed by others around the world, led the World Summit for Children to declare the elimination of IDD as a priority goal to be met by the year 2000.

Table 1: Laws on salt iodization in Latin America and their impact on prevalence of goiter

Region / Country	Legislation		Iodine requirement (ppm)		Prevalence of goiter	
	Approved (Year)	Enforced (Year)	Original	Changed to	1950-1960 (%)	1980-1990 (%)
North America						
Mexico	1963	1963	10	20-40	5-46	5-50
The Caribean						
Cuba	1990	1999	18-23		ND	30
Dominican Rep.	1994	1994	30-100		ND	ND
Haiti			ND		ND	ND
Central America						
Costa Rica	1941	1972	33-50		19	4
El Salvador	1961	1972	30-100		30	25
Guatemala	1954	1959	30-100	20-60	38	21
Honduras	1960	1971	50-100		22	9
Nicaragua	1968	1978	30-100		27	20
Panamá	1955	1969	66-100	20-60	17	13
South America						
Argentina	1967	1970	30		34-83	10-42
Bolivia	1968	1977	40-80		68	61
Brazil	1953	1977	10	20-60	27	29-35
Chile	1959	1979	100	20-60	25	10
Colombia	1955	1960	50-100		53	14
Ecuador	1968	1973	50-100	30-50	34	37
Paraguay	1958	1966	60-80	40-60	50	49
Peru	1940	1971	30-40		28	36
Uruguay	1961	1963	30-40	30-50	7-38	9
Venezuela	1966	1968	20-30	40-70	33	33

ND = no data

3) Following the World Summit for Children, almost all of the Region's countries have implemented programs for the control of IDD.
4) The estimated potential demand of iodized salt is covered in nearly all countries.
5) About 90% of the population is consuming adequately iodized salt.
6) UI is adequate in most of the countries. Only 3 countries, Guatemala, Dominican Republic and Haiti have inadequate iodine intakes.
7) Globally the countries of The Americas have made significant progress towards the elimination of IDD; however, problems remain that threaten the effective and sustained elimination of IDD in the whole region.
8) The wide range in the level of salt iodization among the countries has led to the risk of insufficient or excess iodine supply. The legislation concerning the level of iodization of the salt has been corrected during the last decade in nine countries.
9) Monitoring of iodine in people and in salt is still non-existent, fragile, or inadequate in many countries. Monitoring is essential to assess and maintain optimum iodine nutrition status. It must be sustained and systematic, and results must be communicated to the appropriate decision makers.
10) Laboratories measuring iodine in salt and urine with adequate quality assurance systems are in place in the majority of countries.
11) The great challenge now is sustaining the progress. The failures after previous success in the past decades in Latin America emphasize the perils of relaxed vigilance.
12) A high level of political commitment must be maintained.
13) Communication, including advocacy and education, needs to be a comprehensive and integral part of the overall national effort. To reach younger generations, it is important to provide permanent ongoing messages through national education systems.
14) Key elements for sustainability are the national oversight committees. They are implemented in 15 countries.
15) All countries should try and report every three years on the status of national programs and on the efforts being made to ensure progress and sustainability, in accordance with WHA Resolution WH58.24.

Varying salt iodine content and a high goiter rate in school children in Paraiba, Brazil

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Iodine deficiency is still a serious public health problem in many countries in the world. Brazil is a country historically affected by iodine deficiency in most of its territory, and severe endemic goiter and cretinism were reported by many early authors. A law ordering the iodization of all salt for human consumption as the main strategy to correct IDD was passed in 1953. However, the iodization level (10 ppm of iodine) was considered low.

The impact of the consumption of iodized salt on the iodine nutrition of the Brazilian population has not been evaluated at the national level. The ThyroidMobil campaign conducted by ICCIDD in 2000 in 17 sentinel sites throughout the country found that 88% of salt at the retail level contained ≥15 ppm of iodine. It reported the median UI concentration was 360µg/L, and the total goiter rate was 4.5%.

The aim of the present study was to determine the iodine nutrition of the municipality of Cabaceiras, Paraiba. For this purpose, two indicators were used: 1) the analysis of UI, recognized as the main indicator of iodine nutrition; 2) the measurement of thyroid volume by ultrasonography, to determine the prevalence of goiter. Additionally, the iodine content in iodized salt consumed in households and the concentration of iodine in drinking water were also investigated.

One hundred and eighty school children (9-14 y-old) attending a public school were randomly selected from among 300 students in this age group; 57.2% of the schoolchildren came from the urban area, 52% were boys and 54.4% of the study group were whites. All the children were evaluated for thyroid volume, both by ultrasonography and by palpation. A casual urine sample was collected and the iodine concentration was measured by the Rapid Iodine Urinary Test®. Household salt samples (n=180) were collected and the iodine content was determined by titration.

The following results were obtained: the goiter rate by ultrasound was 38.3%, and by palpation was 33.3%. The prevalence of goiter was higher in the 11-14 y-olds than in the 9-10 y-olds (21% vs 17%). The median UI was 130 µg/L. The median value of iodine in salt was 30.5 ppm, but only 78% of salt samples contained ≥15 ppm, and a wide variation in the iodization level was observed. In one of the rural communities, the iodine concentration in the drinking water was zero.

The results of this investigation demonstrate that despite a normal median UI, a high prevalence of endemic goiter persists in the municipality of Cabaceiras, Paraíba. The most likely explanation is the uneven iodization of the salt. The requirement of >90% household consumption of iodized salt with ≥15 ppm of iodine has not been met in this community.

Risk of Iodine Excess in Brazil

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The law mandating the iodization of salt in Brazil at a level of 10 ppm was implemented in 1977. However, the official program to provide iodine to the salt producers for iodization was interrupted in 1990 for legal reasons. As a result, low iodine intake was detected in the 1994-1995 national survey of 20,000 schoolchildren (1). Urinary iodine (UI) was <100 µg/L in more than 50% of the urine samples. In 1998, the iodization of salt was reinstituted, but the fortification level of salt for human use was increased to 40-100 ppm of iodine.

In 2001 the Thyromobil project (2,3) examined 2,106 schoolchildren from 21 villages of 8 States and found a median UI of 360 µg/L with 70.6% of State medians above 300 µg/L. The risk of excessive iodine intake was reconfirmed in 2004 in São Paulo State by Duarte et al. (4), who found a median UI of 460 µg/L. In 2003, the legal concentration of iodine in salt was reduced to 20-60 ppm.

To evaluate the possible consequences of more than 5 years of excessive iodine intake (1998-2003) on the thyroid gland, we examined 829 adults from the urban Metro Region of São Paulo, who were divided into two groups according to their residency in two different environmental areas (5), one group (Polo Area, n=409) living close to a petrochemical complex with high environmental pollution, and a second group (San Bernardo Campo area, n=420), 10 miles southwest of the petrochemical complex. The mean concentration of iodine in salt at household level in the whole area was 36±7 mg/kg (range 24.7-51.4 in Polo area and 23.8-81.2 in São Bernardo Campo area). The median UI was 306 µg/l in both areas, with 58.5% of individual values >300 µg/l.

Chronic autoimmune thyroiditis was diagnosed by the analysis of autoantibodies against thyroid peroxidase (TPO Ab) and by ultrasonography (marked hypoechogenicity). The prevalence of chronic autoimmune thyroiditis was similarly high in both groups: 15.6% in the Polo Area and 19.5% in the São Bernardo Campo area. In a previous study in Sao Paulo before 1994, in a population moderately iodine deficient, the prevalence of anti TPO Ab in healthy subjects was 4.8%. The overall prevalence of hypothyroidism was 6.6%, not significantly different between the groups (4.9% in the Polo Area and 8.3% in the São Bernardo Campo Area), a figure comparable to other countries around the world (5). The mean thyroid volume was 11.2 ml, within normal limits.

The high prevalence of chronic autoimmune thyroiditis found in the Metro Region of Sao Paulo may be related to the high iodine intake of the population from 1998 through 2004. It is hoped that the reduction in the level of iodization in 2003 will result in the elimination of the risk of iodine excess. Currently the Brazilian MOH is conducting a national survey to evaluate the iodine nutrition of the population.

This article is excerpted from: Camargo RYA et al. Prevalence of chronic autoimmune thyroiditis in the urban area neigboring a petrochemical complex and a control area in São Paulo, Brazil. Clinics 2006;61:307-312.

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Iodine deficiency persists in northern Argentina

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Moderate-to-severe endemic goiter due to iodine deficiency has been historically found in the western part of Argentina, particularly in the Andean foothills, as well as in the northern part of the country, including the Provinces of Jujuy, Salta, Catamarca, Tucuman, Santiago del Estero, La Rioja, San Juan, Mendoza, San Luis, Neuquen, Formosa, Chaco, and Misiones, as well as the western regions of Cordoba, La Pampa, Rio Negro, Chubut, Santa Cruz and Tierra del Fuego, and the northern regions of Santa Fe and Corrientes, as shown in Figure 1.

Argentina was one of the first Latin American countries to use iodized salt to correct iodine deficiency, in Mendoza in 1952. A law mandating the iodization of all salt for human consumption at a level of 30 ppm iodine for the entire country was passed in 1967 and implemented in 1970.

Following this intervention, many studies reported remarkable results in the control and prevention of IDD. The prevalence of goiter significantly decreased or disappeared in many areas. However, the problem received relatively little national attention in the following decades, and a relapse of goiter was observed in some regions: in the 1980s and 1990s, a regional goiter rate ranging from 10% to 42% was reported by several investigators.

The main reasons for this relapse were poor comprehension of the problem and its magnitude, inadequate governmental support, the absence of educational efforts, no law enforcement, absent or inadequate monitoring, and failure to involve all sectors in addressing the problem. These are common problems among the Latin American countries, and not only Argentina, but few other Latin America countries have addressed these issues satisfactorily.

Currently in Argentina, there is no official IDD control program.
A National Committee on Micronutrient Deficiencies (including iron, iodine, and vitamin A) was created in 1993 in the Secretariat of Health. But interest in iodine deficiency does not seem to be a priority. Several previous commissions were unable to coordinate and integrate the different national groups interested in IDD control.

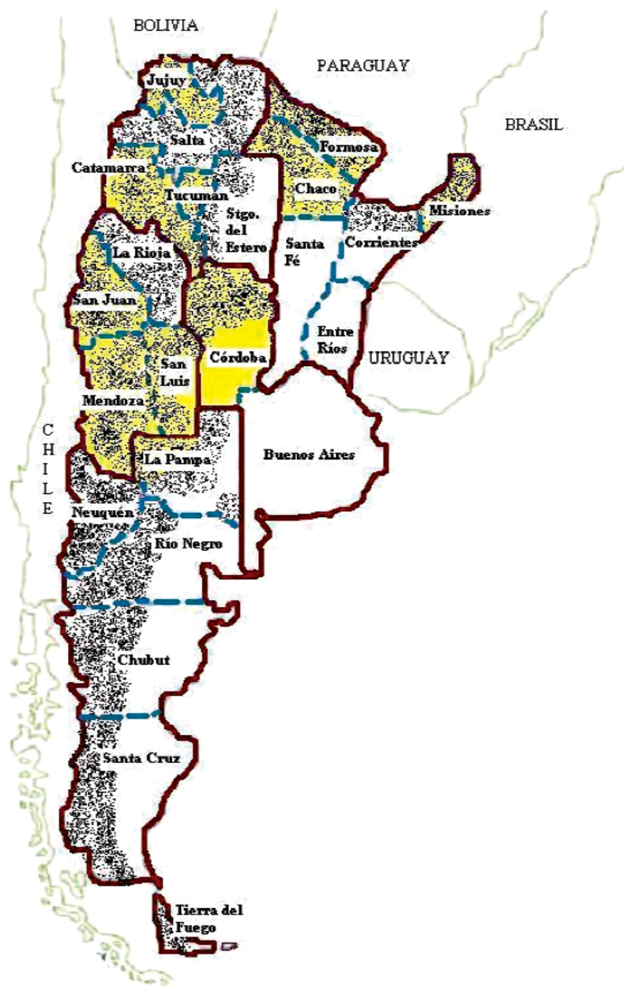

Fig. 1: Map of Argentina showing the historic iodine deficiency areas (shaded), and current iodine deficiency concentrated in the northern provinces (yellow)

The Andes of northern Argentina

The assessment of the IDD situation in Argentina is now being carried out by the Argentinean Federation of Endocrine Societies (FASEN). They instituted the Argentinean Commission for Control of IDD (CACCDI) for this purpose, and the Commission was initially led by Oswaldo Degrossi and, lately, by Hugo Niepomniszcze.

During the period 1999-2008, FASEN, with the agreement of the Endocrine Societies in each province, have visited 67 sites throughout the country to assess goiter prevalence by palpation in school age children and to collect casual urine samples for iodine analysis. Information on the quality of salt consumed by the population was also collected in some regions. The overall results indicated that in 12 of the sites, the median urinary iodine (UI) was <100 µg/L and that in 28 sites the goiter prevalence was >5 %.

To analyze these findings and illustrate the present situation of IDD in the country, the results have been grouped into three geographic areas. Two of them, Endemic North and Endemic South, corresponding to the iodine deficient areas recognized in the past, and the third one corresponds to areas free of IDD (Figure 1). The results of the data analysis are shown in Table 1. The great majority of sites with low median UIs and high goiter rates are concentrated in the Endemic North area, excluding the Provinces of Salta, La Rioja, Santiago del Estero and Corrientes. Thus, in this area 37.5% of site UI medians are <100 µg/L, indicating the persistence of iodine deficiency. But in the areas free of IDD, 29.4% of the UI medians are >300 µg/L, signaling the risk of iodine excess. In 65.7% of sites in the Endemic North, >5 % of children have goiter, mainly grade I. The ThyroMobil study in 1998 was conducted mainly in sites from the Endemic North and found a goiter rate of 15.7% using ultrasonography. However, the explanation of the finding of 28.6 % of sites in the Endemic South with high rates of goiter, where there is not a high prevalence of low median UIs, is unclear. It has been observed in other countries that there is a delay between the normalization of iodine intake and a decrease in goiter rate. Also, the contribution of goitrogens to the prevalence of goiter in some sites is under investigation.

Table 1: **IDD status in Argentina, 1999 - 2008**

Area	Median urinary iodine (µg/L)					Goiter	
	N	< 100	101 - 199	200 - 299	≥ 300	N	Sites with > 5% goiter rate
Frequency distribution (%)							
Endemic North	33	36.3	57.6	6.1	0.0	36	23 (63.8%)
Endemic South	11	0.0	72.7	27.3	0.0	14	4 (28.6%)
Non-Endemic	17	0.0	58.8	11.8	29.4	17	1 (5.6%)

In conclusion, these studies show that IDD pockets persist in the Andean and Northern provinces, possibly because the goal of universal salt iodization (USI) has not been met. Although iodized salt is produced and distributed throughout the country, there is no quality control and the population is not aware of the benefits of its consumption. Studies have shown that poorly or non-iodized salt is still being consumed in some areas. The ThyroMobil study in 1998 found only 73% of iodized salt was adequately iodized (≥ 15 ppm of iodine).

Thus, there is an urgent need to strengthen the national IDD control program. It is of particular importance to ensure adequate iodine intake in pregnant and lactating women and in children <2 years of age to prevent the risk of brain damage caused by iodine deficiency.

Two years ago the National Institute of Nutritional Investigations of the MOH of Salta received technical assistance from ICCIDD to formulate the implementation of a national IDD control program. The draft proposal was submitted to the MOH for its consideration and we hope that this first step will receive full support from all concerned Argentinean organizations.

Iodine excess in Chile

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The Chilean population was moderately iodine deficient prior to salt iodization (1). A law mandating the iodization of all salt for human consumption was passed in 1960. It was implemented in 1979 and the level of iodization was fixed at 100 ppm. Enforcement of the law was interrupted from 1984 to 1991, but the salt iodization process was maintained by the large producers of iodized salt. An early study in school age children carried out in Santiago City in 1982 (2), before the law was fully enforced, found a mean urinary iodine (UI) of 109±78 µg/gr creatinine (cr), with 58.2% of samples <100 µg/gr cr (Table 1).

By 1991, following the reinstatement of the law, the mean iodine level in salt was 82 ppm (Table 1) and the mean UI was sharply increased to >700 µg/gr cr, indicating excess iodine intake. Sustained iodine excess in the population was confirmed by a surveys conducted 4 years later (3,4) (Table 1). It was also confirmed by the ThyroMobil study in 1998 that found a median concentration of iodine in salt of 78 ppm, and a median UI of 540 µg/L. The prevalence of goiter was 12.7% (5).

These results led the health authorities to change the law in 2000 to reduce the iodine content of salt to 20-60 ppm. This change resulted in a rapid fall of the iodine concentration in salt to about 30% of the figure found in 1992 (Table 1). The UI in the population, as expected, also significantly decreased nationally, but to a varying degree. Thus, in Santiago and Punta Arenas (sites located in the center and south of the country, respectively), the UI was in the normal range in 2003, while in Calama, a site in the north, the median UI remained elevated (Table 2).

Through follow-up studies, Calama has persistently exhibited higher UI values than the other monitoring sites. The reason for this seems to be additional iodine intake through the consumption of bread with a high content of iodine, but the possibility of environmental iodine contamination or the existence of other dietary sources of iodine needs further investigation.

To investigate the impact of the chronic iodine excess on the thyroid gland, TSH, thyroid hormone concentrations and autoantibodies against thyroid peroxidase (TPO Ab) titers were measured in school age children from Calama, These values were compared to results obtained from children in Punta Arenas (6) and in Santiago.

The results of the studies showed the following:

Thyroid volume. The goiter prevalence (detected by palpation) in the 3 sites has remained slightly above 10% since 1991, mainly grade I. The ThyroMobil study (by ultrasound) also showed a goiter prevalence of 12.7%.

Thyroid function tests. The results of the analyses of T4, T3 and TSH are shown in Table 2. Although the values are within the normal range, T4 and T3 levels are significantly lower and TSH significantly higher in Calama, compared to the other 2 sites with normal UI concentrations.

Table 1: **Salt iodine, goiter prevalence and urinary iodine in Chile, 1979-2004**

Year	Iodine in salt (mean) ppm	TGR %	Urinary iodine (mean) µg/gr Cr	Legislation level of iodization ppm
1979				100
1982		18.8 [1]	109 ± 78 [1,2]	
1984				Iodization was discontinued
1986		7.6	127 [2]	
1991	82	11.4 [3]	702	Iodization re-started
1994	92	9.4 [4]	768	
2000				20-60
2001	30.7	6.5 [4]	1191	
2003	33.6	11.1 [5]		
2004	32.3	9.0		

[1] Santiago
[2] Calama and Santiago
[3] Calama, Santiago and Temuco
[4] Calama, Santiago, Temuco and Punta Arenas
[5] Calama and Punta Arenas

Table 2: **Thyroid function and antithyroid antibodies in monitoring sites in Chile; 2003-2004**

Sentinel Site	Year	UI µg/gr Cr	T4 µg/ml	T3 ng/ml	TSH mU/L	AntiTPOAb Positive, %	TGR %
Calama	2003	487	7.1 ± 1.5**	104 ± 33**	3.3 ± 1.8*/**	31.7	11.6
Punta Arenas	2003	255	7.2 ± 1.	145 ± 26	2.9 ± 1.2	10.9	10.5
Santiago	2004	253	8.3 ± 2.	156 ± 62	2.3 ± 1.2	3.3	9.0

P values: Calama vs Punta Arenas (*) < 0.01; Calama vs Santiago (**) < 0.05

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Thyroid autoimmunity. There is a marked difference in the prevalence of TPO Abs among the 3 sites, suggesting excess iodine intake in Calama is associated with a higher prevalence of thyroid autoimmunity.

These studies suggest that excessive iodine intake in the Chilean population has increased the risk of autoimmune thyroid disease. This confirms the observations published by other authors, both in humans and in experimental animals. The cause of the excess iodine intake has been the high iodine content of salt (5). Therefore, the change in the legislation reducing the level of salt iodization to 20-60 ppm should reduce the risk of thyroid autoimmunity.

Chilean iodine mines produce most of the world's supply of iodine

Peru celebrates 25 years of sustained elimination of IDD

Control of iodine deficiency must be sustained in order to be effective. Unfortunately, there are many examples of countries around the world where IDD control programs, after transitory success, later relapsed because they did not receive the necessary long-term support.

Eduardo A. Pretell and **Ana Maria Higa** ICCIDD Office of the Regional Coordinator for the Americas

The Peruvian IDD Control Program is one of the few programs that has eliminated iodine deficiency as a public health problem and has also sustained its success. The story of the elimination of iodine deficiency in Peru is a long struggle, lasting more than a half a century, since the law mandating the iodization of salt was approved in 1940.

Peru is a country divided by the Andean Mountains into three geographic regions: the coast which is iodine-sufficient, and the sierra (mountains) and jungle where severe endemic goiter and cretinism due to low environmental iodine was recorded in many early reports. About half of Peru's 26 million people live in the jungle and the sierra, but historically the problem received little attention. A renewed interest in the control of IDD emerged in the late 1940s, and six small plants for iodization of salt were established throughout the country. Unfortunately this effort did not have sustained support and vanished within a decade.

In 1966, renewed interest in endemic goiter at the Cayetano Heredia Peruvian University led to a reinvestigation of IDD. Along with epidemiological studies that confirmed the persistence and severity of endemic goiter and cretinism, three findings were of particular importance:
a) the effect of iodine deficiency on the maternal-fetal unit and its deleterious effect on the mental and neural development of the fetus; b) the use of iodized oil in the prophylaxis and treatment of IDD with a long-term effectiveness in preventing fetal brain damage; and c) the validity of the analysis of iodine concentration in spot urine samples as an indicator for diagnosis and monitoring of iodine nutrition.

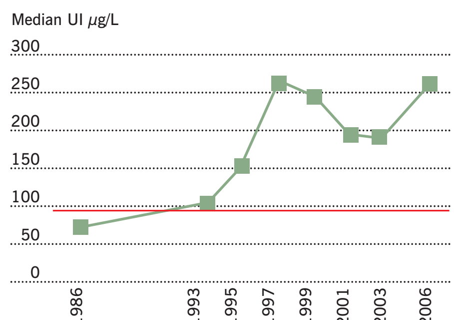
Public health intervention. Twenty five years of successful experience

The weight of the above studies was a powerful argument to move from scientific research to public health action. We convinced the authorities at the Ministry of Health (MOH) on the urgent need for action to fight IDD. In 1983, the Endemic Goiter Office was created, which later began operating as the National Program for the Control of Endemic Goiter and Cretinism, with the support of the Joined PAHO-UNICEF Nutritional Support Program and the MOH.

Baseline IID Situation

The full implementation of the Program was reached in 1985. Its first task was to carry out a national survey to evaluate the current IDD situation and its concurrent factors, which was completed in 1986. The survey included 136 provinces in the sierra and jungle regions. Goiter was endemic in 87% of the villages, with a total goiter rate of 36.4%. The median UI was 71 µg/L.

Fig. 1: The Peruvian iodized salt program 1986-2006: national median urinary iodine concentration



Salinas de Maras has been producing salt in the Peruvian Andes since Incan times and its current salt production is iodized

The extensive use of UI as the main indicator of IDD allowed us to precisely determine the degree of the deficiency. The northern and southern sierra were the areas more severely affected with median UIs of 57 μg/L and 56 μg/L, respectively.

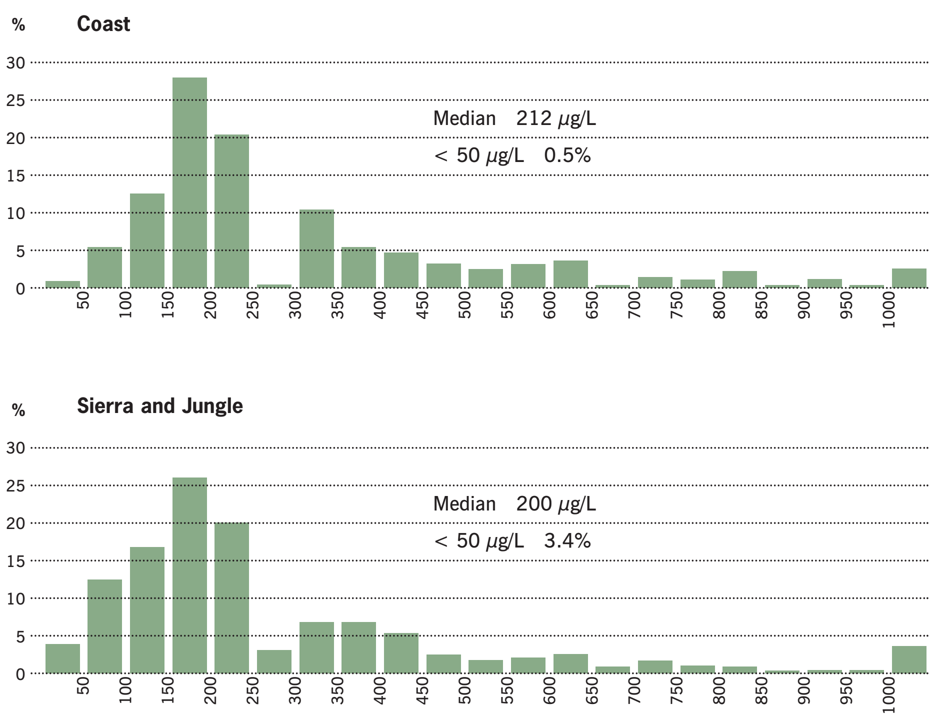
The production and commercialization of iodized salt was carried out by the government mainly in one factory on the coast. The annual production of iodized salt only covered 57% of the country's requirement and was mainly distributed in the coastal region. Only 31% of salt at the retail level contained >15 ppm iodine. There was little public knowledge of IDD, and only 40% of household heads recognized goiter and cretinism as a disease while <10 % related these disorders to iodine deficiency.

Plan of action

A realistic and strategic plan of action was implemented. This strategic model has proven highly successful. It achieved the immediate protection of the population at higher risk of severe IDD with iodized oil administration. At the same time, it moved progressively towards universal salt iodization, while building structures to guarantee its sustainability. Its main components were the following:

a) IDD Network. This has been a key component of the Program. From the very beginning an IDD network was created composed of central management and a functional decentralized organization of 29 Regional and Subregional coordinators. In addition, 156 Local Coordinators at primary health care establishments were appointed. The network consists of regional health workers who are highly motivated and well-trained. They were continuously retrained and hold annual meetings to review progress, examine difficulties and new guidelines, and update scientific knowledge on IDD. The program is supported by other government agencies, including the Ministries of Education, Industry and Agriculture, and local governments.

Fig.2: Frequency distribution of the current urinary iodine concentrations in the coastal and the sierra and jungle regions of Peru.



b) Protection of high risk populations. Recognizing that the availability of iodized salt to cover the whole population, as well as its acceptance, was going to take time, the population at higher risk was immediately protected with iodized oil injections. About 2 million people in 83 provinces were injected during the period 1986-1987. Subsequently, until 1996, iodized oil was administered (by injection or oral routes) to progressively smaller groups, wherever the consumption of iodized salt was not guaranteed.

c) Salt iodine. At the same time, a strong effort was made to increase the production and consumption of iodized salt and to improve its quality.

Production and coverage of population demand. During the first six years, when the salt industry was still a governmental monopoly, the increase in production was gradual, but slow. It was only after 1992, when the industry became a private enterprise, that a significant and sustained increase was observed. Since 1995 the supply of iodized salt to the market has surpassed the population demand. Currently there are 2 large producers on the coast, and 60 small/medium size producers mainly located in the northern coastal area and in the southern sierra. About 75 % of the iodized salt for internal consumption in Peru is covered by the large plants. The small producers received continuous technical assistance provided by the MOH.

Quality of iodized salt. The program has also proven successful in that since 1998 more than 90% of salt at the retail level contains ≥15 ppm of iodine. Monitoring is systematically done year-round with collection of a large and representative number of salt samples. For the analysis of iodine level, there are 15 laboratories distributed throughout the country.

Household consumption. Surveys on the consumption of iodized salt are carried out yearly since 1994, either through home visits or by asking school children to bring salt samples from their homes. The iodine is tested with semi-quantitative certified kits produced in the country. The results reveal an important change in the population's attitude: iodized salt is no longer suspect. For the last thirteen years, adequately iodized salt has been consumed by more than 90% of households.

d) Urinary iodine. The median UI has been the main indicator used to monitor national iodine nutrition, and it has been >100 µg/L since 1995 (Figure 1). The iodine nutrition in the sierra and jungle regions is now comparable to that of the coastal region (Figure 2). Moreover, in most of the population, the median is in the range of 100-299 µg/L, and is likely providing adequate intake for pregnant/lactating women. A small proportion of the population has a median >300 µg/L; this is likely due to food supplemented with iodine and needs further investigation.

The UI surveys are carried out every three yeas and the analysis of UI is done by well-qualified laboratories that are members of the IRLI Network (the High Altitude Research Institute of Cayetano Heredia University until three years ago and, since then the National Food and Nutrition Center).

e) Information, education, communication and advocacy. These activities are of great importance to strengthen IDD knowledge and thereby ensure the active participation of the community. Most of the educational material is produced by local teams to take into account the cultural background of the target population.

f) Social marketing. This strategy was extensively applied from 1993 to 1999 and improved the consumption of iodized salt. It was particularly targeted to the people involved in the salt production, distribution and commercialization chain, the Health, Education, Agricultural and Industry sectors, the media, local authorities, police and opinion leaders.

Political and economic support

A key factor that has contributed to the success of the sustained elimination of IDD has been the political and economic support received from the government since its inception. The Program also has received economic and technical support from UNICEF, ICCIDD and PAHO/WHO.

Nursery school children during a public awareness campaign against iodine deficiency in the Peruvian Sierra. Two girls are dressed up as pregnant women with goiter, to stress the risk of iodine deficiency during pregnancy.

External evaluation of the Program

The Program at its request has been evaluated three times by expert international teams composed of experts of PAHO/WHO, ICCIDD, UNICEF and PAMM. The first evaluation took place in 1996 and found that the goal of universal salt iodization had been achieved. The second evaluation was in l998 and declared the country had achieved virtual sustained elimination of IDD. A joint PAHO/WHO-UNICEF-ICCIDD Recognition Award was given to the Country. The third evaluation took place in 2004 and confirmed the sustained elimination of IDD.

Guarantee of sustainability

The sustainability of the elimination of IDD in Peru is based on the following:

1. Its organization and infrastructure: a highly qualified central team at the MOH and a national network in 34 Regional Health Directions, with multisectoral support.
2. Political and economical governmental backing.
3. A systematic monitoring and surveillance system, of iodized salt, urinary iodine and goiter.
4. Qualified laboratory facilities
5. Full support of the salt industry.
6. Technical support: PAHO/WHO, UNICEF, ICCIDD
7. Creation of a National Oversight Committee

Elimination of IDD and emerging risk of iodine excess in Paraguay

Elsi Ovelar, Juana Redondo, Zuni Zarza, Nilda Gonzalez, Jorge Jara and **Eduardo A. Pretell** National Institute of Food and Nutrition, Paraguayan Ministry of Health and Social Welfare and ICCIDD Office of the Regional Coordinator for the Americas

Background

Paraguay has a long history of iodine deficiency. In the early 1950s, the total goiter rate was 50%. A law mandating the iodization of salt was passed in 1958, establishing the iodization level at 60-100 ppm. All salt consumed in the country is imported. Therefore, iodization plants were installed at the entrance ports and the law stated that all salt entering the country should be iodized either at customs or in registered iodization plants in the country. Unfortunately, because of weak governmental support, the laws were not enforced. A large proportion of the imported salt was not iodized. As a result of this negligence, in 1988, thirty years after the law's approval, the goiter rate remained at 48.6%, with a median urinary iodine concentration of 72 µg/L. In 1991, there was renewed government support for the control of iodine deficiency and the Program for Control and Prevention of IDD was founded by the Ministry of Health. The Program is currently under the responsibility of the National Institute of Food and Nutrition, which was created in 1996.

Present situation of the IDD control program

1. Supply and consumption of iodized salt

Since its creation, the Program has been very successful in promoting and reaching the goal of USI after the approval of the Decree # 3597 in 1999. This Decreee mandated the iodization of all salt for human and animal consumption, including salt used by the food industry, and also advocated for its consumption. Two important factors have contributed to its success: 1) the decentralization of the Program's activities with the participation of all the Departments; and 2) the foundation of Paraguayan Salt Industrial Association.
The supply of iodized salt is provided by four local iodization plants, plus direct importation of iodized salt. Retail sales of the iodized salt are carried out directly by the producers or through their distributors. The population requirement for iodized salt, estimated at 30 000 metric tons per year, is fully covered.
Monitoring of quality of the iodized salt is carried out at four levels: 1) iodization plants; 2) distributors; 3) retail market; and 4) household. The later is done through quantitative analysis of iodine in salt samples brought by the schoolchildren from their homes. Strong emphasis is given to household monitoring, and it is carried out monthly. The results indicate more than 95% of households are consuming salt with more than 15 ppm of iodine, and that ca. 75% of the salt consumed contains more than 40 ppm of iodine (Figure 1), the maximum level recommended by WHO-UNICEF-ICCIDD.

The level of iodine in the salt was reduced to 40-60 ppm in 2001, after the results of the ThyroMobil campaign were made available, as discussed below.

2. Iodine nutrition

The median concentration of iodine in spot urine samples is used as the principal indicator of the impact of the consumption of iodized salt and of iodine nutrition in the population. Monitoring of urinary iodine (UI) has been carried out every three years since 1996.

The results clearly show that the median UI had increased to 148 µg/L five years after the foundation of the Program. This clearly showed its effectiveness in normalizing iodine nutrition in the country (Figure 2). However, the next evaluation, 3 years later, showed that the median UI had increased to 294 µg/L, with many departmental medians above 300 µg/L, increasing the risk of iodine excess. This risk was confirmed by the ThyroMobil campaign in 2001, which led to the decision to reduce the level of iodization to 30-60 ppm. However, despite this change, the risk of excess has persisted and the latest monitoring studies in 2003 and 2006 found the national UI median has continued to increase. These studies reported 89% and 94% of the departmental medians above 300 µg/L (Figure 2 and Table 1).

3. Reasons for the excess of iodine

The main cause for elevated iodine intake in Paraguay is the high iodine content in the salt. Although the national standards state that the level of iodization should be 40-60 ppm, the monitoring results at the production plants and the distributors show that only 34% of the salt met those standards and that in 40% the iodine content is above the maximum official level. As a result, more than 70% of the salt contains more than the maximum concentration of 40 ppm recommended by WHO/UNICEF/ICCIDD at retail (Table 2) and household (Figure 1) levels.

4. Measures to be taken to reverse the risk

Following a recent ICCIDD consultancy to the National IDD Control Program, it has been recommended to initiate the following:

- Reduce the level of iodization of salt to 30-50 ppm
- Improve the monitoring system in the plants of iodization, the distributors and at the entrance ports for imported salt, to guarantee compliance with the national standards
- To investigate the potential clinical consequences of the high iodine intake in the population, and particularly in pregnant/lactating women and their newborns

Table 1: **Urinary iodine in Paraguay 1999-2006: the percentage of departmental medians indicating iodine deficiency, optimal iodine status and iodine excess**

Year	National median µg/L	Frequency of medians (%) <100	100-199	200-299	≥ 300
1999	294	0	5.5	61.1	33.3
2003	373	0	5.5	5.5	88.9
2006	437	0	0	5.9	94.0

Table 2: **Iodine concentration in Paraguayan salt at the retail level (ppm) 2006-2008**

Year	n %	<10	≥15	20-40	<20	>40
2006	100	4	95	21	6	73
2007	18	0	94	22	6	72
2008	40	0	100	28	0	73

Fig. 1: **Iodine concentration at household level (2008)**

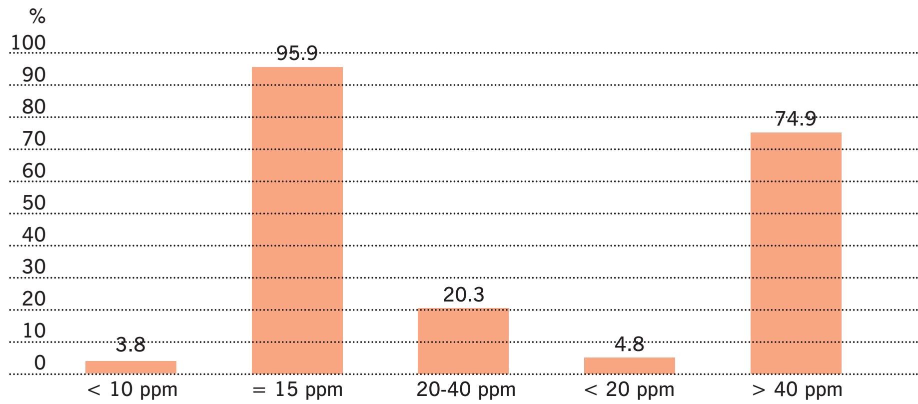
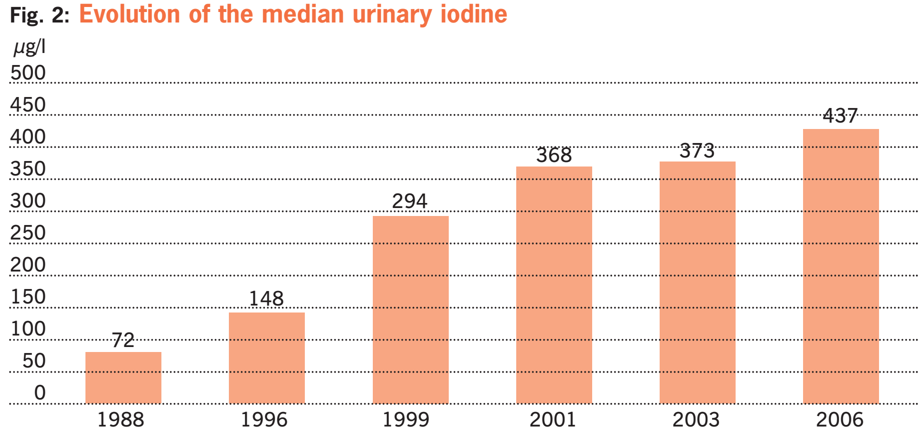


Fig. 2: **Evolution of the median urinary iodine**



A well-monitored iodized salt program provides adequate iodine intake for Venezuelan pregnant women

Luis A. Caballero Coordinator of the Program for Control of IDD, National Institute of Nutrition, Caracas, Venezuela.

The Andean region of Venezuela, including the States of Tachira, Merida and Trujillo, historically was an area of endemic iodine deficiency (1). The national iodized salt program corrected iodine deficiency in this region, and in 1999, an external evaluation by a team of experts of PAHO/WHO, UNICEF and ICCIDD, declared Venezuela virtually free of IDD (2).

The determination of the median concentration of iodine in casual urine samples collected from school children has been used since 1993 to evaluate the impact of iodized salt and the iodine nutrition of the population. The Program also includes information, education, communication and advocacy activities, monitoring of iodine content in salt, with all activities aimed at improving the availability and consumption of iodized salt.

Monitoring of urinary iodine (UI) is carried out every three years and the median value in the past decade has been consistently >100 µg/L. In 2005, the median value was 185 µg/L, despite a moderate decrease in the proportion of iodized salt samples with >15 ppm of iodine.

Recently, WHO/UNICEF/ICCIDD have underlined the need to ensure adequate iodine intake in pregnant and lactating women to prevent the brain damage due to iodine deficiency in the fetus and newborn (3). But until recently, there was little information on the iodine status of pregnant women in Venezuela.

In 2008, we measured UI in 885 pregnant women from 30 different localities in the States of Táchira, Mérida and Trujillo who were attending health care facilities for prenatal control. The results of this investigation are shown in Table 1.

The median UI in the three States and in the whole Andean region are within the adequate range (150 to 249 µg/L) defined by the 2007 WHO Technical Consultation for the prevention and control of iodine deficiency in pregnant and lactating women and in children less than two years old (4). The medians for the first, second and third trimester of pregnancy were 182, 162 and 176 µg/L, respectively.

Thus, we can conclude that iodine nutrition in pregnant women in the Venezuelan Andean region is adequate. Nonetheless, the finding that 37% of individual urine samples had a concentration <150 µg/L raises the question of whether, despite a normal UI median, this high proportion of low individual values suggests a risk of iodine deficiency. For nonpregnant women it is recommended that iodine nutrition is adequate if the median UI is in the range of 100-199 µg/L, with no more than 20% of individual values <50 µg/L.

Table 1: **Urinary iodine excretion in pregnant women**

State	N	Median µg/L	Urine samples <150 µg/L (%)
Tachira	300	166	40.0
Merida	285	153	47.4
Trujillo	300	228	25.0
Andean Region	885	174	37.3

It is critical to maintain normal iodine intake in pregnant women through the use of iodized salt, particularly when they live in conditions of poverty and when they do not have access to other sources of iodine, such as multivitamin/mineral supplements that contain iodine (5). The Venezuelan iodized salt program is a well-implemented and sustained program that provides adequate intakes of iodine for the general population and for pregnant women. But it requires systematic monitoring to ensure that >90% of households are consuming iodized salt with an iodine content of 20 to 40 ppm. The findings of this study should be confirmed by further investigation.

Like their mothers, Venezuelan schoolchildren are also iodine sufficient

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Raising the World's I.Q.

Nicholas D. Kristof Op-Ed Columnist of The New York Times, December 4, 2008

Nicholas D. Kristof

Travelers to Africa and Asia all have their favorite forms of foreign aid to "make a difference." One of mine is a miracle substance that is cheap and actually makes people smarter. Unfortunately, it has one appalling side effect. No, it doesn't make you sterile, but it is just about the least sexy substance in the world. Indeed, because it's so numbingly boring, few people pay attention to it or invest in it. (Or dare write about it!) It's iodized salt.

Almost one-third of the world's people don't get enough iodine from food and water. The result in extreme cases is large goiters that swell their necks, or other obvious impairments such as dwarfism or cretinism. But far more common is mental slowness. When a pregnant woman doesn't have enough iodine in her body, her child may suffer irreversible brain damage and could have an I.Q. that is 10 to 15 points lower than it would otherwise be. An educated guess is that iodine deficiency results in a needless loss of more than 1 billion I.Q. points around the world.

Development geeks rave about the benefits of adding iodine and other micronutrients (such as vitamin A, iron, zinc and folic acid) to diets. The Copenhagen Consensus, which brings together a panel of top global economists to find the most cost-effective solutions to the world's problems, puts micronutrients at the top of the list of foreign aid spending priorities. "Probably no other technology," the World Bank said of micronutrients, "offers as large an opportunity to improve lives ... at such low cost and in such a short time."

Yet the strategy hasn't been fully put in place, partly because micronutrients have zero glamour. There are no starlets embracing iodine. And guess which country has taken the lead in this area by sponsoring the Micronutrient Initiative? Hint: It's earnest and dull, just like micronutrients themselves. Ta-da – Canada! (Years ago, New Republic magazine held a contest for the most boring headline ever. The benchmark was from a Times Op-Ed column – not mine – that read "Worthwhile Canadian Initiative." Alas, that's salt iodization!)

Pakistan is typical of the challenges. Until recently, 6 in 10 Pakistani schoolchildren were iodine-deficient. Iodine just wasn't on anyone's mind. "I had never heard of iodized salt," said Haji Sajjawal Khan, a 65-year-old owner of a small salt factory here, near the capital of Islamabad. Officials from the Micronutrient Initiative and other aid agencies reached out to factory owners like Mr. Khan and encouraged them to iodize salt, in part to help make Pakistanis healthier and more intelligent. "It will prevent people's necks from being swollen and will make people smarter," Mr. Khan said. So he agreed to add an iodine drip into his salt grinder.

One of the obstacles is the rumor that iodized salt is actually a contraceptive, a dastardly plot by outsiders to keep Muslims from having babies. That conspiracy theory spread partly because the same do-good advertising agency that marketed iodized salt also marketed condoms. Yet progress is evident. One of the attractions is that a campaign to iodize salt costs only 2 cents to 3 cents per person reached per year.

"We are spending very little, but the benefit is enormous," said Dr. Khawaja Masuood Ahmed, an official of the Micronutrient Initiative here. "We're preventing people from becoming mentally retarded." Indeed, The Lancet, the British medical journal, reported last month that "Iodine deficiency is the most common cause of preventable mental impairment worldwide."

Occasionally in my travels I've been unnerved by coming across entire villages, in western China and elsewhere, eerily full of people with mental and physical handicaps, staggering about, unable to speak coherently. I now realize that the cause in some cases was probably iodine deficiency. Indeed, the problem used to be widespread in the Alps. The word "cretin" is believed to come from a mountain dialect of French, apparently because iodine deficiency in the Alps produced so many cretins. The problem ended when food was brought in from elsewhere and salt was iodized.

There is talk that President-elect Barack Obama may reorganize the American aid apparatus, perhaps turning it into a cabinet department. There are many competing good causes – I'm a huge believer in spending more on education and maternal health, in particular – but there may be no investment that gets more bang for the buck than micronutrients. So, yes, salt iodization is boring. But if we can add 1 billion points to the global I.Q., then let's lend strong American support – to a worthwhile Canadian initiative.

Meetings and Announcements

"One Step Forward" in the control of IDD in Australia and New Zealand

On 9 October 2008, mandatory iodine fortification was gazetted by the Commonwealth of Australia, known as the Australia New Zealand Food Standards Code – Amendment no. 103-2008. Under item 16, mandatory addition of iodized salt to bread is required, that is, "iodized salt must be used for making bread where otherwise salt would be used". This is a welcomed step from the Australian government out of the concerns about a resurgence of iodine deficiency among Australian population, and follows the recent release of FSANZ P1003, a proposal of the New Zealand-only standard mandating the replacement of salt with iodized salt in bread. There will be a 12-month transition period, and the change commences on 9 October 2009. It will be important to monitor the effect of this change on the iodine nutrition status of the Australian population.
For the Gazette Notice Amendment you can visit
http://www.foodstandards.gov.au/_srcfiles/Gazette%20Notice%20Amendment%20No%20103%20WEB%20VERSION.pdf

International Salt Symposium "Salt, Essence of Life" scheduled in Beijing, China from September 4-7, 2009

In May 2000, at the World Salt Symposium ("Salt 2000") in The Hague, executives of the salt industry met with leaders of governments, NGOs and international organizations to discuss how to better collaborate on eliminating IDD forever. An agreement was reached to form a global coalition of public, private, international and civic organizations whose goal would be the sustained elimination of iodine deficiency disorders through universal salt iodization. This agreement culminated two years later in the high-profile launch at an UN General Assembly side event (A Smart Start for Children) of the Network for Sustained Elimination of Iodine Deficiency or the Iodine Network.

Now, almost a decade later the International Salt Symposium entitled Salt, Essence of Life is scheduled to take place in Beijing, China from September 4-7, 2009. Hosted by China National Salt Industry Corporation (CNISC), it is an opportunity to celebrate "one of the biggest public health success stories of the last decades" with more than 70% of the world now consuming iodized salt compared to 20% in 1990. It is also an outstanding occasion to deepen and update the commitment of the world salt industry to the objectives of eliminating IDD and review new approaches to preventing the brain damage in the 38 million children born at risk of IDD every year. IDD elimination is one of the themes to be discussed at the Symposium. Interested individuals are encouraged to submit abstracts on a range of topics including building national oversight and coalitions, motivating salt producers, traders and importers, as well as to sustaining success with salt iodization.
For further information, enquires may be directed to the World Salt 2009 Secretariat:

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Fax: +86 10 63272289.

All parties interested in the elimination of iodine deficiency disorders can register and submit papers to CNISC through the www.worldsalt2009.com website. Deadline for abstract submissions is April 30, 2009.

The Micronutrient Forum, Beijing, China, May 12-15, 2009

The Second International Meeting of the Micronutrient Forum will be held in Beijing, China, from May 12–15 at the Beijing International Convention Center in the heart of the 2008 Olympic Games Village. The theme of this conference is "Micronutrients, Health and Development: Evidence-based Programs". Registration is free. About 700 delegates are expected to attend the Forum, which focuses on the impact of micronutrient deficiencies on public health and development, concentrating specifically on populations that are deficient in vitamin A, iron, folate, iodine and zinc.
Interested individuals should register at: *http://www.micronutrientforum.org/Meeting2009/registration.cfm* before March 1.
For more information please consult *http://www.micronutrientforum.org/Meeting2009* or contact Silvana Faillace at *mnforum@aed.org*.

19th International Congress of Nutrition, Bangkok, Thailand, October 4-9

The 19th International Congress of Nutrition (ICN 2009) will take place at the Bangkok International Trade & Exhibition Centre in Bangkok, Thailand, on October 4–9. The ICN is a major event that, every four years, provides the highest quality scientific program featuring internationally recognized experts. It brings together more than 3,000 nutrition scientists, practitioners and researchers from all over the world and provides an excellent opportunity to meet and interact.
With its theme "Nutrition Security for All," the ICN 2009 addresses nutrition as an integrative science, linking with other disciplines to engage and advance evidence-based policies and programs within comprehensive food and health delivery systems. The message of the Congress will be addressed through 13 sub-themes broadly representing proximal determinants and ecological, social and cultural determinants of nutrition security for all people. To benefit from the 'Early-bird' registration fee of US$600, international delegates should register before July 4. For program and speaker details, please consult:
http://www.icn2009.com/conference.html

Abstracts

Iodine deficiency in pregnancy and the effects of maternal iodine supplementation on the offspring: a review.

The World Health Organization (WHO) recently increased their recommended iodine intake during pregnancy from 200 to 250 μg/d and suggested that a median urinary iodine (UI) concentration of 150-249 μg/L indicates adequate iodine intake in pregnant women. Thyrotropin concentrations in blood collected from newborns 3-4 d after birth may be a sensitive indicator of even mild iodine deficiency during late pregnancy; a <3% frequency of thyrotropin values >5 mU/L indicates iodine sufficiency. New reference data and a simple collection system may facilitate use of the median UI concentration as an indicator of iodine status in newborns. In areas of severe iodine deficiency, maternal and fetal hypothyroxinemia can cause cretinism and adversely affect cognitive development in children; to prevent fetal damage, iodine should be given before or early in pregnancy. Whether mild-to-moderate maternal iodine deficiency produces more subtle changes in cognitive function in offspring is unclear; no controlled intervention studies have measured long-term clinical outcomes. Cross-sectional studies have, with few exceptions, reported impaired intellectual function and motor skills in children from iodine-deficient areas, but many of these studies were likely confounded by other factors that affect child development. In countries or regions where <90% of households are using iodized salt and the median UI concentration in school-age children is <100 μg/L, the WHO recommends iodine supplementation in pregnancy and infancy.
Zimmermann MB. Am J Clin Nutr. 2009; 89(2):668S-72S.

Association of High Iodine Intake with the T1799A BRAF Mutation in Papillary Thyroid Cancer.

Epidemiological studies have indicated that high iodine intake might be a risk factor for papillary thyroid cancer (PTC), which commonly harbors the oncogenic T1799A BRAF mutation. The objective of this study was to investigate the relationship between BRAF mutation in PTC and iodine intake in patients. The prevalences of the T1799A BRAF mutation in classical PTC of 1,032 patients from five regions in China that uniquely harbor different iodine contents in natural drinking water, ranging from normal (10 - 21 μg/L) to high (104 - 287 μg/L) was assessed. The prevalence of BRAF mutation was significantly higher in the regions with high iodine content than in the regions with normal iodine content. Overall, BRAF mutation was found in 387/559 (69%) PTC with high iodine content vs. 252/473 (53%) PTC with normal iodine content, with an odds ratio of 1.97 (95% CI = 1.53 - 2.55) for the association of BRAF mutation with high iodine content (P <0.0001). Thus, high iodine intake seems to be a significant risk factor for the occurrence of BRAF mutation in thyroid gland and may therefore be a risk factor for the development of PTC.
Guan H, et al. J Clin Endocrinol Metab. 2009 Feb 3. [Epub ahead of print]

Iodine levels and thyroid hormones in healthy pregnant women and birth weight of their offspring

This study assessed the association between thyroid hormones and urinary iodine concentration (UIC) in 657 healthy Spanish pregnant women and the birth weight of their children. The association between thyroid hormones during the first trimester, UIC during the first and third trimesters and birth weight was studied in mother-newborn pairs. Only 239 women had all data available (thyroid function and UIC at first and at third trimesters). Six percent of newborns were classified as SGA. The median UIC was 95 μg/L and 104 μg/L during the first and third trimesters, respectively. Women with third trimester UICs between 100 μg/L and 149 μg/L had lower risk of having a SGA newborn than women with UICs below 50 μg/L (adjusted OR (95%CI): 0.15 (0.03-0.76). There was no significant reduction in SGA among mothers with higher UICs. Lower free T4 and higher TSH levels during the first trimester were not associated with birth weight or SGA. Thus, the present study suggests that iodine status during pregnancy may be related to prenatal growth in healthy women.
Alvarez-Pedrerol M, et al. Eur J Endocrinol. 2008 Dec 29. [Epub ahead of print]

Evaluation of the potential effectiveness of wheat flour and salt fortification programs in five Central Asian countries and Mongolia, 2002-2007.

A project for universal salt iodation with potassium iodate and wheat flour fortification with a vitamin-mineral premix was implemented in Azerbaijan, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, and Uzbekistan between 2002 and 2007. The objective was to determine the potential effectiveness of the food fortification programs in improving the micronutrient status of selected families in a sentinel population in each country. An area was selected in each country in a sentinel population expected to have early access to iodated salt and fortified wheat flour. Within this area, an average of 40 families with a woman of reproductive age and two children between 2 and 15 years old were sampled at baseline. All the rounds of the study were carried out in women and children in the same households. In the third round in 2007 significant increases were observed in the average levels of blood hemoglobin, serum ferritin and folic acid, and urinary iodine. The authors concluded that salt and wheat flour fortification resulted in a significant improvement in the micronutrient status of children and women living in sentinel households in the countries participating in the Asian Development Bank project. Sentinel studies were a cost-effective way of determining potential national effectiveness.
Tazhibayev S, et al. Food Nutr Bull. 2008; 29(4):255-65.

Iodine deficiency disorders in the iodine-replete environment.

The clinical presentation, biochemical findings, and radiological features of three women with goiter who were living in iodine-replete environments were reported. Two of them presented with goitrous hypothyroidism. Radioactive iodine scintigraphy showed a characteristic finding of diffusely increased uptake (in the absence of clinical and biochemical evidence of hyperthyroidism). This scintigraphic pattern was found to be pathognomonic. Dietary iodine supplementation alone resulted in complete remission of IDD in the subjects, including the 2 patients with hypothyroidism. Thus, IDD can occur in iodine-replete environments. A high index of suspicion is needed to recognize these cases. It is pertinent that the correct diagnosis be made to avoid unwarranted life-long thyroxine therapy in patients presenting with goiter and hypothyroidism, which is easily treatable with iodized salt. These cases underscore the need for considering iodine deficiency in the etiologic diagnosis of goiter and hypothyroidism, even in iodine-sufficient regions.
Nyenwe EA et al. Am J Med Sci. 2009; 337(1): 37-40.

Iodine nutritional status of children on the island of Tanna, Republic of Vanuatu.

To evaluate the iodine nutritional status of children living on the island of Tanna, Republic of Vanuatu, a cross-sectional study was done. Urine and household salt samples were collected for iodine measurement. Thyroid volumes were measured by ultrasound. A food consumption frequency survey was carried out, particularly in relation to salt, iodine-rich foods and foods that containing thiocyanate, a potentially goitrogenic substance. Urinary thiocyanate levels were also measured. One hundred and fifty-three schoolchildren between 8 and 10 years of age from four locations on the island participated. The median urinary iodine excretion (UIE) among the children was 49 μg/L, indicating moderate iodine deficiency. This was corroborated by 27% of boys and 33% of girls having thyroid glands greater than the international standard for their age, and 36% of boys and 45% of girls having thyroid glands greater than the international standard for their body surface area based on ultrasonography. There was no correlation between thiocyanate and UIE or thyroid volume. Only 34% of children reported to consume fish (tinned or fresh) on a weekly basis. Against the common perception, the study has demonstrated that the children on the island of Tanna were in a state of moderate iodine deficiency. More data need to be collected from other Pacific Island countries in order to provide evidence for formulating public policy in prevention and control of iodine deficiency disorders in these nations.
Li M, et al. Public Health Nutr. 2009 Jan 20:1-7. [Epub ahead of print]

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