

Section V

Iodized Salt for the Elimination of Iodine Deficiency Disorders

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1. Introduction

The importance of addressing iodine deficiency disorders (IDD) on a global basis was first recognized at the World Summit for Children in 1990. Seventy one (71) Heads of State met in New York and approved a plan to promote the welfare of children (World Summit for Children 1990) that included seven major goals and 26 supporting/sectoral goals of which three related to micronutrient malnutrition-one specifically to eliminate IDD. Although the micronutrient goals seemingly constituted only a fraction of all the goals they were the cutting edge, they were amenable to fulfillment in the shortest possible time and their cost benefit ratio was highly favourable. They also underscored the unique opportunity we had to provide nutritional well being as fundamental to sustainable human development on a scale not witnessed before. The summit goals became a mission for the entire UN family-for the aid agencies, for governments and non-governmental organizations. Following the summit, governments working with the salt industry and supported by international agencies and expert groups then set to develop programs that would enable this measure.

The inadequacy of iodine in the diets of many populations is caused by the lack of iodine in the food that people eat owing to a deficiency in the soil and water where the food is grown. This can be corrected through provision of small doses of iodine through commonly eaten foods or condiments. Salt iodization has been identified as the main intervention to deliver iodine on a continuous and self-sustaining basis to populations around the world. Salt has been demonstrated to be an excellent carrier for iodine and other nutrients as it is consumed at relatively constant and well-defined levels by most people within a country or region. Intake is largely independent of economic status. Iodization of salt therefore needs to be instituted as on a sustained basis. Salt iodization is a remarkably cost effective public health goal. On average, the one-time increase in cost is only 3-5 cents per person per year, a price so low that even consumers in least developed countries would barely notice it.

Once established in a country, salt iodization is a permanent and long-term solution to the problem. It eliminates iodine deficiency and continues to give each individual his/her daily iodine needs and prevents recurrence. Within one year of a community regularly consuming iodized salt containing the required iodine, there will be no further birth of cretins or children with subnormal mental and physical development attributable

to iodine deficiency. Goitres in primary school children and adults will have started to shrink and even disappear altogether. Children will be more active and perform better at school. Conversely, if there is a slippage in iodization programs and people do not receive their daily requirement of iodine on a regular basis, iodine deficiency disorders and Goitres will resurface very quickly (Sections II, IV).

2. Achievements

By the year 2003 many developing countries had taken steps to ensure that they iodize all salt produced for human and livestock consumption. Nearly 70% of the world's human and livestock salt is iodized today. But the problem is not eliminated and further efforts are needed to complete the task and sustain the achievement. In 2002 world leaders re-convened at the UN General Assembly Special Summit for Children (UNGASS). They reaffirmed their commitment to "...achieve sustainable elimination of iodine deficiency disorders by 2005 (A World Fit for Children, United Nations 2002).

Policy makers realize that in the wider picture technological problems are not nearly as serious as operational ones related to making programs work in communities where deficient people live. Issues of supply and logistics, communications and community participation, partnership building across a wide spectrum of players-public and private-are recognized as equally important to ensure the success and sustainability of efforts to eliminate micronutrient deficiencies in large populations.

The following achievements in IDD elimination over the past decade are noteworthy (Gross 2003).

- By 2002, more than 170 countries had committed themselves to universal iodization of salt. Many countries have provided resources for IDD elimination in their national financial budgets and are progressing toward the goal of Universal Salt Iodization.

- Salt iodization has witnessed a remarkable growth in application. According to UNICEF reports in 2002, most of the populations in more than 87 countries-at least 65% of the world's population-already have access to iodized salt. **(fig. 1)** Forty-five countries have achieved more than 75% coverage.

- Most countries already have all, or most, of the necessary program components in place. Producers are clearly supporting increased production and sale of iodized salt. In most countries, iodized salt is

already available, public awareness and knowledge is high and they are monitoring IDD rates. Regulations or laws are in place or being developed.

- Investment (Public & Private) in the iodized salt industry over the past decade exceeds one billion dollars and continues to grow.

- Large populations are no longer iodine deficient. (China is one of the great success stories in salt iodization, having gone from 50 percent coverage just ten years ago to more than 95 percent coverage today (see further below).

- There is significant reduction in total Goitre rate in several countries with maximum impact in regions where household level consumption of iodized salt is high (**fig. 2**). We are preventing more than 12 million cases of mental retardation in infants annually (UNICEF 1998). Human function and development will benefit enormously. Intellectual capacity of a significant number of the next generations born into the world will increase.

- There is now potential for eliminating the ancient scourge of iodine deficiency disorders. Success with salt iodization has given governments a new confidence to address other more complex micronutrient problems through food fortification to deliver essential micronutrients to their populations.

By any yardstick this is a major global public health achievement. In many developing countries, salt iodization is the first large-scale experience in national fortification of a commodity to eliminate a public health problem. It has taught valuable lessons in collaboration between government, industry, non-governmental organizations, the media, the community at large and other sectors. It has also offered insights into building and sustaining an intervention politically, technically, managerially, financially and culturally.

Universal Salt Iodization (USI) may be in reach, yet we are not yet there. In as many as 50 countries less than 50% use iodized salt. Further a disturbing sign of “backsliding” has been recently noted in some regions. With less than two years remaining to achieve this goal, there is an urgent need to reinvigorate the global effort and to accelerate country level action. Countries need to identify constraints and weaknesses and develop corrective actions. Monitoring is key since time and again, we have seen the re-emergence of IDD when monitoring slackens. Countries require a well-designed monitoring system to provide information for decision-making, targeting, focusing attention, raising awareness and garnering resources.

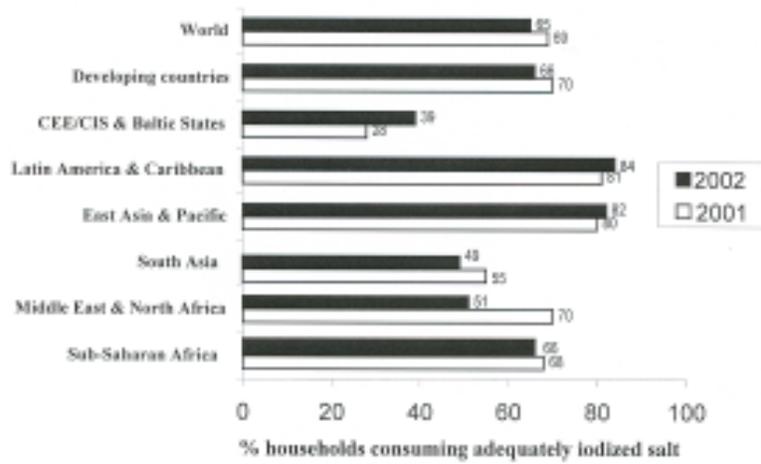


Fig. 1 Consumption of Iodized Salt (by Geographic Region)

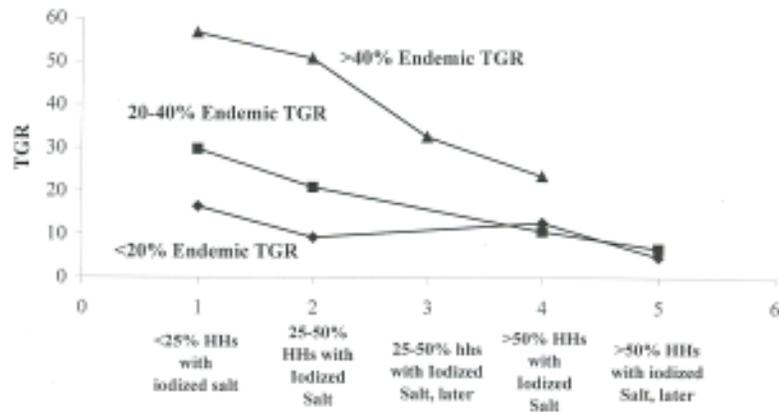


Fig. 2 Trends in Total Goitre Rate with Increasing Household Consumption of Iodized Salt

3. Key Partners in the Global Effort

Salt iodization represents the first effort to advocate and institute national fortification programs to deliver essential nutrients. Effective and sustainable iodization is possible only when the public sector (that has the mandate and responsibility to improve the health of the population), the private sector (that has experience and expertise in food production and marketing), and the social sector (that has the grassroots contact with the consumer) collaborate to develop, produce, and promote the fortification of a basic food commodity such as salt.

The rapid promotion and realization of the goal of USI has been the outcome of a growing international dialogue on micronutrient malnutrition to develop this new coalition between governments, private food companies, scientific expert groups, multilateral and bilateral development assistance agencies and other stakeholders to discuss collaborative approaches to eliminate micronutrient malnutrition. This effort is a new kind of partnership—a partnership at different levels. At the global level, it links the international agencies and groups (each with their own plans to pursue) to ensure that key issues and needs are addressed. At the national level—where the war really needs to be won—it brings together public and private sectors, profit, and non-profit sectors. At the regional level the initiative needs to be supported with agreement on issues of inter-country food movement, standards, and regulation.

Following the international commitment at the World Summit for Children in 1990 these linkages and partnerships got steadily established (UNICEF 1990). They were supported at the international level by several agencies including UNICEF, the World Health Organization and The World Bank. The International Council for Control of Iodine Deficiency Disorders provided the scientific leadership and consensus for intervention and surveillance. Other groups such as the Micronutrient Initiative provided technical and financial support to expand and refine salt iodization practices and monitoring. Bilateral donor agencies (primarily, Australia, Canada, Japan, the Netherlands, Sweden and the USA) provided initial financial support. More significant funding followed through a global service project undertaken by Kiwanis International to raise and provide resources to support national programs.

At the World Salt Symposium held in The Hague, The Netherlands in May 2000, salt iodization became one of the main themes and priorities for the salt industry (Mannar 2000). During the Symposium executives of

the salt industry met with leaders of governments and NGOs and directors of international organizations to look at how they could better collaborate to accelerate global progress towards ending iodine deficiency forever. An agreement was reached to form the Network for Sustained Elimination of Iodine Deficiency, a collaborative coalition of public, private, international and civic organizations (see further Section III).

The IDD elimination goal was re-affirmed by multi-sector national delegations during the UN Special Session for Children (UNGASS) in New York, May 2002 and a timetable was set for global elimination by 2005. The Network for Sustained Elimination of Iodine Deficiency (IDD Network) was formally launched by the Director General of WHO at a side event during UNGASS which included contributions of high-level global leaders, including the Ministers from Canada, Netherlands and the United States of America. Today the Network includes key actors: UN agencies, salt producers, major salt industry associations, scientific bodies, non-government interests and civil society. The Network has organized regional meetings in Europe (Ghent 2001) and Latin America (Miami, March 2002) and Asia (Beijing, October 2003), to bring together the important stakeholders to assess the status of IDD prevalence and progress towards USI and develop strategies to accelerate progress towards the goal.

The Network's mandate is to support national efforts to eliminate iodine deficiency—and to sustain elimination—by promoting collaboration among public, private and civic organizations. These partner organizations are committed to ensuring that universal salt iodization is sustained in all countries, and that recurrence of brain damage from iodine deficiency will be prevented. The Network is unique in bringing together such a broad range of partners—especially the salt industry.

4. Integrating Iodization within Salt Production and Distribution Systems

The specific objective is to dovetail iodization into the prevailing salt production and distribution system in a country at minimum cost and disruption. The salt industry has obviously been a key player in enabling this major public health achievement. However the production process and scale vary over a wide range in this most ancient of industries. Salt manufacturing techniques and product quality vary over a wide range from cottage scale units producing a few hundred tons a year to very

large fully automated plants producing several million tons. Some countries depend entirely on mining of underground rock salt deposits. Others on the extraction of salt from sea water or saline lake/underground brine by solar drying. In a few countries they produce both forms. For units with production of more than 10,000 tons per year that are well organized with quality control systems, the integration of iodization has been easy. Such large producers account for nearly 75% of all salt for edible consumption in these countries.

However, many small units along coastlines or lake shores produce some of the salt as a semi-agricultural operation. These units often operate with a minimum of organization and almost no quality control. They are scattered along the coast or lake shores and do not lend themselves to regulation by the government. Very often precise figures regarding even their location, extent of holdings and production statistics are not available. The producers have limited financial means and lack access to technical or financial assistance to begin quality iodization processes and to monitor quality. As a result the salt produced in these units is of poor quality. This has complicated USI programs. Additionally they have poor packaging practices or do not package the salt at all. Yet they are often the main salt supplies to the communities most at risk of IDD.

As USI implementation enters the critical final phase in many countries, support needs to be provided to small producers. The producers often have to first be convinced that they have a role to play in the USI program and that they are capable of doing it. Benefits to them, including economic returns, have to be illustrated. Their limitations and constraints need to be recognized. They cannot and should not be expected to participate for the good of the country, although this should be developed as a motivating factor. At the end of the day, the production of iodized salt must benefit them economically in order for their contribution to be sustainable. As a long-term aim, they should also be supported to upgrade their facilities in general. In order to remain economically viable, small salt producers will have to change with the times. The trend will inevitably be towards better quality, iodized salt. To work towards this they may need to form cooperatives with other producers. A shared iodization machine may be the starting point for such a cooperative. The next step may be a packing machine. Alternatively they could be facilitated to supply their salt to larger producers, who undertake the task of iodization and packaging and perhaps purification. Technical training and assistance is often needed, for example in establishing production, quality control sampling and analytical procedures. In some cases, appropriate

technology for salt purification needs to be provided. Simpler quality control and analytical techniques, such as test kits, may also be needed.

A further problem experienced in some countries, is multiple levels of iodization and packaging. In this situation, raw salt producers supply their un-iodized salt to multiple small re-packagers who take on the task of iodization and packaging the salt into consumer-size bags. As with small salt producers, these facilities often do not have the capacity to consistently produce good quality iodized salt and to monitor its quality. Where this practice occurs, governments should encourage raw salt producers, especially if they are large, to iodize the salt at source. These raw salt producers can thereafter supply large sacks of iodized salt to re-packers for packing into small bags. By encouraging iodization at source, the number of facilities that need to be monitored is reduced and large producers can take advantage of economies of scale to implement more dependable and uniform iodization techniques.

The stability of iodine in salt and levels of iodization are questions of crucial importance to national planners and salt producers as they have implications for program effectiveness, safety and cost. High humidity results in rapid loss of iodine from iodized salt, ranging anywhere from 30 to 98% of the original iodine content. By refining and packaging salt in a good moisture barrier, such as low density polyethylene bags, iodine losses can be significantly reduced, during storage periods of over six months (Mannar 2000). Over the past decade there have been significant investments in salt refining capacity in several countries. In India, refining capacity has increased from less than 5% to nearly 50% over the past 15 years. China has undergone a major modernization of refining iodization and packaging facilities over the past six years. This augurs well for iodization since refined salt in watertight packing retains up to 80% of iodine for 12 months.

5. Achieving and Sustaining Universal Salt Iodization

As significant as the progress over the past decades has been and as promising as their potential might be, there is still much to be done. There is evidence of declining IDD prevalence but the goal of elimination has not yet been achieved. Experience over the past decade has provided several valuable lessons, which point to future strategies to expand and sustain the universal iodization of salt.

5.1 Sustaining Political Commitment at the National and Sub-National Level

The Goal of IDD elimination and USI is a national obligation. Continued and strong government commitment and industry motivation are essential to eliminate IDD. Senior political leaders should strongly support the cause. Political commitment to IDD elimination needs constant renewal through periodic advocacy events. We therefore need to ensure advocacy for long term sustained commitment from all collaborating partners. Programs should continue after external inputs are withdrawn with more national resources in firm and permanent budgets to sustain progress. National plans must commit resources for sustained elimination of IDD.

Multi-sectoral national and sub-national coalitions are practical and effective means to sustain IDD elimination. Coalitions should have clearly defined goals, authority and definition of roles and responsibilities. They should use monitoring information for strategic planning and decision making. Coalitions should promote collaboration between government departments and between government and other partners in particular the salt industry. The economics of the salt industry and the food processing industry need to be more fully understood by the health and scientific community in order that recommendation for national consideration makes good business sense as well as good public policy. Elimination of IDD will reduce preventable mental retardation but this must be made into a socially positive political good. Periodic external evaluations could be invited to provide an independent perspective and insights.

5.2 Ensuring the Supply of Iodized Salt

The production and marketing of adequately iodized salt needs to be accelerated until all households and individuals have access. While voluntary iodization is a good step, only mandatory iodization will ensure universal compliance. It is important to ensure that all salt for human and animal consumption including salt for food processing is iodized. The salt industry should have the mandate and resources to ensure effective iodization including mechanisms to secure regular and efficient supply of raw materials including salt, bags, potassium iodate and laboratory supplies. Refining and moisture-resistant packaging are essential to retain iodine. Producer compliance, quality assurance, logistic problems and

bottlenecks need to be addressed through effective advocacy and social communications.

Associations of salt producers should be strengthened to build capacity to produce and distribute adequately iodized salt. Salt producers should be provided with the infrastructure and financial assistance through innovative mechanisms such as revolving funds where necessary. They should be provided with sustained management inputs to ensure quality assurance of product, process and progress.

The flow of non-iodized salt into the market should be actively discouraged. Technical assistance and other support should be made available to small salt producers to be able to produce adequately iodized salt or to pool their salt to enable iodization.

5.3 Quality Assurance of the Product, the Process and the Progress is Key

An effective and ongoing monitoring system to check iodine levels in salt from production to consumption is essential for the success of an iodization program. Once national standards for iodization are in place and understood by producers and processors alike, the issue becomes their application universally and over time persistently to assure the public health-public nutrition benefit desired. Nationally monitoring implies regular oversight of:

- i) The Product (clean products, quality standards, appropriate iodine levels, fair prices),
- ii) The Process (access to raw materials, iodate, packaging, labeling, quality assurance mechanisms in place, systematic and regular training, public communication, social marketing, management, accountability).
- iii) The Progress (impact measurement in humans and animals to confirm success and shows its positive consequences in health, well-being, productivity and progress of the nation)

There should be a sustained commitment by all parties—government, industry and trade and the consumer to ensure effective monitoring of iodized salt. Monitoring of salt at all levels particularly at the production level is key. Private producers of iodized salt should accept the responsibility for quality production of iodized salt at competitive and fair prices universally. Monitoring systems should ensure specified salt iodine levels and coordinated with effective regulation and enforcement.

They need to be supported with administrative and lab infrastructure and be functional to enable corrective action when required. They should help identify problem areas. The use of salt testing kits should be expanded especially at consumer level in markets and households. To support monitoring we need to look at ways in which modern technology can be more rapidly applied to essentials of programs in IDD elimination. Some immediate ways are through rapid field test and assessment techniques, electronic communications tools and reporting techniques, management information systems, training, orientation and motivation.

5.4 Reaching the Unreached

Reaching iodized salt in rural terrain and difficult geography-mountainous or coastal-presents a challenge. Access to iodized salt by rural populations requires special strategies to meet situations that are unique and varied. The focus should be on improving marketing to difficult locations and transient, remote, isolated populations and/or island groups. However in so doing we must avoid the danger of thinking of IDD as a problem mainly for rural or mountain populations. It is a major urban problem, as well. Countries with limited resources or smaller problems need more help; others need support to accelerate existing plans.

5.5 Social Mobilization, Demand Creation and Community Participation

The consumption of adequately iodized salt should be the norm for all. The rationale should be that children have the right to reach their genetic potential and people have the right to demand fortified products like salt at convenient locations, in appropriate packages, at fair prices...and forever. Towards this end a clear communications strategy should be implemented to expand and sustain consumer awareness and demand for iodized salt. This should include education on the health, economic and social value of iodine in the daily diet through school curricula, media and other channels. Communications and monitoring of USI and IDD elimination should be integrated within existing health/education/agricultural extension structures and procedures in imaginative ways. Demand for iodized salt could be increased through consumer education, a national logo for easy identification and social mobilization. Innovative ways of building awareness amongst stakeholders through religious leaders or well-known personalities could be used. Salt testing

kits could be used as a social mobilization tool in schools and communities and also by traders and dealers (see further Section VI).

5.6 Salt Iodization Strategies and Programs need to Keep Adjusting to a Changing Environment

Globalization and free trade are having significant impacts on salt production, import, refining and distribution patterns and need to be monitored. Adequate inputs (material, financial, trained human resources) need to be ensured. Public demand for a balanced iodine intake should be expanded and sustained. While gearing up for USI, the salt industry needs to build strong regional networks. Iodine levels in salt should be harmonized across regions. Process and impact monitoring could be included in household surveys, census, and other ancillary information-gathering efforts on a permanent basis.

5.7 Capacity Building

This is a vital and continuing component. The need in every country is for constant vigilance to assure that (i) the producers are fully up-to-date and have good personnel in packaging, monitoring, reporting and analysis (ii) the country is inserting knowledge through iodine courses, public communication and schools; (iii) the responsible agents like Ministries of Health have adequate trained personnel for their vital role of surveillance and assessment of progress in human nutrition, including laboratories and other support measures. In addition National training schemes in micronutrient malnutrition are priority needs. The need for constant attention to this aspect cannot be over stated. These need to be multi disciplinary in composition and scope. All stakeholders in success must be kept up to date.

5.8 Impact Evaluation

The final proof of impact and successful elimination of iodine deficiency is reflected in the reduction in prevalence of Iodine Deficiency Disorders. These need to be monitored and tracked at periodic intervals. The ICCIDD/WHO/UNICEF/ 2001 Report recommends indicators and a standard protocol for assessment including the 'wheel' model (Section II). Countries should request periodic external evaluations to provide independent feedback and timely recommendations and support high level advocacy. The results of national and regional progress made

toward optimal iodine nutrition should be widely shared. A permanent network of reference labs around the world has been established using standardized procedures for salt-iodine and UIE estimation (International Resource Laboratories for Iodine (IRLI) Network 2002).

6. What made Salt Iodization in the People's Republic of China Successful

In China, the coverage of iodized salt has increased from 54% (of which 39.9% met standards) in 1995 to 95.2% (of which 88.8% met standards) in 2002. The Total Goitre Rate in children has been reduced from 20.4% in 1995 to 5.8% in 2002. Essentially, China has reached the goal of Universal Salt Iodization (USI). This has been achieved since 1991 when Premier Li Peng, in response to the World Summit for Children, signed the *Declaration and Plan of Action of the Peoples Republic of China (PRC)* which included the goal of eliminating IDD by the year 2002 (**fig. 3**). National goals were set for reducing the number of children with an enlarged thyroid to under 5% and providing more than 90% of all households with adequately iodized salt.

The Government of China Salt Iodization Program was launched during a high-level Advocacy Meeting convened by the State Council in 1993. The program focuses on increasing the production of iodized salt through strengthening of the salt industry and providing quality assurance and monitoring over the salt distribution system. Currently, there are 1,300 producers and distributors employing more than 400,000 personnel. The industry produces more than 28 million tons of salt annually, of which approximately 7 million tons are for human consumption or food use. Components of the Salt Iodization Project include legislation, management, process production, facilities upgrading, marketing, social mobilization and quality assurance monitoring. The China National Salt Industry Corporation is designated as the lead agency in this effort with the support from a number of key partners including the Ministry of Health, Ministry of Railways, Ministry of Transportation, industrial and commercial sectors, quality and technical sectors, and international organizations. To assure iodized salt supply and quality, three state laws decreed by the State Council together with 34 provincial regulations enabled the Government of China to strengthen the centralized management of the food salt monopoly from national and provincial to prefecture and county levels. Beyond controlled production through the

state monopoly mechanism the program developed a number of strategies. This includes:

- Nationwide licensing for wholesale and transport sectors to ensure adequate distribution;
- An enforcement team of 25,000 assures that only legally produced salt reaches the market; and
- Direct cooperation among salt producers and local governments supplies iodized salt directly to consumers.

A key factor has been the upgrade of production and packaging facilities at 120 large-scale plants at a cost of US\$100 million, including a US\$27 million loan from the World Bank. As a result, production of iodized salt at these facilities more than doubled since 1995.

While the nation as a whole has reached the goal of 90% iodized salt coverage, a number of areas are far below that goal. The challenge will be to achieve Universal Salt Iodization (USI) in poor and remote areas such as Sinjiang and Tibet. Moreover, attention must be focused on controlling the flow of non-iodized salt in specific areas where there is over production or easy access to raw salt. This includes the southern coastal provinces with sea salt production and the western provinces with large lake deposits. China's goal for the future is to assure that these provinces that remain at high risk of IDD also achieve USI (see further Section VIII).

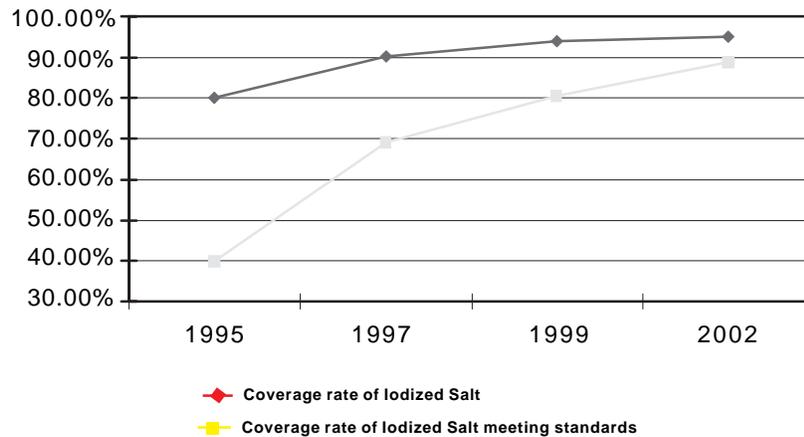


Fig. 3 Progress with Salt Iodization in China

7. New Frontiers

Over the past decade there has been a worldwide movement by consumer groups to raise private sector consciousness to participate in tackling social and environmental problems. Viewed from this angle, IDD control presents an opportunity for the salt industry to derive economic and social benefit for itself while simultaneously providing a social benefit to the community by fortifying the salt they produce and sell.

Salt enjoys unique advantages as a carrier of nutrients in most parts of the world in terms of universal coverage, uniformity of consumption and low cost of fortification. Encouraged by the progress made in several countries in implementing successful salt iodization programs, efforts have been directed at examining the feasibility of fortifying salt with iron and other nutrients such as fluorine along with iodine. With production, surveillance and monitoring infrastructure for iodization programs already in place, such as integration and coordination would enable resource savings and maximum efficiency. The commercial application of large-scale multiple fortification programs would be a major breakthrough in establishing a cost effective delivery system for these nutrients to cover large populations (Diosady et al 1997).

8. A Continuing Partnership

The public-private-civic partnership to achieve and sustain USI needs to continue with each of the partners playing an important role:

- Salt Producers must assure supply and access. They should always reach all customers with a quality (iodized) product and progress toward self-monitoring
- Governments (especially the health, industry, food and drug administration and standards departments) must provide permanent support to universal salt iodization and monitor the situation; there should be a strategy to cover populations not reached by iodized salt
- The Social Sector must remain supportive and insist on national supervision. It should oversee progress and guard against reversal
- The Public must understand and demand its right to iodized salt
- UN and Other Agencies - continue to focus attention at a national and global level

Such coalitions should be multi-sectoral and have clearly defined roles and responsibilities and oversight authority. They must be cohesive and well coordinated with the partners working with a spirit of transparency, openness with each other and sharing experiences that will help achievement of the common goal. Only through such a coordinated effort and vigil at the global, regional and country level in terms of social advocacy and providing the vitally needed technical and financial inputs can we eliminate iodine and other nutrient deficiencies from the face of the earth.

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