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Universal salt iodization in the Central and Eastern Europe, Commonwealth of Independent States (CEE/CIS) Region during the decade 2000–09: Experiences, achievements, and lessons learned

Frits van der Haar, Gregory Gerasimov, Vilma Qahoush Tyler, and Arnold Timmer

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Universal salt iodization in the Central and Eastern Europe, Commonwealth of Independent States (CEE/CIS) Region during the decade 2000–09: Experiences, achievements, and lessons learned

Frits van der Haar, Gregory Gerasimov, Vilma Qahoush Tyler, and Arnold Timmer

Abstract

Background: By 2000, the global track record on universal salt iodization (USI) indicated 26% access to adequately iodized salt in the Central and Eastern Europe, Commonwealth of Independent States (CEE/CIS) Region.

Objective: Aimed at extracting lessons learned, this study examined experiences, achievements, and outcomes of USI strategies in CEE/CIS countries during the subsequent decade.

Methods: Information from the design, timing, execution, outputs, multi-sector management and results of actions by national stakeholders yielded 20 country summaries. Analysis across countries used a LogFrame Analysis typical for public nutrition development.

Results: By 2009, USI strategies had reached the target and population iodine nutrition shown adequate levels in 9 countries, while in 6 others, USI was close and/or population iodine status showed only minor imperfection. True USI, i.e., iodization of salt destined both for the food industry and the household, had been made mandatory in 13 of these 15 countries. In the Balkan area, USI and iodine nutrition advanced more than in CIS. Of the 20 sample countries, 17 (85%) had exceeded the mark of 50% adequate access, while the overall regional score reached 55% by 2010.

Conclusions: Experience from this region suggests that strong partnership collaboration, a new concept in post-Soviet societies, was a major success factor. Voluntary iodization or focusing on household salt alone was less likely conducive for success. Achieving optimum iodine nutrition required the setting of proper iodine standards. Weak political leadership insistence in the Russian Federation and Ukraine to embrace USI is the main factor why the region remains behind in the global progress.

Key words: Formative assessment, functional strategy analysis, national salt iodization strategies, programmatic lessons learned, sustainable IDD elimination
Executive summary

During the early 1990s, while UNICEF and the World Health Organization (WHO) were reaching an agreement to recommend universal salt iodization (USI) as the national strategy for the prevention and control of iodine deficiency disorders (IDD), the UNICEF Central and Eastern Europe, Commonwealth of Independent States (CEE/CIS) Region was undergoing a lengthy period of political turmoil and economic transition. The Yugoslav Federation had started fragmenting after Tito’s death in 1980, a process that lasted into 2006 with the peaceful separation of Serbia and Montenegro. After the USSR dissolved in 1991, the political, administrative, and productive arrangements in the Commonwealth of Independent States (CIS) began making transitions toward market-based economies in each state. Upon establishing country and area offices throughout the region, UNICEF started collaborating with national counterpart organizations in reaching for USI, using the lessons learned from experience of similar actions in other parts of the world. The global USI record showed that by the year 2000, only about 25% of the population in the region was using adequately iodized salt.

The present report aimed at documenting the experiences, achievements, and lessons learned from USI strategies in 20 countries of the region during the first decade of this century. By the end of 2009, the use of adequately iodized salt had risen to 55%—a quantum improvement compared with a decade ago but still short of the operational target of 90%. Progress in the region is being held back appreciably by persistent low supplies of iodized salt in only two countries, the Russian Federation and Ukraine. When the regional progress is expressed as the national ability to execute a USI strategy, 85% of the countries in this study had surpassed the mark of at least 50% of the population having access to adequately iodized salt by the end of the decade.
The analysis in this report starts out with the global health planning experience that progress in USI strategies takes hold from planned simultaneous action in four principal components, or professional areas: iodization of edible salt, communications, monitoring and evaluation, and strategy oversight. This conceptual model was used in an exploration of the actions, outcomes, and impact observed in 20 CEE/CIS countries from the execution of national USI strategies, i.e., the rational sequence captured in a Logical Framework Analysis. Included in the report are detailed summaries of the national USI strategies executed during the decade in the 20 country cases, and the report uses this information to analyze experiences and achievements, leading to lessons learned in the region.

By the end of the decade, a principle statutory act for mandatory USI had been decided upon in 18 of the 20 countries reviewed. In the majority of countries, this principle decision involved the “true” USI strategy, i.e., the iodization of edible salt destined for both the food industry and the households. The mandate was focused on only the fraction of consumer salt in three countries, and the food industry salt fraction was the focus for mandatory iodization in one country. By 2009, a national USI statute had not yet been enacted in two countries: the Russian Federation and Ukraine. The considerable convening power of UNICEF at the executive level has been a major factor in mobilizing national, multisection, public–private collaboration and in generating persuasive common testimony from the stakeholder organizations in favor of mandatory USI legislation.

The information in the country summaries demonstrates that the USI strategy was accomplished, along with a demonstration of adequate population iodine nutrition, in nine countries of the region during the decade, while USI was close to being achieved and/or population iodine nutrition indicators showed minor imperfections in six other countries. True USI had been enacted in 13 of these 15 countries. Analysis of the national salt supply situation in these 15 countries suggests that the major factors underlying the achievement of USI were the solid quality assurance practices in the salt industries, combined with due diligence in official regulatory practices by Standardization and Metrology officials in the countries with domestic salt production, or rigorous inspection and release procedures by food inspection officials in the salt-importing countries.

In the Balkan area, the two “near successful” countries, Serbia and Montenegro inherited their mandatory salt iodization levels (12 to 18 mg iodine/kg salt) from the former Yugoslav Republic. These levels are low not only for the Balkans but also for the region, as well as being below global recommendations. The achievement of success in Bosnia and Herzegovina shows that “adequate” population iodine nutrition was attainable in this country with true USI at the former Yugoslav iodization standards. In contrast, the experiences in Macedonia (with standards of 20 to 30 mg iodine/kg salt) and Kosovo (with standards of 18 to 23 mg iodine/kg salt) show that adequate population iodine nutrition was achieved only after a modest increase in the salt iodization standards. The mandatory salt iodine levels in Bulgaria (17 to 33 mg iodine/kg salt) and Romania (15 to 25 mg iodine/kg salt) are also slightly higher than those in Serbia, Montenegro, and Bosnia and Herzegovina. Bulgaria has reached USI and adequate iodine nutrition in the population with true USI, which was objectively verified and acknowledged by the global Iodine Network (as was the case in Macedonia). Progress in USI in Romania, while focused on consumer salt alone, has been impressive, but as yet not successful. The law on mandatory salt iodization in Albania dates from 2008, leaving too short a period to expect evidence of successful accomplishments. Comparison of the evidence in this part of the region indicates that national progress toward achievement of USI and attainment of optimum iodine nutrition status in the population is responsive to the mandated national salt iodization standards.

In the CIS area, the Minsk agreement of 2001 on a common iodization standard of 40 ± 15 mg iodine/kg salt and mutual collaboration in promoting trade and proper salt quality has been a key factor in facilitating the USI strategy. True USI legislation was enacted in eight CIS countries (all before 2005); five achieved USI success with demonstration of adequate population iodine nutrition, two are tantalizingly close, and one continues to face critical operational challenges. The strategy in two other CIS countries is being pursued under an act that focuses on iodization of consumer salt only, while, as noted above, no legislative act has been passed in another two CIS countries.

The foremost important overall conclusion of the review in this region is that successful attainment of USI strategies was achievable despite the region’s unique sociocultural background and the major political and economic transitions that took place during the decade from 2000 to 2009. The remaining obstacles in the region to completion of the full national supplies of adequately iodized salt for the food companies and the households are specific for each nation. Major issues identified in this study include a weak, ill-informed, or factious national constituency of stakeholders, a law based on political compromise among conflicting values and interests, low political will to respect and uphold the mandated iodization standards, and limited capacity for self-sufficient procurments combined with poor quality assurance in small-scale salt companies.

In exploring the reasons for success or failure, the present analysis corroborates a number of lessons known from global experience. They include the importance of operating strong partnerships at the
national level, which was a new concept in post-soviet societies. A related lesson from the region is the crucial gatekeeper role that influential government advisors can exploit to put a stranglehold on a national statutory decision. Their stated objections in the lagging countries (the Russian Federation and Ukraine in particular) are mostly of a sociocultural nature, while financial gain may also play a role. The objections are intertwined with low epidemiologic skills and a poor embrace of public health principles, which in the past have encouraged a mostly clinical attitude to address goiter and cretinism problems in the region. The final overall critical conclusion from the analysis is that USI strategies should be mandatory and apply to the salt destined for the food industry as well as the households. Focusing on the visible “vehicle” only is not adequate.

The main part of the analysis explored the experiences and achievements of the various components in national USI strategies. The region is home to 15 large salt companies, which together produce the major share of the overall supply of food-grade salt, which is estimated at 2.2 million MT per year. These companies are subject to strict rules for technology approval, fortificant authorization, product quality and safety standards, and licensing, which are upheld by the standardization and metrology authorities, typically under the Ministry of Industry and Trade. Certification up to modern International Organization for Standardization (ISO) standards has been obtained by a number of large companies in the region, e.g., Mozyr (Belarus), Artemsol (Ukraine), Avan (Armenia), and others. The experience of leadership roles by large company CEOs ranges from positive activism (e.g., in Armenia, Bosnia and Herzegovina, and Kazakhstan) to lukewarm collaboration and aloofness.

A salt industry association has been—and can potentially be—useful, particularly in countries such as Azerbaijan, the Kyrgyz Republic, Tajikistan, and Uzbekistan with a large number of small salt companies that typically have difficulty in gaining access to the fortificant at a reasonable price. The issues of iodizing salt for livestock have not been a factor of importance for national progress, although the availability of noniodized animal salt may yet turn out to be of local significance. No evidence was found that the cost of iodization or the price of the product was an impediment to success. That said, the persistently low penetration among the poor communities in Kalthon and Direct Rule District (DRD) oblasts of Tajikistan suggests that free product vouchers may be considered as a tactic in poverty alleviation schemes, especially in view of their role in promoting adequate iodine nutrition among pregnant women.

The information from large, multichannel communication campaigns that targeted various audiences was reviewed. In the majority of countries with campaigns during the decade, nongovernmental organizations (NGOs) were included in the delivery, which added the value of spreading the new information more readily and swiftly through more layers of society and may have helped turn potential gatekeepers into supporters. Extensive campaigns were conducted in almost half of the countries in this study. Their distribution between the countries that were successful or not in executing national USI strategies during the decade does not suggest a relationship: in the group of countries with successful or near-successful USI strategies, the amount of progress in USI did not differ between countries without a large-scale communication campaign and those in which a major effort was spent on the communications component of the strategy. This finding suggests that the public information effort should not be focused on changing the public’s purchasing behavior.

Other actions considered important under the communications component included the stimulation of stakeholders in the national strategy, moderation of opinions among potential gatekeepers, and insertion of knowledge into ongoing education programs. Stimulation of the salt industry could benefit from more comprehensive analysis and on-the-job training in small salt companies to address the needs for systemic capacity development in quality assurance and product promotion.

In a broad area of Eastern Europe and western CIS, opinions of the technicians in the fruit and vegetable preservation industry surfaced as a barrier to the acceptance of iodization of food-industry salt. Moreover, in Moldova, Ukraine, and the Russian Federation, an old Soviet bread bakery regulation is frequently quoted to justify a prohibition of the use of iodized salt in bread production. Finally, insertions of essential learning about IDD and USI in primary, secondary, and professional education have contributed to a foundation for sustained success in a sample of countries.

Managing for national progress depends on information, obtained by monitoring and evaluation, which is the third strategy component reviewed in this report. Although a national salt industry situation analysis, typically with the amounts and types of the salt supplies included, was recognized early as an essential oversight need, the obligation of periodic reporting of national salt supply was achieved in only four countries. Moreover, the collection, analysis, and use of national data on the amount and quality of iodized salt in the food industry remain rare. “Watching over” the salt situation in order to verify that the national iodized salt provisions are optimal cannot yet be reliably conducted in most of the region. The review revealed that salt inspections in consumer markets are usually strict and respected in a number of countries. Information on the use of iodized salt in households is typically collected by intermittent house-to-house surveys, in some countries with sizable time intervals. In the majority
of countries in the region, national household surveys remained the basis for tracking the use of iodized salt in households over time. Universal use (more than 90% of households) of adequately iodized consumer salt was attained in 11 countries of the region, including Serbia and Montenegro where the mandatory salt iodine standard is below international recommendations.

For assessments of iodine nutrition status, 13 countries have a national laboratory that can generate data on urinary iodine (UI) assays; 8 of these countries are participating in the Centers for Disease Control and Prevention (CDC)-provided external quality assurance program Ensuring the Quality of Urinary Iodine Procedures (EQUIP). On sampling designs, surveys stratified (by region) and 30 × 30 probability proportional to size (PPS) designs each constituted about 50% of the national iodine surveys conducted in the region. School-age children were the target group in most national surveys, although the inclusion of pregnant women in iodine nutrition assessment surveys increased during the decade. The time since the most recent survey was more than 5 years in six countries, and in two countries a population-representative national iodine survey was never undertaken. A review of the available survey reports indicates that the analysis methods and, thus, the interpretation of results are improving. Increasingly, distribution analysis of UI concentration data is proposed to arrive at an index of optimum iodine nutrition, while the use of analytical techniques to describe the relationships among the indicators of iodine supply, consumption, and status is also improving.

Finally, a review of the information, where available, on the forms and structures for national oversight suggests that both formal and informal interactions characterize the national partnership arrangements in the region. The level of these interactions, and therefore the structure used, naturally depend on the issues arising and the importance accorded to the expected decisions. In most countries of the region, a national committee or commission exists, at least on paper. Obligatory Ministry of Health reports and publicity are typical accountability examples of national collaboration in progressing to USI.

The report concludes that exemplary progress in salt iodization strategies was made during the decade from 2000 to 2009 in the region under review. Nevertheless, iodine deficiency remains an enduring public health problem in a significant part of the area, with well-known repercussions for national health and for social and economic development. The problem remains manifest in populations where no national USI mandate has been enacted as yet (the Russian Federation and Ukraine), as well as in the countries where a statutory act has been decided upon but progress is lagging due to operational challenges (Albania, Tajikistan, and Uzbekistan). True USI strategies remain the preferred policy approach for elimination of IDD. A focused effort is called for during the next 5 years to support the progress toward USI in the region overall and in selected national situations.

### Introduction

Public health aims at preventing disease, prolonging life, and improving the quality of life among whole populations through organized efforts in society. Public nutrition is the field of science and practice within public health that deals with the determinants of food consumption and nutritional outcomes in populations. Public nutrition practice addresses the critical link between, on the one hand, our advances in understanding of the determinants and consequences of nutrition and, on the other, the application of this understanding in policies and programs. Public nutrition science studies how specific policies and programs affect the food consumption and nutrition outcomes of populations in various contexts, and it researches the factors that influence the effectiveness of programs in improving these outcomes. The findings can then be used to adjust public nutrition policies with the aim of improving program practice.

The main purpose of this study was to examine experiences and obtain critical lessons learned from the execution of national salt iodization strategies during the period from 2000 to 2009 in the UNICEF CEE/CIS Region. In addition to in-depth descriptions of the iodine deficiency situation and the progress made in addressing the problem of iodine deficiency in each country, the analysis was directed at exploring how in each country the national salt iodization strategy was conceived, designed, and executed, and what the effects of the execution were on the iodine nutrition status in each country’s population. Because the norms for safety and wholesomeness of the food supply are typically defined in national laws and regulations, salt iodization strategies have national scope, and therefore the unit of analysis in this report is national, i.e., country-based. The present report covers the decade from 2000 to 2009, even though the history of concern about the problem of iodine deficiency and national efforts to address it dates back to the middle of the previous century.
**Background**

In 1994, the Joint UNICEF-WHO Committee on Health Policy agreed to recommend universal salt iodization (USI) as the main strategy in countries where iodine deficiency disorders (IDD) were a public health problem [1]. USI was defined as “iodization of salt for human and animal consumption, including the salt for food processing.” This recommendation was the crucial remaining step in providing practical guidance in working toward the goal of virtual elimination of IDD, which was adopted at the 1990 World Summit for Children [2] upon advocacy at the World Health Assembly in 1986 [3]. As stated in the report by the UNICEF-WHO Joint Committee, “For IDD prevention, the main strategy globally is the iodization of salt, together with necessary support measures, which should be feasible in almost all countries.”

The adoption and execution of USI strategies took off around the world once the recommendation was shared and understood. UNICEF amplified its commitment by increased support for advocacy, iodization equipment and supplies, and technical assistance and training. International and bilateral agencies, NGOs, and technical organizations added financial support and expertise to help create and develop the necessary abilities for actions in salt iodization, communications, and monitoring. High-level policy advocacy events were held to unite the national stakeholders, while emphasizing that the likelihood of a successful USI strategy is limited when approached only as a Ministry of Health-led or public sector-dominated intervention. Once the salt industry joined the national efforts to bring its ability in the salt production and supply channels to bear, the strategy accelerated in country upon country [4].

The outstanding progress in USI during the decade of the 1990s was a central feature at the 8th World Salt Symposium “Salt2000” in May 2000 [5]. At the Salt2000 opening ceremony, UNICEF Executive Director Ms Carol Bellamy stated, “Now we have reached the point in time that 85 million newborns each year are being protected from a loss of intellectual performance that would otherwise occur,” and in the scientific keynote speech at Salt2000, the Vice-Chairman of the International Council for the Control of Iodine Deficiency Disorders (ICCIDD), Professor V. Ramalingaswami, offered the following thoughts: “Early in the year 2000 it may be too soon to declare global triumph over this age-old scourge but it is not too soon to observe that we have arrived for the first time in history on the brink of virtual elimination of iodine deficiency. At this point in time, it is a privilege for all concerned to join the chorus of partners of the global IDD alliance in congratulating the productive salt producers with their key responsibility of providing the required additional iodine through iodized salt to all people of the world” [6].

When producers iodize their salt, the added iodine enters the salt supply channels and, hence, it appears in the common consumption pattern of households. In consequence, the presence of iodized salt in households became commonly accepted as a key measure for USI progress during the decade of the 1990s. Testing of salt for the presence of iodine was greatly facilitated by a rapid test solution that makes the iodine in salt visible by the blue color that appears when the solution is dropped on a salt sample. UNICEF included rapid test kits in large-scale Multiple Indicator Cluster Surveys (MICS) in many developing countries, and the Demographic Health Surveys (DHS) and other nutrition surveys also adopted the rapid test to obtain estimates of the prevalence of iodized salt consumption in the population.

A summary of the presence of adequately iodized salt in households by global region in the year 2000 is

![FIG. 1. Estimated percentage of households with adequately iodized salt by UNICEF region (2000). E Europe/CIS/B, Eastern Europe/Commonwealth of Independent States/Baltic states](image-url)
illustrated in figure 1 [7]. About 70% of households worldwide were using adequately iodized salt by the beginning of the decade, compared with less than 20% a decade earlier. Moreover, in more than 30 developing countries, the national USI strategy had attained the operational threshold of 90% or more households using adequately iodized salt. Stable, large, and populous countries, as well as smaller, poorer and politically challenged countries were among the high performers [4]: Benin, Bhutan, China, Croatia, Eritrea, Iran, Jordan, Lao PDR, Kenya, Nigeria, Peru, and Zimbabwe were among the examples of nations with extraordinarily swift progress and achievements in USI during the 1990s.

Although the overall global achievement during the 1990s was impressive, in 38 countries less than half of the population had access to adequately iodized salt by 2000 [8]. This included most of the countries in the CEE/CIS. The region was going through a considerable political and economic transition period upon the downfall of the centrally directed Soviet economy, which caused serious upheaval of the production and sales relationships in the salt industry. Also in the Balkans, the 1990s and early 2000s was a period of strong political turmoil. The result was that all over the region, practices in salt iodization that were once deemed adequate were either abandoned or pursued hesitantly during much of the decade of the 1990s. By the turn of the century, scattered evidence indicated that iodine deficiency was re-emerging, with expected serious consequences for the future development of the population.

Geographic scope

During the year 2000, the UNICEF CEE/CIS Region also included the three Baltic states of Estonia, Latvia, and Lithuania. The Baltic countries “graduated out” of programmatic support by UNICEF during the study period, and they are not included in the present analysis. Turkey was also not included in the country sample due to its distinct geographic and cultural character as compared with the countries of the Balkan and CIS areas. The sample of 12 CIS states in this study remained stable during the decade. They encompass the four European CIS states, Belarus, Moldova, the Russian Federation, and Ukraine; the three Caucasus states, Armenia, Azerbaijan, and Georgia; and the five Central Asian republics, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. It should finally be noted that the total number of countries in this study changed during the decade due to the ongoing fragmentation of the former Yugoslav Republic. By 2009, the countries or geographic units from the former Yugoslavia included in the present analysis were Bosnia and Herzegovina, Kosovo, Macedonia, Montenegro, and Serbia. The study sample in the Balkan area also includes Albania, Bulgaria, and Romania.

An analysis of USI strategies

Fortification, supplementation, diet diversification, and public health promotion are feasible strategies in programs that aim to overcome micronutrient malnutrition. Depending on the context—e.g., factors such as the nature and severity of dietary deficiency, available resources, infrastructure and reach, health service penetration into communities, and so on—each of these strategies may be applicable in programs to address a particular situation. After the goal of elimination of IDD was adopted at the 1990 World Summit for Children [2], the agreement from the UNICEF-WHO Joint Committee on Health Policy in 1994 [1] offered a practical recommendation on the preferred strategy to attain the goal, and it accelerated the adoption of salt iodization strategies as a central part of the global action plan for the virtual elimination of IDD. The generic description of USI strategy in this section is intended to assist in outlining the method of analysis and discussion in the later sections of this report.

Design

The design rationale for programming the elimination of IDD follows an analysis of experience in global health planning [9] that identified the key components on which public nutrition strategies are built. In this view, USI strategies consist of four major components (or professional areas), of which three are technical (iodization, communication, and monitoring) and one is managerial (strategy oversight) (fig. 2).

Each of the key components in a USI strategy encompasses a range of essential elements (or actions) to be fulfilled:

» Iodization of salt involves adequate capacity and technology, secure input self-procurement, proper quality assurance during production, stable access to customers, and ethical product promotion.

» Communication maintains acceptance among the public, advocates for a strong and permanent
national constituency, educates professionals of the various sectors involved, and keeps the attitude among gatekeepers favorable while being prepared to counter adverse opinions.

- **Monitoring** calls for regular data collection and interpretation of inputs, activities, outputs, and results for joint multisector decision-making and periodic reporting about the state of the strategy in preventing the (re)occurrence of the problem.

- **Oversight** unites the different organizations responsible for action (i.e., the stakeholders) under one umbrella and drives continued action in executing the strategy.

The three technical components are tightly linked, and their interrelationships are as important as the elements themselves. Promoting acceptance of iodized salt, for example, is an element of both the salt iodization and the communication components, and inspection of iodized salt quality in the industry is a measure of how well iodization performs, while the results of such inspections yield monitoring data.

The performance of each component depends on the progress made from fulfilling their elements. In turn, the overall success of the strategy rests on the interplay and progress of all the components in concert. This functional description indicates that identifying a single success factor in USI strategies is rarely possible in a given case. Instead, successful USI is more likely to arise from the combination of actions that continually propel the different elements in the strategy, buttressed by the political will in combination with joint oversight of all the stakeholder organizations involved.

Adequate capacity in the organizations that execute the USI strategy is a necessary but not sufficient condition for the achievement of success. Developing adequate capacities in all the components needs continuous attention, but having each capacity established does not automatically mean that the overall strategy will inevitably perform well and be habitually practiced. Performance shortfall in the presence of apparently adequate capacity can be addressed by a national collaborative arrangement, tasked to oversee and ensure that iodization, communication, and monitoring yield their expected results. This forecasts the need for “partnership collaboration” in executing the USI strategy, based on a clear action plan in which all of the partners are in agreement on their specific roles and responsibilities. Adequate capacity averts external dependence in the future by adding to national ownership and to the likelihood of permanent progress, thus promoting sustainability.

### National planning

The description of USI strategies above was informed by the global experience of success that followed upon actions taken in all the strategy components with the use of inputs that had led to outcomes and produced expected result(s). Although the practice may differ among different organizations, the core approach for organized planning and management is known as the **logical framework approach**. A logical framework (logframe) forces managers to think logically about the rational relationships that exist among the essential aspects in a strategy plan: the objectives, progress indicators, key activities, required resources, monitoring and evaluation, and any important external factors outside the control of stakeholders. Using the logframe extends the political choice for the USI strategy to the definition of key resource inputs (including finance and tools) and activities, and the rational sequence of events that lead the strategy to its successful accomplishment. The logframe narrative can, therefore, also be useful for an analysis of “what happened and how” in countries where the political decision was made for USI.

Irrespective of whether a logframe was explicitly developed and used, national USI managers in any case will have worked according to a national program or plan of action for the elimination of IDD. In a number of countries, this action plan took the form of one, or a succession of, national IDD program(s).

### Roles and responsibilities

Each stakeholder in a strategy has strengths and needs. Health scientists know the signs and symptoms of IDD and who are affected, but they cannot iodize salt. Government sets standards and inspection officials test the product, but they do not produce and deliver salt. The salt industry has the capacity, the technology, and the channels to reach the customer, but it looks for guidance for what to add and at which level. Agencies can provide information, technical assistance, and start-up funds, but they cannot take away from the national responsibilities. Informed consumers desire wholesome, affordable foods that help promote healthy, productive lives, but they depend on the action of...
other partners for realization of their rights. A national coalition brings all of these factors together under one umbrella. The coalition may or may not need to have formal status, but it does have to include the participation and express commitment of the major sectors in the USI strategy: public institutions, the salt industry, civic society, scientists, and so on.

Providing and using inputs

The activities under the USI strategy are clusters of actions that fulfill the essential strategy elements outlined above. Taking action requires capable staff, finance and time, tools and equipment, and key inputs such as fortificant, media channels, measuring devices, and so on. From the global experience of salt iodization strategies during the 1990s, expert analysis generated international recommendations on preferred tactics and methods. The iodine fortificant (as potassium iodide or potassium iodate) is a typical example of an input that must be obtained externally in most countries. Notwithstanding the amount of external resources and support, however, the major share of inputs for action and, therefore, the ownership of success are due to the stakeholders who execute the national action plan.

Monitoring outcomes

A good national plan defines the expected outputs from actions under the USI strategy. These would usually include improvements in the production and supply of iodized salt; increased use of iodized salt in the food industry and the households; more support from influential opinion makers; insertions of knowledge, methods, and techniques in educational curriculums; improved UI in the at-risk population groups; and so on.

Documentation of the outcomes produced by the actions of stakeholders is important to account for the delivery of the actions and their costs. By definition, the staff and technicians in the stakeholder organizations that take the actions are not responsible for goal and strategy setting, but the outcome of their action determines the impact of the strategy in the end.

Impact measurement

Reductions in the extent and severity of iodine deficiency that follow after the actions by stakeholders indicate that the USI strategy is effective. In the same way as the baseline assessment of IDD, the impact of the USI strategy can be measured by UI concentrations, thyroid size (goiter), functional indicators such as blood hormones, and, ultimately, brain development, intelligence, and educational attainment.

Iodine deficiency and salt iodization in the CEE/CIS Region

Balkan countries

Former Yugoslav countries

The history of iodine deficiency after the end of World War II in the former Yugoslavia is closely connected to the conscientious work by Josep Matovinovic at Zagreb Medical University, who published a detailed summary of the numerous findings of goiter and cretinism in the Federal Republic up to 1950 and called attention to a failure of the iodized salt supplies [10]. The regulations at that time stipulated that the salt for household use that was to be delivered in highly affected areas should contain 5 mg KI/kg salt. After a review at the second Congress for Preventive Medicine in 1954, it was decided to raise the salt iodization level to 10 mg KI/kg salt and extend the regulation to all salt for human and animal consumption [11]. The mandatory universal supply of iodized salt and the twofold increase in salt iodine level were credited for the fourfold reduction in goiter prevalence revealed 10 years later [12]. Regular inspections of the iodized salt supplies and local goiter studies were coordinated through a network of public health hygiene institutes, with Belgrade in a lead position. The Public Health Institutes in Ljubljana (Slovenia), Zagreb (Croatia), Sarajevo (Bosnia and Herzegovina), Titograd (Montenegro), Skopje (Macedonia), and Belgrade (Serbia) continued their surveillance during the 1970s and 1980s and demonstrated that despite the improvements after 1954, goiter continued to arise in the population born after the introduction of USI.

Marshall Tito’s death in May 1980 was followed by a period of intense political turmoil and conflict that descended into several interethnic wars. The Yugoslav Federation increasingly fragmented into the constituent republics. The Balkan conflict caused a serious economic decline, which also affected the salt companies and led to shortages and disruptions in iodized salt supplies [13]. Nevertheless, new legislation introduced upon the finding of persistent goiter in school-age children required an increase of the salt iodine level to
12 to 18 mg iodine/kg salt, although still permitting a choice of potassium iodide or potassium iodate as fortificant. By the end of the 1990s, after the public health institutes had started adding UI measurements to the array of methods, various surveys showed a significant improvement of the iodine nutrition situation in the populations of Bosnia and Herzegovina, Macedonia, and Serbia and Montenegro (see country summaries in the Appendix).

Albania, Bulgaria, and Romania

In Albania, the communist regime of Enver Hoxha kept the population isolated for most of the post-World War II period. Nonsystematic survey data before 1990 indicated widespread, significant goiter, along with numerous cretins and deaf-mutes. A first formal nationwide survey in 1993 by the National Institute of Public Health confirmed the existence of moderate-to-severe iodine deficiency in all parts of Albania. It took into the new millennium for a systematic USI strategy to become pursued aggressively. At the beginning of the century, adequately iodized salt was used in 57% of the households of Albania, with rural areas lagging behind urban centers.

A WHO monograph on Endemic Goiter in 1960 [14] offered detailed evidence of the occurrence of widespread goiter and cretinism in Romania and Bulgaria after World War II. Due to their proximity and similar political systems, scientists and health officials of Romania and Bulgaria maintained close contacts and information exchange with their colleagues in the Balkans and the former Soviet area. Thus, the general approach in tackling iodine deficiency throughout the 1980s and 1990s was similar to that in the remainder of the region, although there were some variations in legislated standards and in the pace of acceptance of modern guidelines for the comprehensive conduct of USI strategies.

Goiter and cretinism surveys during the 1950s by Academician Penchev in Bulgaria [15] had defined certain areas as endemic; this was followed by a government decision in 1958 to mandate exclusive use of salt fortified at 20 mg iodine/kg salt in these areas and to provide free supplies of potassium iodide tablets to primary schools and mother and child health clinics. When large-scale surveys during the early 1970s showed significant reductions in goiter prevalence among school-age children, the overall attention to the problem waned. By 1990, however, goiter prevalence among schoolchildren had increased again, and once the political turmoil of the 1990s subsided, the Council of Ministers adopted a comprehensive approach based on several concurrent elements under a unified USI strategy [16]. Regular close monitoring of the iodized salt supplies to the food industry and consumer markets in Bulgaria showed that about two-thirds of the salt supply was iodized at the mandated level of 28 to 55 mg KIO₃/kg salt (17 to 33 mg iodine/kg salt) by the end of the 1990s.

In Romania, the Ministry of Health initiated distribution of iodine supplements from 1947 onward, which was followed by a decree in 1956 to supply iodized consumer salt in the most affected, mainly mountainous, areas. After finding persistent goiter not just in the affected districts only, the government issued an ordinance in 1995 that increased the salt iodization level to 24 to 30 mg iodine/kg salt and mandated the use of potassium iodate as the fortificant for iodized table salt throughout Romania, while continuing to permit the supply of noniodized salt by the salt industry. Notably, the ordinance prohibited the use of iodized salt in the food industry. It also required that packages of iodized salt carry a warning against its use by people with certain thyroid conditions. A survey in 2000/01 of iodine status among schoolchildren in 30 counties [17], however, showed that iodine consumption had not yet reached acceptable levels in Romania by the end of the 1990s.

Commonwealth of Independent States

The Asian section of the former USSR was described in the WHO monograph on Endemic Goiter of 1960 [14] as “one of the most notorious goiter areas of the world.” The monograph reported that goiter also occurred abundantly in most other geographic areas of the vast territory of the USSR. The Soviet authorities promoted the production of salt by establishing large-scale companies under the Ministry of Food Industry, starting first in Russia and Ukraine and, from the mid-1950s onward, also in the Kazakh and other Soviet republics. These factories were given annual production plans, which had in essence the character of a law. An ordinance issued by the Ministry of Health in Moscow in 1956 with the title “On Improvement of Measures to Fight Endemic Goiter” [18] included a list of the majority of administrative subdivisions of the USSR that were affected by endemic goiter and elevated the production and targeted supply of iodized salt as a matter of high official concern. During the 1960s, a comprehensive geologic chemistry survey was completed, and thereafter the areas with the lowest iodine contents in the soil and water were put under even stricter control in terms of compulsory iodized salt deliveries. In 1969, a large-scale population survey covering more than 30 million people demonstrated that the occurrence of goiter in the Soviet Union had decreased to a sporadic level and that large goiters and cretinism were no longer observed. In consequence, the Ministry of Health during the early 1970s officially declared that endemic goiter had been overcome; it abolished the central and regional mandates for management oversight, canceled
the obligatory registration and monitoring of goiter cases, and broadened the attention of the network of specialist endocrinology centers from its singular focus on goiter prophylaxis [18].

After the centrally led prophylaxis approach had been abolished, the aging technologies and stagnant quality assurance practices in the large Soviet salt factories led to an increase in failures to maintain the prescribed range of 23 ± 11 mg iodine/kg salt. In addition, the lower stability of the potassium iodide fortificant in combination with the paper and carton packaging and the long railway supply lines were reasons for a diminishing quality of iodized salt in the retail outlets. With the overall decline in the centrally directed economy, the amount of iodized salt production also started to decrease. By 1990, the total production of iodized salt stood at little more than half of the planned amount of 1.4 million MT. After the USSR dissolved, the economic problems associated with the transition, the privatization of the industry, and the absence of incentives for the private sector caused an even greater reduction in the amount and quality of the iodized salt supply in the new CIS [18].

Several information sources demonstrate that iodine deficiency had made a vigorous comeback by the time that the newly independent CIS countries started building their own human, administrative, and economic systems. An international conference in 1991 in Tashkent, Uzbekistan, conducted by UNICEF and WHO with ICCIDD support, reviewed detailed reports from Belarus, the Russian Federation (several regions), Kazakhstan, Ukraine, and Uzbekistan [19]. The vignettes of Azerbaijan and the Kyrgyz Republic (Section 5) offer similar information of resurgent IDD in the CIS area around the time of the breakup.

A workshop of multisector delegations held under the aegis of the Economic Cooperation Organization in Ashkhabad, Turkmenistan, in 1994 was one of the earliest efforts to stimulate high-level government concern to reverse the deteriorated iodine nutrition situation [20]. In six participating CIS countries (Azerbaijan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan), quick assessments were conducted for generating national review papers on the IDD situation, prepared by local experts with the support of international consultants with expertise in IDD and the salt industry. The reports invariably showed significant IDD problems, along with fledgling salt industry capacities and uncertain national supplies of iodized salt. The Workshop Declaration is a clear articulation of the need for decisions on the iodization of the salt supply and adoption of a multisector approach with a key role for the salt industry, along with the establishment of systems for communication, marketing, and enforcement, as well as regular monitoring of progress toward the goal of elimination of IDD.

### Salt sources

The iodization of salt is a responsibility of the salt-producing industry. From the history of the goiter prophylaxis approach [18], the technology was familiar and experience with the targeted iodized salt supplies had established that the strategy was feasible and effective. Also, salt iodization continued to be practiced in the salt companies in Bulgaria, Romania, and Yugoslavia, despite the overall decline in iodized salt supplies in the remainder of the region. Against this background, the expectation that full iodization in the region could be fairly rapidly achieved [21] was not irrational. However, as was the case in other parts of the world [4], the major missing determinant at the turn of the century was that blending of the public and private sector interests was needed. National dialogues in the Republic of Georgia (1998) and the Russian Federation (1998/99) were examples of high-level advocacy efforts that aimed to stimulate national coalitions for fostering the required collaboration.

There are plentiful natural salt sources in the region, including underground salt domes in the Balkans (Bosnia and Herzegovina, Romania), eastern Europe (Belarus, Ukraine), Caucasus (Armenia, Azerbaijan), and the Russian Federation and Tajikistan and natural salt lakes in Azerbaijan, Kazakhstan, the Russian Federation, Turkmenistan, and Uzbekistan. The major salt-producing companies in the region are summarized in table 1.

An approximate estimate of the total amount of food-grade (i.e., edible) salt produced per annum in the region is 2.2 million MT, or 5.5 kg per capita. Of this amount, up to 1 million MT, or 2.5 kg per capita (approximately 45%), is iodized. As shown in the last column of table 1, a brisk salt trade exists in the region, thus ensuring that the countries without a national salt-producing industry can efficiently provide themselves with their national salt needs for human consumption. The Artemsol Company in Ukraine is a major and highly reputable export source of edible salt to many CIS countries. A number of large salt companies have obtained certification under the ISO 9000 standards for quality management performance, which includes proficiency in assuring the mandatory quality of the end product.

The country summaries (Appendix) offer further details of the salt sources and supply situation in each country of the region.

### Iodine sources

Iodine sources are located in the Russian Federation, Ukraine, and Turkmenistan. In the Russian Federation, the Troitsky Iodine Plant in Krymsk, Krasnodar Territory, manufactures pure and analytical grade potassium...
iodate with iodine recovered from iodine-rich drilling water. The other Russian potassium iodate manufacturer is the Uralsk Chemical Reagent Plant Verkhnyaia Pyshma in the Sverdlovsk Region, which purchases the iodine ingredient from the Troitsky Iodine Plant. All the Russian salt manufacturers, with the exception of Bassol, purchase their fortificant from these two domestic companies. Bassol obtains fortificant from the Cheleken Chemical Plant in Turkmenistan, which is the source of fortificant for the Tuzlyduz salt factory in Turkmenistan. In Ukraine, potassium iodate is manufactured by the Iodobrom Company in the Crimean Peninsula.

Since 2008, the Neftçala iodine factory in southeast Azerbaijan has been rehabilitated and expanded with a US$15 million loan from the European Bank for Reconstruction. Although many salt producers base their actual purchases on habitual trade relationships with supply sources from outside the region, the established iodine production capacities can in theory provide for the entire salt fortificant needs of all the countries in the region.

### UNICEF support and collaboration

#### Engaging with the salt industry

Working with the Worldwide Service Project of Kiwanis International and the US Agency for International Development (USAID), and stimulated from the Regional Office in Geneva, UNICEF started supporting salt situation analyses [21] during the second half of the 1990s in Armenia, Azerbaijan, Belarus, Russia, Kyrgyzstan, Uzbekistan, Serbia, Montenegro, Kosovo, Macedonia, Georgia, Romania, Russia, Belarus, Kazakhstan, Moldova, Armenia, and Turkey.

### TABLE 1. Large-scale food-grade salt companies in the Central and Eastern Europe, Commonwealth of Independent States (CEE/CIS) Region

<table>
<thead>
<tr>
<th>Country</th>
<th>Company</th>
<th>Source of salt</th>
<th>Total salt supply estimate (1,000 MT/yr)</th>
<th>Food-grade salt estimate (1,000 MT/yr)</th>
<th>Iodized salt estimate (1,000 MT/yr)</th>
<th>Major export markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armenia</td>
<td>Avan</td>
<td>Rock salt mining</td>
<td>40</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Belarus</td>
<td>Mozyrsol</td>
<td>Rock salt mining</td>
<td>350</td>
<td>280</td>
<td>100</td>
<td>Russia, Kyrgyzstan</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>Hemijski Kombinat “Sodaso”</td>
<td>Rock salt mining</td>
<td>50</td>
<td>50</td>
<td>45</td>
<td>Serbia, Montenegro, Kosovo, Macedonia</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Tchernomorski Solnitzky</td>
<td>Sea salt</td>
<td>75</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>Araltuz</td>
<td>Lake salt</td>
<td>350</td>
<td>90</td>
<td>70</td>
<td>Kyrgyzstan, Uzbekistan</td>
</tr>
<tr>
<td>Romania</td>
<td>Salrom</td>
<td>Rock salt and solution mining</td>
<td>2,200</td>
<td>200</td>
<td>120</td>
<td>Moldova</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>Bassol</td>
<td>Lake salt</td>
<td>1,250</td>
<td>450</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>Russian Federation</td>
<td>Silvinit</td>
<td>Kali by-product</td>
<td>900</td>
<td>90</td>
<td>30</td>
<td>Kazakhstan</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>Iletskol</td>
<td>Rock salt mining</td>
<td>350</td>
<td>250</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Russian Federation</td>
<td>Tyretskii Solerudnik</td>
<td>Rock salt mining</td>
<td>300</td>
<td>90</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Tajikistan</td>
<td>Koni Namak</td>
<td>Solution mining</td>
<td>45</td>
<td>30</td>
<td>20</td>
<td>Kyrgyzstan, Uzbekistan</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>Namaki Yvon</td>
<td>Solution mining</td>
<td>15</td>
<td>15</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>Guvlyduz</td>
<td>Lake salt</td>
<td>80</td>
<td>35</td>
<td>35</td>
<td>Georgia, Russia, Romania, Azerbaijan, Belarus, Kazakhstan, Moldova, Armenia</td>
</tr>
<tr>
<td>Ukraine</td>
<td>Artemsol</td>
<td>Rock salt mining</td>
<td>950</td>
<td>450</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>Uzbekistan</td>
<td></td>
<td>Lake salt</td>
<td>240</td>
<td>160</td>
<td>70</td>
<td>Kyrgyzstan</td>
</tr>
</tbody>
</table>

first data were consolidated in a regional database that was used in the preparation for a Regional Salt Producers Meeting in Kiev, Ukraine, in 1999 [22]. At around that time, UNICEF also provided material support to the major salt producers in the CIS countries in an early attempt to help re-establish the practice of quality iodization of the salt supplies.

Regional priority-setting

A review of early UNICEF experiences in the region during 1997 [21] led to an increase in the emphasis on USI strategies, supported by a regional agenda aimed to assist and complement UNICEF’s country and area offices in the development of national capacity for USI strategies. At the turn of the century, several meetings attended by experts with global experience assisted the UNICEF Regional Office in Geneva in devising a draft regional strategy, which was followed by the creation of a post of Nutrition Officer, tasked to manage UNICEF’s support in networking for advocacy and technical assistance and to stimulate regional meetings for partnership formation, fund-raising, and assistance to address managerial and technical issues, training, and monitoring systems.

Multisector approach

In accordance with UNICEF corporate practice, the regional office adopted the promotion of USI strategies by multisector collaboration through the country offices that became established in the course of the 1990s in all the countries of the region. By the mid-1990s, the realization had begun to dawn globally that the USI goal could not be pursued with success by a government-led approach in combination with scientist-organized meetings. As a first attempt to bring multisector stakeholders together, UNICEF supported a training workshop in Tbilisi, Georgia, in June 1998 [23]. Although participation in this course fell somewhat short of the high expectations, officials from parliament and health ministries, as well as employees of Sanitary–Epidemiologic Services, nutrition institutes, standards bureaus, NGOs, salt industry and trade, and scientific institutions, were engaged in the one-week sessions. The report of the training exemplifies the need for, and a newly growing understanding of, the many interconnections and linkages that need to be addressed in tackling the challenges in salt iodization, communication, monitoring of supplies, and iodine nutrition and for decisions on legislation and regulation. As argued above, the iodization of salt was not new in the region, but partnership collaboration among the stakeholders was a new concept and needed to be promoted.

Regional support

In 2001, when the elimination of IDD through USI was formally made a regional priority for UNICEF, UNICEF and its collaborating partners in the region substantially increased support to the national efforts in advocacy, stakeholder mobilization, partnership collaboration, stepping up salt iodization, ensuring public acceptance, developing systematic monitoring, and influencing scientific understanding. Crucial in these efforts has been financial support from and collaboration with Kiwanis International’s Worldwide Service Project, USAID, the Bill and Melinda Gates Foundation, the US and the Netherlands Fund for UNICEF, and the International Micronutrient Malnutrition Prevention and Control Program (IMMPaCi) program of the CDC, while technical support and collaboration were obtained from the Asian Development Bank, ICCIDD, WHO, EU Salt, the USAID-Sponsored Micronutrient Project (MOST), the Program Against Micronutrient Malnutrition (PAMM), and the Network for Sustained Elimination of Iodine Deficiency.

UNICEF’s emphasis in regional and national advocacy was steadily focused on promoting mandatory legislation as a necessary foundation for reaching the USI target and the goal of elimination of IDD in the most equitable, cost-effective, and timely fashion [1]. The success of USI strategies requires high-level political support, mutual collaboration, and harmonized conduct across the region. A significant step toward these ends was the adoption in 2001 of a CIS-wide agreement among the heads of state of the CIS [24] that signaled the political determination on the use of a unified iodization standard, agreement on practical enforcement by the Sanitary–Epidemiologic Services, and mutual acceptance of conformity certificates in the trade of iodized salt across borders.

Advocacy for USI became channeled to and via high-level authorities in regional and global forums. For example, the Prime Minister of Bosnia and Herzegovina shared the progress of the USI strategy and elimination of IDD in his country at the UN Special Session on Children in New York in 2002, and nine countries of the region participated in October 2003 at a high political level in the International Conference on IDD Elimination in Beijing. Within the CIS area, UNICEF goodwill ambassador and former chess world champion Anatoly Karpov advocated for USI legislation through his high public celebrity profile and his personal access to politicians and other gatekeepers. Nationally, UNICEF organized a variety of advocacy efforts in close collaboration with like-minded partners, such as scientific associations (Bosnia and Herzegovina, Bulgaria, and Macedonia) and civic organizations (Azerbaijan, Georgia, Tajikistan, and Ukraine). Innovative advocacy material on the
economic rationale for USI strategies was produced in collaboration with the Micronutrient Initiative in 2004 by a series of damage assessment/protection audit reports that exposed the national economic and social costs of continued iodine deficiency. In the CEE/CIS Region, the Kyrgyz Republic and Moldova were examples of countries where these reports reached high-level decision makers and drew major media attention. The “social and economic damage” approach was also used in an expanded and more detailed fashion during high-level national round tables in Ukraine, the Russian Federation, and Uzbekistan.

Building technical capacities in the countries of the region was pursued in many forms: several regional and subregional workshops and training courses (often in collaboration with technical partners such as MOST, the Asian Development Bank, ICCIDD, IMMPaCt, etc.), international exchange of experiences (study tours and conference attendance), and technical assistance by expert consultants. Several intercountry study tours succeeded in facilitating face-to-face discussions among the technicians in the food-processing industries who became exposed to the business practices of their peers in other countries where iodized salt was accepted as a basic ingredient in the industrial manufacturing of common foods such as bread, sausages, cheese, etc.

To raise awareness, build partnerships, and strengthen the expanding iodized salt supplies, national, regional, and subregional salt producers’ meetings were organized in Moscow (1997 and 2002), Kiev (1999), Tashkent (2002), Bishkek (2004), and again Tashkent (2006). National capacity development and technical assistance frequently took the form of a national workshop with a dedicated training purpose. Regional and subregional technical training courses were held with multiple sector participation, including meetings and/or workshops in Almaty on micronutrient strategies (2003) and on monitoring and evaluation (2004), national strategy development training in Ankara (2004) and Antalya (2005), and a workshop on iodine assessment and laboratory technology in Istanbul (2006). Through its network of country offices, UNICEF has continually promoted ample publicity of the key events and achievements with frequent media information and press releases.

Subregional collaboration developed over time also. In particular, the Central Asian and Balkan countries developed close ties within their areas and jointly developed communication approaches, piloted monitoring mechanisms, and maintained continuous exchange of information.

Two important program management tools were developed by the UNICEF Regional Office: an iodine resource package* and a so-called indicator framework. The iodine resource package enables national IDD managers to find relevant resource materials for all strategy components, experiences from other countries, and general background information. It also includes links to other websites and best practices of other countries. The indicator framework lists critical success factors for the elimination of IDD and can be used to obtain an overview of the progress of all strategy elements and to identify gaps or comparative weaknesses in strategy implementation.

Salt iodization status at the beginning of the decade

At the beginning of the decade in CEE/CIS, the use in households of adequately iodized salt (15 mg iodine/kg salt and above) was universal in Macedonia (fig. 3), and in five others (Armenia, Bulgaria, Kosovo, Serbia and Montenegro, and Turkmenistan), more than half of households were using adequately iodized salt. The overall regional average household coverage was estimated at 26%.


Objectives, approach, and methods

The present study aimed to explore and analyze the USI strategies and offers lessons learned from the design, timing, multisector management, execution, and results of concerted actions by stakeholders in 20 countries, with special reference to the first decade of the 21st century. The study was a formative evaluation, meaning that its purpose was not to examine the accountability for actions under the USI strategy, nor was the study an immediate effectiveness evaluation of the various USI components and elements. Instead, the study attempted an impartial analysis of resources, events, actions, experiences, outcomes, and results that contributed, alone or in combination, to the national progress in USI and the elimination of iodine deficiency, including the positive and possibly negative effects of such actions.
Steps in the analysis

The study started out with a desk review of reports on IDD and USI from the countries in the region, especially findings from planning and monitoring, to more precisely inform the methodology and instruments for country analyses. The outcome of this step was a collection of “country vignettes” that summarizes the information in each country: *What* occurred and was achieved, *when* it was achieved, and, if possible, *who* among the involved stakeholders took the action. The achievements in each country summary were described in terms of strategy inputs (such as national legislation, communication actions, and oversight efforts), outcomes (especially the iodized edible salt supplies), and impact on iodine nutrition indicators (such as UI levels in the population). The country summaries are reported in alphabetical order in the Appendix to this report.

In the second part of the analysis, the findings in the country vignettes were placed in an overall framework that set the USI inputs and achievements in the sequential order as expected from a typical logframe approach [25]. The purpose of combining the experiences across the countries in the region was to illuminate and explore any common patterns or experiences that would appear from the succession of inputs, outcomes, and results. The findings of this step are reported in the next section.

The final part of the study aimed to extract lessons learned from the experiences in pursuit of the USI strategy in the region. In this part, the common patterns discovered in the previous step were compared with similar reports in the literature, followed by an overall conclusion and recommendations for next steps in research, and in programming and practice of the USI strategy. The Discussion and Conclusions sections describe the lessons learned and offers the conclusions of this study.

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Progress toward USI in the region

The recommendation by the UNICEF-WHO Joint Committee in 1994 to adopt USI [1] was addressed to countries with a significant IDD problem, which was or had been the case in the countries selected in this report. With the exception of Ukraine, the question whether IDD objectively signified a public health issue was therefore typically not challenged during the national consultations about adoption of a salt iodization strategy.

National decisions on legal frameworks

With evidence of the nature and extent of a public health problem available, politicians and lawmakers usually remain hesitant to make a policy decision of national stature. In many cases, therefore, the enactment of a law and/or national USI regulation demands persuasive testimony from the stakeholders about the feasibility and institutional capacity for executing a
recommended strategy. Each country summary reports a principle decision on the adoption of the USI strategy at some point in time. Often—but not invariably—this decision included the formation of a coordination structure or mechanism for the facilitation of concerted actions by the principal stakeholders. This process and the final shape of the USI strategies took different forms in different countries.

Most of the reports reviewed do not contain the details of the events leading up to a decision (i.e., the intensity or origin of advocacy and testimony), nor are the considerations regarding why a decision was taken by the authority in the case always reported (i.e., by the Council of Ministers, the President or Prime Minister, the Ministry of Health, or the Chief Sanitary Physician), or why the decision was enacted in the reported legislative form (i.e., a principle law, decree, or otherwise). In promoting acceptance among lawmakers, high-level advocacy by UNICEF, often with Regional Ambassador Anatoly Karpov’s involvement, has played a key role. In addition, as global experience shows, the salt industry typically demands a principle decision to level the playing field of national competition. This was apparent during the various salt producers’ meetings, and it underlay the decisions in Armenia and Romania, where the major national salt company wished to shield the national market against undue competition from the suppliers from outside.

It must be assumed that the laws and decrees enacted on USI are intended to be binding, but the fact that in some countries the supply of iodized salt did not change or changed only marginally after the statutory decision suggests that the enactment by lawmakers was not always followed by a conscious effort to hold the stakeholders to account. A low resulting response in the national iodized salt supply would indicate that the salt industry did not abide by the decision and that, at the same time, the food inspection authority did not insist on enforcement of its decision. Examples of such a situation during the period of review are reported in the country summaries for Albania (before the current law), Azerbaijan, Georgia (before the change of government in 2005), the Kyrgyz Republic, Moldova, and Romania. Examples of countries where the passage of USI statutes was followed by evident increases in the national iodized salt supplies and due diligence in enforcing the set iodization standards are reported in the summaries for Bulgaria, Kazakhstan, Kosovo, Macedonia, Serbia, and Turkmenistan.

In the majority of country cases, the principle decision comprised a “true USI strategy,” encompassing the entire supply of salt destined for both the food industry and the households (i.e., Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Georgia, Kazakhstan, Kosovo, the Kyrgyz Republic, Macedonia, Montenegro, Serbia, Tajikistan, and Turkmenistan). In some countries, the principle decision was mainly focused on the consumer salt fraction (Moldova, Romania, and Uzbekistan) or on the salt used in the food-processing industry (Belarus), or the decision had more the character of a recommendation rather than being compulsory (the Russian Federation). The record of several countries also shows instances, some in the past, where the use of iodine supplements was included as part of the national approach, e.g., most of the Balkan countries as well as Bulgaria and Romania previously, and presently Uzbekistan.

Table 2 (first column) lists the different statutory decisions in force at the end of the decade. A detailed analysis of the attendant rules in each case is beyond the scope of this report. Such an analysis may be considered useful among the next steps in countries that are lagging in progress toward USI.

National progress and attainments

The information that reflects the progress attained in USI in the region is categorized in the second, third, and fourth columns of Table 2 as:

» Input indicators (Provision)
  — Production and supply situation of iodized salt;
  — Ancillary information on industry input sourcing or practices in supplies.

» Outcome indicators (Use)
  — Access to and utilization of iodized salt in food industry, coverage in households; amount, timing, and quality characteristics;
  — Ancillary information on household consumption and use in food industry.

» Impact indicators (Effect)
  — Iodine status of population groups: schoolchildren and pregnant women; adequacy, timing, and pertinent contrasts;
  — Ancillary information on biomarkers and/or functional outcomes, if any.

An analysis of the linkage and sequence of changes in these indicators yields information described by Habicht et al. [26] as a statement of adequacy: when substantive improvements are evident in the development of processes, outcomes, and impact indicators, the strategy is having an important effect. The results of this analysis are particularly informative in those cases where the end situation contains information on three achievements, namely:

» Quality iodization of all the edible salt has been attained by the salt producers/suppliers;
» The amount and use of iodized salt in the supply channels has reached sufficiently high levels; and
» Adequate impact has taken place on the iodine status of the population.

The extent to which each of these stages had been completed during the decade differed between the countries in the region. This gives rise to a classification
### TABLE 2. Key progress indicators of USI strategies

<table>
<thead>
<tr>
<th>Country, statutory decision, year, level</th>
<th>Indicators of provision</th>
<th>Indicators of use</th>
<th>Indicators of population impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Albania, parliamentary USI law, 2008, 25 mg iodine/kg salt</strong></td>
<td>Practically all salt is imported, 80% from Greece. Local salt company (Vlora) is barely viable</td>
<td>77% of households use Niki brand (from Greece), which is reportedly well iodized</td>
<td>No data</td>
</tr>
<tr>
<td><strong>Armenia, government decree, 2004, 50 ± 10 mg iodine/kg salt, KIO₃ only</strong></td>
<td>Avan Salt Company capacity is self-sufficient and fully adequate</td>
<td>Universal. Potential leakage from Georgia and/or Iran</td>
<td>Complete, but no data</td>
</tr>
<tr>
<td><strong>Azerbaijan, parliamentary USI law, 2001, 40 ± 15 mg iodine/kg salt, KIO₃ only</strong></td>
<td>50% imported from Ukraine and Turkey, 50% from small factories at Masazyr Lake (Baku)</td>
<td>Most imported salt is iodized. Masazyr Lake companies supply variable quality</td>
<td>Yes, but no data</td>
</tr>
<tr>
<td><strong>Belarus, 2001 government resolution, USI in food industry and catering, 40 ± 15 mg iodine/kg salt, KIO₃ only</strong></td>
<td>Mozyr Company and BelarusKaliy (local small amounts). Fully adequate</td>
<td>Universal. All bread producers and most meat and dairy processors, some food companies reluctant</td>
<td>2006: 60% ≥ 15 mg iodine/kg salt, SI 21.2 mg iodine/kg salt</td>
</tr>
<tr>
<td><strong>Bosnia and Herzegovina, FBH: USI law, 2001, 20–30 mg iodine/kg salt, both KIO₃ and KI permitted; RS: USI regulation, 2005, 20–30 mg iodine/kg salt, KIO₃ only</strong></td>
<td>Tuzla Company is self-sufficient and fully adequate, plus imports from Croatia</td>
<td>Universal</td>
<td>Yes, but no data</td>
</tr>
</tbody>
</table>

*continued*
<table>
<thead>
<tr>
<th>Country, statutory decision, year, level</th>
<th>Indicators of provision</th>
<th>Indicators of use</th>
<th>Indicators of population impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georgia, presidential USI law, 2005, 40 ± 15 mg iodine/kg salt, KIO₃ only</td>
<td>All salt is imported, mainly from Ukraine</td>
<td>Universal</td>
<td>Small survey in 2007 found food industry mostly in compliance</td>
</tr>
<tr>
<td>Kazakhstan, parliamentary USI law, 2003, 40 ± 15 mg iodine/kg salt, KIO₃ only</td>
<td>Aral Tuz (70%) and 2 other companies, small imports from Russian Federation</td>
<td>Universal</td>
<td>SES inspections show appropriate use by food companies</td>
</tr>
<tr>
<td>Kyrgyz Republic, parliamentary USI law, 2001, 40 ± 15 mg iodine/kg salt, KIO₃ only</td>
<td>75% processed in approximately 15 small local companies; 25% imported from various sources</td>
<td>Universal, but iodized at too low level</td>
<td>Traditional bakeries are using iodized (consumer) salt</td>
</tr>
<tr>
<td>Country</td>
<td>Iodine Level</td>
<td>Iodine Source</td>
<td>Iodine Regulation</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------</td>
<td>---------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Macedonia</td>
<td>20–30 mg iodine/kg</td>
<td>All salt imported</td>
<td>Universal</td>
</tr>
<tr>
<td></td>
<td>KIO₃ only</td>
<td>from various sources.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>One small local processor (Solbit)</td>
<td></td>
</tr>
<tr>
<td>Moldova</td>
<td>25–35 mg iodine/kg</td>
<td>All salt imported</td>
<td>Iodized salt</td>
</tr>
<tr>
<td></td>
<td>KIO₃ and KI permitted</td>
<td>mainly from Ukraine</td>
<td>imports are being undercut by illegal noniodized salt supplies</td>
</tr>
<tr>
<td>Montenegro</td>
<td>12–18 mg iodine/kg</td>
<td>Most salt imported, Tuzla major source, local company at Ulcinj is fledgling</td>
<td>Universal</td>
</tr>
<tr>
<td></td>
<td>KIO₃ and KI permitted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>15–25 mg iodine/kg</td>
<td>Salrom is the major producer, import from Ukraine (mostly noniodized)</td>
<td>Universal</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>40 ± 15 mg iodine/kg</td>
<td>Large Russian salt companies unified. Import approximately 1/3 of consumer salt, mainly from Ukraine and Belarus</td>
<td>Universal</td>
</tr>
</tbody>
</table>

### Notes:
- **Macedonia, government rule book, 1999:** 20–30 mg iodine/kg salt, KIO₃ only.
- **Moldova, government decree, 1997:** 25–35 mg iodine/kg salt, both KIO₃ and KI permitted.
- **Montenegro, former Yugoslav USI legislation, 1999:** 12–18 mg iodine/kg salt, both KIO₃ and KI permitted.
- **Romania, government decision, 2002:** 15–25 mg iodine/kg salt, both KIO₃ and KI permitted, staged introduction for table salt and bread bakeries.
- **Russian Federation, national standard for iodized salt prescribes:** 40 ± 15 mg iodine/kg salt if salt is iodized, KIO₃ only.
<table>
<thead>
<tr>
<th>Country, statutory decision, year, level</th>
<th>Indicators of provision</th>
<th></th>
<th>Indicators of use</th>
<th>Indicators of population impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sourcing</td>
<td>Supplies</td>
<td>In food industry</td>
<td>In households</td>
</tr>
<tr>
<td>Serbia, former Yugoslav USI legislation, 12–18 mg iodine/kg salt, KIO₃ and KI permitted</td>
<td>All salt is imported, mostly from Tuzla and other sources. One local processor, So Product; good QA</td>
<td>Universal</td>
<td>Yes, but no data</td>
<td>2007: National survey: schoolchildren 195 µg/L and pregnant women 158 µg/L. Pregnant women not using supplements were deficient. 1998–2000: Schoolchildren 2.8% elevated Tvol (BSA reference)</td>
</tr>
<tr>
<td>Tajikistan, parliamentary USI law, 2002, 40 ± 15 mg iodine/kg salt, KIO₃ only</td>
<td>Local companies supply sufficient quantity and have self-sufficient production QA</td>
<td>Universal. Abundant salt deposits in Kathlon are sourced by local traders</td>
<td>Yes, but no data</td>
<td>2009: National survey: Children &lt; 5 yr 117 µg/L and women of reproductive age 108 µg/L</td>
</tr>
<tr>
<td>Turkmenistan, presidential decree, 2003, 40 ± 15 mg iodine/kg salt, KIO₃ only</td>
<td>Guvlyduz salt company fully sufficient and proper QA</td>
<td>Universal according to SES inspections</td>
<td>Complete</td>
<td>2007: National survey: schoolchildren 139 µg/L and pregnant women 130 µg/L</td>
</tr>
<tr>
<td>Ukraine, national standard for iodized salt prescribes 40 ± 15 mg iodine/kg salt if salt is iodized, KIO₃ only</td>
<td>Artemsol supplies main share. All salt companies united under &quot;Ukrsol&quot; association</td>
<td>Iodized salt is supplied upon specification in the purchase orders (no shortage of supply capacity)</td>
<td>None</td>
<td>2003: National survey: Children &lt; 5 yr 73 µg/L and women of reproductive age 94 µg/L</td>
</tr>
</tbody>
</table>

Solid estimates of cost-effectiveness on health and national economy. Randomized, controlled trial in Donetsk shows that use of iodized salt in households alone is insufficient to raise UI in pregnant women to desirable level.
### USI progress in the CEE/CIS Region during 2000–09

The progress of universal salt iodization (USI) from a regional perspective (the “2009 end situation”), as follows [27]:

- **USI was achieved and adequate iodine status demonstrated** in Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Georgia, Kazakhstan, Kosovo, Macedonia, and Turkmenistan;
- **USI was close** in Azerbaijan, the Kyrgyz Republic, Moldova, Montenegro, Romania, and Serbia;
- **Operational challenges** remained in Albania, Tajikistan, and Uzbekistan;
- **Political challenges** prevented a principle national decision for the USI strategy in the Russian Federation and Ukraine.

#### USI achieved, with demonstration of adequate iodine status

- All food companies are using iodized salt (no data reported).
- 97% of households use adequately iodized salt (> 15 mg iodine/kg salt) on quantitative assays.
- Median UI in schoolchildren, 313 µg/L.

- The majority of the food companies and 94% of the households are using iodized salt.
- Median UI in schoolchildren, 179 µg/L.

**Bosnia and Herzegovina** (separate decisions in the Federation of Bosnia-Herzegovina and the Republika Srpska, both aimed at USI): two nationwide surveys, one of schoolchildren (2005) and the other of pregnant women (2008).
- Iodized salt is being used in the food-manufacturing companies (no data reported).
- Salt iodine content in the households: 2005, 23.1 mg iodine/kg salt, 41% within the mandated range of 20 to 30 mg iodine/kg salt; 2008, 26.5 mg iodine/kg salt; no noniodized salt found in the households.
- Median UI: schoolchildren, 157 µg/L; pregnant women, 157 µg/L (Federation of Bosnia and Herzegovina) and 160 µg/L (Republika Srpska).

**Bulgaria** (Council of Ministers ordinance in 2001): national survey of schoolchildren (schools) and pregnant women (clinics) in 2003, with oversampling in previous endemic areas.
- Iodized salt is universally used in the food companies and the households.
- Median UI: 197 µg/L in schoolchildren and 165 µg/L in pregnant women (no difference between women reporting and those not reporting the use of iodine supplements).
» Virtually all food companies use iodized salt, and 91% of households use adequately iodized salt (≥ 15 ppm by rapid test kit).
» Median UI in schoolchildren, 321 µg/L.

» All food companies are using iodized salt; salt iodine content in households, 25.6 mg iodine/kg salt, with 77% within the mandatory range of 25 to 55 mg iodine/kg salt.
» Median UI in 15- to 49-year-old women, 249.5 µg/L.

Kosovo (Minister of Health decision in 2008): national school-based survey, connected to prenatal clinics in 2009.
» All food companies are using iodized salt; mean salt iodine content in households, 16.5 mg iodine/kg salt, with 21% within the mandated range of 18 to 23 mg iodine/kg salt; no noniodized salt found in the households.
» Median UI: 176 µL in schoolchildren and 183 µL in pregnant women.

Macedonia (government decision in 1999): national school-based surveillance system (annual surveys 2000/03).
» All food companies are using iodized salt, and Sanitary–Epidemiologic Services inspections show that 65% to 70% of the salt in retail markets, catering, large kitchens, and food companies is within the mandated range of 20 to 30 mg iodine/kg salt.
» Median UI in schoolchildren, 191 µg/L (2003).

» All food companies are using iodized salt, and Sanitary–Epidemiologic Services reports show that all salt supplies in retail markets, catering, large kitchens, and food companies are iodized ≥ 15 ppm (by rapid test kit).
» Median UI in schoolchildren, 170 µg/L.

Although not all the process, outcome, and impact indicators in this category of countries are uniform, the information from the nine countries collectively provides strong evidence that the enactment of true USI was accompanied by a sufficient ("universal") supply of adequately iodized salt in the channels of the food industry and/or the households, which in turn was followed by an evident increase in the iodine nutrition status of the population. The findings demonstrate high plausibility that the true USI strategy can effectively overcome iodine deficiency as a national public health problem.

The details of the available information on inputs, outcomes, and impact of the various USI strategies demonstrate a varied constellation of factors in each of the countries in this category. Further fine-tuning of the mandated iodization levels may be desirable in Armenia, Georgia, and Kazakhstan (downward) and perhaps Kosovo (upward). The common theme of the country summaries in this category remains the same, however: Adequate uniform iodization of all the salt that enters the national supply channels to the food-manufacturing companies and the households ensures the delivery of a steady amount of additional iodine in the common diet, resulting in optimum iodine nutrition of the population.

USI close, iodine nutrition has improved but not reached optimal level

» No data on whether food-manufacturing companies are using iodized salt; 77% of the households use iodized salt with ≥ 15 mg iodine/kg salt; 45% of salt is in the mandated range of 25 to 55 mg iodine/kg salt.
» Median UI, 204 µg/L in schoolchildren and 195 µg/L in pregnant women.

» Traditional bread bakeries are using iodized salt; unknown whether other food companies are using it; 39.5% of households use iodized salt with ≥ 15 mg iodine/kg salt; 15% of salt is in the mandated range of 25 to 55 mg iodine/kg salt.
» Median UI, 114 µg/L in schoolchildren and 111 µg/L in pregnant women;
» Increase in thyroid volume in pregnant women with increased duration of pregnancy.

» Food industry is generally reluctant to use iodized salt; 34% of the salt in households is not iodized; more salt is iodized in rural (44%) than in urban (18%) areas (rapid test kit).
» Median UI in 9- to 11-year-old schoolchildren, 165 µg/L; lowest status in rural households not using iodized salt.

» Food companies are using iodized salt (no data reported). Mean iodine content in household salt is 12.4 mg iodine/kg salt, with 53% of salt in the
**USI progress in the CEE/CIS Region during 2000–09**

The mandatory range of 12 to 18 mg iodine/kg salt. No noniodized salt found in the households.

» Median UI, 174 µg/L in schoolchildren and 134 µg/L in pregnant women. Iodine deficiency persists in northern Montenegro.


» Iodized salt was not being used in the food companies at the time of the survey; 74% of households used iodized salt with ≥ 15 mg iodine/kg salt; mean salt iodine content, 25.3 mg iodine/kg salt, with 31% of salt in the mandated range of 12 to 18 mg iodine/kg salt.

» Median UI, 101 µg/L in schoolchildren and 68 µg/L in pregnant women.

**Serbia** (former Yugoslavia legislation): national school-based survey, extended to prenatal clinics in 2007.

» Food companies are using iodized salt (no data reported). Mean salt iodine content in households is 13.9 mg iodine/kg salt, with 76% of salt in the mandatory range of 12 to 18 mg iodine/kg salt. No noniodized salt found in the households.

» Median UI, 194 µg/L in schoolchildren and 158 µg/L in pregnant women; 146 µg/L in pregnant women not using iodine-containing supplements.

In this category, national decision-making resulted in legislation or regulation aimed at compulsory USI, but the actions to assure proper iodization at source and adequate iodized salt use in the food industry and/or consumer channels was not sufficient in all cases. The latest information on the iodine nutrition status of the population of the countries in this category shows minor differences from optimal levels.

Montenegro and Serbia (and perhaps Azerbaijan) are arguably closest to graduating into the category of countries with successful USI achievement plus attainment of adequate iodine nutrition. All of these countries pursue a true USI strategy, i.e., the mandate includes the salt supplies for the food-manufacturing companies and the households. The remaining issues in Azerbaijan are the imperfect iodization practices in the small salt companies at Lake Masazyr near the capital of Baku, whereas in Montenegro and Serbia, the mandated iodization levels of 12 to 18 mg iodine/kg salt, enacted in the time of the former Yugoslavia, may be too modest to assure the attainment of optimum iodine nutrition throughout the entire population.

In the Kyrgyz Republic, most domestic and foreign salt supply companies are not acting in conformance with the mandatory iodization standards, which affects the supply channels to both the food-manufacturing companies and the households, whereas in Moldova a permissive regulatory attitude inhibits the complete provision of iodized salt in the supply channels of both the food industry and the households. This has led to evident weaknesses of impact in both cases. The law in Romania at the time of the survey in 2004 addressed table salt only and had been enacted shortly before the time of the national survey. To improve iodine nutrition levels across the population in Romania, the use of iodized salt in bread bakeries would appear critical in view of the widespread belief that iodized salt is improper for home food preservation and the limited authority of local health officials in quality control of the consumer markets.

With the exception of Montenegro and Serbia, therefore, improved inspection and enforcement of the mandatory salt standards in all the supply channels appears a common theme for action that should help propel countries in this category to success.

**USI not accomplished, iodine nutrition suggests insufficient impact**


» No data on whether food companies are using iodized salt; adequately iodized salt (rapid test kit) was used in 60% of households, with higher rates in urban than in rural areas.

» Median UI, 86 µg/L in schoolchildren and 95 µg/L in pregnant women. Rural areas are more iodine deficient than urban areas.


» No data on whether the food companies are using iodized salt; adequately iodized salt (rapid test kit) was present in 58% of the households; rural households in DRD Oblast and Gorno-Badakhshan Autonomous Oblast (GBAO) had the lowest use.

» Median UI, 117 µg/L in schoolchildren and 108 µg/L in nonpregnant women.


» The law does not mention an obligation that the food industry should use iodized salt; 53% of households (rapid test kit) used adequately iodized salt in 2006; self-reporting by salt producers indicates that 60% to 65% of the estimated national salt need was iodized;

» School-based surveys in some regions show sufficient median UI levels in schoolchildren; no data on iodine nutrition in pregnant women.

In Albania and Tajikistan, national lawmakers have enacted the principle decision for USI, but the follow-through in both cases suggests weakness and obstacles in enforcing the agreed standards in the supply channels. Albania has stepped up enforcement since 2008.
Progress in Tajikistan is hindered by easy access to noniodized salt from numerous salt deposits in Khatlon Oblast.

In Uzbekistan, lawmakers opted to enact a law that combines official support for ensuring full access to iodized salt in the consumer markets with a permissive attitude to the use of (other) iodized foods and continued use of iodine supplements, while the food-manufacturing industry is not obliged to use iodized salt. The national effort to eliminate IDD in Uzbekistan has become incorporated in a national Nutrition Investment Strategy, while moving the USI achievement deadline forward to 2015.

The delay in each country in this category in reaching complete iodized salt penetration in the supply channels is due not to lack of political will to legislate but to weakness in follow-through.

**Acceptance of the USI strategy faces political challenges**

**Russian Federation** (resolution by the Chief Sanitary Physician in 1998 endorsed the standard of 40 ± 15 mg iodine/kg salt and exclusive use of potassium iodate for salt if it is iodized); no formal national survey.

» In the absence of an obligation, the Russian food industry does not use iodized salt; the use of iodized salt in households is estimated at 30% to 35%.

» Local surveys in nine administrative divisions throughout the Russian Federation show persistently low UI in samples of school-age children. No data are available on iodine nutrition in pregnant women.

**Ukraine** (decree of the Cabinet of Ministers in 1997 endorsed the standard of 40 ± 15 mg iodine/kg salt and exclusive use of potassium iodate for salt if it is iodized); national survey of women aged 15 to 49 years in 2002.

» In the absence of an obligation, the food industry in Ukraine does not use iodized salt; the use of iodized salt in households is estimated at approximately 20%.

» The national survey in 2002 found a median UI of 90 µg/L in nonpregnant women.

The common underlying factor for the persistent delays in enacting a USI strategy in the Russian Federation and Ukraine is the lack of consensus among the principal stakeholders that would compel the lawmakers. Although the two cases differ somewhat in an assessment of why this is the case, the very aggressive promotion of “alternative” iodine-fortified food products and, especially, potassium iodide supplements by commercial interests is a key obstacle to obtaining increased agreement and common support for mandatory legislation on salt iodization in these countries [28].

The Russian salt-producing industry has taken a constructive position overall. The Russian Salt Producers Association voiced its support for enacting the USI strategy at several points in time, but it has not adopted it as the industrial norm in the face of a strong national anticartel directive. The data that iodine deficiency persists in major parts of the Russian Federation are convincing, though not exceptionally strong. Influential nutrition scientists have stated their preference for the adoption of a so-called all-encompassing approach. Although their position does not deny that USI is effective, it implies that the provision of alternatives—i.e., commercial supplements—is as effective. Furthermore, their stated preference does not address the known inequality in the intake of iodine among individuals that results from leaving the success of voluntary salt iodization to consumer choice, nor does it acknowledge the risk of excess iodine from multiple intake sources among the higher-income sections of the society. Lawmakers, finally, refer to the Russian Constitution to emphasize the freedom of consumer choice and entrepreneurship in their objection to mandatory USI [28].

In Ukraine, the position of the Salt Producer Association Ukrsil, dominated by the Artemsol Company, has remained passive throughout the decade. The achievement of USI in neighboring countries (Georgia as the best example) demonstrates that Artemsol has been true to their commitment that once their customers order iodized salt, they will provide it. However, despite the fact that the results of the national survey in 2002 provided clear evidence that the population of Ukraine was iodine deficient, Artemsol has not advocated or supported the national need for salt iodization promotion, nor has it made any voluntary effort to increase their sales of iodized salt in Ukraine. Moreover, the influential health advisors in Ukraine have persisted in a preference for dividing the Ukrainian geography into parts that are affected by iodine deficiency and those that are not, thereby undermining the national approach principle. In addition, a reputable national NGO, Women of Ukraine, has objected strongly against USI, arguing the right of free consumer choice.

The barriers to an enactment of statutory national regulations have led to different situations in these two countries. The like-minded partners in the Russian Federation, including the salt producers, are continuing to work jointly on finding a solution for national progress on USI, which recently has included an effort to mobilize the bread industry into acceptance of iodized salt as the common recipe ingredient. In Ukraine, the passive attitude of the salt industry and the lack of support among influential health scientists and NGOs for the adoption of a USI strategy has spawned some oblast-level initiatives to promote the use of iodized salt in the households by communication efforts. Some initiatives have proved successful in significantly raising the household use of iodized salt [29], and these...
experiences are taken as a model for similar promotion in other oblasts.

**Underlying factors in the progress toward USI**

In this part of the report, information from the previous section is connected to the key efforts and achievements in the three technical components of the USI strategy. To recapitulate, the three components and their elements (Section 2) were the following:

- **Salt iodization**: adequate capacity and technology, secure self-procurement of inputs, quality assurance during production, access to customers, and product promotion;
- **Communication**: stimulation of public acceptance, maintenance of a strong and permanent national constituency, education of professionals, and keeping opinions among gatekeepers favorable;
- **Monitoring**: regular data collection and interpretation of inputs, activities, outputs, and results for joint multisector decision-making, and periodic reporting about the state of the strategy in preventing the occurrence of the problem.

The country summaries (Section 5) offered detailed summaries from the reviews of reports from each country, which led to the “end situation” description above. **Table 3** puts this information in a matrix of actions in the three key technical components, where possible showing their strengths and limitations in the ability to stimulate overall progress toward successful USI attainment. The actions for each component reported in **table 3** were chosen to describe the situation in the various elements recapitulated above.

**Salt iodization**

Of the nine countries where USI was achieved (category I), three (Georgia, Kosovo, and Macedonia) depend entirely on importation of salt from foreign producers. Complete, adequately iodized salt supplies in each case were achieved by close inspection and release of the shipments of imported salt, followed, when needed, by disciplinary action to enforce compliance with the national salt iodization standard. The three cases provide evidence that true USI can succeed in countries dependent on imported salt by due diligence in inspection and enforcement of the national standards at the import stage. In each case, the shipments of imported salt arriving at the border are released only upon a successful inspection or verification by the national food authority. In Kosovo, unlawful salt is diverted to other uses, whereas in Macedonia, noncomplying salt shipments are returned to the original supplier. Because the import firm bears the costs of these consequences, this procedure appears to be an effective deterrent. The same rule of conduct is practiced in other countries in this category where part of the national salt needs is imported: examples are Bosnia and Herzegovina (import from Croatia), Bulgaria (import from various foreign sources), and Kazakhstan (import from the Russian Federation).

In all six other countries in this category (Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Kazakhstan, and Turkmenistan), the salt industry is fully self-sufficient in input procurement, including fortificant access and purchase. The information in each case shows that iodized salt is also being used in the food-manufacturing industry; in fact, the salt supply to the food industry is the mandated tactic for additional iodine consumption of the population in Belarus. Inspection and enforcement of national standards in these six countries takes place routinely at production under the responsibility of the Sanitary-Epidemiologic Services (for food inspection) and the Technical Regulation and Metrology Branch of the Ministry of Trade and Industry (for management practice, including product certification).

In the six countries close to USI achievement (category II), the practices depend on the national salt production and supply situation. Romania is self-sufficient in national salt supply capacity, although some salt continues to be supplied from Ukraine. The national producer of Romania, Salrom, is self-reliant in input procurement. All of the other countries depend on imported salt, either completely (Moldova, Montenegro, and Serbia) or partially (Azerbaijan and the Kyrgyz Republic). The authorities in Montenegro and Serbia—both dependent on imports for virtually all of their national salt needs—follow due import diligence as described above for category I countries that depend on imports. The fact that no noniodized salt was present in the households of Montenegro and Serbia during the surveys in 2007 indicates that the border control system is functioning well in these two countries.

Moldova, a country fully dependent on foreign salt suppliers, has yet to exert the political willpower in the government for enforcing the national standards on all imported salt, including shipments that arrive outside the responsibility of the bona fide salt importers’ association, Bigsalt. The prospect of success of the USI strategy to reach optimum iodine nutrition in Moldova has been greatly improved by the recently increased acceptance of iodized salt use among the various food-processing companies. In Azerbaijan and the Kyrgyz Republic, the weak self-reliance of the mostly small-scale salt-processing companies is a key concern. The output of iodized salt in these companies has depended on donations of fortificant by donors for most of the decade. However, there is potential for improved industry access to the fortificant in the short term in both countries, as detailed in their country summaries.

Of the five countries with operational or political challenges (categories III and IV), Albania is importing...
## TABLE 3. Situational information about the key actions in the technical components of national USI strategies

<table>
<thead>
<tr>
<th>Country</th>
<th>Production capacity, including QA</th>
<th>Self-procurement of inputs</th>
<th>Access to markets; product promotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>Most salt is imported from Greece. Local company (Vlora) has long been fledgling, but may be rehabilitated</td>
<td>The import company and traders are accountable for quality of iodized salt</td>
<td>No formal access barriers. Logo shown on packages</td>
</tr>
<tr>
<td>Armenia</td>
<td>Avan Salt Company is the major national supplier and has demonstrated full and adequate capacity. Small imports from Ukraine and Iran</td>
<td>Avan Salt Company adopted the practice of complete salt iodization early and is fully self-reliant</td>
<td>No access barrier. Package of Avan salt offers positive and accurate information, including national logo</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>Small companies at Lake Mazasyr supply 50% of the market and perform poor QA. 50% is imported, mostly from Ukraine and Turkey. The salt company in Naxicevan has only local importance</td>
<td>Donor dependency by local producers during most of the decade for fortificant supplies. Producers, importers, and traders are accountable for quality of iodized salt</td>
<td>No formal access barriers. Unknown if product promotion takes place by producers and importers</td>
</tr>
<tr>
<td>Belarus</td>
<td>The two major producers, Mozyr and Belaruskaliy, perform well and have full capacity to meet the national demand</td>
<td>Both companies are self-reliant</td>
<td>Full access; adequate promotion. Mozyr exports to several other countries, including the populous European part of Russian Federation</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>Part of the salt is imported from Croatia. Tuzla company has adequate capacity</td>
<td>Tuzla is self-reliant. Importers and traders are held responsible for quality of iodized salt</td>
<td>Full access; positive, adequate promotion by Tuzla on package</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Three companies import raw salt and iodized salt. The one producer (processor) performs adequate QA</td>
<td>All salt companies are self-reliant. Importing companies and traders are accountable for quality of iodized salt</td>
<td>Full access; adequate promotion on package</td>
</tr>
<tr>
<td>Georgia</td>
<td>All salt is imported, mostly from Ukraine and some from Turkey</td>
<td>Importers and traders are held responsible for quality of iodized salt</td>
<td>No access barriers. Unknown whether product promotion takes place</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>AralTuz (75%) is dominant and has adequate production capacity and QA. Pavlodarsol (10%) has adequate capacity, including QA. Situation at SuzakTuz (10%) unknown. Small amount imported from Russian Federation</td>
<td>All salt companies are self-reliant. Importers and traders are accountable for quality of iodized salt</td>
<td>No access barriers. Companies do not engage in active product promotion. Adequate information on package, including common Healthy Food logo</td>
</tr>
<tr>
<td>Kosovo</td>
<td>All salt is imported, mostly from Tuzla (Bosnia and Herzegovina), which has adequate capacity</td>
<td>Importers are held accountable for quality of iodized salt</td>
<td>No access barriers, provided salt shipments meet the standard at import</td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td>10–15 local companies serve 75% of the market; the remainder is imported from several other countries</td>
<td>Major reliance on donations of fortificant during access for KIO₃ purchases</td>
<td>Companies do not engage actively in product promotion. A common Healthy Food logo is on the packages</td>
</tr>
<tr>
<td>Macedonia</td>
<td>All salt is imported, from various sources</td>
<td>Importers are held accountable for quality of iodized salt</td>
<td>No access barriers, provided salt shipments meet the standard at import</td>
</tr>
<tr>
<td>Moldova</td>
<td>All salt is imported, mainly from Artemsol in Ukraine, which has adequate capacity</td>
<td>Importers are responsible for quality of iodized salt</td>
<td>No formal access barriers. Unknown whether product promotion takes place</td>
</tr>
<tr>
<td>Country</td>
<td>Salt Production and Quality Assurance</td>
<td>Access Barriers</td>
<td>Component II: Communications</td>
</tr>
<tr>
<td>------------------</td>
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<td>------------------------------</td>
</tr>
<tr>
<td>Montenegro</td>
<td>Almost all salt is imported, mainly from Tuzla (Bosnia and Herzegovina), which has adequate capacity. Small amount of salt from Ulcinj on Adriatic seacoast. Ulcinj company has unknown capacity and QA. Importers are held responsible for quality of iodized salt.</td>
<td>No access barriers. Unknown whether product promotion takes place.</td>
<td>Packages provide information and carry common Healthy Food logo.</td>
</tr>
<tr>
<td>Romania</td>
<td>Major supply by SALROM, which has adequate capacity and QA. Some import from Ukraine of noniodized “technical” salt. Salrom is self-reliant.</td>
<td>No formal access barriers. National iodized salt logo is used in promotion of table salt.</td>
<td>By law, all citizens are to receive free salt (10 kg/yr).</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>Large salt producers perform well and have adequate capacity and QA. Salt companies are self-reliant. Local KIO₃ suppliers (Troitsky and Uralsk). Companies are self-responsible for QA and inputs. Local processing company is self-reliant.</td>
<td>No access barriers. Market shares of the producers depend on the cost of long-distance transport.</td>
<td>No formal barriers to market access. Packages carry adequate information.</td>
</tr>
<tr>
<td>Serbia</td>
<td>All salt is imported. One company imports iodized salt mainly from Tuzla (Bosnia and Herzegovina), the other processes salt and has adequate capacity, including QA. Companies are self-reponsible for QA and inputs. Local processing company is self-reliant.</td>
<td>No access barriers. Unknown whether product promotion takes place.</td>
<td>Packages provide information and carry common Healthy Food logo.</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>The 2 large producers and 2 small processors have adequate capacity, including QA. Major reliance on donations of fortificant during the decade. Local companies have access limitations for KIO₃.</td>
<td>Packages provide information and carry common Healthy Food logo.</td>
<td></td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>One company provides all the national salt needs and has adequate capacity and QA. The company is self-reliant. Local KIO₃ supplier (Cheleken).</td>
<td>Packages provide information and carry common Healthy Food logo.</td>
<td></td>
</tr>
<tr>
<td>Ukraine</td>
<td>Several companies are united in a national association. Artemsol is dominant. All have adequate capacity (Artemsol is also a major exporter in CIS) and adequate QA. All companies are self-reliant. Local KIO₃ supplier (Iodobrom).</td>
<td>Packages provide information and carry common Healthy Food logo.</td>
<td></td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>Many companies involved in harvesting (3 large deposits), production, processing, and packaging of salt. The combined capacity approaches adequacy for national needs. QA practices mostly unknown or not yet perfected. Major reliance on donations of fortificant during the decade. Local companies have access limitations for KIO₃.</td>
<td>Packages provide information and carry common Healthy Food logo.</td>
<td></td>
</tr>
</tbody>
</table>

**Component II: Communications**

<table>
<thead>
<tr>
<th>Country</th>
<th>Promotion of public acceptance</th>
<th>Stimulation of stakeholders</th>
<th>Education of professionals and gatekeepers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>National multichannel campaign in 1998/99, with national logo, school-based testing, and iodized salt promotion during 1999; national campaign was extended from 2002 onward, with special emphasis on northern Albania.</td>
<td>Initial collaboration involved only health officials (MOH, Institute of Public Health) and specialists, but the IDD Committee membership became broadened in 2002. The parliamentary USI law in 2008 is credited for the enhanced multisector approach.</td>
<td>The IDD partnership was extended from early 2000s to include private industry and consumer interests. Special emphasis on primary teachers’ involvement. Since 2008, more efforts on customs checks and supply inspections.</td>
</tr>
<tr>
<td>Armenia</td>
<td>National logo</td>
<td>MOH has long perceived the national USI strategy as being officially driven and imposed upon the salt industry.</td>
<td>NA</td>
</tr>
</tbody>
</table>

*continued*
### TABLE 3. Situational information about the key actions in the technical components of national USI strategies (continued)

<table>
<thead>
<tr>
<th>Country</th>
<th>Promotion of public acceptance</th>
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<th>Education of professionals and gatekeepers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belarus</td>
<td>A re-devised campaign used multiple channels and a wide variety of audiences from 2001 onward and put major emphasis on benefits of iodized salt. Public opinion remains resistant to using iodized salt for home-based preservation of food</td>
<td>Focus on communications on the mobilization of food companies, especially bread bakeries. Ongoing efforts to raise the share of iodized salt in households</td>
<td>Advocacy and training workshops among health professionals. Insertions in medical and technical curriculums completed</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>National multichannel campaign in 2002/03 with a strong focus on proper use and storage of iodized salt in the households</td>
<td>Collaboration involves mostly the health officials and specialists, with a strong role of public health institute(s)</td>
<td>Conferences with health professionals. Insertions in medical and technical curriculums completed</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>The 28 regional inspectorates under the MOH provide regular information and distribute pertinent materials among schools, general practitioners’ offices, clinics, and the press, including results of salt inspections</td>
<td>A National Interagency Commission under the Council of Ministers provides oversight management. IDD elimination has been inserted in the National Food and Nutrition Policy and Action Plan</td>
<td>Regular promotion of USI through the Health Promotion and Education Sections of 28 regional inspectorates to health professionals, food industry employees, and teaching staff</td>
</tr>
<tr>
<td>Georgia</td>
<td>Some informational efforts related to a massive oral iodized oil supplement distribution campaign in 2000/01, but no systematic communication campaign to inform the public of USI</td>
<td>After the Rose Revolution in November 2004, a Parliament Commission coordinates the roles of stakeholders. Social mobilization is conducted by an NGO named SOCO. The salt import firms comply with the presidential decree of February 2005</td>
<td>NA</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>A comprehensive public campaign was planned, including all national stakeholders, and carried out through the NGO Confederation during 2002–05. Information on USI and IDD elimination is part of public reporting by SES and the Salt Association. Kazakh experts developed a special “Healthy Food” logo for use in the Central Asian republics</td>
<td>The Chief Health Inspector heads a multisector coalition that responds to a High-Level Coordination Council for Food Fortification. The President of the Kazakh Academy of Nutrition provides consistent advocacy, leadership, media information, and political testimony. The salt industry is well organized and fully supportive</td>
<td>Knowledge of IDD and USI has been inserted in curriculums of primary and secondary schools and technical training of primary and specialist health staff, food inspection, and food industry</td>
</tr>
<tr>
<td>Kosovo</td>
<td>Communications were stepped up in 2008 following the endorsement by the MOH of a new administrative instruction for higher USI standards. Kosovo has a national USI logo</td>
<td>A multisector Micronutrient Working Group under the MOH is active and includes all stakeholders. The NIPH and the National Food Authority share the leadership. Oversight and public reporting are regular</td>
<td>Insertions in medical and technical curriculums completed</td>
</tr>
</tbody>
</table>
Knowledge of IDD and UI has been inserted in primary and higher education.

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TABLE 3. Situational information about the key actions in the technical components of national USI strategies (continued)

<table>
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<tr>
<th>Component II: Communications</th>
<th>Component III: Surveillance (monitoring and evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country</strong></td>
<td><strong>Promotion of public acceptance</strong></td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>Public awareness is high from history; A 2004 KAP survey showed high acceptance among various public audiences. All food companies use iodized salt</td>
</tr>
<tr>
<td>Ukraine</td>
<td>Oblast campaigns have demonstrated the ability to ensure universal awareness, but no national campaign has been conducted. Acceptance and success in some oblasts show grassroots support for USI</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>High public awareness from history. Major campaigns in 2003, 2005, and 2007 included massive salt testing in primary schools. Collaborative work among a national NGO, scientists, and SES was stimulated to ensure consumer rights perspectives in iodized salt supplies of all provinces in 2004/05. Common “Healthy Food” logo</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Country</strong></th>
<th><strong>Data on iodized salt provision and supply</strong></th>
<th><strong>Data on use in food industry and households</strong></th>
<th><strong>Data on population impact</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>National database devised in 2007 to track salt iodine supplies at customs, production, and markets</td>
<td>Unknown whether iodized salt is used in food industry. Use in households: MICS, national survey with external technical support</td>
<td>2006 national survey showed inadequate iodine nutrition in schoolchildren and pregnant women. No national iodine assay capacity in a public health laboratory</td>
</tr>
<tr>
<td>Armenia</td>
<td>Avan Company is the principal source. Small amount of imports. A salt situation analysis in 2001 provided data on amount and quality of national supply. Global Iodine Network has acknowledged the attainment of successful USI</td>
<td>Food industry uses iodized salt. Use in households: MICS, national survey with external technical support</td>
<td>Latest national survey in 2005. No subsequent survey; no data available on pregnant women. No national iodine assay capacity in a public health laboratory</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>50% of salt supply is imported and 50% is local (producers at Masazyr Lake). A salt situation analysis in 1999 collected data on national supply. NGOs have monitored the market outlets in subsequent years</td>
<td>No data on use of iodized salt in the food industry. Household data obtained from MICS and national surveys</td>
<td>National survey 2007 with small repeat in 2009. No national iodine assay capacity in a public health laboratory</td>
</tr>
<tr>
<td>Belarus</td>
<td>Mozyr Company has high reputation (ISO certified) and is the major source of the national supply. No regular data available on amount and quality of the supplies</td>
<td>Iodized salt is used throughout the food companies with insignificant exceptions. Household use is threatened by belief that it affects home food preservation</td>
<td>Latest national survey in 2006. No iodine nutrition data from pregnant women. Iodine assay capacity at Minsk University</td>
</tr>
<tr>
<td>Country</td>
<td>Details</td>
<td>Notes</td>
<td></td>
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<tr>
<td>------------------</td>
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<td></td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>Tuzla is major supplier and performs well in local and export supplies according to information from surveys and border inspections. Unknown whether regular reports are made on amount and quality of national supplies.</td>
<td>Iodized salt is used in the food industry. In households, use of good-quality iodized salt is nearly universal. Median iodine content of iodized salt has increased over the years.</td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Close independent inspections of the supplies from import and production, followed up with enforcement. Regular national reporting on the amount and quality of imports and supplies. Global Iodine Network has acknowledged successful USI attainment.</td>
<td>Iodized salt is used in all food companies. Complete inspection system of food companies and consumer markets, followed by enforcement. Household data from special iodine survey.</td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td>All salt is imported, mostly from Ukraine. The current inspection system is not clear. Unknown whether regular reports are made of import amount and quality</td>
<td>Reportedly, iodized salt use is universal in food industry (small exceptions possible) and households. SES inspections ensure adequate quality in the markets. Iodized salt use is universal in food industry and households. SES reports quarterly and annually on inspection results.</td>
<td></td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>Salt Producers Association reports annually on quality and amount of net supplies (production, import, and export)</td>
<td>Universal iodized salt use in food companies and households. Data from special iodine surveys with external technical assistance.</td>
<td></td>
</tr>
<tr>
<td>Kosovo</td>
<td>All salt imports are closely inspected prior to release in the markets. Border inspections show increasing SI content</td>
<td>Some (traditional bakeries) but not all food companies use iodized salt. Household use of iodized salt is universal due to the raids with RTKs in the supply channels. Data depend on MICS and special surveys.</td>
<td></td>
</tr>
<tr>
<td>Kyrgyz Republic</td>
<td>Inspections of salt production and imports are wanting. National survey showed that very few suppliers are iodizing adequately. Constraints on access to fortificant among small producers</td>
<td>Reportedly, iodized salt is being used in food industry. In households, use of good-quality iodized salt is nearly universal (increases in median SI over the years).</td>
<td></td>
</tr>
<tr>
<td>Macedonia</td>
<td>All salt imports are closely inspected prior to release in the markets. Unknown whether regular reports are made on amount and quality of supplies. Global Iodine Network has acknowledged successful USI attainment.</td>
<td>Several large-scale surveys in succession in various areas show adequate iodine nutrition in schoolchildren and pregnant women (2005–08). Research in Tuzla Canton suggests low status in pregnant women when they reduce their salt intake. Iodine assay capacity at Tuzla University National survey in 2003 showed optimum iodine nutrition in schoolchildren. No subsequent national survey available. Ongoing surveillance can become based on national newborn TSH screening. The previous iodine laboratory has been closed down. Latest national survey in 2005. No subsequent survey data available. No iodine nutrition data from pregnant women. No iodine assay capacity in a national public health laboratory. Latest national survey in 2006 showed adequate to high status in women of childbearing age. Not likely that any other segment of the population is deficient. Iodine assay capacity in Kazakhstan Academy of Nutrition (Almaty) is being strengthened as IRLI focal point for regional QA service. National surveys in 2007 and 2008 show optimum iodine nutrition among schoolchildren and pregnant women. Iodine assay capacity in the Public Health Institute, connected with EQUIP. National survey of 2007 demonstrated inadequate iodine nutrition among pregnant women. Iodine assay capacity in Endocrinology Center connected with EQUIP. National surveys showed improvements in iodine nutrition among schoolchildren (1995/06–2003). Studies among pregnant women suggest adequate iodine nutrition, while iodine supplements are still encouraged. Iodine assay capacity in national research institute (Skopje) connected with EQUIP.</td>
<td></td>
</tr>
</tbody>
</table>

continued
TABLE 3. Situational information about the key actions in the technical components of national USI strategies (continued)

<table>
<thead>
<tr>
<th>Country</th>
<th>Data on iodized salt provision and supply</th>
<th>Data on use in food industry and households</th>
<th>Data on population impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moldova</td>
<td>Most salt is imported from Ukraine. Unknown whether regular reports are made on amount and quality of supplies. Illegal supplies of noniodized salt exist in rural and urban markets</td>
<td>Latest national program envisaged staged iodized salt use in the food companies. One major bread company is using iodized salt; unknown whether other companies are also using iodized salt. Household use is threatened by beliefs that iodized salt affects home food preservation. Household data depend on MICS and other surveys</td>
<td>Latest national survey in 2006 showed adequate status only in urban households using iodized salt. No subsequent survey data collected. No information on iodine nutrition of pregnant women. No iodine assay capacity in a national public health laboratory</td>
</tr>
<tr>
<td>Montenegro</td>
<td>Most salt is imported. Tuzla has a large share of national market. Unknown whether regular reports are available on amount and quality of supplies. Production status and QA at Ulcinj salt factory are unknown</td>
<td>Food industry uses iodized salt but no data are available. Use in households is universal (2007), with relatively low iodine content. Household data from special survey</td>
<td>National survey in 2007 demonstrated insufficient iodine nutrition in pregnant women, with lower iodine status in north. No iodine assay capacity in a national public health laboratory</td>
</tr>
<tr>
<td>Romania</td>
<td>SALROM is the major supplier and has certified ISO standards. Noniodized salt enters from Ukraine. Unknown whether regular reports are available on amount and quality of supplies</td>
<td>Continued resistance among most food companies. Household use is threatened by the belief that iodized salt affects home food preservation. Data from special iodine survey with external technical assistance</td>
<td>Latest national survey in 2004 showed mild iodine deficiency in schoolchildren and continued deficiency in pregnant women. No subsequent survey data available. Iodine capacity in national public health laboratory (Bucharest)</td>
</tr>
<tr>
<td>Russian</td>
<td>Large-scale factories have adequate capacity and QA systems, as have the major import sources (Mozyr and Artemsol). No regular reporting on amount and quality of supplies</td>
<td>In the absence of compulsion, use of iodized salt in food industry is absent. For years, iodized salt use in households was estimated at 30%–35%, with no data on quality</td>
<td>Small regional surveys up to 2005 show persisting iodine deficiency. Subsequent survey data not available. No national representative survey conducted. No data on pregnant women. Iodine assay capacity in Endocrinology Research Center (Moscow), connected with EQUIP</td>
</tr>
<tr>
<td>Federation</td>
<td>All salt is imported. One company has adequate capacity, the other imports only iodized salt. Unknown whether regular reports are available on amount and quality of supplies</td>
<td>Food industry is said to use iodized salt, but no data. Iodized salt use in households is universal (2007), with relatively low iodine content. Household data from special survey</td>
<td>National survey in 2007 showed adequate iodine nutrition in schoolchildren but not in pregnant women who reported not using iodine supplements. Iodine assay capacity in National Public Health Institute (Belgrade), connected with EQUIP</td>
</tr>
<tr>
<td>Serbia</td>
<td>Two large-scale and two small-scale suppliers have adequate capacity and QA systems. Local companies have limitations to access of KIO₃. National adequate supplies threatened by illegal sourcing in Kathlon Oblast. Unknown whether reports are made on amount and quality of supplies</td>
<td>No data on use of iodized salt in the food industry. Use in households has increased over time but is stalled at inadequate coverage in poor rural households in Kathlon and DRD. Data on household use depend on MICS and other surveys</td>
<td>National survey in 2007 showed optimum iodine nutrition in schoolchildren but not pregnant women. Iodine assay capacity in Endocrinology Center (Dushanbe)</td>
</tr>
</tbody>
</table>
Government-led effort to develop the national salt iodination program, with an emphasis on pregnant women. No subsequent survey data or inspection oversight also indicates the full ability of the existing salt companies to exclusively supply iodized salt. In Tajikistan, where mandatory USI has been enacted, the evidence of production quality assurance and inspection oversight also indicates the full ability of the existing salt companies to exclusively supply iodized salt, although the arrangement for easy access by the companies to the fortificant at a reasonable price needs to be strengthened.

**Communication**

Communication activities in support of USI strategies [30] span a very wide array of purposes (raising political will, mobilizing resources, strengthening policy support, stimulating stakeholder cooperation, promoting public acceptance, educating professionals, etc.), employ a variety of delivery channels and intermediaries (television, radio, newspapers, magazines, postcards, banners, billboards, classrooms, salt traders, healthcare professionals, celebrities, etc.), and target a range of audiences (e.g., salt industry staff, traders and merchants, media, the medical and educational profession, food manufacturers, and public opinion leaders). The choices seem overwhelming, and the available guidance for composing a minimum essential package of communications that can effectively support the planning of USI from its

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**Ukraine**

- Single government-owned company supplies all edible salt and has acknowledged successful USI attainment.
- ULRI members have adequate capacity and QA systems.
- Unknown whether regular reports are available on amount and quality of supplies.
- Government-led effort to develop the national salt iodination program, initially with low attention to iodization.
- Government-led effort to develop the national salt iodination program, initially with low attention to iodization.
- Notably, all four countries with tenacious impediments to USI progress (the Russian Federation, Tajikistan, Ukraine, and Uzbekistan) possess major salt production capacity (table 1). In Uzbekistan, the major dependence on foreign donations for the fortificant has yet to be replaced by a viable self-reliant access arrangement. The capacity of the Uzbek salt production industry to supply iodized salt has been growing, but it is still insufficient to satisfy the national household and food industry requirements. In the Russian Federation, Tajikistan, and Ukraine, on the other hand, the main barrier is not the productive capacity. The Russian and Ukrainian salt companies are large-scale, self-sufficient, quality-conscious, well organized, and well connected. If so mandated by law, each company in these countries possesses adequate capacity to supply their customers exclusively with quality iodized salt. In Tajikistan, where mandatory USI has been enacted, the evidence of production quality assurance and inspection oversight also indicates the full ability of the existing salt companies to exclusively supply iodized salt, although the arrangement for easy access by the companies to the fortificant at a reasonable price needs to be strengthened.

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**Uzbekistan**

- Single government-owned company supplies all edible salt and has acknowledged successful USI attainment.
- ULRI members have adequate capacity and QA systems.
- Unknown whether regular reports are available on amount and quality of supplies.
- Government-led effort to develop the national salt iodination program, initially with low attention to iodization.
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**Communication**

Communication activities in support of USI strategies [30] span a very wide array of purposes (raising political will, mobilizing resources, strengthening policy support, stimulating stakeholder cooperation, promoting public acceptance, educating professionals, etc.), employ a variety of delivery channels and intermediaries (television, radio, newspapers, magazines, postcards, banners, billboards, classrooms, salt traders, healthcare professionals, celebrities, etc.), and target a range of audiences (e.g., salt industry staff, traders and merchants, media, the medical and educational profession, food manufacturers, and public opinion leaders). The choices seem overwhelming, and the available guidance for composing a minimum essential package of communications that can effectively support the planning of USI from its
inception (with major emphasis on high-level political advocacy) to sustained success (ongoing education of professionals) is limited.

The elements shown in the second section of table 3 (Component II: Communications) were intentionally chosen among the many options, a choice that was guided by the growing experience of effective USI strategies in the region [27], which has shown that:

- Public education in support of USI strategies should not replace the supply-based strategy with a focus on changing the public’s purchase behavior;
- Progress in USI depends on, and benefits from, continued stimulation of the stakeholders who are intimately involved;
- Communication can safeguard progress in USI by recognizing and influencing gatekeeper opinions; and
- Insertion of essential learning about IDD and USI in the regular education system builds a condition for sustained success.

Public education

The provision of public information on the needs and benefits of salt iodization in the countries of the region has typically been managed in time-limited campaigns. Table 3 (Component II: Communications; column 1: Promotion of public acceptance) lists cases with evidence of large-scale communication campaigns either nationally or in the major part of the country. Such campaigns were conducted in Belarus, Bosnia and Herzegovina, Kazakhstan, and Macedonia (category I); Azerbaijan, Moldova, and Romania (category II); and Albania and Tajikistan (categories III and IV). A close relationship between evidence of large-scale communication campaigns and the extent of national USI progress or accomplishment of success is not evident from this case distribution. This would not be surprising, since the content of the campaigns focused on the household fraction of the salt supply only, i.e., the salt that is “visible” to consumers. Addressing the issue of iodized salt use in the food industry has typically been a weak, or even absent, element of public information campaigns.

An earlier summary of USI progress in the region in 2004 [27] reported that communication efforts had limited impact in the absence of mandatory USI legislation. The current outcome summary (table 2) suggests that within the more advanced categories I (USI achieved) and II (close to USI), iodine nutrition achievements during the decade in those countries without a large-scale public communication campaign (Armenia, Georgia, Kosovo, Montenegro, Serbia, and Turkmenistan) did not significantly differ from those in countries where a major communication effort was directed to educating the public (Azerbaijan, Belarus, Bosnia and Herzegovina, Kazakhstan, Macedonia, Moldova, and Romania).

Stakeholder stimulation

The findings of stakeholder stimulation listed in table 3 (Component II: Communications; column 2: Stimulation of stakeholders) show the diverse ways in which common interests, collaboration, and partnerships were pursued. In Albania, for example, the enactment of a USI law in 2008 was credited with the broadening of the national IDD Committee beyond the health experts and officials. The newly included partners came to recognize what stake they held in the USI strategy, thereby leading to a stronger constituency and joint positive testimony in convincing the lawmakers of the need for legislation. A national NGO in Azerbaijan, the Independent Consumers Union, assumed a lead stakeholder role when the government, despite enacting a true USI law, lacked the willpower to hold the salt companies to account. Working with health officers and scientists in UNICEF and Baku Medical University, the Union’s grassroots networks engaged in salt monitoring, using the results to generate consumer insistence on adequate quality of iodized salt in the industry’s delivery channels. Within a 3-year period, the use of adequately iodized consumer salt rose to approximately 80%. Other key contributions by NGOs were evident in Belarus, Georgia, Kazakhstan, the Kyrgyz Republic, Romania, the Russian Federation, Tajikistan, Ukraine (some oblasts), and Uzbekistan, each with the added value of spreading the information more readily and swiftly among more layers of society.

Communication designs typically included advocacy efforts directed at the salt industry with the aim of informing the political mindset of salt industry leaders toward USI. In many cases, this was accompanied by training of salt industry workers, especially those responsible for quality assurance. Such activities, aimed at strengthening the salt industry’s role in USI strategies, were carried out in most countries in the region. Examples that recognized, and took advantage of, the specific “business” approach in the salt industry were few, however. The most effective example of this tactical approach may have been the development and extension of branding and consumer recognition of healthy food in Central Asia, with specialists of the Kazakh Academy of Nutrition in the key facilitating role.

Training of physicians and health workers and working through the (primary) educational systems were a major part of all the communication packages in the region. Similar to the efforts to disseminate public information, these activities were again typically focused on the benefits of iodized household salt.

Stimulation of stakeholders in the salt industry typically included advocacy targeted at the companies’ leaderships. A closer look suggests that advocacy of the fact that salt iodization should occur was not matched with a similar effort to communicate about how the salt companies should make iodization happen, and
even less about how to stimulate the industry to always provide, promote, and sell the product to its customers through establishment of an industrial norm. Detailed analysis and action on the salt industry’s role in a national USI strategy has been somewhat weak in the overall support effort, including the communication component [31].

Influencing opinions among gatekeepers

It would appear from the communication designs in a sample of countries in this study [31] that the campaigns involved potential opinion gatekeepers (journalists, local authorities, influential NGOs, etc.) in the delivery of information, while their inclusion in the specific target groups (such as the medical profession, technical specialists and practitioners, NGO activists, and practitioners in community and district administration) was another feature that may have helped to keep negative influences at bay.

Professional, technical, social, and normative opinions or beliefs (among stakeholders and other elements in society) can potentially lead to indifference, obstruction, or even outright opposition to USI, to the extent that national progress is held up. An example of this occurrence in the region was that the technical staff of food companies, mostly those in eastern Europe, argued that the use of iodized salt in the preservation of vegetables (e.g., for canning and pickling) would affect the quality of the end product, thus making it potentially less acceptable to the industry’s customers. Similar professional beliefs surfaced in the cheese and bread industry, where technicians referred to literature from Soviet times that prohibited the use of iodized salt. The regulations in these eastern European countries prohibit the use of ingredients that are not specifically listed in the authorized recipes for the manufacturing of foods. A review of communication designs conceived during the early years of the decade [31] showed that the technical gatekeepers in the food-manufacturing industry were not among the target groups, however.

In the Russian Federation and Ukraine, two other society partners that were initially anticipated as being supportive stakeholders during the design phase of communication campaigns became instead obstructionists to USI. The professional societies of nutrition and/or endocrinology experts were expected to be in favor of USI legislation and interested in assessing and evaluating the USI strategy. NGOs with consumer interests at heart were typically expected to be on the side of the natural proponents of the USI strategy in view of the potential to eliminate the risk of brain damage in each new generation. As shown in the examples where an NGO took major responsibility in the public information campaigns, they were proponents in many countries. It is not surprising, therefore, that these actors were not anticipated as potential gatekeepers in the Russian Federation and Ukraine.

Insertion of knowledge in education systems

Permanent success of USI strategies is more likely when iodization is established as the custom in the salt industry; each new generation of children is taught about the dangers of IDD and the importance of iodine for their health, education, and future career; and there is vigilant public health surveillance of the iodine content of the common food supply and the iodine nutrition status of the population [29, 30]. These three desirable end situations justify the insertion of knowledge of IDD and USI into educational systems, in particular primary schools, professional schools for health workers and specialists, and polytechnic training for salt industry and trade professionals. Table 3 (Component II: Communications) lists the country cases where work was accomplished (Belarus, Bosnia, and Herzegovina, Kazakhstan, Macedonia, Montenegro, the Russian Federation, Serbia, and Turkmenistan) or initiated (Azerbaijan, Kosovo, the Kyrgyz Republic, Moldova, and Uzbekistan) in revising educational curriculums for ongoing learning.

Monitoring and evaluation

Salt supply. Except in the former Yugoslavia, the national iodine monitoring systems in the region were mostly designed with a view to capture changes during the trajectory from USI enactment to its full attainment. Data and information about these changes typically were obtained from the salt companies or national associations (amount of salt production, import, and export), the government (e.g., survey data and analyses in iodine laboratories), and national statistics agencies based on large-scale household surveys, often with the support of donors. Frequently, a national salt situation analysis dated approximately at the start of the decade formed a salt supply baseline against which USI progress could be compared.

A review report of UNICEF experiences up to 1997 [21] recommended salt industry assessments as an integral part of developing a regional strategy, specifically stating that “countries should prepare and update regular salt maps.” The usefulness of keeping a close watch on the national salt supply situation was again emphasized at the Munich meeting in 1998 [32]. Efforts to collect and analyze the national salt supply data in countries of the region were initiated by the UNICEF regional office and used as input for the salt producers’ meeting in Kiev in 1999 [22]. National salt situation assessments needed to be established nationally, but in only a few countries (Bulgaria, Kazakhstan, Kosovo, and Turkmenistan) was the end situation achieved that annual reporting on the amount and quality of national...
(iodized) salt supplies was made obligatory.

**Iodized salt use in the food-processing industry.** Direct data or information in the region on the use of iodized salt by food companies is still scarce (table 3) [Component III: Surveillance: Monitoring and evaluation]. Inspection of the salt used in industrial food manufacturing (bread, dairy, cheese, preserves, pickles, meat products, etc.) is an integral part of the weekly task planning for food inspectors of the Regional Inspectorates for Protection and Control of Public Health in Bulgaria, with the results reported to the head office in Sofia. Strict border assessments in the salt import-dependent countries Kosovo, Macedonia, Montenegro, and Serbia effectively prevent noniodized salt from entering the supply channels (see above), including the food companies. In Belarus, because the emphasis on the food industry is the key target for mandatory USI, virtually all of the food-processing companies are using iodized salt as part of the recipe. Analyses of UI levels from national surveys in Armenia, Bosnia and Herzegovina, Georgia, and Kazakhstan strongly indicate that iodized salt is being used in the food industry, and Turkmenistan prevents the entry of noniodized salt into the country. Thus, iodized salt is part of the regular manufacturing practices in the food-processing industry in at least 11 countries of the region. In contrast, public opinion and technical food industry concerns are delaying the use of iodized salt in food processing in Moldova, Romania, the Russian Federation, and Ukraine, whereas in the remaining countries (Albania, Azerbaijan, the Kyrgyz Republic, Tajikistan, and Uzbekistan), the situation is less clear or the data are not available or are incomplete.

**Market supply and use of iodized salt in the households.** Data on consumer use of iodized household salt are collected during the periodic MICS, DHS, or specialized iodine surveys, in some countries supplemented by obligatory reporting of findings from market inspections by the Sanitary–Epidemiologic Services (Kazakhstan and Turkmenistan) or the Public Health Institutes or Inspectorates (Bosnia and Herzegovina, and Bulgaria). By design, the information available from such national surveys is intermittent, in many instances with sizable time intervals between surveys. Despite the limited accuracy of salt iodine assessments obtained with rapid test kits, the large-scale survey sources can still offer a national track record over time of the attained use of iodized household salt (Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Kazakhstan, Kosovo, the Kyrgyz Republic, Macedonia, Moldova, Tajikistan, and Turkmenistan). Universal use of iodized consumer salt (> 90% of households) was reported in each category I country, as well as in Montenegro and Serbia, at some point in time during the decade.

**Iodine nutrition status assessments.** The accurate laboratory assay of the iodine concentration in urine samples is a critical factor in national surveys [33], and therefore every country of the region needs access to a reputable iodine laboratory. As listed in table 3 (Component III: Surveillance: Monitoring and evaluation), laboratory capacity in the region is available in 13 national institutes of various backgrounds or orientations (endocrinology in the Kyrgyz Republic, the Russian Federation, Tajikistan, Ukraine, and Uzbekistan; public health in Bosnia and Herzegovina, Kosovo, Romania, and Serbia; research and/or universities in Belarus, Macedonia, and Turkmenistan; and nutrition in Kazakhstan). Working with the CDC, UNICEF has strongly promoted the participation of iodine laboratories in the EQUIP/International Resource Laboratories for Iodine (IRLI) Network quality assurance program [33] to help ensure that the results from iodine assessments can be considered accurate and reliable. Examples of countries with iodine laboratories where blind UI assays have shown successful performance against the EQUIP standards during the decade are Kazakhstan, Kosovo, the Kyrgyz Republic, Macedonia, the Russian Federation, Serbia, Turkmenistan, and Ukraine.

Population-representative surveys of iodine status have used various sampling designs, among which the use of the recommended cluster approach (30 subjects per 30 clusters) increased with time. Stratified surveys (by region) were performed in Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Kazakhstan, Romania, and the Russian Federation. As established previously in initial assessments of the public health severity and extent of iodine deficiency, school-age children were the dominant survey group during the decade, although the age range for selection of schoolchildren differed from the recommended 6 to 12 years in Moldova and Romania. In Kazakhstan and Ukraine, women of childbearing age were examined as the target group.

The importance of assessing the iodine status of pregnant women as the most vulnerable group was being realized increasingly during the decade, and samples of pregnant women were included (mostly in addition to school-age children) later during the decade in surveys in Albania, Azerbaijan, Bosnia and Herzegovina, Kosovo, the Kyrgyz Republic, Montenegro, Serbia, and Tajikistan. Measurements of thyroid volume by ultrasound were included in surveys where the interest in iodine situation assessment went beyond iodine nutrition status.

At the time of this report, more than 5 years had elapsed since the last national survey of iodine status in Armenia, Bulgaria, Georgia, Romania, Turkmenistan, and Ukraine. No nationwide population-representative iodine status survey has been undertaken in the Russian Federation or Uzbekistan.

**Figure 4** summarizes the key results from national surveys of the iodine nutrition status in the region.
during the decade. By international convention, the UI levels are expressed as median concentrations in micrograms per liter, and the shaded areas indicate the normative range for each group. In the national surveys in Ukraine and Kazakhstan, the enrolled women were not pregnant.

**Joint collaborative oversight**

The fourth component of the USI strategy, *strategy oversight*, is aimed at bringing the stakeholders together to jointly manage the progress, discuss emergent information, make decisions on barriers, and promote public accountability by regular publicity. Table 4 provides narratives of the national oversight information obtained from the country summaries.

Throughout the region, the Ministry of Health is the focal government entity that is held responsible for elimination of IDD as a public health goal and coordinates the USI strategy on behalf of the government. Examples of very strong public–private collaboration during the decade were evident in Belarus, Bulgaria, Kazakhstan, and Kosovo. Other instances of active national leadership during the decade were in Bosnia and Herzegovina, the Kyrgyz Republic, Romania, Tajikistan, and Turkmenistan. The growing ambiance over the three consecutive meetings showed a clear

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**FIG. 4.** Summary of key results from national iodine surveys in the region during the decade. *The women in the surveys in Ukraine (2002) and Kazakhstan (2006) were not pregnant. CIS, Commonwealth of Independent States. Shaded areas show range of normal values*
<table>
<thead>
<tr>
<th>Country</th>
<th>Role of a National Coalition</th>
<th>Public accountability</th>
<th>Progress oversight and decisions</th>
<th>Narrative information about joint collaborative oversight of USI strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>MOH assumed lead role and pulled other departments into the USI process.</td>
<td>NA</td>
<td>Evidence of slow progress from the 2006 survey led to a decision to tighten border control, inspections.</td>
<td>Results of salt inspections, surveys, and newborn screening are used for regulatory review of progress.</td>
</tr>
<tr>
<td>Armenia</td>
<td>MOH assumed lead role and pulled other departments into the USI process.</td>
<td>Media reports and press releases</td>
<td>MOH communicates with Avan salt company, salt importers, and NGOs</td>
<td>Media reports, publicity</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>MOH (Chief Sanitary Inspector) leads a National Coalition with all major stakeholders.</td>
<td>Obligatory annual reports of MOH and National Statistics Agency, Publicity and media releases</td>
<td>MOH previously had a central leading position. Major government reorganization in 2007/08 has left the responsibilities for a food control authority unclear.</td>
<td>Coordination role by MOH has been fluctuating. Kyzyl-Salt Producers Association was defunct for some years when first President left office.</td>
</tr>
<tr>
<td>Belarus</td>
<td>MOH (Chief Sanitary Inspector) leads a National Coalition with all major stakeholders.</td>
<td>Media reports</td>
<td>MOH previously had a central leading position. Major government reorganization in 2007/08 has left the responsibilities for a food control authority unclear.</td>
<td>Coordination role by MOH has been fluctuating. Kyzyl-Salt Producers Association was defunct for some years when first President left office.</td>
</tr>
<tr>
<td>Bosnia Herzegovina</td>
<td>MOH (Chief Sanitary Inspector) leads a National Coalition with all major stakeholders.</td>
<td>Media reports</td>
<td>MOH previously had a central leading position. Major government reorganization in 2007/08 has left the responsibilities for a food control authority unclear.</td>
<td>Coordination role by MOH has been fluctuating. Kyzyl-Salt Producers Association was defunct for some years when first President left office.</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>MOH (Chief Sanitary Inspector) leads a National Coalition with all major stakeholders.</td>
<td>Media reports</td>
<td>MOH previously had a central leading position. Major government reorganization in 2007/08 has left the responsibilities for a food control authority unclear.</td>
<td>Coordination role by MOH has been fluctuating. Kyzyl-Salt Producers Association was defunct for some years when first President left office.</td>
</tr>
<tr>
<td>Georgia</td>
<td>MOH (Chief Sanitary Inspector) leads a National Coalition with all major stakeholders.</td>
<td>Media reports</td>
<td>MOH previously had a central leading position. Major government reorganization in 2007/08 has left the responsibilities for a food control authority unclear.</td>
<td>Coordination role by MOH has been fluctuating. Kyzyl-Salt Producers Association was defunct for some years when first President left office.</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>MOH (Chief Sanitary Inspector) leads a National Coalition with all major stakeholders.</td>
<td>Media reports</td>
<td>MOH previously had a central leading position. Major government reorganization in 2007/08 has left the responsibilities for a food control authority unclear.</td>
<td>Coordination role by MOH has been fluctuating. Kyzyl-Salt Producers Association was defunct for some years when first President left office.</td>
</tr>
<tr>
<td>Kosovo</td>
<td>MOH (Chief Sanitary Inspector) leads a National Coalition with all major stakeholders.</td>
<td>Media reports</td>
<td>MOH previously had a central leading position. Major government reorganization in 2007/08 has left the responsibilities for a food control authority unclear.</td>
<td>Coordination role by MOH has been fluctuating. Kyzyl-Salt Producers Association was defunct for some years when first President left office.</td>
</tr>
<tr>
<td>Country</td>
<td>MOH Role and Collaboration</td>
<td>Evident Coordination</td>
<td>Annual Surveys and Data Use</td>
<td>Decisions Made and Communication</td>
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<tr>
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</tr>
<tr>
<td>Macedonia</td>
<td>Strong MOH role. National IDD expert driving the action agenda with support from UNICEF</td>
<td>Evident coordination across departments and with salt importers</td>
<td>Annual surveys of UI and Tvol data are used for tracking the situation</td>
<td>Decisions made in MOH are communicated to stakeholders</td>
</tr>
<tr>
<td>Moldova</td>
<td>Government hesitant to accept a multisector coalition management role. Strong technical role of NIPH. USI is not high government priority</td>
<td>MOH coordinates across government departments. Coordination with official salt importers remains “at arm’s length”</td>
<td>MOH coordinates across government departments</td>
<td>No decisions after the 2007 survey by MOH and Institute of Public Health</td>
</tr>
<tr>
<td>Montenegro</td>
<td>MOH and Institute of Public Health are in charge. No evident structure for multisector collaboration</td>
<td>MOH coordinates across government departments</td>
<td>MOH to coordinate across government departments</td>
<td>Despite decision for true USI, action became limited to table salt and salt used in bread bakeries only</td>
</tr>
<tr>
<td>Romania</td>
<td>MOH ultimately responsible. No evident coalition structure. SALROM strong national player</td>
<td>NA</td>
<td>Results of 2007 national survey are used by MOH and Institute of Public Health to argue for a revision of the national salt iodization standard</td>
<td>The CIS-wide iodization standard (Minsk) was initially promoted by Russian officials, but the commitment waned subsequently. Endocrinology Research Institute conducts regular small-scale surveys</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>Chief Sanitary Physician MOH in charge on behalf of government, Salt producers positive. Consumer Rights NGO is active. No National Coalition</td>
<td>MOH to coordinate across government departments. Coordination among like-minded partners is by Working Group (Public Coordination Council)</td>
<td>MOH revised standards upward on finding too low impact in a 2001 national survey</td>
<td>The CIS-wide iodization standard (Minsk) was initially promoted by Russian officials, but the commitment waned subsequently. Endocrinology Research Institute conducts regular small-scale surveys</td>
</tr>
<tr>
<td>Serbia</td>
<td>MOH and Institute of Public Health are in charge. Previously dysfunctional multisector coalition is now being revived</td>
<td>MOH coordinates across government departments. NIPH making efforts to mobilize all stakeholders</td>
<td>CIS iodization standard accepted</td>
<td>Results of 2007 national survey are used by MOH and Institute of Public Health to argue for a revision of the national salt iodization standard</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>National Coalition in existence during period of ADB support, with Chief Sanitary Inspector as Chair. Unknown whether coalition still is functional</td>
<td>MOH coordinates across government departments</td>
<td>CIS iodization standard accepted</td>
<td>CIS iodization standard accepted</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>Central decision-making. MOH is held accountable for leadership. Single government-owned salt company</td>
<td>MOH coordinates across government departments</td>
<td>MOH revised standards upward on finding too low impact in a 2001 national survey</td>
<td>MOH revised standards upward on finding too low impact in a 2001 national survey</td>
</tr>
<tr>
<td>Ukraine</td>
<td>MOH-conceived National Committee did not meet for years. Salt industry not keen to participate in collaborative platform. Some major NGOs were opposed to USI</td>
<td>MOH to coordinate across government departments and communicate to stakeholders</td>
<td>CIS iodization standard accepted</td>
<td>MOH revised standards upward on finding too low impact in a 2001 national survey</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>Period of ADB support illustrates that MOH tends to act in isolation while not using all expertise. Iodization had low priority while government stimulated an emerging national salt industry</td>
<td>MOH to coordinate across government departments. Government decisions are communicated to stakeholders</td>
<td>CIS iodization standard accepted. Institute of Endocrinology performs oblast-based standard UI surveys at intervals</td>
<td>CIS iodization standard accepted. Institute of Endocrinology performs oblast-based standard UI surveys at intervals</td>
</tr>
</tbody>
</table>

ADB, Asian Development Bank; CIS, Commonwealth of Independent States; FBH, Federation of Bosnia and Herzegovina; IDD, iodine deficiency disorders; MOH, Ministry of Health; NIPH, National Institute of Public Health; NA, NGO, nongovernmental organization; RS, Republika Srpska; SES, Sanitary–Epidemiologic Services; Tvol, thyroid gland volume; UI, urinary iodine; USI, universal salt iodization
improvement in comfort among the different stakeholders with collaborative agreements on expected roles and responsibilities. Iodizing salt was not a new concept in the region, but the idea that iodizing the entire edible salt supply was imperative for preventing brain damage in each new generation was new and deviated from the former focus of controlling goiter and cretinism in endemic areas only. The evidence-informed reasoning and the logic in advocating USI became increasingly accepted by the participants in the Almaty Forums, shifted a key part of the responsibility for implementation to the salt-producing industry, and led to an increased political will among all the stakeholders to accept mandatory laws and collaborate in multisector coalitions to bring the strategy to successful achievement.

As the final column of table 4 indicates, specific data on national accountability practice are scarce. The reports from the countries in this study show that the reporting on national progress was addressed by media exposure (Armenia, Belarus, Bulgaria, Kazakhstan, Kosovo, the Kyrgyz Republic, Macedonia, the Russian Federation, and Tajikistan), at times connected to the obligatory Ministry of Health reporting (Bulgaria and Kazakhstan), but mostly in response to journalistic inquiries.

Discussion

The information in the present report adds to the accumulating global experience [35, 36] with the progressive adoption of salt iodization for sustainable elimination of IDD, and it extends the information basis to the practice of national USI strategies in the CEE/CIS, which has its own history and particular outlook among the decision makers, key stakeholders, and populations. The analysis of progress made during the past decade on tackling the challenges of elimination of IDD in this region offers the first lesson that despite the unique sociocultural environment and the major political upheaval and economic transition that lasted into the decade under review, the USI strategy was readily adopted and dynamically pursued in the large majority of countries of the region. The findings and results from the present analysis add to the growing global evidence that USI can effectively alleviate iodine deficiency throughout the population, and they support the view that global success is achievable by ensuring that iodization of food-grade salt becomes the norm in the salt industry.

Progress overview

At the turn of the century, attainment of USI in the region was lagging behind the global rate of 70% [8]. Large-scale household surveys before the year 2000 showed that only one-quarter of the households in the region were using adequately iodized salt. Figure 5 shows the quantum improvement that had taken place by 2009. According to the agreed-upon indicator of adequately iodized household salt [36], access to the product in the countries in this study had risen to 55% by 2009.

Notably, the regional average of 55% is strongly attenuated by the large populations in the Russian Federation and Ukraine, where the iodized salt supply...
levels remained essentially unchanged during the decade. Figure 6 shows the progress in USI by category of population access to adequately iodized salt. At the end of the decade, more than 50% of the population had access to iodized salt in 85% of the countries in this study, compared with only 39% of countries in the year 2000.

Obviously, more needs to be done to achieve the goal of elimination of IDD throughout the region. But the prospects for action to address the remaining challenges are encouraging, considering the increased acceptance of national multisector partnership collaboration in the region. The narrative reports of national progress and accomplishments (see the Appendix) offer various examples of how, and under which conditions, the USI strategy was implemented, and how they were received. They can be useful models for informing the leadership of other countries about the contextual variables that require adaptation in design and implementation processes to the characteristics of their own populations, stakeholder organizations, and the detailed sociocultural and political forces in society [37].

Figure 7 shows the evolution of key benchmarks in implementing salt iodization strategies in the region. The figure suggests an average time lapse of about 5 years between the enactment of legislation and the achievement of universal household coverage, although the length of this period varied sizably between countries. The attainment of adequate population iodine status does not show a delay after universal coverage with iodized household salt was achieved, however, which suggests an immediate effect of dietary iodine supply on UI levels in the population groups surveyed.

Reasons for success or failure

The theoretical analysis of USI strategies made it plain that a single success factor for USI strategies can rarely be expected. Instead, progress in USI in terms of activities (e.g., supplying iodine) that lead to outcomes (e.g., consuming it) and impact (e.g., iodine status) typically takes place from the combination of efforts in all the strategy components, buttressed by keen oversight that promotes fidelity among the stakeholders to their commitments. This review did not find evidence that this interpretation differed in the countries in this study.

The present analysis confirms the known lesson [4, 35] that joint, collaborative strategy development and management by a multisector, public–private partnership is a key factor for success. In the CIS countries at the start of the first decade of the 21st century, the concept of joint collaborative decisions across sectors and between different professions was new, and it took time to be grasped and sink in [27, 34]. UNICEF used its significant convening power at the executive level many times to connect the key stakeholders, all of which have essential, complementary expertise and resources for bringing a USI strategy to fruition. UNICEF’s skill and know-how to deliver high-level advocacy, and its ability to directly involve any organization that is most valuable for the given cause, have been important factors for promoting a winning constituency, acceptance of a
true USI statute, and execution of a solid USI strategy in most of the countries in this study.

As reported in an earlier overview of USI progress in the region [27], strategically placed members of the academic profession often have highly influential roles in the political decision-making process. Weak knowledge of public health principles and low skills in the interpretation of epidemiologic data have in the past encouraged a significant clinical slant toward the population-wide prophylaxis approach [28]. In Ukraine and the Russian Federation, proposals to provide iodine supplements for especially susceptible target groups based on clinical susceptibility are still dominant, which continues to delay a principle decision to adopt mandatory salt iodization based on public health nutrition considerations. More public health principles-informed analysis and action are being strengthened in the Balkan area [38], but these practices need to be extended in other parts of the region.

The present review also confirms the known lesson [4, 7, 36] that legislation should make iodization of all food-grade salt mandatory to achieve optimum iodine nutrition throughout the population in a short time. As Table 5 shows, both universal supplies and adequate iodine nutrition were more likely to be achieved where the focus of the strategy was on the entire supply of food-grade salt. The fundamental purposes of the USI strategy include the provision of additional dietary iodine in a way that is equitable across the socioeconomic population sections [1]. Because food-grade salt not only is used in the household but also enters a range of industrially manufactured foods that are common in the diet of a population, focusing attention on a single product, such as household salt alone, is typically insufficient.

The analysis in this report revealed a number of unique characteristics of the region's experience in achieving national progress and success. The following sections indicate the key lessons learned from the principal components of national USI strategies.

Salt iodization

At the start of the decade, particularly in the majority of large-scale salt companies, technology issues had for the major part been addressed and overcome. Follow-through operational issues needed to be addressed, such as the management of quality assurance in the use of the technology, stimulating viable business models for small producers (Azerbaijan, Kyrgyzstan, and Tajikistan, for example), diligence in trade, and easy access to the fortificant at reasonable cost, especially for the smaller salt companies—not the technology of iodization itself. This implied attention to systemic capacity development [34], for example, to the timely collection of data on product quality during production, the proper authority for decision-making on iodization performance, and promotional communication with customers in the supply channels. An improved adoption of these more intractable tasks of salt iodization management became evident from the USI achievements, especially in category I and II countries.

The salt situation in the region includes a number of large salt companies (Table 1) with state-of-the-art capacities that are servicing a major share of the overall food-grade salt supplies. These companies are typically subject to oversight by a national metrology/standardization authority (e.g., under the Ministry of Trade and Industry or Economic Development), with strict rules for technology approval, authorization of the fortificant, and verification of products for quality and safety. The websites of the majority of these companies show that they have obtained ISO 9000 certification for quality management performance. This combination of modern industry capacity and official industry oversight was a factor in the successful attainment of USI in Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, and Kazakhstan; in the near successes in Montenegro, Romania, and Serbia; and in the significant progress in Azerbaijan. This suggests that when the quality of the product from the supply source is certain, the need for frequent quality control downstream in the markets and the food-manufacturing companies diminishes. In the salt import-dependent countries Kosovo and Macedonia (and Serbia and Montenegro), the strict due diligence by the Food Authority in the inspection and release procedures of salt import shipments at the border was a major factor in ensuring proper quality of iodized salt supplies. Finally, the agreement on a common standard and mutual collaboration in CIS countries [24] succeeded in raising confidence in the proper quality of iodized salt when traded across borders in this part of the CEE/CIS Region. The acceptance of uniform standards and common rules for inspection and certification in the CIS area was an important factor for successful achievements in those countries where salt iodization became mandated by law [34, 39].

The progress in USI strategies in the Balkan area shows that setting proper standards for salt iodine levels remains important. By 2009, success had not yet been completely attained in the three countries with the
Salt industry, making certain that animal salt is iodized would probably concern only the remote farm communities, and this can perhaps be better addressed locally. The information on USI strategies in the region also indicates that the cost of iodization and the price of the product in the market are not impediments. This review did not discover any iodized salt-specific pricing control effort during the decade. VAT exemption was given to salt producers to stimulate iodized salt production in some countries, but no information was available to evaluate the effect of such exemption. The persistent finding of low user rates in very poor communities of Kathlon and DRD oblasts in Tajikistan suggests that iodized salt vouchers may be an effective adjunct in poverty alleviation, while this would also stimulate the amount of iodized salt produced by small Tajik salt companies in this area.

Communication

Effective communication designs develop, test, and deliver messages that create the right awareness in their target group(s). In supporting a USI strategy, the information should emphasize the connections among salt iodization (an action by the industry), consuming sufficient iodine (obtained through common foods), and brain protection (a hidden danger for each new generation of newborns). In the region, the brain damage issue was new and a change from the previous time when the emphasis for intervention was on goiter and cretinism, which are visible mostly in adults. A review of communication efforts in the region [31] presents many examples of the formative research that was conducted with the aim of exploring the facts and perceptions among various intermediary and target groups related to the specific problem and strategy, providing information on the most effective channels and messages, and allowing specific adjustment to the information needs and frameworks of understanding of target audiences. Such research provided critical information to formulate better targeted and more effective messages, which in turn led to better reception by the
public, the ultimate beneficiaries.

Large-scale campaigns in almost half of the countries in this study have made substantial contributions to the growing awareness in wide segments of society that iodine deficiency is connected to brain development and, therefore, to the future learning potential of each new generation. By involving opinion leaders recognized at the grassroots, this component helped initiate and support innovative activities in communities to ensure access to iodized salt, for example, in Azerbaijan, Kazakhstan, and the Kyrgyz Republic [39]. Moreover, involvement of officials in the design of campaigns strengthened the political will and improved collaboration among stakeholders. Communication efforts probably also helped to prevent undue influence of the potential gatekeepers of USI strategies [34].

Since USI strategies are national, thus requiring national legislation and regulation, the national leaderships and decision makers form a special audience. Advocacy for USI strategies early during the decade was especially driven by technical and economic evidence [31]. In the course of time, however, it became increasingly clear that the remaining obstacles were political. Where USI progress was seen lagging, the objections seemed more motivated by financial gain, and they were being expressed typically as social-normative concerns. Communication skills in advocacy should be brought to bear on these barriers. Stated concerns in Ukraine and the Russian Federation about “free consumer choice” and/or “freedom of entrepreneurship” may be countered by human dignity principles from the Convention of the Rights of the Child, as is being done, for example, by the UN Special Rapporteur on the Right to Food [40].

At the start of the decade, the recommended USI strategy was being criticized on the basis that the public promotion of iodized salt would lead to increased salt intake [41], even though no evidence was provided that the promotion among the public in the region had led to an increase in salt consumption in any instance [4]. The guide for social mobilization of USI strategies [30] cautions against raising a perception that consuming larger amounts of iodized salt makes people smarter or grow taller, and a report on the ostensible conflict between public health objectives [42] concludes that the mandated iodization standards can easily be adjusted for any level of salt consumption. Humans need salt for life, and there has always been a human preference for salt as a flavorful ingredient in food consumption. The present review did not find any differences in the pace of progress, level of USI achievement, or impact on iodine nutrition during the decade between countries that conducted a major communication campaign and those that did not. Because the fundamental purpose of USI strategies is to insert additional iodine into the common food supply, the proper aim of providing promotional information to the public was to increase their acceptance of the national strategy rather than to stimulate higher consumption of iodized salt. The focus on the product or the vehicle instead of the strategy distracted from the genuine issues.

The insertion of essential knowledge about USI strategy and brain damage in educational curriculums is part of an unfinished agenda. As the present generation of trained professionals grows older, their jobs and functions will be taken up by the next generation. Regular education of each generation will endow the nation with the proper knowledge basis to maintain USI. In the majority of countries, insertions were accomplished or in progress in primary and secondary schools and often in medical schools. In many cases, salt testing with a rapid test kit in primary schools provided an opportunity to demonstrate the product. In polytechnic schools, the training of industry staff typically requires a “business” orientation for maintaining USI as the habitual norm in the salt industry – the associated costs should be accepted as a normal part of the operations in the companies, and included as part of the price for the customer.

As convincingly demonstrated in the Kyrgyz Republic, the use of the rapid test kit as a tool to demonstrate the presence of iodine in salt can help to raise public awareness and mobilize communities to insist that iodized salt be made available [43]. The empowerment of community members to check at the retail level, or retailers to check at the wholesale level, was an effective method to quickly increase household supplies of iodized salt also in Azerbaijan.

Preparedness planning for adverse events associated with salt iodization remained a comparatively underexposed element in the action plans of communications campaigns in the region. Early on, it was anticipated that a rise in iodine-induced thyroid disease might occur upon the increases in dietary iodine supplies, which could easily discredit the strategy. Coordinated by the Regional Office, UNICEF officers and their counterpart health officers were provided with the relevant literature on the balance of benefits vis-à-vis risks related to salt iodization strategies, which they could use in case of national discussions on adverse side effects. Although some endocrinology experts, in consultations with external experts, did mention the occurrence of new cases of hyperthyroidism, a direct connection with the legislated USI strategies was not evident in any country.

Monitoring and evaluation

The present review is primarily directed at the analysis of change in dietary iodine supply (measured by levels of salt iodine content and amounts of production or supplies), iodine consumption (typically measured by household use and coverage rates), and iodine nutrition (approximated by UI concentration in target groups).
This sequence reflects the rational relationships in a logical framework and can serve the objective of assessing the adequacy and plausibility of USI strategies for the elimination of IDD [26]. During the decade, the few direct assessments of IDD burden were obtained by thyroid volume measurements, and the experience from Serbia indicates that even with a strong effort to align these measurements among different observers, the survey data may not necessarily be reliable in the end. Although the collection of these data by a single observer increases the ability to make comparisons within groups, such as was the case in the Kyrgyz Republic, comparisons between countries and at different time points within countries remain problematic because of this methodologic concern.

This review found that the development of obligatory annual reporting on the national salt supplies was accomplished in four countries (Bulgaria, Kazakhstan, Kosovo, and Turkmenistan). Monitoring and verifying that the amount of iodized salt provided nationally is sufficient is a valuable tool for oversight [21, 34]. The establishment of this national monitoring practice in each country forms part of the unfinished agenda. The intention would be to evaluate the amount of all food-grade salt provided nationally for delivery to consumers and the food industry. The separation is important for policies that provide different regulations for salt for the food industry and household salt, such as is the case in Belarus.

The country summaries show that inspection of the quality of iodized salt in the food-manufacturing industry has been integrated into the job descriptions and tasks of food and hygiene inspectors in Belarus, Bulgaria, and Kazakhstan (and perhaps also Armenia, Georgia, and other countries). Except for the annual report requirements mentioned above, however, no example was found in which the results were shared with national partnerships for the purpose of watching over the quality and amount of iodine in manufactured foods.

As already stated, setting proper salt iodine production standards remains important. Of the nine category I countries with successful USI achievement and adequate population iodine nutrition, the four Balkan countries (Bosnia and Herzegovina, Bulgaria, Kosovo, and Macedonia) had comparatively low iodization standards compared with the five CIS countries in this category (Armenia, Belarus, Georgia, Kazakhstan, and Turkmenistan). All of the CIS countries have adopted the harmonized iodization level of 40 ± 15 mg iodine/kg salt, except Armenia (50 ± 10 mg iodine/kg salt). The national iodine assessment in Armenia showed that the salt iodization standard was excessive. In comparison, the low iodization standards in Bulgaria (17 to 33 mg iodine/kg salt) and Kosovo (18 to 23 mg iodine/kg salt) were associated with (possible) low iodine status in pregnant women, and in Bosnia and Herzegovina (20 to 30 mg iodine/kg salt) and Macedonia (20 to 30 mg iodine/kg salt), the evidence of attained iodine adequacy among pregnant women is weak. Finally, the salt iodization standards in Serbia and Montenegro (12 to 18 mg iodine/kg salt) were the lowest in the entire region. In Serbia, the UI levels of pregnant women who stated that they did not use a supplement were too low, and in Montenegro, the national median UI in pregnant women was too low. The collective evidence of the Balkan countries, summarized in table 6, shows that successful achievement of optimum iodine nutrition by national USI strategies is related to proper setting of the mandated salt iodization levels.

While progress was being made in the execution of USI strategies across the sample countries in this study, a transition took place in the survey systems for assessment of a population's iodine status, which did serve well for the initial assessments of severity and extent of iodine deficiency. Increasingly, pregnant women are understood as a prime target group for iodine nutrition assessment; analysis of UI distribution is being proposed to arrive at an index of optimum iodine nutrition; and the use of statistical analysis for exploring the relationships among the indicators of iodine supply, consumption, and status is improving. The country summaries in the Appendix offer examples of new methods in national survey design, methodology, and interpretation, which can be more useful in a national policy-making role [44] and also exploited for global development of surveillance. Related to the call by the World Health Assembly for reporting by state members on the status of IDD elimination every 3 years [45], the experience of the region suggests that periodic large-scale surveys may not be the most efficient and least costly approach for the future.

The establishment and maintenance of capacity for reliable iodine measurements is crucial. The WYD checker, a simple and reliable reading device for salt iodine [46], has found ready acceptance in the Central Asia area [39]. This method deserves to be extended to situations that are still relying on rapid salt test kits, in the salt industry as well as for iodine survey work. Specialized iodine laboratories have been established in a number of countries of the region, most of them with evidence of successful participation in the CDC-managed EQUIP Program [33], which benefits the program managers by a demonstration that the results from the laboratory can be trusted. As for quality assurance procedures for salt supplies, the credibility of laboratory data on population iodine status requires an independent quality check.

**Joint collaborative oversight**

The present review cited a number of strong and effective public–private partnerships as a critical success
factor. The experience suggests that the participation of government officials and the rules of engagement in national coalitions mostly mirror the bureaucratic principles in the specific state. It may, for example, not be very realistic to expect a prime minister to effectively manage the national oversight coalition when her/his scope of responsibilities encompasses the social sector only and, thus, lacks proper influence on the private sector and national fiscal institutions. Bureaucratic influence at the appropriate place and levels is required to get the institutions in government to accept change.

UNICEF advocacy and considerable funding from the Asian Development Bank were conditions that accelerated the formation and operation of national coalitions in Central Asia [39], but extraneous events, such as a frequent change of government (the Kyrgyz Republic) and the processes of health reform (Tajikistan), limited expectations. In Kazakhstan, the strong personalities in the national coalition of the members from industry and academia were driving the decisions of a coalition chaired by the Minister of Health.

In the region, it sometimes was perceived that being a member of the national coalition required official authorization, would take an undue amount of time, and/or implied a heavy administrative burden. The fairly loose arrangements and strategically targeted communications (Bulgaria and Macedonia), in combination with supportive action at professional levels (Kosovo), exemplify how the actual situation typically differs from this perception.

Information about the forms and structures for national oversight is not plentiful. Formal as well as informal coordination characterized most partnership structures in the region. Where it was demanded by the political set-up, usually some national council or committee existed, at least on paper. At the technician level, however, the interactions and coordination often proceeded in informal ways, for example, at the time of external assistance and/or visits by global stakeholders of reputable stature.

Other iodine supply strategies

The Ordinance of 1956 by the Soviet Ministry of Health included free provisions of potassium iodide tablets to high-risk groups, i.e., pregnant and breastfeeding women, children, and adolescents, in the officially designated areas of high goiter prevalence. The official budgets for health, hygiene, and education during that time were sufficient for the Ministry of Health to direct a platform with adequate reach and service penetration to attain meaningful supplement coverage through the kindergartens and schools and the prenatal and maternity clinics, supported by the networks of 63 antigoiter dispensaries. During the 1950s, several pharmaceutical factories began the production of Antistrumin tablets containing 1 mg of potassium iodide, which is still the cheapest over-the-counter iodine drug available in Russia.

Unfortunately, data for the period from the 1950s to the 1970s about potassium iodide supplement coverage and the number of beneficiaries reached are hard to pin down. The significant reductions in goiter prevalence across the vast territory and the absence of new cases of cretinism during two successive large-scale population surveys in 1965 and 1969 were reasons for the Ministry of Health to declare success and then abandon the overall national monitoring and oversight systems. It is impossible retrospectively to distinguish the fractions of the significant reductions in goiter and cretinism that were attributable to the supplement from those that were attributable to the iodized salt supply strategy. Probably both strategies contributed. Nevertheless, the idea that providing potassium iodide supplements is an intrinsic part of a national plan to address problems of iodine deficiency had been definitely planted in the mind of the professionals and the population alike [18].

The country summaries in the Appendix attest that targeted potassium iodide supplement schedules were also part of the historical record in the Balkan countries, the former Yugoslav countries (Bosnia and Herzegovina, Macedonia, Montenegro, and Serbia), and Bulgaria and Romania. Similar as for the former USSR area at that time, however, data from the Balkan area on the coverage and the numbers of beneficiaries reached are elusive.

At the beginning of the decade covered by the present review, the nationally mandated potassium iodide supplement supply schedules had either withered from resource constraints or been officially abandoned. Among the examples in this review where a national policy approach mentioned the inclusion of potassium iodide supplementation strategies were Moldova, Romania, and Uzbekistan. In other countries, the functional role of potassium iodide supplements appeared to have evolved from the previous organized effort of sponsored provisions at substantial scale as a state obligation, toward a guideline for healthcare providers to advise the use of potassium iodide supplements either in response to perceived susceptibility or from historical experience of their usefulness.

A national decision on the functional role of iodine supplementation remains difficult and is related to the extrapolation of public health data to the care of single individuals, while accounting for factors such as the presence and efficiency of a national USI strategy; the political climate of state responsibility and resource allocation; the availability, access, and costs to individuals of purchasing potassium iodide supplements; and the freedom of medical practice. There is no question that potassium iodide supplements can swiftly raise the UI levels of individuals and, if used sensibly, improve
their position in a population distribution toward or into the recommended UI range. For assessing a population-scale effect, the iodine nutrition situation of pregnant women is particularly relevant, since they are the population group first affected when the iodine supply from the common diet diminishes. The evidence from the present analysis in CEE/CIS countries on the question of whether potassium iodide supplements make a difference at the population level is equivocal. The survey data among pregnant women in Bulgaria found no difference in UI levels between women who reported the use of a potassium iodide supplement and those who did not. In Serbia, in contrast, the UI concentrations among women taking a supplement were significantly higher and forced the entire population distribution of UI levels into the recommended range. It should be noted that in both cases, the consumption of iodine from potassium iodide supplements was additional to the iodine consumption provided by an existing salt iodization strategy, with higher salt iodine standards in Bulgaria than in Serbia and, therefore, leading to different recommended next programmatic steps in each case.

The ongoing debates about, and the resistance against, the enactment of an IDD policy based on salt iodization in the Russian Federation and Ukraine are in large part complicated by the confusion, either implicit in expert proposals or perceived among legislators, between potassium iodide supplementation as an alternative rather than an additional strategy option. This artificial presentation of “alternatives” underlies the lack of agreement about the merits for the population of adopting the salt iodization strategy in the first place. Also, various manufacturers of iodine preparations have been very inventive in developing a range of products that find ready acceptance mainly in the urban markets of this part of the CIS. Compared with Western countries, the business practices of the pharmaceutical and food supplement companies are uncommonly aggressive in promotional marketing and mass advertising. They work from the point of view of selling a product and making a profit. The hundreds of millions in profits from the sale of iodine-containing substances other than iodized salt override any concern about addressing an invisible public health issue. Furthermore, their influence with lawmakers reaches far beyond the impartial recommendations of technical advisors.

Finally, the present review found one instance during the past decade where iodized oil supplements were used. In Georgia during 2000/01, as an emergency measure while salt iodization was virtually stalled, nearly 500,000 iodized oil capsules were distributed in repeated rounds among 3- to 18-year-old children and pregnant and lactating women in the 12 most goiter-affected regions. Detailed utilization reports are available, but they do not permit an estimate of coverage, since the population denominators are lacking. The reports also mention perturbed thyroid hormone and low UI levels at baseline. Blood and urine assays were announced for follow-up assessments, but this review has been unable to retrieve any actual data or information about these outcome indicators.

Distribution of iodized oil among nearly 300,000 school-age children in 13 districts of Azerbaijan dated from 1998/99, before the current review period and also in the virtual absence of salt iodization at scale. The project, sponsored by the European Commission through the Patras Medical School in Greece, succeeded in raising an alarm and heightened concern among the health authorities and endocrinology experts about the severity of IDD in Azerbaijan. A staggered pre–post supplementation comparison design resulted in a scientific publication in 2008, which showed that the correction of severe iodine deficiency in the age group from 6 to 16 years accelerated linear growth and normalized the time of onset of pubertal development for both sexes.

**Conclusions and recommendations**

Recently, there has been increased realization [26, 47] that the adoption of national public health and nutrition strategies demands scientific standards of evidence beyond the typical controlled research designs and should use the totality of the available evidence [48]. In the course of tackling dietary iodine deficiency, a national policy-decision approach typically moves through three steps [49]: discovery and characterization of the problem, addressing the problem through multisectoral initiatives, and determining whether the problem is being properly addressed.

The information in the present report of USI progress during the past decade in the CEE/CIS offers information about the two last-mentioned steps. Mindful of the history of tackling goiter and cretinism and informed by the recommendation from the UNICEF-WHO Joint Health Policy Committee [1], most national decision makers in the region proceeded to enact a variation of the USI strategy while trying to make an optimum choice that best matched the given salt supply situation and the contextual variables in their societies. The country summaries report on the execution of the national strategies and show how and under which conditions the strategy variations were implemented.
and received, and what their impact was on the iodine nutrition situation [37]. Thus, the analysis in this report is focused on “how things should be done” and can thereby assist in a principle decision in those countries where the strategy has not yet been adopted (category IV) and in refined adaptation in countries facing challenges in execution (categories II and III).

From the perspective of reports of global progress, the present study follows in the footsteps of an in-depth analysis of experiences, early in the decade, with micronutrient programs in 12 countries, all but one in South or South-East Asia [50]. Similarities exist in the focus of analysis, not only on what has happened and under what conditions, but also on how the interventions were conducted and what evidence of impact was obtained. The present report had the advantage of an explicit model [9], derived from the design rationale of professional areas, or components, that comprise the USI strategy. Also, our analysis took a viewpoint of societal partnership action. The strength of the South and South-East Asia report was its angle of technical evaluation, with detailed data from a longer time period that straddled the point in history of the adoption of USI as the preferred strategy globally. This permitted learning also from the transitions of pilot iodized salt projects and targeted supplementation approaches toward national programs at scale. The practice of iodizing salt and the access to the product in markets was a known fact of history in the society of our review. Iodine supplements were also known from history in the CEE/CIS, but their large-scale provision during the decade under review remained severely constrained through a combination of low health budgets, waning political will for scaling up their provision, and extensive poverty of the population. In the CEE/CIS Region during the decade of our review, such transitions were therefore either absent or so small-scale as to be meaningless, while the greater part of the action described in this report took place after the choice was made to recommend USI as the main strategy for the elimination of IDD [1].

Seen from a technical perspective, the conclusions and lessons learned from the present study are not strongly different from those of the South and South-East Asia study. But there are key differences in the valuation and attribution of stakeholder roles and responsibilities, the engagement of stakeholders in a national coalition, and the details of executing the strategy components by each stakeholder. The latter include the monitoring and evaluation design, target group selection and preference of indicators, the orientation and value of supportive communications, and the national management responsibilities of salt iodization and management of the iodized salt supply. The recent UNICEF report on global progress [36] concluded that the agreed techniques for tackling and solving public iodine nutrition problems have matured.

Our present analysis suggests that “strategy maturity” derives in the first place from an increase over time in the comfort level among the national stakeholders about blending their essential roles, encouraged by the tangible experience that USI progress takes place from the concert of their actions. Hence our major highlight on the function of national coalitions.

In conclusion, the specific insights from this review can be summarized as follows:

During the first decade of this century, the CEE/CIS Region has witnessed a marked improvement in the execution of national USI strategies by multisector collaborations. From only a few countries with effective national partnerships for ensuring adequate iodine nutrition at the onset, successful and near-successful national partnerships were found in 75% of the sample countries of this report by the end of the decade. The information from the nine successful countries adds to the global evidence that well-designed, true USI strategies are adequate for eliminating iodine deficiency in populations. The present analysis also shows that achievement of optimum iodine nutrition is most likely to be successful where national legislation mandates the iodization of all salt for the supply channels to the food industry and to households. This indicates that focusing on iodizing only household salt, the fraction visible to the public, is usually not sufficient.

Overall progress in this region has benefitted from the fact that the majority of the food-grade salt supply is produced by 15 large salt companies, which are regulated by the Standardization and Metrology agencies under a Ministry of Industry and Trade. Several of these large companies have attained state-of-the-art ISO certification. The available information across the large companies from assessments of the quality of supply confirms their competence for quality-assured production of iodized salt. The history of the region provides examples in which the role played by the CEOs and technical staff of the companies has been critical in upholding salt iodization as the industry norm. On the other hand, the attitude of some of the largest salt companies has remained noncommittal and submissive only to official regulation. A vision that the “captains of industry” can be decisive for elevating USI as the region-wide industrial norm has not yet fully taken hold.

The food inspection authorities have a critical role in upholding quality salt supplies in the countries that are either completely or partially dependent on imports. Due diligence of inspections followed by enforcement of the national standards are among the underlying reasons for universal adequately iodized salt supplies in the fully import-dependent countries. Because the importing firm must bear the costs of diversion or return of noncompliant shipments, this procedure has proved an effective deterrent against unscrupulous suppliers. The food authority also plays an important
role in inspecting iodized salt in the markets and the food industry of the other countries. In Belarus, mandatory iodization of the entire supply of salt to the food industry is the main successful USI tactic in reaching adequate population iodine nutrition.

The report recommends thoughtful design of national communication campaigns, with proper attention to raising acceptance of the strategy by public education. Other elements considered important in these campaigns are the stimulation of stakeholders, keeping gatekeepers at bay, and insertion of knowledge in ongoing education. Public information efforts should not aim at increasing the amount of (iodized) salt that consumers purchase. Experience with the use of rapid test kits by community members and salt retailers indicates that the insistence at the grassroots level on properly iodized salt can quickly raise the supply of iodized household salt in cases of failure of enforcement by the food authority. Stimulation of small salt companies calls for more attention and training on arrangements and skills for quality assurance during production and ethical product promotion to customers. New insights on significant gatekeeper opinions include resistance by industry technicians to the use of iodized salt in food preservation in a number of Eastern European and Western CIS countries and the persistent objections to enactment of USI by influential scientists in the Russian Federation and Ukraine, rooted in a weak understanding of public health concepts and principles in combination with aggressive promotion of alternative products by industry.

The region has a considerable capacity for iodine nutrition assessments. Quality assurance practices have become established successfully in the iodine laboratories of nearly half of the countries in this study. The upward trend in design, measurement, analysis, and interpretation of national surveys includes assessments of iodine nutrition in pregnant women, analysis of UI distribution as an index of optimal iodine nutrition, and the improved analysis of relationships among key indicators of iodine supply, consumption, and nutrition. The development bodes well for the future design of national surveillance systems aimed to assist in sustaining the elimination of IDD.

This review of USI strategies provides an update of action over the past decade and shows the major improvements that occurred in addressing iodine deficiency at the national scale. The quality of efforts and the availability of information have substantially improved across the region. Yet, there is a remaining burden that needs to be addressed on priority in the high-population countries of the Russian Federation and Ukraine. This should be a major focus of support efforts during the next years, up to the Millennium Development Goals deadline.

There are additional remaining challenges and opportunities across the region. A summary outline is as follows:

- Establish a "national salt watch" (annual quantitative supply mapping) in each country of the region;
- **Strengthen the quality management practices**, especially in small-scale salt companies, by assisting in systemic capacity development and establishing self-reliant input procurements;
- **Explore a regional "Captains of Salt Industry Council"** to promote establishment of an industry norm as part of a growing business-oriented approach to national USI strategies;
- **Insert the essential IDD and USI knowledge in ongoing basic and technical education systems in each country of the region**;
- Extend professional development and training opportunities on public health principles-informed analysis and action to current and future medical specialists in the CIS;
- Strengthen the advocacy ability of national partners to counter the relentless political objections with socionormative counterarguments, such as those in the Convention of the Rights of the Child and the Universal Declaration of Human Rights;
- Promote diligent quality assurance practices for imported salt in situations where progress is still weak or lagging (Albania, Azerbaijan, Moldova, Romania, and Uzbekistan);
- Develop good surveillance practices for national oversight of sustained optimal iodine nutrition in the population.

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References


Appendix: Country summaries of progress toward USI

Albania

A poster presented at the International Workshop on “Iodine Deficiency in Europe,” held in Brussels, Belgium, in 1992, reported a 41% goiter prevalence among 6- to 20-year-old participants in a survey of nearly 200,000 people in Albania. The same survey also identified 192 cretins and 46 deaf-mutes [1]. A first national survey using formal systematic sampling was carried out in 1993 by the Institute of Public Health, Tirana, collecting urine samples from 2,395 8- to 10-year-old children from 32 clusters. Thyroid volume was measured in 241 children in four villages in the northeast, and blood thyrotropin (TSH) was determined in 227 newborns in a maternity clinic in Tirana. In children, median UI levels by cluster varied from 20 to 49 µg/L, and the prevalence of elevated thyroid volume was 29%; 33% of newborn TSH levels were elevated. These findings confirmed the existence of moderate to severe iodine deficiency in Albania [2].

Almost all salt in Albania is imported, mainly from Greece (approximately 80%) and Italy. The 2000 MICS [3] reported that 57% of Albanian households used adequately iodized salt, with a significant contrast between rural (48%) and urban (71%) areas. To stimulate progress, UNICEF provided iodization and quality assurance technology and training to the Vlora salt company, but domestic salt production has been slow to develop. The Albanian Government created a National IDD Committee, and the Prime Minister issued a decree banning the import of noniodized salt for human consumption. The standard for salt iodization was set at 25 mg iodine/kg salt. A public awareness campaign and a salt quality monitoring system were also started with UNICEF support. A scientific study in 2003 [4] demonstrated the continued inequality between rural and urban areas. Among urban schoolchildren in southern Albania, the median UI was 45 µg/L, goiter prevalence was 32%, and 78% of household salt samples had less than 15 mg iodine/kg salt. Among rural schoolchildren, the median UI was 17 µg/L, goiter prevalence was 95%, and no household salt samples were adequately iodized. The 2005 MICS reported that 77% of the households used imported Niki salt from Greece, followed by locally produced Vlora salt.

In 2006, a national iodine survey was conducted with UNICEF support by the Institute of Public Health and the Hospital of Bolzano, Italy [5], covering 6- to 13-year-old schoolchildren and pregnant women (< 6 months gestation) in 30 clusters stratified by four zones: coastal cities, coastal villages, internal cities, and internal villages.

From each group, urine and household salt samples were collected for quantitative analyses, and thyroid size was quantified by ultrasound. A total of 840 children and 365 pregnant women were examined. The survey results are summarized in Table 7. The survey confirmed that iodine deficiency is more intense in rural than in urban Albania. Overall, 60% of household salt samples were adequately iodized, and UI levels were adequate among urban schoolchildren. Nevertheless, the iodine status among pregnant women was insufficient in all strata, and the median salt iodine content was below the national standard. In conclusion, despite the ongoing program efforts aimed at promoting USI, schoolchildren and pregnant women in Albania remain severely to moderately iodine deficient according to UI levels.

The Parliament of Albania enacted a USI Law on 26 June 2008, and enforcement was stepped up during the same year to ensure that all salt for human nutrition (consumer salt, food-industry salt, and salt for livestock) was adequately iodized. The Agribusiness Council has become involved in advocacy among food processors, traders, and retailers. Customs officers have

<table>
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<tr>
<th>Population indicator</th>
<th>Coastal</th>
<th>Internal</th>
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<tr>
<td></td>
<td>Cities</td>
<td>Villages</td>
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<tr>
<td>Median salt iodine (mg iodine/kg salt)</td>
<td>18.5</td>
<td>15.9</td>
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<tr>
<td>% of households with adequately iodized salt (≥ 15 mg iodine/kg salt)</td>
<td>61</td>
<td>53</td>
</tr>
<tr>
<td>Median UI in children (µg/L)</td>
<td>113</td>
<td>70</td>
</tr>
<tr>
<td>Median UI in pregnant women (µg/L)</td>
<td>122</td>
<td>98</td>
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<tr>
<td>% children with elevated Tvol (BSA reference)</td>
<td>9.9</td>
<td>18.9</td>
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BSA, body surface area; Tvol, thyroid gland volume; UI, urinary iodine
been trained in improved control of salt imports, and mobilization campaigns among the population have been organized through schools with the use of rapid test kits and educational activities, jointly conducted with health and education authorities. These activities are focused especially on areas known from the previous surveys to have a higher prevalence of iodine deficiency. The Government of Albania has recently privatized the Vlora salt factory, thus rekindling the hope that the domestic production of iodized salt may improve in the future.

References and important documents


Armenia

At the time of the Ministry of Health ordinance of the USSR in 1956, high goiter rates (25% to 30%) were reported in the northern mountainous areas of Armenia. The Avan Salt Company, established in 1970, started producing “Extra” quality vacuum salt for local supply and export of iodized salt at 23 ± 13.5 mg iodine/kg salt using potassium iodide, which was the GOST standard used in the USSR at that time [1]. UNICEF support in 1995 assisted in modernizing the Avan Salt Company production line and improving the laboratory-based quality assurance capacity in the industry. A Goiter Control Unit was established in the Ministry of Health in 1997 for thyroid volume and UI assessments. The iodization standard was revised in the same year to 35 ± 10 mg iodine/kg salt as potassium iodate, although iodization remained voluntary [2].

A national iodine survey in 1997 among 2,000 households [3, 4] reported a median UI of 139.5 µg/L among children under 5 years of age, with goiter in 6% of women of reproductive age, and 66% of households using iodized salt as tested by rapid kits. In 1999, the (still voluntary) salt iodization standard was raised to 50 mg iodine/kg salt as potassium iodate. According to two salt situation analyses conducted during 1998/99, the salt produced by the Avan Salt Company, reported at 12,000 MT, was fully iodized [5]. The 2000 DHS showed that 90.4% of households used iodized salt, and 83.6% of households used salt with > 15 ppm iodine. An analysis according to province [6] showed relatively low coverage in the northern provinces due to infiltration of noniodized salt from Georgia, where iodized salt coverage was low (fig. 8).

In the absence of mandatory USI legislation, the Avan Salt Company continued to produce only iodized salt. With continued stimulus by the company, compulsory USI was decreed by the Government of Armenia in 2004 while reconfirming the iodization standard at 50 ± 10 mg iodine/kg salt with potassium iodate [7]. In 2005, a national assessment conducted with UNICEF support used a 30 × 30 cluster design among 8- to 10-year-old children. UI analyses were conducted by the IRLI laboratory in Sofia, Bulgaria, and salt iodine was measured by titration in the National Public Health Institute. The results showed that 97.2% of 926 salt samples contained more than 15 mg iodine/kg salt and that the national median UI level was 313 µg/L. UI levels varied from 159 to 365 µg/L by province [8].

An in-depth analysis of the relationship between the iodine content in household salt (a proxy indicator for iodine consumption) and UI levels (reflecting the children’s iodine status) showed that the large variation in salt iodine content did not explain the differences in UI levels among children [9]. This lack of a relationship indicates that the proportional contribution of iodized household salt to total iodine consumption is small in comparison with the consumption of iodine from foods manufactured with iodized salt (bread, dairy and meat products, cheese, etc.).

The 2005 national iodine survey offered testimony that iodine deficiency in the population of Armenia had been overcome by the USI strategy. The survey report recommended an adjustment of the technical salt standard downward in alignment with the CIS-wide standard of 40 ± 15 mg iodine/kg salt and emphasized the need for continued oversight. The success in
attaining the goal of elimination of iodine deficiency in Armenia was acknowledged in July 2006 by the Network for Sustained Elimination of Iodine Deficiency [10]. Internet site ArmeniaNow.com of June 2009 [11] shows the continued interest and concern about the linkage between thyroid disease and salt iodization among the scientific, civic, and official organizations in Armenia.

To summarize, the Avan Salt Company in Armenia has long been a strong proponent of USI to ensure optimum iodine nutrition in the population. The company has consistently iodized its edible salt production, which in theory should suffice for the full national consumption needs. Going through several voluntary variations from the mid-1990s, USI became mandatory by decree in 2004 with the standard set at a relatively high level of 50 ± 10 mg iodine/kg salt. A national iodine survey with external expertise in 2005 showed that the population is protected against iodine deficiency. The UI distribution in large part exceeded the upper recommended limit, however, and Armenia was advised to reduce the mandated standard to the agreed-upon CIS level of 40 ± 15 mg iodine/kg salt. The survey results indicated that the food-manufacturing industry makes the key contribution to dietary iodine consumption due to its use of iodized salt in processed foods.

References and important documents

**Azerbaijan**

Before independence, most salt in Azerbaijan was imported from Kazakhstan, Ukraine, and Russia. In the early 1990s, local surveys by the National Institute of Endocrinology demonstrated a mild to moderate burden of iodine deficiency [1]. Salt for human consumption was largely imported at that time from Ukraine, with small amounts from Iran and Turkey, and none of it was iodized. A first advocacy meeting was held in Baku in 1994, where the Vice-Minister of Health committed herself to start addressing the problem while seeking collaboration with UNICEF.

A national health and nutrition survey in 1996 [2] revealed a nationwide goiter prevalence of 11% with higher rates among women, refugees, and people living in the mountains. A National IDD Commission was formed and developed a plan of action including attention to ensure salt iodization by a state enterprise located at Masazir Lake, northeast of Baku. The underground deposits in Neftçala, 100 km south of Baku, were noted for potential iodine production [3].

A detailed survey of iodine nutrition took place in 1998 with collaboration between Patras Medical School, Greece, and Azerbaijan Medical University, Baku, covering a purposive sample of schoolchildren 8 to 14 years of age in 13 regions [4]. The mean visible goiter prevalence (stages II and III) was 13%; the prevalence was higher among people living in the mountains and in girls. The median UI level was 54 µg/L, and UI values were significantly related to blood thyroglobulin levels, a surrogate indicator of long-term stimulation of the thyroid gland. In follow-up to these alarming findings, 293,000 schoolchildren 6 to 16 years of age in the mountainous areas were given oral iodized oil capsules in 1999/2000, which on follow-up was found to promote linear growth and normal onset of pubertal development [5].

During the 1990s, the conflict with Armenia and economic collapse were among the reasons why the action plan of the IDD Commission was slow to proceed. For example, three iodization machines ordered by UNICEF in 1996 had not been installed by May 1999 [6]. A salt situation assessment in May 1999 found 20 different brands of edible salt in the Baku markets, only 3 of which were iodized sufficiently. Six of the 20 brands were packaged by two local companies, and these 6 brands together were estimated to provide 10% to 12% of the total salt supply. Other brands were imported from Iran, Turkey, Ukraine, Russia, and Turkmenistan. The salt situation report [6] also notes that the Nakhchivan Salt Factory had been provided with iodization technology but produced only 2,000 MT of salt per year. The MICS report [7] stated that by the end of 2000, 41% of the households used adequately iodized salt.

A more encompassing situation analysis in 2001 [8] confirmed the isolation of the Nakhchivan factory and stated that it had started iodizing 185 MT of salt, or 18% of production capacity. The report mentioned that progress had been made in the development of an overall legislative frame (sanitary–hygienic well–being, consumer rights protection, and standardization) and some regulations (standards for food-grade salt and for test methods). A law “On Prevention of Iodine Deficiency Disorders” was also being drafted, which included a clause to prohibit the importation and sale of noniodized salt. The report listed 11 licensed producers in Baku and at Masazir salt lake, some producing iodized salt. The companies applied a variety of crude quality assurance methods and produced around 150 to 500 MT tons of salt each during 2000, some iodized and some not. According to customs information, the annual import of food-grade salt was 37,000 MT in 2000, which was handled through 84 small firms, joint ventures, companies, and private individuals. Most of the salt was imported noniodized from Ukraine (Artemsol) and repackaged by small firms in Baku.

During 2001, a comprehensive approach was adopted by the Multi-Agency IDD Commission as reported by UNICEF in early 2002 [9]. Key elements included advocacy, public awareness, civic participation, training, and capacity building in quality assurance and quality control, partnerships with private producers and packers, direct assistance to production and import, insertion in school curriculums, etc. Also, the law on USI/IDD was adopted by Parliament and signed by the President in 2001, making it mandatory that all edible salt produced, imported, and sold in Azerbaijan be iodized, effective January 2003. The CIS-agreed iodization level was adopted: 40 ± 15 mg iodine/kg salt, as was the mandatory fortificant potassium iodate.

Azerbaijan was invited to participate in the Asian Development Bank–managed project “Improving Nutrition of Poor Mothers and Children in Asian Countries in Transition,” but the national delegation had to participate as observers during a multisector launch event in Almaty, Kazakhstan, in October 2001 because of the long delay by the Ministry of Health in signing a memorandum of understanding with the Asian Development Bank. The project aimed at establishing the required national policy capacity, iodized salt production and delivery systems, and operational competence in managing a national alliance for elimination of IDD [10]. Despite the opportunities provided through this project, the Ministry of Health was slow in organizing the agreed management frameworks and mobilizing the required multisector collaboration arrangements [11], and the Asian Development Bank terminated support of the project by the end of 2003. Despite the retreat by the Asian Development Bank...
project, investments in advocacy, expert training, iodized salt testing, laboratory and quality control capacity, mobilization of civic society, and official oversight [12] were continued with Kiwanis support through UNICEF. The Ministry of Health also initiated closer collaboration with the Independent Consumers Union, which conducted mass education and tracked the supplies and consumption of iodized salt on a regular basis [13–15]. The reports show that in the various regions of Azerbaijan, 50% to 80% of the household salt supplies were found to be adequately iodized by 2003. According to these monitoring data, about half of the household salt used in Azerbaijan was imported, mainly from Ukraine (Artemsol) and Turkey. The other half originated from small producers around Masazyr Lake, while the production by the plant in Naxicevan Autonomous Republic remained negligible.

A population-representative iodine survey was conducted in 2007 by Azerbaijan Medical University, Baku, with support by UNICEF and ICCIDD, covering all of Azerbaijan except Naxicevan. The design consisted of 30 clusters (schools) selected proportional to enrollment and 30 children, aged 8 to 10 years, selected at random in each school. The field teams also enrolled approximately 10 consecutive pregnant women in a prenatal clinic located nearest to each school [16]. Samples of household salt were obtained from about half of the children and women, and their iodine content was measured by titration.

The median iodine content in 558 salt samples was 22.2 mg iodine/kg salt, and 77% of the salt contained ≥ 15 mg iodine/kg salt. The median UI levels in school-age children (204 µg/L) and pregnant women (195 µg/L) were within the recommended safe range. The UI in school-age children showed a close relationship (p < .01) with the salt iodine levels in their households (table 8), indicating that the salt used in the households was the major contributor to their dietary iodine consumption.

The median UI levels in pregnant women and in schoolchildren were also closely correlated (p < .001, two-tailed) when analyzed by cluster. As shown in table 9, the median iodine levels in salt and children’s urine were lowest in Baku and its suburbs.

Thus, although the population of Azerbaijan on average enjoys optimum nutrition, significant quality problems remain, especially in domestically produced iodized salt at Masazyr Lake [17]. On the other hand, two recent developments indicate a promising potential for achieving USI based on the national industry capacity in Azerbaijan. The Azersun Holding is due to open a salt factory in 2010 near Masazyr Lake, with the capacity to produce 100% of the country’s needs for iodized salt [18]. Furthermore, a note of the European Development Bank, dated April 2009, reports the modernization and expansion of the capacity of the Neftçala factory for iodine production at 500 MT/year [19]. Although this is positioned as an investment in the production of raw material for iodized, LCD displays, and X-ray contrast media, it should also permit improved access by the salt industry to the fortificant.

### References and important documents

3. Eliminating Micronutrient Malnutrition with focus on

### TABLE 8. UI excretion in schoolchildren according to salt iodine content in their households, Azerbaijan, 2007

<table>
<thead>
<tr>
<th>Household salt iodine (mg iodine/kg salt)</th>
<th>n</th>
<th>UI (µg/L)</th>
<th>RR</th>
<th>RR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Median</td>
<td>95% CI</td>
<td>&lt; 100 µg/L</td>
</tr>
<tr>
<td>0–4.9</td>
<td>85</td>
<td>175&lt;sup&gt;a&lt;/sup&gt;</td>
<td>149–199</td>
<td>1.84</td>
</tr>
<tr>
<td>15–29.9</td>
<td>175</td>
<td>202&lt;sup&gt;b&lt;/sup&gt;</td>
<td>180–230</td>
<td>1.71</td>
</tr>
<tr>
<td>≥ 30</td>
<td>130</td>
<td>242</td>
<td>206–271</td>
<td>1.0</td>
</tr>
</tbody>
</table>

CI, confidence interval; RR, relative risk; UI, urinary iodine

<sup>a</sup> p < .01 compared with the group with ≥ 30 mg iodine/kg salt.

<sup>b</sup> p < .05 compared with the group with ≥ 30 mg iodine/kg salt.

### TABLE 9. Iodine levels in salt and urine in different regions of Azerbaijan, 2007

<table>
<thead>
<tr>
<th>Source</th>
<th>Median iodine level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>North: mountain</td>
</tr>
<tr>
<td>Salt (mg iodine/kg salt)</td>
<td>27.5</td>
</tr>
<tr>
<td>Child urine (µg/L)</td>
<td>201</td>
</tr>
</tbody>
</table>


11. Regional Coordination and Administration Office.

Belarus

MozyrSalt was one of the larger salt companies established in Belarus during the Soviet period [1]. At the time of independence of Belarus, however, the output of MozyrSalt was less than one-sixth of the national needs and the salt quality was poor. Nowadays, MozyrSalt has technology for the production of vacuum-dried edible salt, using facilities developed with support and grants from the European Community and UNICEF [2]. The factory meets ISO quality standards, and the production potential is several times greater than the national requirement. MozyrSalt exports sizable amounts of iodized salt to the Russian Federation, the Baltic States, and Eastern European and other countries. The company BelarusKaliy produces iodized salt as a by-product of fertilizer manufacturing and sells in local markets. In 2003, both companies produced approximately 65,000 MT of iodized salt, of which more than 50% was exported. They obtain the potassium iodate fortificant from Russia.

At the international symposium on elimination of IDD with special reference to the former USSR, held in Tashkent, Uzbekistan, 18–22 November 1991 [3], researchers from the Medical Academy of Belarus shared data on extensive goiter prevalence in many areas of the Republic. Their research indicated that low consumption of iodine from the common diet and drinking water was an underlying factor in the variation in goiter prevalence among the regions. The publication also mentions that the former approach of prophylaxis through iodization of salt and distribution of Antistrumin (potassium iodide) tablets had been abandoned.

A massive survey conducted from 1997 to 1999, supported by WHO and UNICEF, found a national median UI among school-age children of 44 mg/L and a goiter prevalence by ultrasound of 17.2%, ranging up to 25% in various locations. The authorities at that time felt that the consequences of iodine deficiency were particularly acute in view of the meltdown of the nuclear reactor in Chernobyl, Ukraine, that had occurred just previously. Because massive distribution of potassium iodide tablets was ongoing at that time, public awareness also became connected to the issue of iodine needs, although many housewives continued to use noniodized salt from a widely held belief that iodized salt would affect the preservation and taste of food.

Food regulations issued by the Senior Sanitary Physician of Belarus in 2000 specified that edible iodized salt (for the food industry and consumers) should contain 40 ± 15 mg iodine/kg salt as potassium iodate. In April 2001, the Belarussian Government adopted a resolution making the use of iodized salt mandatory in catering
USI progress in the CEE/CIS Region during 2000–09

and the food-manufacturing industry, except for seafood and ocean fish processing. Also, iodized table salt was ordered to be made available in all the consumer retail outlets. An advocacy campaign through the major media, health facilities, and educational institutions was another aspect of the national strategy.

Thus, the mandatory use of iodized salt in the food industry of Belarus became the key tactic of the USI strategy for raising the iodine intake of the population. Since bread is a central item in the common diet of the population, major emphasis in advocacy, communication [4], monitoring, and research [5] has been put on the bakery industry. At a bread consumption of 200 to 300 g/day, the use of iodized salt by the bread bakeries would provide 40% to 70% of the daily iodine needs of the average Belarussian person. Between 2001 and 2005, much effort was directed to overcoming the widespread concerns and reluctance among the bread bakeries and canning industries, mostly due to considerations of cost and product quality. Food research in 2003/04 showed that different kinds of breads sampled in the regions of Belarus contained 25 µg iodine/kg bread on average (fig. 9), an increase of 15 to 20 µg/kg above that in breads baked with common salt. An estimated 90% of bread bakeries in Belarus are using iodized salt [5]. Taking these factors into consideration, the use of iodized salt in the bread bakeries of Belarus would raise the typical iodine consumption in the population by 30 to 60 µg/day.

Inspection of food products is conducted by officers of the Ministry of Health’s Center for Hygiene, Epidemiology and Public Health and the Ministry of Trade. All the prescribed recipes for bread baking, meat products, and some brands of bottled water and dairy products include iodized salt as an ingredient. Iodcasein (in sour milk products) and Iodis Concentrate (in bottled water, egg production, and some dairy items) are also being used, although the contribution from these products is not significant in the population’s dietary iodine supply. Resistance to iodization remains in the cheese industry, due to a publication of the Russian Research Institute for Cheese and Butter Production that contends that iodized salt influences the taste and color of cheese.

From the late 1990s onward, in the wake of the Chernobyl meltdown, much effort has been invested in training, advocacy, publicity, and communication to promote salt iodization. The Government of Belarus has conducted workshops for health professionals,
distributed information brochures and pamphlets among newspapers and magazines and to the press, provided training to teachers, and raised awareness among the public (fig. 10). A follow-up assessment in 2003 reported that 74% of the public was aware of the problem and 87% had noticed the advertising of iodized salt. Less well-informed respondents included those with lower educational levels, especially in rural areas.

Following the formal adoption of the strategy in 2001, much information was collected at regular intervals on the use of iodized salt among consumers and in the food industry [6]. For example, retail studies show that the share of iodized consumer salt jumped from 36% in 2001 to 75% in 2008. In some rural areas, the share of iodized salt in the retail outlets remained very low, however, which is attributed to the persistent belief in the side effects of iodized salt in pickling and food preservation. That advocacy at the high decision-making level has not been able to change some attitudes is attested by the fact that a draft proposal for banning the import of noniodized salt has been rejected repeatedly by the Ministry of Health.

A follow-up iodine survey was conducted in 2006 under the coordination of the Belarus Medical Academy among 1,304 schoolchildren aged 10 to 14 years, selected from 12 areas on the basis of the results of the previous national survey. As illustrated in table 10, the findings offer evidence that iodine deficiency had been overcome in the population of Belarus. Ninety-four percent of the households were using iodized salt (level not specified), and goiter was present among 12.8% of the children. In view of the high usage of iodized salt and the optimum UI levels, the goiter prevalence is probably a remainder of the iodine deficiency burden documented previously.

In conclusion, serious iodine deficiency from the past in Belarus has been overcome through a national strategy that combines the mandatory use of iodized salt in the food-manufacturing industry with the promotion of iodized salt in households and careful, continuous monitoring of the iodine supplies through food companies, canteens, markets, and households. The experience demonstrates success in reaching optimum iodine nutrition by a model that ensures fortification of common foods in a situation of conflicting opinions about the enactment of mandatory iodization of the salt supplies and a persistent public belief that the use of iodized salt affects the home-based preservation of food. The major national salt company, MozyrSalt, has attained high standards of production, earning it an ISO 9001 certification, which benefits its customers not only in Belarus but also in Russia, the Baltic States, and other countries of the former Soviet area.

References and important documents


Table 10. Iodine nutrition situation among 10- to 14-year-old children, Belarus, 2006

<table>
<thead>
<tr>
<th>Township or village</th>
<th>n</th>
<th>UI &lt; 50 µg/L (%)</th>
<th>UI &lt; 100 µg/L (%)</th>
<th>Median UI (µg/L)</th>
<th>Goiter (%)</th>
<th>Household iodized salt use (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volkovysk</td>
<td>139</td>
<td>0.7</td>
<td>5.7</td>
<td>189</td>
<td>15.8</td>
<td>89.9</td>
</tr>
<tr>
<td>Pervomaiskii</td>
<td>105</td>
<td>0.0</td>
<td>6.7</td>
<td>207</td>
<td>16.2</td>
<td>98.1</td>
</tr>
<tr>
<td>Pinsk</td>
<td>106</td>
<td>6.6</td>
<td>22.6</td>
<td>170</td>
<td>8.5</td>
<td>88.7</td>
</tr>
<tr>
<td>Krovoshein</td>
<td>96</td>
<td>3.1</td>
<td>27.0</td>
<td>166</td>
<td>26.0</td>
<td>95.8</td>
</tr>
<tr>
<td>Oktyabrskii</td>
<td>107</td>
<td>1.9</td>
<td>6.6</td>
<td>188</td>
<td>12.1</td>
<td>92.5</td>
</tr>
<tr>
<td>Myshanka</td>
<td>107</td>
<td>2.8</td>
<td>10.3</td>
<td>164</td>
<td>10.3</td>
<td>94.4</td>
</tr>
<tr>
<td>Osipovichichi</td>
<td>101</td>
<td>2.0</td>
<td>11.9</td>
<td>222</td>
<td>17.8</td>
<td>97.0</td>
</tr>
<tr>
<td>Gorki</td>
<td>107</td>
<td>3.7</td>
<td>15.8</td>
<td>175</td>
<td>5.6</td>
<td>94.4</td>
</tr>
<tr>
<td>Dubrovno</td>
<td>101</td>
<td>2.0</td>
<td>11.9</td>
<td>186</td>
<td>3.0</td>
<td>98.0</td>
</tr>
<tr>
<td>Braslav</td>
<td>101</td>
<td>1.0</td>
<td>15.9</td>
<td>198</td>
<td>6.9</td>
<td>91.1</td>
</tr>
<tr>
<td>Pogost</td>
<td>106</td>
<td>1.9</td>
<td>15.1</td>
<td>157</td>
<td>7.5</td>
<td>95.3</td>
</tr>
<tr>
<td>Myadel</td>
<td>128</td>
<td>6.3</td>
<td>20.6</td>
<td>189</td>
<td>21.9</td>
<td>94.5</td>
</tr>
<tr>
<td>Total</td>
<td>1,304</td>
<td>2.7</td>
<td>14.0</td>
<td>179</td>
<td>12.8</td>
<td>93.6</td>
</tr>
</tbody>
</table>

UI, urinary iodine
Bosnia and Herzegovina

Iodine deficiency has historically been a significant problem in the State of Bosnia and Herzegovina, with evidence of high goiter prevalence accompanied by cretinism in many central locales. Salt iodization was made mandatory in 1954 throughout the former Yugoslavia, leading to a substantial reduction in goiter prevalence also in Bosnia and Herzegovina [1].

During 1999, researchers from Tuzla University performed extensive canton-based studies [2] in the Federation of Bosnia and Herzegovina, collecting measurements of goiter prevalence, UI concentration, and household salt iodine content from more than 5,500 schoolchildren aged 7 to 15 years. The mean iodine content in household salt samples was 14 mg iodine/kg salt, the total goiter prevalence was 27%, and the median UI level was 78 µg/L, thus providing evidence that iodine deficiency persisted despite the salt iodization policy.

To examine the role of iodine levels in salt [3], the data from this study were divided into cantons where more than 90% of the salt was produced in the Tuzla plant at 5 to 15 mg iodine/kg salt, and cantons where more than 80% of the salt originated from the Pag plant in Croatia, which was iodized at 20 to 30 mg iodine/kg salt. The iodine content in household salt of the Tuzla group (table 11) was significantly (p < .001) lower than that in the Pag salt group, and this contrast in salt iodine supply between groups corresponded with significantly (p < .001 in each case) lower UI concentrations and higher goiter prevalence among the children in the Tuzla than in those in the Pag group. The analysis underscored the key importance of the iodine levels in the salt supplies for determining iodine nutritional status and the impact on functional IDD indicators.

At independence in 1992, Bosnia and Herzegovina was left with one poorly equipped salt factory in Tuzla. During 2000 to 2002, UNICEF provided iodization equipment and automatic salt packaging machines. The Tuzla Salt Laboratory was also assisted with equipment for salt quality measurements, thus completing the full capacity to supply quality iodized salt that meets the needs for Bosnia and Herzegovina, as well as for export to Croatia, Montenegro, Macedonia, Serbia, Kosovo, and Slovenia.

A small survey on the level of iodine in salt in markets during 2000 showed complete iodization of all domestically produced salt. However, imported salt, mainly from Poland and Romania, remained accessible in local markets and was not iodized to the nationally mandated levels. Consequently, about 80% of the household salt in the markets did not supply adequate iodine and did not have proper labeling (Federal Sanitary Control Commission report). A UNICEF report mentioned that sanitary inspectors had not been given adequate authority to enforce sanctions on traders and retailers selling salt that was in violation of the mandated iodization levels at that time.

During 2000 to 2002, approximately 400 health professionals and sanitary inspectors throughout Bosnia and Herzegovina received 2 days of practical training on IDD prevention, including inspection needs and procedures. Educational materials on the prevention of IDD were also produced and provided to health professionals and sanitary personnel. A small formative research study in the Federation of Bosnia and Herzegovina in 2002 [4] revealed that the majority of adult citizens were aware of the threat of iodine deficiency and knew about the relationship with goiter (78%), mental retardation (33%), and stillbirths or abortions (35%). Nevertheless, only about half of the respondents purchased iodized salt habitually, in small packages and at short intervals. Among the reasons for not buying iodized salt was simply that it was not available. Using these results, UNICEF supported the salt industry to devise improved packaging and collaborated with officials and professional social marketers to devise key messages for public awareness communication, with emphasis on the proper use of iodized salt in the households. A comprehensive campaign was conducted in 2002/03 using multiple channels, including mass media (television, radio, newspapers, etc.), advertisements and billboards (streets, mass transport, etc.), mass mailings, round tables, etc.

Cognizant of the key importance of salt iodization, UNICEF also supported the governments in the Federation of Bosnia and Herzegovina and the Republika Srpska to stimulate action through IDD committees for updated legislation, revised policies, and improved quality monitoring of the salt supplies from local

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Predominant source of salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median salt iodine</td>
<td>11.4</td>
</tr>
<tr>
<td>(mg iodine/kg salt)</td>
<td>18.9</td>
</tr>
<tr>
<td>Median UI (µg/L)</td>
<td>75.2</td>
</tr>
<tr>
<td>Goiter prevalence (%)</td>
<td>32.6</td>
</tr>
</tbody>
</table>

UI, urinary iodine

6. Kolomiets ND, Kamyschnikov VS, Petrenko SV, Okeanov AE, Leushev BU, Korytko SS, Gomolko NN.

production (Tuzla) and imports. The Parliament of the Federation of Bosnia and Herzegovina passed a law in January 2001 that mandated the iodization of all salt for households and the food industry at 20 to 30 mg iodine/kg salt, permitting the use of both potassium iodide and potassium iodate. The Republika Srpska enacted a regulation in 2005 that made iodization of household and food-industry salt obligatory at 20 to 30 mg iodine/kg salt, permitting the use of potassium iodate only.

Researchers at Tuzla University conducted a follow-up study in 2004 [5], enrolling 962 schoolchildren (with equal numbers from rural and urban areas) aged 11 to 14 years in the 10 cantons of the Federation of Bosnia and Herzegovina. The nonweighted mean salt iodine content was 21.4 mg iodine/kg salt and the median UI was 139.5 µg/L, confirming the progress that had been made since enactment of the salt iodization law in the Federation of Bosnia and Herzegovina. The publication suggested that neonatal TSH screening would be a useful source of information for monitoring the situation.

From June to October 2005, an iodine survey of the entire country of Bosnia and Herzegovina was initiated [6] under the overall auspices of the public health authorities, with technical assistance from the Institute for Patho-Physiology and Nuclear Medicine, Skopje, Macedonia. In view of the political reality, the survey design was stratified into three geographic areas: Federation of Bosnia and Herzegovina, estimated population 2.5 million; Republika Srpska, estimated population 1.5 million; and Brcko District, estimated population 80,000. The target group was children in grades 2 and 3 of primary school. The survey began with PPS selection of 3 schools in Brcko and 30 schools each in the Federation of Bosnia and Herzegovina and the Republika Srpska. Within each school, the school enrolment list was used for randomized systematic selection of 40 children, half from each grade. The authorities in Tuzla Canton of the Federation of Bosnia and Herzegovina (estimated population, 500,000) did not give permission for the survey; however, thus limiting the Federation of Bosnia and Herzegovina stratum to 23 schools. In Brcko District, two more schools were added during fieldwork to improve on precision. Trained survey teams visited the schools, examined the children by palpation and ultrasound measurement of the thyroid gland, and collected a sample of household salt and casual urine from each child. The salt was analyzed for iodine content by titration at the local Institutes of Health Protection, and the urine samples were shipped for analysis of the iodine concentration to the laboratory of the Institute for Patho-Physiology and Nuclear Medicine, which holds a certificate of successful participation in the CDC-provided EQUIP program.

For the entire cohort of children, the unweighted median UI concentration was 157 µg/L, demonstrating that iodine deficiency had significantly abated in Bosnia and Herzegovina. Elevated thyroid volume (body surface area [BSA] reference) was found by ultrasound among 7.8% of the children. Of all the salt samples from the households, 31% were iodized with potassium iodate, and the overall iodine content was 23.1 mg iodine/kg salt. An in-depth secondary analysis [6] did not find significant associations between the iodine levels in household salt and the UI levels among the children in each stratum, indicating that iodized salt was also used in the food industry, which rendered the portion of total iodine intake from household salt less influential [7].

Figure 11 illustrates the distribution of iodine intake estimates of these children, calculated by the Institute of Medicine formula [8]. The data indicate that the diet of the children in Bosnia and Herzegovina typically supplied 105 µg iodine/day, or 103% of the Recommended Dietary Allowance (RDA). Classified by stratum, these estimates were 128% in Brcko, 99% in the Federation of Bosnia and Herzegovina, and 102% in the Republika Srpska. The estimated iodine intake was below the Estimated Average Requirement (EAR) in 22.8% of the children, with no significant difference between strata. The survey report [6] concluded that the iodine status in the population is sufficient, notwithstanding the remaining goiter prevalence, which is known to be attributable to the remaining effect of previous iodine deficiency.

A stratified iodine survey in 2007/08 assessed the iodine situation among pregnant women in Bosnia and Herzegovina [9]. Of the 20 maternal health centers invited in Bosnia and Herzegovina, 18 agreed to participate, and in each center, 70 pregnant women and 30 breastfeeding women were enrolled for collection of

[FIG. 11. Histogram of iodine intake estimates in schoolchildren, Bosnia and Herzegovina, 2005]
demographic data and measurements of iodine in salt and urine. The age range of the 1,222 pregnant women and 522 breastfeeding women was 16 to 45 years, with a median of 27 years. Salt iodine was measured in Bosnia and Herzegovina, and UI was measured at the Institute for Patho-Physiology and Nuclear Medicine, Skopje, Macedonia.

Seventy-six percent of household salt samples were iodized with potassium iodate, which is twice the proportion found in the 2005 survey in children. The median salt iodine content was 26.5 mg iodine/kg salt (27.5 mg iodine/kg salt in the Federation of Bosnia and Herzegovina and 25.7 mg iodine/kg salt in the Republika Srpska), with 65% of the samples in the mandated range of 20 to 30 mg iodine/kg salt, similar to the situation in 2005. The median UI concentration was 157 µg/L among the 757 pregnant women in the Federation of Bosnia and Herzegovina and 160 µg/L among the 484 pregnant women in the Republika Srpska. Therefore, in both administrative regions, the typical UI fell within the recommended range for pregnancy of 150 to 250 µg/L. The median UI of all the women was 168 µg/L in the first trimester and 155 µg/L in the third trimester (p < .05). Since early pregnancy is the period of highest vulnerability, these findings are encouraging, despite a small decrease with the duration of pregnancy. The respective UI levels of breastfeeding women were 179 µg/L in the Federation of Bosnia and Herzegovina and 159 µg/L in the Republika Srpska, showing adequate iodine status in both areas. Unfortunately, the survey did not analyze whether the women had enlarged thyroid volume, nor did the data collection include the origin of the salt (e.g., salt brand or company name) or the use of iodine supplements by the women.

The importance of collecting additional information about specific habits (such as the use of supplements and iodized salt) during pregnancy became apparent from a study by researchers at Tuzla University in 2007 [10], which examined UI and household salt iodine levels among 300 pregnant women sampled from Tuzla (urban and rural areas), Federation of Bosnia and Herzegovina. The overall median UI level in the pregnant women was 142 µg/L, and women who were not restricting their salt intake had significantly higher UI levels than those who were restricting their salt intake.

To conclude, iodine deficiency in the State of Bosnia and Herzegovina, which was a significant problem historically, has been addressed successfully, despite the factious political situation and the different statutory approaches in the various regions. Recent local and regional assessments suggest that the iodine nutrition situation among children and pregnant women is adequate, although the evidence that this is fully attributable to the USI policy is not complete. There is active interest among the research community, but a joint multisector oversight arrangement has remained largely elusive. Household salt assessments indicate that the iodine content in Bosnia and Herzegovina corresponds to the mandated levels, but direct evidence that iodized salt is used throughout the food industries is not available. The Tuzla salt factory has fully established capacity for quality iodization of edible salt, and the company remains an important source of salt also for neighboring countries.

References and important documents

During the 1950s, extensive surveys by Academician Pentchev demonstrated that the inhabitants in many areas of Bulgaria had severe IDD, including goiter and cretinism (fig. 12) [1]. The early epidemiologic findings were followed by a government decision in 1958 to mandate the supply of only iodized household salt (20 mg iodine/kg salt, using potassium iodide) in the affected regions, combined with free supplies to pregnant and lactating women and 6- to 18-year-old children of potassium iodide supplements once weekly. Follow-up surveys among schoolchildren confirmed a significant reduction in goiter prevalence from 56% initially to 31% in 1964 and 12% in 1974.

Waning political attention and lack of permanent follow-through on the government decision were among the causes for the re-emergence of the signs and symptoms of iodine deficiency by 1990, when goiter prevalence in schoolchildren was found to have risen to 23%. Consequent small exploratory studies during the period of significant political turmoil up to 1994 showed the persistence of moderate to severe iodine deficiency in the previously defined endemic areas.

The introduction of a free-market economy was accompanied by a reorientation of the IDD policy, and in 1994, the Council of Ministers and the Chief State Sanitary Inspector issued decrees that introduced the following key program characteristics:

» Creation of a National Inter-Agency Commission under the Council of Ministers as the apex body for overall coordination and policy advice on elimination of IDD;

» Prohibition of the sale of noniodized salt in the entire territory of Bulgaria;

» Setting the national iodization standard at 28 to 55 mg KIO₃/kg salt (17 to 33 mg iodine/kg salt) by subsequent amendment, dated 1 July 1996;

» Assignment of authority for salt inspection and enforcement to the State Health Control System, i.e., the 28 Regional Inspectorates for Protection and Control of Public Health;

» Establishment of laboratory capacity for population monitoring at the National Centre for Public Health Protection and for food control at the Central Veterinary Institute;

» Mandating periodic population surveys for tracking the disappearance of IDD by assessments of goiter, UI, neonatal TSH, and other relevant population indicators.

A nationwide survey in 1996 [2] employed for the first time a combination of assessments of UI levels and goiter grading among 8,445 schoolchildren in 10 regions, with oversampling in the previously defined endemic areas where 77.6% of the children were reportedly receiving iodine tablets. Overall, the median UI was 111 µg/L, with no significant difference between endemic and other regions. The goiter rate was 28.6% in endemic areas.

From 1998 onward, the various measures and practical procedures under the national USI program have been continuously enhanced and perfected, and complemented by small-scale special interest studies at regular intervals. In 2001, the Council of Ministers issued an ordinance for mandatory iodization of all salt for households, public catering, and the food-processing

![FIG. 12. Endemic areas of iodine deficiency in Bulgaria identified in the 1950s, mapped according to present regions. Source: Penchev [1]](image-url)
industry. The ordinance also stipulated the use of potassium iodate as the single permitted fortificant, and it improved upon the definition, authority, and enforcement details for salt labeling and salt inspection. The potassium iodate titration in salt was made uniform, technicians in all the regional Inspectorates for Public Health were trained, and external quality assurance of the salt titration procedure was introduced under the responsibility of the National Centre for Hygiene, Medical Ecology and Nutrition. Reports of salt iodine inspections by the regional inspectorates showed a consistent improvement in the proportion of salt within the mandated range of 28 to 55 ppm potassium iodate from 56% in 1995/96 to 67% in 1997–99, 77% in 2000–02, and 86% in 2003/04. At that time, the number of salt samples inspected each year in Bulgarian market outlets and food companies varied around 4,000.

By 2005, all the salt iodine laboratories of the 28 regional inspectorates were participating in quality assurance assessments organized by the National Centre for Public Health Protection in Sofia. In the same national public health center, the iodine laboratory was a recognized quality assurance service laboratory for the region as part of the CDC-supported IRLI laboratory network. The results of blind quality assurance samples provided on a regular basis by the CDC showed that the laboratory performed consistently within the acceptable range. The Health Promotion/Education Section of each inspectorate conducted regularly planned education sessions among professionals in the healthcare system (general practitioners and nurses), teachers and other concerned groups, and food industry employees. A range of information materials (leaflets, magazines, etc.) were distributed systematically in schools, general practitioners’ offices, clinics, etc., and the inspectorate staff provided the press with regular pertinent information.

The total market of salt for human consumption (table salt, food-industry salt and salt for catering) in 2005 was estimated at 40,000 MT/year. The standard presentation to consumers is in 1-kg polythene bags, which state clearly that the salt is iodized. Approximately 90% of the national salt market was captured by one producer (Tchernomorski Solnitzy in Burgas) and two large import firms located along the Black Sea. All three companies import iodized and noniodized salt from Israel, France, Tunisia, Ukraine, and Belarus, and they have sufficient capacity together to meet the national market needs. Salt is sold partly under the brands of the producer/importers, and about half of the total market supply of iodized salt appears to be imported as such. The companies consider the iodization range of 28 to 55 mg KIO₃/kg salt comfortably wide and easily met. The single producer uses spray iodization by a UNICEF-donated machine of maximum 10,000 MT/year, but actual production varies around approximately 4,000 MT, as evidenced by purchases of potassium iodate.

As detailed above, a comprehensive system for monitoring the iodate content of salt had been put in place and increasingly perfected by the government and the salt industry since 1994. The three salt companies understand the system well and support it loyalty. During iodization, companies perform iodine content titrations four times daily. They issue certificates for the final products leaving their facilities. As to imports of iodized salt, the regional inspectorate laboratory inspects and releases the consignments on a shipment-by-shipment basis. The producer/importer’s laboratories are checked by the inspectorate at least once a month. Products found to be seriously outside of specifications are not allowed to be sold or may have to be called back (removed) from the market. The inspectorates perform regular testing of salt quality in the market, including checks on inventory turnover, although shelf life is not a big issue with iodate, and the market turnover on average lasts less than 3 months. If salt samples are found outside of specification upon inspection, the inspectorate in Burgas handles the matter of notifying and making follow-up decisions with the producer/importers. At the household level, a national survey in 2003 showed that 90.4% of households used salt with 25 mg KIO₃/kg salt (15 mg iodine/kg salt) or more.

To assess the iodine situation, a national survey in 2003 [3] collected data among 7- to 11-year-old schoolchildren and pregnant women (second and third trimesters) in 10 regions of Bulgaria: 8 regions with previous endemic goiter and 2 (Pleven and Dobrich)
Figure 13 shows the median UI levels of the schoolchildren in each region. All are comfortably above 100 µg/L, and not surprisingly, the UI levels were highest in children from the previously nonendemic regions Pleven and Dobrich. Only 4.3% of the children had enlarged thyroid volume (BSA reference) by ultrasound. The same survey also obtained urine samples from pregnant women, except in Sofia city and region. The median UI among pregnant women was 165 µg/L overall and varied from 148 µg/L (Pleven) to 220 µg/L (Lovech) (fig. 14). The median UI levels among women who reported taking iodine supplements were not significantly different from those among women who did not (170 and 164 µg/L, respectively). Taking the body weights obtained from these women into account, an estimated iodine intake of 248 µg/day (95% CI, 231 to 264 µg/day) was obtained, exactly equal to the RDA of 250 µg/day proposed by the Institute of Medicine and ICCIDD/UNICEF/WHO.

Systematic newborn screening for congenital hypothyroidism was introduced in Bulgaria in 1994, with more than 70,000 newborns per year being examined around 2005. The screening is routinely established, with strong central support by the University Children’s Hospital in Sofia. The results of TSH assays by the Delphia method on heelprick samples are entered in a database and linked with data on residence, day of blood sampling (> 70% 3 to 5 days after delivery), and clinical data. The laboratory participates in external quality assurance exchanges with the Deutsche Gesellschaft für Klinische Chemie. Recall rates for congenital hypothyroidism diagnosis have been steadily falling in recent years, from 1.8% initially to less than 0.1% in 2004 (of approximately 68,000 newborns tested). The system is very well organized and is useful for comprehensive monitoring of signs of insufficient iodine nutrition. A publication in 2005 [4] showed that the proportion of newborns with TSH > 5 mIU/L has steadily decreased from 9.6% in 2000 to 3.6% in 2004.

A team nominated by the Network for Sustained Elimination of Iodine Deficiency visited Bulgaria in April and May 2005 for a comprehensive external review, including program leadership and surveillance. The team examined the available data, information, and reports and collected information during visits and meetings with the range of partners collaborating in the USI strategy, including salt producers and importers and food industries (bread, dairy products, canning), four regional inspectorates, the TSH newborn screening center, and the laboratory of the National Center for Health Promotion. In their report [5], the experts concluded that the USI strategy had succeeded in overcoming serious IDD in Bulgaria and that the iodine status indicators among children indicated optimum iodine nutrition. The experts recommended that the policy of free provision of iodine tablets (Antistrumin) be discontinued, given the low apparent coverage and negligible effect on UI values among pregnant women. To further improve on strategy effectiveness, the range for iodization may be improved to 35 to 55 mg KIO₃/kg salt. The final advice given by the team was that the oversight of the USI
strategy should become integrated with a newly formed set-up under the Food Law and Food Safety Council. USI achievement in Bulgaria was acknowledged by the global Iodine Network in May 2007 (fig. 15), and an award ceremony took place later in the same year at the Ministry of Health, with all the key partners and national press in attendance.

In 2005, the Government of Bulgaria endorsed a National Food and Nutrition Action Plan, 2005–10, which specifically stated as one of the sub-objectives, “maintain sustainable adequate iodine intake.” The plan document outlines the responsibilities of various partners in government and industry in a spectrum of actions, including assessments and monitoring, quality assurance of production and salt supply inspections, formal education, maintenance of awareness, and annual reporting of progress.

References and important documents


Georgia

Historically, high rates of goiter (40% to 52%) and cretinism were reported in the mountainous districts of Georgia [1] and attributed to the low iodine content in the soil and water. Because the Soviet Republic of Gruzia had no domestic salt sources, the Soviet authorities directed shipments of iodized salt to the most affected areas from the large salt factories in Ukraine and Armenia.

From 1996 onward, UNICEF started supporting national efforts to eliminate iodine deficiency in Georgia by assisting in advocacy, capacity building, support for salt situation analyses, and communication toward attaining USI, while also assisting the Ministry of Health on government request in a massive oral iodized oil distribution campaign in 2000/01 [2]. Small surveys of the southern Caucasus mountain valleys from 1996 to 1998 under the Atlanta–Tbilisi Health Partnership [3] reconfirmed the high prevalence of goiter among the general population and found TSH elevation among 63% of newborns.

A national survey in 1998 showed that goiter prevalence was 36% by thyroid gland volume measurement and that 80% of schoolchildren had UI below 100 µg/L [4]. A State Goiter Control Program under the Ministry of Labor, Health and Social Affairs was transformed in 1998 into a National Program for IDD Elimination with the Georgian Parliament as ultimate coordinator. Parliamentary and presidential decrees on salt iodization, tax exemption for iodized salt imports, a mandatory standard (40 ± 15 mg KIO$_3$/kg salt), and a ban on noniodized salt importation were enacted between 1996 and 2003. The MICS report of 2000 showed that only 8.1% of the households in Georgia were using adequately iodized salt (fig. 16).

A salt situation analysis in 1999 [5] identified 29 local trading firms dealing with salt importation, mostly from Ukraine but also from Azerbaijan and Iran, with small amounts from Greece and Germany. The series of presidential decrees, the improvement in the capacity for salt quality inspections by Georgian authorities,
and the continued informational efforts resulted in a significant increase in the national iodized salt supplies and a concurrent improvement in the proportion of households with adequately iodized salt to almost 60% in 2003 (fig. 16). A repeat salt situation analysis early in 2003 estimated that 75% of household members were aware of the IDD problem and the benefits of salt iodization [6].

Up to 2004, the activities to attain USI were carried out through state structures, with the Public Health Department in a leading role. A major reorientation toward a multisector approach was initiated during a national conference in June 2004, where the status and achievements of the program were reviewed together with salt importers, the media, parliamentarians, and a national NGO that reflected consumers’ interests. The conference adopted a comprehensive national plan to achieve USI, which became the guidance for accelerated action after the change of government with the Rose Revolution in November 2004. In February 2005, the new president signed a Law on Prevention of Iodine and Other Microelements and Vitamins Disorders, banning the importation of noniodized salt for households and the food industry and authorizing the respective government departments to enact and enforce the attendant norms, standards, and regulations aimed at reaching USI.

The MICS [7] carried out in Georgia during November and December 2005 in 12,000 households reported that 87.2% of the households were using adequately iodized salt (> 15 ppm by rapid test kit). Also in November 2005, a national iodine survey was carried out by the National Center for Nutrition with the standard 30 × 30 PPS design among 6- to 12-year-old schoolchildren. Casual urine samples were analyzed at the Centre Universitaire Saint-Pierre, Brussels, which was accredited for successful participation in the EQUIP network. Salt brands were recorded, and the iodine content was tested with rapid test kits. Approximately 10% of salt samples that tested positive were analyzed by titration in the Institute of Endocrinology, Kiev, Ukraine. In each of the 30 schools, 200 children were palpated for goiter classification. The results showed 90.6% of the 957 salt samples with > 15 ppm iodine and a national median UI of 321 µg/L. Salt brand records showed that 85% of the household salt was imported from Ukraine and 15% from Greece and Turkey. Figure 17 illustrates the progress in Georgia toward USI over time [8].

The results of the 2005 national iodine survey demonstrated that iodine deficiency had been overcome in Georgia by universal salt iodization. A comprehensive overhaul of Georgia’s governmental structures, initiated after the Rose Revolution, left the responsibility for regulation and oversight of the salt supplies somewhat unresolved, however. A small follow-up inquiry in 2007 [9] confirmed that the food industry in Georgia (bread, canned food, and cheese) was using iodized salt. None of the producers had ever received a complaint from a customer or consumer regarding the use of iodized salt in their food products. Only one cheese producer was found using noniodized salt, stating that the product quality (odor) would be affected if iodized salt was used.

In conclusion, impressive progress was made in Georgia to establish USI for elimination of IDD within a relatively short time period. All salt used in Georgia is imported, with Ukraine, Turkey, and Greece as important sources. Before the change of government in November 2004, the approach had included a large-dose iodized oil distribution effort and an attempt to start local salt processing, but shortly after his inauguration, the new president issued a law that mandated true USI and banned the import of noniodized salt. A standard iodine survey less than 1 year later showed optimum iodine nutrition in the population. Some evidence suggests that the food companies in Georgia are using iodized salt. The overhaul of the government’s institutions during most of 2007 has left the responsibilities for oversight and quality control somewhat unclear, however, which weakened the prospect for sustained elimination of IDD.

References and important documents

3. Atlanta-Tbilisi Healthcare Partnership. Interim report
Kazakhstan

Prior to independence in 1991, Kazakhstan was a republic of the USSR. The Soviet historical record offers ample evidence [1] that following a period of quick success in the control of goiter and cretinism during the 1960s, iodine deficiency made a comeback during the 1980s after the oversight from Moscow was abandoned and changes in iodine supply and biologic status were no longer monitored for central review and decision-making. Emerging in 1991 as a sovereign nation, Kazakhstan started building its own human, administrative, and industrial basis for economic development. A law “On Prevention of Iodine Deficiency Disorders,” enacted in November 2003, banned the sale and trade of noniodized salt, specified the exclusive use of potassium iodate at 40 ± 15 mg iodine/kg salt, and laid down the requirements for packaging and labeling. The national law on IDD prevention has been anchored in a comprehensive set of decrees and declarations by the President and Government of Kazakhstan, aimed to promote a healthy population as the basis for national development [2].

The domestic salt producers are AralTuz (80% to 85% of domestic human consumption), SuzakTuz (approximately 10%), and PavlodarSol (< 10%). Each company conducts regular qualitative production checks, complemented by quantitative measurements in the company’s laboratory. The salt companies and traders are united in a National Association of Salt Producers, which represents their interests and reports on production and supply data. Inspections in wholesale and retail markets and mass catering are conducted by Sanitary–Epidemiologic Services under the authority of the Ministry of Health, and the results are summarized in obligatory quarterly reports to the Chief Health Inspector. Salt imports, which constitute approximately 15% to 20% of the total food-grade salt, are subject to a mandatory certificate of conformity issued by the exporting country’s food authority and inspected by the Kazakh Customs, accountable to the Technical Regulation and Metrology Department of the Ministry of Trade and Industry. Prior to release of their products, the domestic companies must operate under the same rule [2].

Two landmark events in 2001 are especially noteworthy for their influence on the national IDD elimination effort: the Minsk agreement [3] and the Almaty Forum on Food Fortification [4] sponsored by the Japan Fund for Poverty Reduction (JFPR) through the Asian Development Bank. The Minsk agreement among the heads of state and government of the CIS countries expressed the political will for coordinated policy and collaboration in setting uniform national standards for iodization in the salt industry, as well as for inspection of salt quality requirements by the national Sanitary–Epidemiologic Services authorities. The Almaty Forum was a summit gathering of multisector national delegations from Central Asia and Mongolia who pledged to work together with the support of the Asian Development Bank and UNICEF on IDD program development and agreements on the rules of engagement for joint collaborative public–private–civic actions to tackle vitamin and mineral deficiencies in their populations by food fortification.

UNICEF started to assist the salt industry (first AralTuz) from 1996 onward with technology and potassium iodate in the effort to boost the capacity of iodized salt supplies, but the impact on the markets and consumption in the population was limited. The DHS carried out by the Kazakh Academy of Nutrition in 1999 showed that less than 30% of the households were using iodized salt [5], and UI measurements among reproductive-age women indicated that iodine deficiency was widespread in the population (table 12).

Following the Almaty Forum in 2001, the JFPR project, which was managed by the Asian Development Bank for two consecutive periods [6], supported AralTuz and PavlodarSol with iodization and packaging equipment and potassium iodate against one-third reimbursement of costs, which were fully paid back by the companies. In 2005, AralTuz invested in five additional automatic packing machines and new iodization sprayers. The production of iodized salt by AralTuz for domestic use was approximately 65,000 MT in 2006. Initially, the iodized salt production by PavlodarSol remained low and of insufficient quality; only by the end of 2006 did the laboratory records begin to show
that proper salt iodization levels were attained. A new salt producer, SuzakTuz, emerged in 2005 in South Kazakhstan Oblast.

The domestic salt supply is matched with imports of approximately 15,000 MT/year edible iodized salt from Russia (Iletskol and Tyretskii Solerudnik) and Ukraine (Artemsol). The Kazakh salt companies purchase potassium iodate from a domestic chemical import firm, L-Pharma, which usually sources it in the Crimea, Russian Federation (Verkhnyaia Pyshma). The production, import, and export data indicate that the supply of iodized salt for use by households and the food-manufacturing industry is currently sufficient.

The collaborative efforts, stimulated by continued support from the Asian Development Bank and UNICEF, accelerated during the period from 2001 to 2004. High-level oversight of fortification policy became vested in an Interdepartmental Coordination Council on Food Fortification, headed by the Minister of Health and with membership of the two chambers of Parliament, various government departments, the NGO and scientific communities, industry (salt and flour) associations, and supportive agencies. The Committee of State Sanitary–Epidemiologic Services, headed by the Chief Health Inspector, was made ultimately accountable for technical progress. Data on the production, import, export, and supplies of iodized salt became included in the official state statistical reporting by the Ministry of Health and the National Agency on Statistics.

From 2003 to 2006, knowledge of the dangers of IDD at that time, and 45% of the households were found to either purchase or store their salt without packaging. Branded salt (i.e., salt purchased and stored in its package) generally appeared to be higher on average and more frequently adequately iodized than unpackaged salt.

The improvements in iodized salt supply became apparent in a survey conducted by the Kazakh Academy of Nutrition in 2004 [7], using the same design as the 1999 DHS. Distinct patterns of iodized salt adequacy and use were apparent in the different regions (fig. 18) related to the supply sources. The prevalence of adequately iodized salt in the households in northern and eastern Kazakhstan, serviced by PavlodarSol and imports from Russian Siberia, significantly lagged behind that in the remainder of the country. Purchase of loose edible salt by consumers was still common at that time, and 45% of the households were found to either purchase or store their salt without packaging. Branded salt (i.e., salt purchased and stored in its package) generally appeared to be higher on average and more frequently adequately iodized than unpackaged salt.

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From 2003 to 2006, knowledge of the dangers of IDD

<table>
<thead>
<tr>
<th>Region</th>
<th>Household use of iodized salt</th>
<th>UI in women</th>
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<tbody>
<tr>
<td></td>
<td>KIO&lt;sub&gt;3&lt;/sub&gt; only (%)</td>
<td>Any iodized salt (%)</td>
</tr>
<tr>
<td>North</td>
<td>30.5</td>
<td>34.0</td>
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<tr>
<td>East</td>
<td>12.7</td>
<td>21.6</td>
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<tr>
<td>South</td>
<td>20.9</td>
<td>24.5</td>
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<tr>
<td>West</td>
<td>21.8</td>
<td>25.5</td>
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<td>Central</td>
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<tr>
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<td>24.5</td>
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<tr>
<td>Total</td>
<td>23.5</td>
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UI, urinary iodine
and the benefits of USI was progressively inserted in the awareness training systems. Technical and methodological learning was inserted in the basic and ongoing curriculums of the primary healthcare staff, institutions of academic learning, and secondary schools. A comprehensive communication campaign was carried out from 2002 to 2006 with technical and funding support from the Asian Development Bank and UNICEF, using a multitude of media, materials, and channels and with the participation of a wide array of national stakeholders orchestrated by the Kazakh Academy of Nutrition. The communication efforts played a significant part in the quick achievement of an uncommonly high awareness and acceptance level among broad layers of the population that iodine deficiency constitutes a significant threat to the intellectual performance of children and that the regular use of iodized salt is an effective means for its prevention. The systematic inclusion of civic society in the delivery of the communication drive “at the doorstep” of the population, the keen attention to ensuring that the salt industry and its sales agents remain well informed, and the inclusion of food inspection and control bodies of Sanitary–Epidemiologic Services and customs in a series of training workshops, as well as the planned targeting of key politicians with specific information and advocacy, were important elements in the communication effort.

Practically all the necessary financing of costs associated with USI and elimination of IDD have currently been incorporated in the ongoing expenditures of the relevant private and public organizations. The salt producers and traders assimilate the costs of iodization, reflecting them in the price of the product to their customers. The costs of inspections by Sanitary–Epidemiologic Services and customs are carried in the annual state budgets of the respective agencies, as is the official reporting on national statistics. Research and surveys related to the iodine nutrition situation in the population are requested on a periodic tender basis by the Ministry of Health, with the

Kazakh Academy of Nutrition among the contenders. It should be noted that by the end of 2008, the budget of the Ministry of Health still had an item for iodine supplement entitlements for pregnant women, despite Kazakhstan’s own evidence that the USI strategy alone is sufficient to ensure adequate dietary iodine supplies in the population.

Starting in 2005, the Committee of State Sanitary–Epidemiologic Services under the Ministry of Health has been building a national database to consolidate and track key performance indicators of USI for IDD elimination. The obligatory quarterly reports by the Republican Sanitary–Epidemiologic Services of the salt iodine inspections, in combination with reports of the Customs Committee on iodized salt imports and the Committee on Technical Regulation and Metrology on the Certificates of Conformity, are entered. These data are combined and verified against information supplied by the Salt Producers Association to reflect the complete iodized salt supply situation. In 2006, the Ministry of Health introduced a report form for cases of hypothyroidism or thyrotoxicosis, with or without goiter, diagnosed in clinics and hospitals. This data system is under review to be replaced in the future with newborn TSH data from a new national system of newborn screening for congenital developmental disabilities that is currently being introduced. The Ministry of Health also recognizes the additional need for continuous surveillance of iodine consumption connected to iodine nutrition status indicators in pregnant women, but a scheme for collecting these data has yet to be developed.

The MICS survey in spring 2006 [8] tested salt in more than 14,000 households, distributed over 625 clusters that were selected on a PPS basis in the 16 provinces (oblasts) and cities of Kazakhstan. Only 0.3% of the tests showed that no iodine had been added to the household salt, and overall, 92.0% of the salt tests were recorded as ≥ 15 ppm iodine. The lowest rate of adequately iodized salt use (68.3%) was noted in

FIG. 19. Histogram of iodine content in household salt, Kazakhstan, 2006
Pavlodar Oblast, and only three other oblasts also scored below 90%.

The MICS was immediately followed by a National Micronutrient Survey, which used the same design and sampling framework as the MICS, measured salt iodine by titration, and recorded food consumption frequencies, blood hemoglobin levels, and UI concentrations among a systematic subsample of 5,000 women of reproductive age. The iodine content in household salt (fig. 19) was somewhat skewed to high values, and the histogram had a small but discernible shoulder below 10 mg iodine/kg salt. The median salt iodine content was 25.6 mg iodine/kg salt. The majority (90%) of measurements of salt iodine content were between 6.2 and 48.1 mg iodine/kg salt, and 86.9% of the households were using salt with 15 mg iodine/kg salt and above. The histogram of the UI values of the reproductive-aged women was also skewed (fig. 20). The median UI concentration was 249.5 µg/L. Of all the UI concentration measurements, 52.1% fell in the range of 100 to 300 µg/L. UI < 100 µg/L was found in 13.6% of women, UI < 50 µg/L in 5.1%, and UI < 20 µg/L in 1.8%.

Figure 21 analyzes the changes over time in the

FIG. 20. Urinary iodine (UI) concentrations in women of reproductive age, Kazakhstan, 2006

FIG. 21. Changes in the use of iodized salt in households of Kazakhstan, 1999 to 2006

Fig. 22. Prevalence of low urinary iodine (UI) (< 100 µg/L) in reproductive-aged women in Kazakhstan, 1999 and 2006
iodized salt supply in the households based on the salt iodine data by the rapid test kit from the three national surveys. From 1999 to 2004 (left part of fig. 21), the salt iodine levels were assessed in terms of all iodized salt, whereas from 2004 to 2006 (right part of fig. 21), the surveys were assessing specifically for adequately iodized salt—i.e., the salt that tested visually as ≥ 15 ppm iodine. From 1999 to 2004, the percentage of Kazakh households using iodized salt increased from 29% to 89%; from 2004 to 2006, the percentage of households using adequately iodized salt increased from 83% to 92%. Notably, the reduction in household usage rates in Almaty City and the southern region from 2004 to 2006 was offset by sizable increases in the northern and eastern regions over the same period.

The sizable increases that took place in the iodine content of household salt in Kazakhstan were accompanied by significant improvements in UI concentration among women of reproductive age. The overall median UI concentration in this group increased from 95 to 250 µg/L, accompanied by a decrease in the percentage of UI values < 100 µg/L from 53% in 1999 to 14% in 2006 (fig. 22).

Further in-depth secondary data analysis of the National Micronutrient Survey revealed that the use of adequately iodized salt (≥ 15 mg iodine/kg salt) in the households across oblasts was closely correlated ($p < .01$) with the proportion of UI concentrations ≥ 100 µg/L in the women living in these households (fig. 23), thus offering an affirmation that the USI strategy is the underlying factor that drives the alleviation of iodine deficiency in the population of Kazakhstan.

In conclusion, the goal of USI was achieved in Kazakhstan by 2006 thanks to a series of joint collaborative steps taken by national organizations with the support of international agencies. Evidence from a population-representative countrywide household survey in 2006 showed 92% of the Kazakh population using adequately iodized salt. During the National Micronutrient Survey 3 months later, the median UI concentration among women of reproductive age was 250 µg/L, as compared with 95 µg/L in 1999.

The case of Kazakhstan illustrates the importance of various factors that together stimulate the achievement of quick success. The principle law is crystal clear, and it translated the evident highest-level political will into the demand for national action. Continued close collaboration among concerned leaders—captains of the salt industry, high officials of government, respected national scientists, expert communicators, civic society leaders, and so on—formed a strong basis on which other actions thrived, while the international collaboration and generous donor funding offered strong catalytic support. Partly for historical reasons, but also because of the persistent leadership, advocacy, and testimony of the President of the Kazakh Academy of Nutrition, IDD was widely perceived in Kazakhstan as a nutrition problem that affected the entire nation and required a dietary solution that benefited all. The national salt producer AraTuz was among the early supporters of the national USI strategy. It has sufficient capacity to produce a sizable amount of salt, part of which is exported to neighboring Kyrgyzstan. When the salt for consumption became understood as the key vehicle to convey a critical need to the population, the Ministry of Trade and Industry lent additional support by listing food-grade salt among the consumer goods for which a Certificate of Conformity was compulsory for any productive industry with customers in Kazakhstan. The results of transparent salt quality inspections by Sanitary–Epidemiologic Services in the sales channels and markets, followed by enforcement when needed, are consolidated and analyzed for actions to address any defects in salt iodine quality.

In November 2007, the Ministry of Health of Kazakhstan lodged a request for acknowledgment of USI achievement with the global Network for Sustained Elimination of Iodine Deficiency. Experts from the Network Board have reviewed the dossier submitted by the Ministry of Health and concluded that the evidence is sound. Official recognition of USI attainment from the Network for Sustained Elimination of Iodine Deficiency was accorded in 2011.

Principally, USI in Kazakhstan is made permanent by the joint assurance of proper iodine levels in the national edible salt supplies from ongoing quality assurance by the producers and inspections by the food agency Sanitary–Epidemiologic Services. Domestic salt production continues to cover 91% of the total consumption needs in Kazakhstan, and official data for 2006 to 2008 report that the net import of iodized salt is 13,000 to 15,000 MT/year, mainly from Russia. The Sanitary–Epidemiologic Services report for 2008 indicates that more than 98% of the 10,800 inspections
of edible salt in the supply channels for the food industry and consumers found properly iodized salt levels.

References and important documents


5. Kazakh Academy of Nutrition and MACRO.

Kosovo

Historically, the Kosovo federal unit of the former Yugoslavia was known for areas with endemic goiter, such as Deçan, Peja, Gjakova, and Prizren municipality, where studies conducted from the 1960s to the 1980s showed 30% to 60% of people affected, indicating that the common diet was iodine deficient. Analyses by agricultural agencies found very low soil iodine levels in most of Kosovo. Yugoslav regulations dating from 1993 mandated that edible salt should be iodized at 12 to 18 mg iodine/kg salt, using either potassium iodide or potassium iodate. After the Balkan conflict subsided, Kosovo became administered by an Interim UN Mission with oversight by a Special Representative of the Secretary General of the United Nations. In 2001, the National Institute of Public Health collaborated with the Institute of Food and Nutrition in Rome in a National Micronutrient Status Survey of Kosovo [1]. The results showed that although adequately iodized salt (≥ 15 ppm by rapid test kit) was used in 84% of the households, the iodine status among school-age children and nonpregnant women of childbearing age was borderline (around half of the UI levels were < 100 µg/L in both groups).

All salt used in Kosovo is imported. Import and market monitoring in 2003 [2] showed that the salt imports originated from various sources, with Montenegro (the Ulcinj factory) accounting for approximately one-third of the total. Another key source of the salt supplies in Kosovo was the Tuzla factory in Bosnia and Herzegovina, directly and via Belgrade. Shipments from Macedonia (Skopje) and Slovenia made up the remainder. The border crossing at Peja continues to handle approximately 95% of the salt imported into Kosovo.

The findings of the 2001 survey prompted the government to promote USI more vigorously. The Ministry of Health strengthened...
national oversight and adopted USI, i.e., iodization of all salt, including salt used in the food-manufacturing industry. A multisector IDD (and other micronutrient deficiencies) Working Group was created, and collaboration was intensified among the National Institute of Public Health, the Sanitary Inspection, and the Kosovo Veterinary and Food Agency to ensure the quality of the national salt supplies by inspections at the border crossings (fig. 24) and follow-up of the quality of iodized salt in the markets and the food companies.

After a pilot study in 2004 in 10 primary schools of Deçan municipality showed a clear improvement in iodine status among school-age children [3], the National Institute of Public Health carried out a preliminary survey in 2007 among second-grade primary schoolchildren from one urban and one rural location in each administrative region. The children were asked to bring a salt sample from home, and goiter was determined by palpation by clinicians with the assistance of the Institute of Patho-Physiology and Nuclear Medicine, Skopje, Macedonia. The survey results [3] showed that 79% of the household salt samples had ≥ 15 mg iodine/kg salt; the median UI was 161 µg/L, and palpable goiter was found in 9% of the children. On statistical analysis, the children’s UI levels were not associated with the presence or absence of goiter or with household salt iodine levels [4], which suggests that the salt used in the food industry, such as bakeries and dairies, was also iodized.

In 2008, a private company near the capital of Pristina started to import noniodized salt to process iodized consumer salt for sales in Kosovo. This private company is operating in conformity with the new Administrative Instruction, and the company collaborates closely with the National Institute of Public Health.

Encouraged with the progress overall [5], the Ministry of Health requested the National Institute of Public Health to undertake an assessment of the food consumption and anemia situation in Kosovo, and in 2009 a national survey for that purpose was combined with the collection of iodine population indicators. The underlying justifications for the insertion of iodine indicators were to address some shortcomings in the 2007 survey related to representativeness of the dietary iodine supply and iodine status measurements, and to assess whether the Administrative Instruction of the Ministry of Health had led to universal good-quality iodized salt supplies for the population, including pregnant women. The survey was conducted in spring 2009 [6] using the recommended 30 × 30 design with primary schools as clusters selected proportionate to school population size. In each school, 30 children aged 5 to 14 years who lived in a household that included a pregnant woman were enrolled. A salt sample from each household was obtained for quantitative titration, and the iodine concentration in a urine sample from each of the children and women was measured in the National Institute of Public Health laboratory, which participates successfully in the EQUIP quality assurance program provided by the CDC [7]. The UI values of the children were converted to iodine consumption estimates according to the formula of the Institute of Medicine [8].

Notably, not a single household salt sample in this survey was found to be noniodized. The frequency distribution had a median of 16.5 mg iodine/kg salt and a range from 8.8 to 29.6 mg iodine/kg salt; 605 (67%) of the salt samples contained ≥ 15 mg iodine/kg salt.

The median UI in the children was 176 µg/L (95% CI, 168 to 182 µg/L), and the UI ranged from 43 to 486 µg/L. The UI concentration was < 100 µg/L in 4.9% of the children, between 100 and 199 µg/L in 54.2%, and ≥ 200 µg/L in 12.2%. The frequency histogram of iodine consumption in the children (fig. 25) had
a median of 137 µg/day (95% CI, 129 to 144 µg/day) and a range of 26 to 636 µg/day. The median intake estimates did not differ significantly between boys (137 µg/day) and girls (138 µg/day), between urban (129 µg/day) and rural (142 µg/day) areas, or between households using salt iodized with potassium iodide (140 µg/day) and those using salt iodized with potassium iodate (136 µg/day). As expected, there was a significant relationship between iodine consumption and age: iodine consumption in the children increased from approximately 80 µg/day at 5 to 6 years of age to approximately 200 µg/day at 13 to 14 years. Expressed as the RDA as defined by the Institute of Medicine [8], the children in Kosovo were typically consuming a diet that supplied 124% of their RDA for iodine. Upon further analysis, no relationships were found between the iodine consumption of children and the iodine content of the household salt.

The histogram of UI concentrations among pregnant women was skewed (fig. 26). The median UI was 183 µg/L (95% CI, 173 to 187 µg/L) and the range was 27 to 632 µg/L. There were no significant differences in median UI levels between urban (174 µg/L) and rural (184 µg/L) areas, nor was a significant relationship found between UI and the woman’s level of education (p = .57), duration of pregnancy (p = .60), or trimester of pregnancy (p = .99). Pregnant women living in households using salt iodized with potassium iodide had a slightly higher UI than those living in households using salt iodized with potassium iodate (186 vs. 176 µg/L, p < .05). As was the case in children, the UI among the pregnant women did not vary with the different levels of iodine content of the salt in their households.

The UI concentrations of the pregnant women and their children were strongly correlated (r = 0.63, p < .0001). Figure 27 shows the scatter plot and regression line. The slope of regression (b = 1.002; 95% CI, 0.98 to 1.03) was not significantly different from unity, indicating that the UI concentrations among the women and children of the same households were not different. This same relationship held whether households were using salt iodized with potassium iodide or with potassium iodate.

In conclusion, the experiences are testimony of the outstanding and swift progress in Kosovo toward the goal of sustained elimination of iodine deficiency in the population. The successful national attainment of USI is evident from a detailed iodine survey in 2009.
among school-age children and pregnant women from households throughout Kosovo. The results indicate universal use of adequately iodized salt in households and the food-processing companies, in association with optimum status among the entire population. This success was generated by close, enlightened collaboration of partners from public, private, and civic organizations. The salt imports into Kosovo are being closely monitored for adequacy, public awareness of IDD and USI is widespread, and pertinent knowledge has been inserted in educational curriculums (fig. 28). The National Coalition is active in reviewing progress and reports publicly on a regular basis. The government has adjusted the regulations in response to the results of monitoring of the iodine supply and nutrition situation in the population.

References and important documents


Kyrgyz Republic

At the time of the Ministry of Health ordinance of the USSR, detailed provincial surveys in the Kirghiz SSR had shown high goiter rates in the general population, varying from 11% to 42% in the north and from 55% to 61% in the south. The investigations also demonstrated a close relationship between the iodine content of the local water and food supply and the extent and severity of goiter in the population [1]. The centrally directed Soviet prophylaxis approach with mandatory iodized salt from the AralTuz factory in the Kazakh SSR led to drastic reductions in the prevalence and severity of goiter in the population by the end of the 1960s. After the Soviet authorities abolished the prophylaxis approach during the early 1980s, however, the iodized salt supplies deteriorated, along with the general decline of the economy. During the period from 1985 to 1989, surveys by the Kirgyz Academy of Medical Sciences uncovered new evidence of moderate and severe iodine deficiency: the median UI values among 10- to 12-year-old schoolchildren in various provinces were 25 to 45 µg/L; goiter prevalence varied from 33% to 86%, and rapid spot tests showed that the majority of salt consumed by the population was not iodized at that time [1].

After independence in 1991, an official concern about the poor iodine situation first became evident in a decree of the Kyrgyz Government in 1994, “National Program for Preventing Conditions Related to Iodine Deficiency, 1994–2000.” UNICEF started to assist local salt-processing companies to improve the manufacturing of iodized salt, and information activities were begun to inform the public and to insert the essential knowledge into the regular education curriculums. The Sanitary–Epidemiologic Services of the Ministry of Health adopted rapid test kits and laboratory titration in regular spot checks at the production and retail levels, and the capacities of researchers and salt manufacturers were strengthened in training workshops. Although all these activities helped to boost the production by Kyrgyz companies [2], overall progress toward USI was uneven [3], and progress in protecting the population against IDD fell short of expectations. By 2000, only 27% of the salt consumed by the Kyrgyz population was adequately iodized [4].

In January 2001, the Kyrgyz Government enacted a law on IDD prevention that prohibited the import and sale of noniodized salt for human and animal consumption and prescribed the use of potassium iodate at 40 ± 15 mg iodine/kg salt, in line with the CIS Agreement. In the same year, the State Committee on Standardization and Metrology issued a normative standard for iodized salt and included the product in the list of foods for compulsory certification prior to its release on the markets. A multisector Kyrgyz delegation present at the regional Almaty Forum on Food Fortification in October 2001 [4] developed an
action plan to further develop the national capacities in salt iodization, law enforcement, and monitoring of the salt supplies and population status, together with actions to raise the public’s acceptance of iodization and improve accountability by periodic public reporting. The plan was officially adopted by the government in 2002, followed by the launch of the National Program for Decreasing IDD in the Kyrgyz Republic, 2003–07.

The small, local salt companies coalesced in a Kyrgyz Association of Salt Producers in March 2003, and the Kyrgyz Government lifted the previous import tariffs on the fortificant and iodization machinery. Nevertheless, illegal imports by domestic traders continued to pose an obstacle to reaching USI by their persistent supplying of noniodized salt to the Kyrgyz markets. In view of the lenient official enforcement practices, the Kyrgyz–Swiss–Swedish Health Project started to support village health committees and health workers of Naryn Province in their use of rapid salt test kits as a tool to persuade the traders and retailers to accept only iodized salt supplies [3]. During a 2-year campaign in households and retail outlets, a quantum increase occurred in the supply of iodized salt in the province. By using only test kits specific for potassium iodate, the testing campaign also helped to shift the share in the trade channels away from salt iodized with potassium iodide, the less stable fortificant. Since then, these campaigns have been extended to other provinces, with similar success in raising the iodized salt supplies. In 2006, the MICS by the Kyrgyz National Statistical Committee found adequately iodized salt in 76% of households [5].

There are no viable deposits of salt fit for human consumption in Kyrgyzstan. In 2000, three small companies had begun processing noniodized salt imported from deposits in southern Kazakhstan, all together supplying approximately 5,300 MT of iodized salt. Imported salt, mostly from AralTuz in Kazakhstan, covered 70% of the national salt requirements at that time. The technical, material, and training support since that time from the Asian Development Bank and UNICEF have accompanied a gradual growth of the local processing companies, and by 2006/07, approximately 15 local salt companies were supplying 13,000 MT/year of iodized salt, or approximately 65% of the estimated national needs. At the same time, the Kyrgyz salt companies also adopted self-reliant input procurement and quality assurance practices [6]. The vigorous price competition in the market is testimony of a vibrant industry. Presently, approximately 25% of the national edible salt requirement of 16,000 to 18,000 MT/year is imported as packed iodized salt from suppliers mainly in Kazakhstan (AralTuz) and Belarus (Polose), and from Tajikistan (Koni Namak) and Uzbekistan (various brands). The remaining 12,000 to 13,500 MT/year is imported as noniodized edible salt from salt deposits in Kazakhstan (mainly TarasTuz, Suzak, and Balkash in Zhambyl Oblast) and Uzbekistan (Karakalpakstan and Sukhandarya).

Some 15 small and medium-sized Kyrgyz companies are processing and iodizing this salt, with or without prior washing and/or drying. Salt for household use is packaged in low-density polyethylene bags of 800 to 1,000 g for retail, although loose noniodized salt is also on sale in the markets. An unknown share of the national salt supply is purchased by the food companies that use salt in manufacturing recipes. Among these companies, the bread bakeries are the most important in view of the major role of bread in the common dietary consumption.

A national iodine survey was conducted at the end of the second national program using the standard 30 × 30 design to collect population indicators of supply, consumption, and impact [7]. The regular school-based sampling of 8- to 10-year-old children was extended by also enrolling 20 pregnant women from a prenatal clinic close to each school, for a total of 580 women. The average duration of pregnancy was 22 weeks;
(25%) the women were in the first, 223 (38%) in the second, and 211 (36%) in the third trimester of pregnancy. Sample and information collection included household salt and brand name, casual urine, and thyroid volume by ultrasound. UI concentrations were analyzed in the iodine laboratory of the Endocrinology Dispensary in Bishkek, accredited by EQUIP for successful proficiency, with UNICEF support [8].

The survey yielded 27 different salt brands, 21 of domestic origin. The iodine contents in household salt brought by children and women were not significantly different. The median iodine content of all the salt samples (fig. 29) was 11.2 mg iodine/kg salt; 39.5% of the samples had ≥ 15 mg iodine/kg salt, and only 15.0% fell in the mandated range of 25 to 55 mg iodine/kg salt. Imported salt made up 27% of the samples with

![Graph showing comparison of iodine content in household salt by manufacturer, Kyrgyzstan, 2007. Domestic manufacturers are denoted by letters A through M, foreign manufacturers by letters N through Q. Shown are the 95% CI notched box plots by manufacturer. Circles are individual values, plusses are outliers >1.5 to <3 IQR and stars are outliers >3IQR.](image1)

![Graph showing histogram of urinary iodine (UI) concentrations in schoolchildren, Kyrgyzstan, 2007.](image2)
a discernible brand name, and the iodine content of imported salt brands was 22.7 mg iodine/kg salt, more than twice the median of 10.2 mg iodine/kg salt in domestic salt ($p < .001$). Analysis of salt iodine content according to manufacturer (fig. 30) indicated that the difference was essentially attributable to the iodine content in one imported salt brand (denoted by letter O in fig. 30).

The median UI concentrations in children (114 µg/L) and pregnant women (111 µg/L) were not significantly different. In children (fig. 31), 43.1% of the UI values were < 100 µg/L, 32.0% fell between 100 and 199 µg/L, and 24.9% were ≥ 200 µg/L. In pregnant women (fig. 32), 61.2% of the UI concentrations were < 150 µg/L, 17.2% fell between 150 and 249 µg/L, and 21.6% were ≥ 250 µg/L. The median UI levels in the women and the children across clusters were strongly correlated ($r = 0.63$, $p < .001$).

Thyroid volume was significantly greater in pregnant women than in children (median, 7.9 vs. 2.8 mL; $p < .001$). Based on the age reference, the prevalence of elevated thyroid volume (i.e., goiter) in children was 5.2%. An analysis according to trimester of pregnancy revealed a significant ($p < .001$) increase in the women's thyroid size with the duration of pregnancy (table 13). The UI concentration of children and women was strongly related to the source of the salt used in the household (table 14). The UI of both groups was higher by 30 to 40 µg/L in households using imported salt than in those using domestically produced salt.

Finally, a strong relationship was found between the UI levels of the household members and the iodine levels in the household salt (table 15). Women and children living in households with salt iodized at less than 15 mg iodine/kg salt had significantly higher likelihoods of low UI concentrations than those in households using adequately iodized salt (≥ 15 mg iodine/kg salt).

Thus, the survey revealed a high dependence of the Kyrgyz population's iodine status on the iodization of household salt. Virtually all of the salt for household use was found to be iodized, but the amount of added iodine typically did not reach beyond 10 to 15 mg iodine/kg salt. Although these levels are sufficient to ensure a positive reaction with the rapid test kits, they fall clearly below the legislated mandatory level of 25 to 55 mg iodine/kg salt. Of the approximately 30 salt

TABLE 13. Thyroid volume in pregnant women by trimester, Kyrgyzstan, 2007

<table>
<thead>
<tr>
<th>Trimester</th>
<th>n</th>
<th>Thyroid volume (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Median</td>
</tr>
<tr>
<td>1 (&lt; 13 wk)</td>
<td>146</td>
<td>6.9</td>
</tr>
<tr>
<td>2 (13–26 wk)</td>
<td>223</td>
<td>7.5</td>
</tr>
<tr>
<td>3 (≥ 27 wk)</td>
<td>211</td>
<td>8.6</td>
</tr>
</tbody>
</table>

TABLE 14. UI concentrations in schoolchildren and pregnant women according to source of household salt, Kyrgyzstan, 2007

<table>
<thead>
<tr>
<th>Source</th>
<th>UI in children</th>
<th>UI in women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Median (µg/L)</td>
</tr>
<tr>
<td>Domestic</td>
<td>659</td>
<td>105</td>
</tr>
<tr>
<td>Imported</td>
<td>222</td>
<td>147</td>
</tr>
</tbody>
</table>

CI, confidence interval; UI, urinary iodine

TABLE 15. Association between iodine content of household salt and UI level in schoolchildren and pregnant women, Kyrgyzstan, 2007

<table>
<thead>
<tr>
<th>Salt iodine (mg iodine/kg salt)</th>
<th>Risk of low UI&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds ratio</td>
</tr>
<tr>
<td>Children</td>
<td></td>
</tr>
<tr>
<td>0–4.9</td>
<td>1.36</td>
</tr>
<tr>
<td>5–14.9</td>
<td>1.41</td>
</tr>
<tr>
<td>≥ 15</td>
<td>1</td>
</tr>
<tr>
<td>Women</td>
<td></td>
</tr>
<tr>
<td>0–4.9</td>
<td>1.46</td>
</tr>
<tr>
<td>5–14.9</td>
<td>1.23</td>
</tr>
<tr>
<td>≥ 15</td>
<td>1</td>
</tr>
</tbody>
</table>

CI, confidence interval; UI, urinary iodine

<sup>a</sup> Low UI is defined as < 100 µg/L for children and < 150 µg/L for pregnant women.
brands collected in the survey, only 2 (one domestic and one imported) reached the mandated level on average. The dietary iodine consumption of the pregnant women fell short by some 25% to 30% of their RDA. That the pregnant women were indeed iodine deficient was confirmed by finding an increase in thyroid gland volume (goiter) with the duration of pregnancy.

Therefore, to reach the goal of elimination of IDD in Kyrgyzstan, it had become increasingly important to make sure that all the Kyrgyz companies iodized the salt supply at the legally required levels. This central issue has been recognized by the partners in Kyrgyzstan. In 2008, a quick salt situation analysis among the major salt companies led to specific recommendations to improve iodization practices [9], with particular reference to the systematic use of technology and the provision of training in quality assured production, which was in large part accomplished.

To reinvigorate the collaboration in a national coalition, an assessment of the practices in the salt companies was undertaken in the fall of 2009, followed by a round table in Bishkek to jointly consider the next steps [10]. The assessment revealed that the three medium-scale Kyrgyz salt companies applied a washing-drying step prior to crushing and iodization but that no small company had this capacity. All the companies used a screw-conveyor to mix crushed salt with the added potassium iodate solution, and therefore the mixing quality of the end product was not an issue of significance. Salt producers reported obtaining the fortificant mostly through intermediary traders in China, Uzbekistan, and Kazakhstan and/or from each other. The purchase price typically ranged from 1,300 to 1,800 Som/kg (US$30 to US$40/kg). This compares to world prices f.o.b. from reputable producers that fluctuate around US$22.5 to US$25/kg. All the managers expressed concern about the difficult access to reliable (certified) potassium iodate. In only one case was the potassium iodate observed to have been certified by the original source. Six companies were found to be in possession of a WYD spectrophotometer, and all but one of these had a technician who was trained in the procedures of internal quality assurance. Of the six companies that did possess a WYD, only three were elected for the Kyrgyz Salt Producers Association, who started working with Sanitary–Epidemiologic Services, the Ministry of Health, Standardization and Metrology, NGOs, UNICEF, and the Swiss Red Cross, as well as the press and several parliamentarians. The meeting was chaired by the Chief Public Health Inspector, Ministry of Health. Major immediate issues for presentation and discussion included:

- Ensure secure and stable access by all the Kyrgyz salt companies to quality-assured, affordable potassium iodate;
- Complete the development of quality assurance capacity for quality iodized salt production in all the Kyrgyz salt companies;
- Revive the National Coalition for oversight and decision-making on USI for IDD elimination.

The Chief Public Health Inspector took this reinvigoration seriously. In October 2009, he chaired a meeting with all salt companies in which the next steps to facilitate easier access to the fortificant through a reputable national trading firm were announced. At the same meeting, a new (female) chairperson was elected for the Kyrgyz Salt Producers Association, who started working with Sanitary–Epidemiologic Services to complete the capacity-building of all companies in improved quality assurance practices.

In conclusion, the experience of progress toward USI in the Kyrgyz Republic is one of intermittent public–private–civic collaboration, accompanied by tentative official follow-through in enforcement of the agreed-upon norms and standards laid down in a principle USI law. All salt for human consumption in Kyrgyzstan is imported, one-quarter in the form of packed iodized salt from different origins, one of which is properly iodized. The remainder of the national iodized salt supply is processed in approximately 15 domestic companies that have sufficient technologic and managerial capacity for proper iodization but generally minimize the amount of iodine added to their salt due to difficult access to the fortificant. A major factor in the improved
iodized salt supplies has been the ongoing community-based rapid salt testing throughout Kyrgyzstan, which denies a market to those traders who continue to supply noniodized salt. Small food producers, such as tandoori bread bakers, are using iodized salt obtained from consumer markets, but it is unknown whether the large bakeries and other food manufacturers are using iodized salt. Although official monitoring of iodized salt at import, production, and retail has been continuously weak and hesitant, the scientific community in Kyrgyzstan has a strong capacity for monitoring the population consumption of iodized salt and the impact of iodized salt on iodine nutrition in the population. A multisector national coalition that was established at the start of the national program from 2003 to 2007 was recently revived, as was a Kyrgyz Association of Salt Producers, thereby rekindling the hope for accelerated progress to reach the goal of USI for IDD elimination in the near future.

References and important documents


Macedonia

The Republic of Macedonia shares a history of iodine deficiency with former Yugoslavia [1]. Local surveys during the mid-1950s showed high goiter prevalence in many areas, ranging from 18% in the capital of Skopje to as high as 60% in the Skudrinje area [2]. Regulations on salt iodization were introduced in Yugoslavia in 1937 and initially set a level of 5 mg KI/kg salt for household salt directed to high-goiter areas only. In 1954, after a review at the Congress on Preventive Medicine, the level was set at 10 mg KI/kg salt and was expanded to all salt destined for human and animal consumption. Although studies conducted 10 years later demonstrated a fourfold reduction in goiter prevalence among school-age children, studies in Macedonia during the 1980s revealed that goiter persisted in the population born after USI was introduced [3]. Upon peaceful separation from Yugoslavia in 1991, extensive studies in 1995/96 among 7- to 15-year-old schoolchildren showed enlarged thyroid volume in 18.7% (varying from 7.8% to 29% by municipality) and a median UI of 110 µg/L (varying from 79 to 190 µg/L). These findings led to the formation of an Expert Committee on Iodine Deficiency in December 1997 to provide oversight and policy guidance. The findings of continued weak impact of USI were reconfirmed in a survey in early 1999 in 30 randomly selected primary schools, which again found elevated thyroid volume and a median UI of 117 µg/L. Thus, the Expert Committee proposed and developed a new rule book on edible salt, which was made effective by government decision in October 1999. The regulation specifies that all edible salt imported in Macedonia, including salt used by the food industry, should contain 20 to 30 mg iodine/kg salt, while permitting only potassium iodate. A survey one year later in September and October 2000 among 8- to 10-year-old schoolchildren, which
used the standard 30 × 30 design, showed a quantum improvement in UI to 154 µg/L (varying from 96 to 207 µg/L), with no differences according to sex or urban versus rural location [4].

Macedonia imports its salt, mainly from suppliers in Austria, Bosnia and Herzegovina, Bulgaria, Egypt, and Greece. All salt imports are inspected by the State Sanitary Services, which must issue a certificate of conformity prior to release of the shipment by the Customs Authority. Unsatisfactory salt is returned to the producer. Only one local processing company, Solbit, is exempted from the ban on importation of noniodized salt. The company has plants in Bitola and Skopje (with approximately 40% of the national market share), and it processes salt imported from Egypt and Belarus by spray iodization. This arrangement was found to function well in an independent external assessment in 2003 [5]. Iodization of salt is self-financing with no government subsidy. The importers and the processing plant are the primary responsible partners for the quality of the edible salt supplies, including iodine content. Registered import firms are required to submit the purchase order for each shipment through the Ministry of Economy and Trade, together with a laboratory certificate from the country of origin. On arrival at the border, sanitary inspectors perform an inspection in such a way that the results of iodine measurements are available within 2 to 3 hours. Studies by the State Institute for Health Protection in 2002 confirmed the high stability of iodate in typical imported salt samples under severe storage conditions for 6 months. Measurements by the Veterinary Institute confirm that salt used for animals is as properly iodized as the salt for household and food industry use. Finally, regular salt sampling in the primary schools of Macedonia by the Institute of Public Health demonstrated that during sampling in the primary schools of Macedonia by the

In 2000 is illustrated in figure 34.

Time trends of population iodine indicators (fig. 33) show a clear relationship among the percentage of UI values < 100 µg/L, goiter prevalence (by palpation), and thyroid volume measured by ultrasound in school-age children [6]. The improvement in iodine nutrition of the schoolchildren associated with the change in mandated salt iodine content to 20 to 30 mg iodine/kg salt in 2000 is illustrated in figure 34.

Over the years, a variety of educational activities have taken place, including collaborative mass distribution of informational materials among the public by the Ministry of Education and Science, consumer information by the Consumer’s Association of Macedonia, and extensive publicity in the media. The essential knowledge of IDD and USI has been inserted in several specialist curriculums at the university level. An opinion survey among ambulant patients in Skopje indicated that the population was well aware of the threat of iodine deficiency and the benefit of using iodized salt, although knowledge about the consequences of iodine deficiency for brain development was somewhat wanting.

The Committee on Iodine Deficiency is composed of members from a wide range of government branches (Health, Education, Agriculture/Veterinary, Economy/Trade, etc.), scientific institutions (Public Health, Neonatology, Obstetrics and Gynecology, Food Chemistry and Technology, etc.), salt importers and producers, media (journalists, television, radio, etc.), and consumer interests, thus representing a broad range of partners. The minutes and reports of the committee are publicly available.

In 2003, an external expert assessment team named by the Network for Sustained Elimination of Iodine Deficiency assessed the performance of the USI
strategy and concluded that the problem of iodine deficiency in Macedonia had been successfully overcome. In addition to the recommendation that the USI strategy should be continued, the team suggested that the iodine situation among pregnant women and newborns should be assessed. The report of the external assessment was launched at a national event in October 2003, with a range of high-level officials of various government branches, salt producers and traders, and consumer organizations in attendance.

Neonatal screening for TSH levels was introduced in Macedonia in 2002 and has been scaled up to encompass the majority of newborns in the country. If a population is iodine deficient, more than 3% of the newborns will have TSH values above 5 mU/L. Studies by the Clinic for Pediatric Disorders of the Faculty in Medicine showed the following time trend: the prevalence of elevated TSH was 4.3% in 2002, 5.9% in 2003, 2.8% in 2004, 0.8% in 2005, 1.8% in 2006, and 1.5% in 2007. The data after 2003 indicate that mothers giving birth had not been exposed to iodine deficiency during pregnancy. Extensive studies were also conducted among pregnant and lactating women during the period from 2003 to 2007, which generally indicated that pregnant women had adequate iodine status, although the practice of prescribing iodine supplements during pregnancy is still prevalent among healthcare providers. Most recent results from measurements of TSH, free thyroxine (FT4), thyroglobulin, and thyroid peroxidase (all indicative of thyroid function) among pregnant women indicate that iodine deficiency is not a public health threat for each new generation of newborns in Macedonia [7].

References and important documents


Moldova

Moldova depends entirely on imports for its national salt requirements: about 80% comes from Ukraine (Artemisol) and the remainder from Romania (Salrom) and Western Europe. As the country has a predominantly agrarian economy, the customs of preservation and pickling of fish, vegetables, and other foods are widespread in households and the food-manufacturing industry. Iodine deficiency has been increasingly recognized as a public health problem since the mid-1990s, when population data showed a goiter prevalence of 37% and a median UI level of 78 µg/L among 8- to 10-year-old schoolchildren [1]. In 1997, a government decree banned the import of noniodized salt, and in 1998, the government approved a National Program to Eliminate IDD by 2004, which included stipulations to establish a National IDD Committee under the Ministry of Health and promote the supply of iodized salt by salt importers and its use in homes, catering institutions, and large canteens. The national program statement also included provisions on iodized salt quality and directions for iodine supplements and improved diagnosis and treatment in healthcare centers, but it specifically excluded the food industry from using iodized salt. The iodization level was set at 25 to 35 mg iodine/kg salt, using either potassium iodate or potassium iodide. Finally, the document also outlined the expected roles and responsibilities of a variety of government departments in revising the legislation, conducting research, tracking morbidity due to iodine deficiency, monitoring the supplies of iodized salt and special fortified products, and cooperating with UN agencies. By 2000, despite these measures the MICS showed that only 33% of the households used adequately iodized salt [2]. A UNICEF briefing document dated 2002 noted that cooperation among officials in the National IDD Committee was poor, monitoring at import and in the markets was feeble, public awareness was low, and the budget allocation to the national program was minimal.

To assist in accelerating program activities, UNICEF
supported the Maternal and Child Health Program of the Ministry of Health during 2000 to 2004 in a range of efforts, including advocacy, communication, monitoring and evaluation, legislation, and supply of iodization equipment for one salt importer to begin domestic iodization [3]. As the focal point for coordination, the National Center for Preventive Medicine conducted high-level advocacy to raise the stature, improve the cohesion, and broaden the composition of the National IDD Committee. A comprehensive salt situation analysis was conducted in 2002, and a series of journalist and media briefings was held into early 2003 to prepare for a 3-month intensive communication campaign starting in February 2003. Supported by a reputable advertising agency, the campaign raised the awareness of the public to nearly universal level and convinced half of the mothers in Moldova that the use of iodized salt in the households was a necessity [3]. Also in 2003, the four import firms, which commanded 90% of the total supply of salt and 95% of the supply of table salt, formed an association called Bigsalt and agreed to sell table salt at a single, harmonized price to their customers.

Three major efforts took place in 2004. First, two national multisector workshops aimed to improve the quality assurance and quality control and enforcement of the salt supplies and the monitoring of iodine intake and status of the population [4], as well as to develop a collaborative plan of action to eliminate IDD in Moldova [5]. Second, an external assessment of program performance was conducted [6]. Third, a multisector national advocacy and communication campaign was conducted (in two phases) targeted at high-level policy makers, including the Prime Minister, and reaching over 450,000 secondary school students and their teachers, primary care nurses, and small salt retailers [7]. Despite the high-level advocacy and the technical work to support the government in developing legislation, however, the principal Food Law that was enacted in May 2004 did not stipulate the exclusive import and sale of iodized salt or its use in the food industry. National Center for Preventive Medicine monitoring reports showed that although the salt was fully adequate in the warehouses of the importers, approximately 50% of the salt in the retail outlets still contained less than 25 mg iodine/kg salt because of the continued supply of noniodized food industry salt in the markets [8]. The DHS in 2005 reported that 60% of the salt tested in the households was adequately iodized [9].

After completion of the first National Program, and in recognition of the key importance of addressing the issue of the continued use of common salt in the food industry, a key part of the programmatic efforts in late 2005 and early 2006 became directed toward developing an improved program proposal for the next phase, combined with the mobilization of political will in the food industry and government to accept the true USI strategy. High-level advocacy material was disseminated among politicians and the press in a Damage Assessment Report, Protection Audit, and Leadership Briefing, which outlined the impacts on the economy and the human condition of continued deficiencies [10]. Groups of employees from government, science, and the food industry visited Switzerland and Bulgaria to observe firsthand the practical use of iodized salt in the production of common foods, such as cheese, bread, meat and meat products, pickles, etc. The legislation frame and food control were also discussed in depth during the study tour [11]. A national multisector workshop in Chisinau in May 2006 [12] developed the details of a proposal for the second National Program, drafted a national action plan, and focused on ways to stimulate the use of iodized salt in the bread and cheese industries in the short term and in preserves, such as sweet corn and green peas, and meat and meat products later. A national nutrition conference in late 2006 endorsed the draft second National Program to Eliminate Iodine Deficiency Disorders, which led to its adoption in May 2007 by the Government of Moldova.

In the spring of 2006, a national iodine survey was conducted with the recommended 30 × 30 design among schoolchildren in grades 2 to 4, collecting urine samples that were sent for measurement of iodine concentration in the ILRI laboratory in Sofia, Bulgaria, which is acknowledged for successful participation in the external EQUIP quality assurance service. Children were asked to bring salt samples from home for testing with a rapid test kit, and a short questionnaire was completed by the parents on the type and quantity of salt used and consumed in the household. The rapid test results indicated that 34% of the salt samples brought from the homes (44% in rural areas and 18% in urban centers) did not contain any iodine. The histogram of UI concentrations in the children is shown in figure 35. The median UI was 165 µg/L (95% CI, 155 to

![FIG. 35. Histogram of urinary iodine (UI) concentrations in schoolchildren in grades 2 to 4, Moldova, 2006](image-url)
using iodized salt in urban households and using iodized salt were found the mother had low education. Only the children living 11-year-old children, the iodine intake of the children indicate that relative to the RDA of 120 µg/day for 9- to 11-year-old children is indicated by the broken line.

174 µg/L), within the range recommended for school-age children, which led the draft report to conclude that "Moldova can be considered as a country where iodine deficiency is not a public health problem any more in 2006" [13]. Although the median UI of 165 µg/L seemed adequate, the survey results demonstrated that USI was not attained. Especially in rural areas, the use of iodized salt in the households was below the 90% target level. Moreover, the survey approach assessed schoolchildren within a limited age range (grades 2 to 4, or ages 9 to 11 years), instead of the range of 6 to 12 years recommended internationally. Finally, the UI levels among children from rural households that were not using iodized salt fell below the cutoff of 100 µg/L for adequate iodine nutrition. The report’s conclusion, therefore, would be premature, and a reassessment of the survey data proceeded as follows: first, to enable a comparison with the dietary iodine recommendations for children, the UI data were converted to iodine intake estimates, using the formula of the Institute of Medicine [14]; second, in a more refined analysis, the intake data were classified by use of iodized salt in the household (yes or no), residence area (rural or urban), and mother’s educational level (< 9 or ≥ 9 years of education).

As shown in figure 36, the findings of this reanalysis indicate that relative to the RDA of 120 µg/day for 9- to 11-year-old children, the iodine intake of the children in the households not using iodized salt was insufficient, particularly when the household was rural and the mother had low education. Only the children living in urban households and using iodized salt were found to meet the RDA.

Despite the shortfall in reaching USI and the remaining uncertainty whether the iodine nutrition status is adequate, substantial progress has been made in Moldova since the second National Program began. An external assessment in 2009 noted the following improvements [15]:

» The amount of iodized salt imported into Moldova increased from 20% of the total national salt requirements in 2006 to 45% in 2008.

» The regulations and certification of import consignments ensure that the imported iodized salt is of good quality and according to standards.

» The nationwide food inspection system demonstrates that 95% of all the tests of iodized salt in Moldova were in compliance with the standard (≥ 25 mg iodine/kg salt), with Chisinau and surrounding suburbs at 98%.

» The use of iodized salt in bread production has taken off significantly; the Franzilutza bread company, which has a market share of 30% to 35%, uses only iodized salt in its bread.

» Five major food producers and several small food-processing companies have accepted the use of iodized salt in their production upon extensive research during the past years. Upon rewriting of technical standards, this will reach coverage of more than 80% of the preserved food supply in the national market.

The next steps for the short term include a national iodine survey in 2010, when the current National Program runs out. A preliminary outline recognizes the need for collection of quantitative data on salt used in the households as well as the food industry, iodine status measurements in pregnant women (as the most vulnerable group), and a disaggregated analysis by urban and rural settings.

In conclusion, the iodine situation in Moldova has improved significantly during the past decade. Under the leadership of the Ministry of Health, two successive national programs have been carried out with extensive consultation among the major stakeholders, including the salt import firms and the major food companies. Due to an emphasis on iodine status indicators, a national iodine survey in early 2006 gave the impression that IDD was no longer a significant issue, although rural households where iodized salt was not being used had a sizable shortfall in iodine consumption compared with the RDA. Study tours to Switzerland and Bulgaria have raised the understanding among stakeholders that iodized salt can be used safely in industrial manufacturing of common foods (dairy, bread, meat, and conserves), and a number of studies in Moldova have contributed to acceptance of the idea that the use of iodized salt in the food industry is safe.
and does not affect the quality of the end products. Ongoing inspections by the food agency and customs control of salt import shipments have led to a situation in which the majority of the salt supplies in Moldova meet the agreed standards. A repeat national iodine survey is planned for 2010, with high expectations of a demonstration that USI has been attained, leading to sustained elimination of IDD.

References and important documents


Montenegro

Montenegro shares a history of iodine deficiency with other countries of the former Yugoslavia [1], including reports of high goiter prevalence in many areas, ranging from 30% to as high as 60%, especially in the Sandžak region, which includes the Novi Pazar and Prijepolje municipalities and straddles the present border area of Serbia, Montenegro, and Kosovo.

Regulations on salt iodization were introduced in 1937, initially setting a low level of 5 mg KI/kg salt for household salt that was directed to high-goiter areas only. The iodization level was increased to 10 mg KI/kg salt in 1954 and expanded to all salt destined for human and animal consumption in Yugoslavia. Ten years later, clinical and epidemiologic surveys confirmed a four-fold reduction in goiter prevalence among school-age children [2]. The present legislation mandates that all edible salt be iodized at 12 to 18 mg iodine/kg salt, and it permits both potassium iodide and potassium iodate as fortificants. In 1999/2000, after the Balkan conflict, a survey among school-age children in the territory covering present-day Serbia and Montenegro by the Institute of Public Health, Belgrade, found a median UI of 158 µg/L and a decrease in goiter prevalence to 2.5% [3]. According to the MICS report [4], adequately iodized salt according to rapid test kit was being used in 73% of the households in 2000 (the survey excluded Kosovo–Metohija).

In 1992, Serbia and Montenegro—the two remaining republics of the former Yugoslavia—formed a federation named the Federal Republic of Yugoslavia, which in 2003 was transformed into the State Union of Serbia and Montenegro. Upon peaceful separation,
Montenegro became a sovereign state in 2006, adopted the euro as its currency, and deregulated the trade in goods and services, including salt.

In previous decades, the major domestic salt producer located in Ulcinj along the Adriatic coast had increasingly fallen into disrepair. Currently, the wide variety of salt brands in the market indicates active competition among various, mainly international, sources. The Sanitary Inspection of the Ministry of Health collects salt samples in the markets, shops, and food-processing companies for analysis in the Institute of Public Health, Podgorica, and the Institute of Public Health keeps detailed records of quality-assured analyses, using low and high control pools, each with a maximum variation of 0.5 mg iodine/kg salt in the routine assay.

In late 2007, the Institute of Public Health, Podgorica, carried out a national iodine nutrition survey to assess the use of iodized salt in relation to the iodine nutrition status of the population of Montenegro. The survey used the standard design of 30 clusters (primary...
schools), selected proportionate to school population. In each cluster, 25 children in grades 1 to 6 were selected at random for measurement of thyroid volume and collection of casual urine samples and salt samples brought from home. In addition, 12 pregnant women were enrolled from a prenatal clinic located near each of 15 primary schools across three regions of Montenegro: north (Serbian border), center, and south (Adriatic coast) for urine and household salt samples. Salt iodine content was analyzed in the Institute of Public Health, Podgorica, and UI concentration was analyzed in the iodine laboratory of the Institute of Public Health, Belgrade, which participates successfully in EQUIP. Internal controls during the UI measurements demonstrated a precision of ± 5% for the UI assay.

Since there were no differences in iodine content of the salt samples obtained from the children and the women, the results are combined in figure 37. Notably, all the salt samples were iodized. The median iodine content was 12.4 mg iodine/kg salt, and 15.1% of the salt samples had ≥ 15 mg iodine/kg salt; 53.0% of the samples were within the range of 12 to 18 mg iodine/kg salt mandated for salt imported and sold.

The median UI concentration in the schoolchildren was 174 µg/L (fig. 38). UI was < 100 µg/L in 16.6% of the children, from 100 to 199 µg/L in 44.9%, and ≥ 200 µg/L in 38.4%. UI levels did not differ according to sex or age of the children but differed significantly between regions. Children living in the north of Montenegro had significantly (p < .001) lower median UI (139 µg/L) than children living in other regions of the country (center, 185 µg/L; coast, 191 µg/L). The median UI in children living in the north was not indicative of iodine deficiency, however.

Enlarged thyroid volume (BSA standard) was found in 7.9% of the children, with no difference between boys and girls (fig. 39). Goiter affected approximately three times as many children in the north (15.6%) as in the remainder of the country (center, 3.8%; coast, 7.4%; p < .01).

The histogram of UI concentrations in 192 pregnant women in Montenegro (fig. 40) had a median of 134 µg/L, and 56.3% of the women had UI < 150 µg/L. Despite the significant skew of the UI distribution, only 10.9% had UI > 250 µg/L, and 2% had UI ≥ 500 µg/L. Pregnant women in Montenegro, therefore, had lower iodine status than school-age children, despite the finding that the salt iodine content in the households of pregnant women and children did not differ. The UI in pregnant women did not differ by age, trimester of pregnancy, or region. Most importantly, the median UI level among the women was below the normal range for pregnancy of 150 to 250 µg/L, thereby exposing the risk of iodine deficiency in this group. Further analysis did not reveal any significant relationships among salt iodine content, UI, and thyroid gland volume in children or women.

The results of the survey show that schoolchildren enjoy adequate iodine nutrition, similar to that in 1999/2000 [2, 3] when Montenegro and Serbia were a single federation. The salt supply in the households was found to be successfully iodized (according to national standards), although the median value of 12.4 mg iodine/kg salt was close to the mandated minimum. The thyroid volumes in schoolchildren were indicative of previous iodine deficiency, and in agreement with the differences in UI concentrations, goiter was more pronounced in children living in the north of Montenegro, which is historically known to be severely affected by goiter and cretinism.

The finding of iodine deficiency among pregnant women supports the recommendation of an upward adjustment of the mandatory iodization level and a directive that potassium iodate should be used exclusively in fortification of the salt supply to Montenegro. Although the Ministry of Health is ultimately responsible, the Institute of Public Health is functioning as the de facto implementing entity. The Ministry of Health has not allocated funds for this role in the budget of the Institute of Public Health, however. A
National IDD Committee was functional at the time of the federation, but it has not been active lately. Public knowledge of IDD and salt iodization is high, and it has been included in primary and higher technical education. The Institute of Public Health runs an accredited salt iodine laboratory and has easy access to the accredited UI laboratory of the Institute of Public Health, Belgrade.

References and important documents

Romania

The high prevalence of goiter and cretinism throughout the mountains and hilly regions of Romania [1] led to a decision by the Ministry of Health in 1947 to distribute potassium iodide tablets to schoolchildren (once a week) and pregnant women (twice a week) in mountainous areas. In 1956, the Ministry of Health issued a directive for the supply of iodized salt at 9 to 15 mg iodine/kg salt in the 30 most affected districts, although the sale of noniodized salt remained permitted in the same areas. In 1986, however, a survey among more than 135,000 schoolchildren aged 6 to 14 years, coordinated by the Institute of Endocrinology, found persistent goiter, reaching a prevalence of more than 5%—not only in the mountainous and hilly districts, but throughout the country. Thus, a government ordinance in 1995 increased the mandated iodine level in table salt to 40 to 50 mg KIO₃/kg salt (24 to 30 mg iodine/kg salt) and ordered that this salt be made available for retail in the entire country. The ordinance prohibited the use of iodized salt in the food industry and specified that the label should contain a warning against its use in food preservation and a contraindication for people with certain thyroid conditions [2].

Monitoring in 6- to 16-year-old children during the period from 2000 to 2002 by the Institute of Endocrinology found median UI levels of less than 100 µg/L in 19 of 22 (86%) high-risk districts studied [3]. The UI levels among pregnant women were uniformly characterized as being "alarmingly low." In the end, therefore, the realization was increasingly taking hold that an approach of targeted iodine supplements together with the voluntary supply of iodized table salt had not succeeded in securing adequate iodine nutrition for the population in Romania [4].

During the 1990s, UNICEF started collaborating closely with the government, the salt industry, medical professional groups, and grassroots institutions to help to promote the adoption of a USI strategy. The Institute for Mother and Child Protection conducted an in-depth review of the iodized salt supply in relation to the iodine nutrition situation in the population, which helped to lay a basis for a proposal for true USI legislation in 2000. From monitoring of the salt supply, which demonstrated significant differences in the quality of iodized table salt among districts, the analysis concluded that the underlying causes of iodine deficiency in Romania were the stark inequalities in the distribution and use of iodized salt among districts, compounded by the absence of iodized salt use in the food industries and the loss of iodine during production, transport, storage, and use of iodized salt in the households. The causal analysis of the iodine deficiency situation in Romania was complemented in 2000 by an external review that encouraged significantly increased advocacy and communication efforts to support the promotion of compulsory legislation for USI [5]. In early 2002, UNICEF contracted a reputable NGO to develop and execute a communication campaign, based on special focus group research and robust pretesting of messages tailored for target groups among professional groups and the general public. The communication campaign was conducted in 2003/04, overlapping with the time when the government enacted the new legislation for USI. The campaign contributed greatly to raising public awareness of the IDD problem and the benefits of iodized salt.

The national salt company of Romania, SALROM, is a joint stock company that started out with state capital, although it is administered like a private company. Using up-to-date technology, the company manages major salt deposits in seven branches with a range of products for the food and other companies, water purification, road de-icing, livestock breeding, and human consumption by [6]. Depending on the location, salt iodization is performed by either the wet spraying or the dry mixing method. Some of the SALROM branches use UNICEF-provided equipment. According to a salt situation analysis in 1999 [7], SALROM produced approximately 2 million MT of salt in 1998, about 10% of which was food-grade salt, while approximately 30% of the food-grade salt was iodized. A note of SALROM's technical director in 2002 articulates a supportive position of SALROM in the national efforts to reach USI [8]. SALROM's capacity is sufficient to supply all the national salt needs. The company also exports its products to Moldova, Macedonia, and other nearby countries. On the other hand, noniodized “industrial” salt from Ukraine has for a long time undercut the domestic sales of SALROM, before as well as after the time when USI was made compulsory in Romania.

Government Decision #568, "Regarding universal iodization of salt for human and animal consumption and for use in the food industry," issued in June 2002, stipulates that all edible salt in Romania be iodized at 20 ± 5 mg iodine/kg salt, while permitting both potassium iodide and potassium iodate as fortificants. The decision originally allowed for a phased introduction, starting with table salt from 1 January 2003, followed by salt for the food industry and animal husbandry from 1 January 2004. The decision banned the import and sale of noniodized salt in Romania, and it maintained the provisions for labeling of iodized salt with warnings against its use in food preservation as well as the contraindications, as defined in 1995.

During May and June 2004, the Institute for Mother and Child Protection of Bucharest conducted a cross-sectional nutrition survey of the Romanian population, enrolling pregnant and parturient women, their...
newborn infants, children under 5 years of age, and schoolchildren 6 to 7 years of age. Trained survey teams visited schools and interviewed child caretakers about their children’s use of iodine supplements. The children were invited to bring a salt sample from home and to volunteer a urine sample. The salt and urine samples were analyzed for iodine by standard laboratory assays. Unfortunately, the English summary of the report does not give details of the survey design, sampling frame, or accuracy of the laboratory results [9].

Based on the criteria of ICCIDD/UNICEF/WHO, the survey results indicated that iodine deficiency had started to decline in Romania. The average iodine content of table salt was 25.3 mg iodine/kg salt, and 74% of the 2,051 salt samples had an iodine content ≥ 15 mg iodine/kg salt. The median UI level in 6- to 7-year-old children was 102 µg/L, suggestive of a just sufficient iodine nutrition status. In a separate group of pregnant women, however, the median UI concentration was 68 µg/L, which is significantly lower than the international recommendation for pregnant women. Further analysis showed a significantly lower iodine content in table salt from rural households than in salt from urban households (mean, 21.8 vs. 27.4 mg iodine/kg salt; p < .001), which was in agreement with the finding of lower UI levels in children from rural households than in children from urban households (median, 100 vs. 105 µg/L). The body weights of the children in this survey were also measured, which permits the calculation of iodine intake estimates by the formula published by the US Institute of Medicine [10]:

Estimated iodine intake (µg/day) = body weight (kg) × UI concentration (µg/L) × 0.0235.

The histogram of iodine intake estimates in the Romanian children is shown in figure 41. The estimated median iodine intake of the 2,326 children was 56.5 µg/day (95% CI, 54.1 to 57.8). Eighty percent of the children had iodine intakes below the RDA of 90 µg/day recommended by ICCIDD/WHO/UNICEF, and 59% did not attain the average iodine requirement of 63 µg/day for 6- to 7-year-olds.

An analysis of the findings of iodine status and intake according to urban or rural residence (table 16) indicates that the children in rural households were at a significant disadvantage compared with their urban peers. Rural children not only had significantly lower iodine status (p < .01), but also had significantly lower estimated iodine intake (p < .001). These findings translated to a significantly (p < .001) higher proportion of children in rural households with iodine consumption below the recommended levels.

Finally, the iodine intakes of the children were analyzed according to the iodine contents of their household salt (table 17), which indicated consistently lower dietary iodine intakes in rural households at each level of household salt iodine content. Also, compared with children in households that used salt with iodine content ≥ 20 mg iodine/kg salt, children in households that used salt with iodine content < 20 mg iodine/kg salt were consuming about 10% less iodine in urban (56 vs. 61 µg/day, p = .002) as well as in rural (49 versus 56 µg/day, p = .09) areas.

In conclusion, therefore, although the overall UI findings in the schoolchildren in Romania suggested just sufficient iodine nutrition, an in-depth analysis of their iodine intakes revealed that the majority of the children did not obtain sufficient iodine from the common diet to meet their biologic requirements, and that the deficiency in iodine intake affected children in rural areas disproportionately. The analysis according to iodine content of household salt showed that

TABLE 16. Iodine status findings in 6- to 7-year-old schoolchildren, Romania, 2004

<table>
<thead>
<tr>
<th>Residence</th>
<th>n</th>
<th>Median (µg/L)</th>
<th>95% CI (µg/L)</th>
<th>Median (µg/day)</th>
<th>95% CI (µg/day)</th>
<th>Below RDA (%)</th>
<th>Below EAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>1,417</td>
<td>105</td>
<td>100–108</td>
<td>59</td>
<td>57–61</td>
<td>78</td>
<td>56</td>
</tr>
<tr>
<td>Rural</td>
<td>909</td>
<td>100</td>
<td>95–102</td>
<td>51</td>
<td>49–54</td>
<td>86</td>
<td>64</td>
</tr>
<tr>
<td>p</td>
<td></td>
<td>.0013</td>
<td></td>
<td>&lt; .001</td>
<td>&lt; .001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CI, confidence interval; EAR, Estimated Average Requirement; RDA, Recommended Dietary Allowance; UI, urinary iodine
the mandatory salt iodization policy did address the iodine deficiency problem in Romania but that dietary iodine deficiency still persisted, particularly in rural households that used table salt with low levels of iodine.

At the time that the iodine survey was conducted in 2004, iodization of table salt had been obligatory for more than 1 year, and the use of iodized salt in commercial food manufacturing had not yet been made mandatory. During the time following the survey, however, resistance to USI increased in the food industries. The food conservation industries (vegetable pickling and canning, etc.) voiced especially strong objections based on the belief that their end product would be affected by the substitution of iodized for noniodized salt in the recipes. In response, the Ministry of Health amended the decree on 1 April 2004 to the effect that only the bread bakeries were obligated to use iodized salt.

In an effort to improve confidence in the use of iodized salt by the food industry, UNICEF sponsored a study tour by a professional group to Bulgaria to learn firsthand about the experience in the Bulgarian food industries (dairy, vegetable conservation, bread baking), where the use of iodized salt in food manufacturing is universal. In addition, UNICEF supported a detailed study in the Department of Food Research of the Food Technology Institute of the effects of using various types of iodized salt produced by SALROM on the product characteristics in vegetable conserves [11].

A presentation by the Ministry of Health of Romania in 2005 [12] reported that a National Committee on USI and IDD Elimination had been established in 2004, followed by the creation of a coordination cell in the Institute of Public Health, Bucharest, to assist in data consolidation, analysis, and policy advice. Salt iodine levels at the production level and in the markets were monitored at quarterly intervals by the local public health workers, who report to the Institute of Public Health but lack the authority to follow up on sales of salt that does not have the mandatory iodine content. SALROM reported that it supplied 54,500 MT of iodized salt in 2004, compared with an estimated national consumption need of 70,000 to 80,000 MT. The remainder of the salt needs was believed to be covered by the illegal diversion of “technical” salt (destined for non-dietary purposes) imported from outside Romania and by the use in poor households of noniodized salt intended for animal husbandry. The lack of functional and transparent enforcement of the national legislation was mentioned as a key obstacle to progress toward USI. On the basis of this analysis, the Ministry of Health from 2005 onward started to promote a revision of the iodization levels to 25 to 40 mg iodine/kg salt. Along with the high-level political decision to prepare for EU membership, the Ministry of Health in Romania was obliged to undergo a health sector reform, however, which relegated many health matters, including the USI strategy, to a lower priority status.

In Istanbul, Turkey, in May 2006, UNICEF and ICCIDD collaborated in a regional workshop for national program managers and their counterparts in national iodine laboratories to assist in strengthening of USI/IDD monitoring systems [13]. Participants from Romania included the Ministry of Health program manager and laboratory managers from the Institute of Endocrinology and the Institute for Mother and Child Protection. Part of the workshop was dedicated to the free service provided by the US CDC through the EQUIP UI sample exchange program, which assists in maintaining proper proficiency in UI laboratories [14]. A comparative analysis of the salt monitoring systems in the region concluded that the regular salt titration monitoring system by the local health staff in Romania was an excellent example for the various systems in use in the region. It was also recognized, however, that the laboratory capacity in Romania was in need of improvements in technology and equipment and also needed to sign up with an independent outside quality assurance service [15]. Both institutes applied to the EQUIP service in 2006, but the Institute of Endocrinology did not continue to participate after the first rounds in 2007, whereas the iodine laboratory of the Institute for Mother and Child Protection continued to participate successfully in EQUIP from 2007 onward.

In conclusion, the current USI strategy in Romania is based on mandatory table salt iodization, combined with mandatory use of iodized salt in bread bakeries, both at 20 ± 5 mg iodine/kg salt, while permitting potassium iodate as well as potassium iodide as

<table>
<thead>
<tr>
<th>Salt iodine (mg iodine/kg salt)</th>
<th>Residence</th>
<th>Median intake (µg/day)</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–19.9</td>
<td>Urban</td>
<td>408</td>
<td>56</td>
<td>53–60</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>399</td>
<td>49</td>
<td>46–53</td>
</tr>
<tr>
<td>≥ 20</td>
<td>Urban</td>
<td>869</td>
<td>61</td>
<td>58–65</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>374</td>
<td>56</td>
<td>51–56</td>
</tr>
</tbody>
</table>

CI, confidence interval
forticants. The national salt company, SALROM, is fully capable of supplying good-quality iodized salt fulfilling the national requirements, but the market remains uncertain from alleged illegal imports of non-iodized salt from Ukraine. In addition, salt intended for animal feeding and/or industrial purposes is diverted for household use, especially in rural areas where people habitually practice food preservation and strongly believe that the use of iodized salt affects the quality of preserved food. In Romania, there is a well-functioning system for quality assurance and inspection of salt at the production level, as well as quality testing of table salt at the retail level, although public health officials have limited authority to enforce the national standards. An iodine status survey among young school-age children demonstrated significant improvement in the population in 2004, although the dietary iodine intake was not sufficient to meet the RDA and pregnant women still had deficient status. This survey was completed before the use of iodized salt in bread bakeries was made mandatory, but no large-scale iodine assessment has been reported since then.

References and important documents


Russian Federation

The history of the USSR offers evidence of success in eliminating goiter and cretinism during the 1950s and 1960s [1]. However, after large-scale goiter surveys during the late 1960s demonstrated that new cases of cretinism had ceased and the prevalence of goiter had fallen to a sporadic level, the Ministry of Health in Moscow proclaimed that iodine deficiency was a “virtually eliminated disease,” abolished the central direction and oversight, and discontinued monitoring of iodized salt supplies and of the iodine status of the population. As can be expected on hindsight, iodine deficiency made a comeback, and as in other Soviet republics, surveys in the Russian Soviet Federative Socialist republics during the 1980s revealed that goiter and iodine deficiency had already reoccurred prior to the dissolution of the Soviet Union in 1991 [2].
After 1991, the salt companies in the Russian Federation were privatized while the centrally planned and regulated economy was making way for a market-based trade system. In the scientific community, the understanding started slowly changing from the previous emphasis on prophylaxis in goiter-endemic areas, toward a public health approach aimed at improving the iodine supplies in the common diet. During the 1990s, the Endocrinology Research Center in Moscow, which had played a major role in the previous approach, continued to conduct regional iodine surveys in the Russian Federation, thereby helping to build the evidence base for public health policy-making. In contrast to the previous goiter surveys, the iodine surveys conducted by the Endocrinology Research Center during the 1990s measured UI concentrations and thyroid volume by ultrasound and found that iodine deficiency was evident in practically the entire Russian Federation [3]. In 2003, the findings of the Endocrinology Research Center were corroborated by sample surveys among 2,673 schoolchildren aged 8 to 10 years in a Thyromobil project in the European part of Russia [4].

During the Soviet period, the production of salt was promoted by establishing large-scale companies under the Ministry of Food Industry. The Salt Industry Research and Development Institute of the Ukrainian SSR developed heavy machinery for salt harvesting and processing for the various republics, including Ukraine, Russia, Kazakhstan, Turkmenistan, and Tajikistan. Potassium iodide was readily available from mines located in Azerbaijan, Russia, Turkmenistan, and Ukraine. For the supply of iodized salt, the industry standard prescribed a relatively low level of 23 ± 11 mg iodine/kg salt, and each company was given an annual plan that for all practical purposes had the power of law. From 1950 to 1965, the total supply of iodized salt in the USSR increased from approximately 100,000 to almost 1,000,000 MT/year [1]. With the passage of time, however, the aging technologies and the stagnant quality assurance methods in the salt companies became less capable of maintaining the required range. Moreover, due to the relative instability of potassium iodide and the loss of iodine from the poor packaging and long supply routes, the quality of iodized salt in the retail outlets became increasingly uncertain, and by the mid-1980s, the sanitary-hygience stations of the Ministry of Health reported more and more findings of low-quality iodized salt. At the same time, the amount of iodized salt produced started to decrease, along with the overall decline in the centralized Soviet economy. By 1990, the production of iodized salt reached only 56% of the planned amount of 1.4 million MT [1].

In a joint initiative by Presidents Clinton and Yeltsin at the Vancouver summit in 1993 [5], Vice President Gore and Prime Minister Chernomyrdin established a Joint Commission on Economic and Technological Cooperation (the Gore–Chernomyrdin Commission), which was aimed at promoting mutual cooperation on a range of subjects of mutual interest. At the first meeting of the Gore–Chernomyrdin Commission Health Subcommittee, agreement was reached on the priority areas, including environmental health and maternal and child health. In the spring of 1996, on the tenth anniversary of the Chernobyl nuclear meltdown, which led to a strong increase in the incidence of thyroid cancer in children exposed to the resulting 131I fallout, international scientists and the US CDC emphasized the importance of iodine deficiency, using, in part, the decreased risk of thyroid cancer from assurance of optimum dietary iodine supplies. The CDC scientists contacted the US Assistant Secretary for Health, who brought this issue to the attention of the Gore–Chernomyrdin Commission, and in November 1996, scientific staff briefed the Gore–Chernomyrdin Commission Health Subcommittee, pointing out the prevalence of IDD in Russia and the cost-effectiveness of salt iodization for eliminating the IDD problem in the Russian Federation. Although the Russian Ministry of Health officials did not consider IDD a significant problem, Russian high-level policy makers warmed to the idea, especially after a 2-day briefing in Washington by US and Russian experts in science and technology, together with staff from the food industry, NGOs, and UN agencies. In a signed agreement between the US and Russian Federation Ministers of Health in February 1997 [6], USAID was directed to provide support, and an action plan to promote USI legislation in the Russian Federation became part of the regular agenda of the Gore–Chernomyrdin Commission Health Subcommittee.

The increased mutual collaboration through the Gore–Chernomyrdin Commission, together with the funding for various pertinent inputs and activities, led to a succession of events [5] that stimulated progress toward USI in the Russian Federation and beyond. Workshops, meetings, and conferences in Moscow and elsewhere set off a proposed Healthy Nutrition Policy in Russia (April 1997); launched an action plan to address micronutrient deficiencies (June 1997); informed Russian scientists and officials about IDD policies and issues in Europe (September 1997); encouraged the salt producers and associations of Russia, Ukraine, and Belarus to collaborate in their national efforts (November 1997); devised a monitoring approach for iodized salt supplies and biologic status (June 1998); and reformulated medical training by including modern knowledge of IDD and USI (June 1998). Policy initiatives in legislation and regulation during this period included a decree on IDD control by the Deputy Minister of Health (May 1997), a Resolution by the Chief Sanitary Physician on norms and requirements for iodized salt production and trade (April 1998), a resolution by the Federal Government...
to adopt the IDD control program (October 1999), and an order by the Ministers of Health of the Russian Federation on IDD prevention (December 1999). In 1999, Russian Ministry of Health officials introduced a draft proposal for collaboration on USI in the CIS countries, which led to an agreement, signed by the Prime Ministers at the CIS Secretariat in May 2001, on harmonized mutual assurances of the quality of iodized salt in cross-border trade, as well as a common standard for iodization at 40 ± 15 mg iodine/kg salt, adopting potassium iodate as the sole fortificant [1]. As a final accord from the joint Russian–US collaborative efforts, an international conference was held in Moscow in February 2000 on the subject of "State Healthy Nutrition Policy; Elimination of Micronutrient Malnutrition in the Russian Federation," which accorded priority to USI as a dietary improvement strategy for the entire population.

The change to a market-based economy after 1991 effectively abolished the existing legal frameworks for the production and distribution of iodized salt in Russia, without replacing them with guidance or the resources for the salt industry to conduct its business. The Ministry of Health reported that in 1996, less than 1% of the edible salt in Russia was iodized and that only specialty shops offered the product, at a higher cost [5]. The supply of iodized salt came to its lowest level of 25,000 MT in 1997. Meanwhile, UNICEF’s global experience in promoting USI had led to the realization [7] that the salt-producing industry had an indispensable key role in achieving USI. Therefore, together with like-minded partner organizations, UNICEF started promoting the inclusion of the Russian salt companies and associations in the activities stimulated through the Gore–Chernomyrdin Commission collaboration.

A turning point for iodized salt production emerged at a first joint meeting of salt producers from Russia, Ukraine, and Belarus in Moscow in November 1997, which reached an agreement to gradually raise the iodization level to 40 ± 15 mg iodine/kg salt while switching to the stable potassium iodate fortificant. The Chief Sanitary Physician officially endorsed this standard in the above-mentioned resolution of April 1998, followed in October 1999 by additional specifications for labeling, packaging, storage, and certification of iodized salt. While the six major salt companies in Russia had been able to re-establish their production, trade, and sales networks, UNICEF helped with funds from Kiwanis International to strengthen the capacity of the Russian salt companies and accelerate the production of iodized salt with donations of equipment and potassium iodate to the Russian salt plants. Consequently, production of iodized salt by the Russian companies started to increase again (fig. 42), and by 2000 the combined capacities of the Russian salt companies were adequate to provide the full required amount of iodized edible salt for Russia [8].

A thorough and detailed assessment of the salt industry situation in 2002 [8] described the six major salt production companies and their practices in salt production, iodization, and sales. The salt industry assessment report illustrates the constructive and supportive position of the Russian salt industry in the national effort toward USI at that time. Consumer sales in Russia constitute less than 10% of the total salt market [9], which was estimated at 4.5 million MT in 2005. The largest producers of salt overall are Bassol (Astrakan Region), Silvinit (Perm), and Iletskol (Ohrenburg), but in the consumer salt markets, the large companies Iletskol and Sibsol (Irkutsk), together with a few specialized packaging companies in large urban centers, play the major role. In addition, under the increased free trade policy, the markets for salt in Russia are witnessing vigorous competition from foreign sources. Among the international contenders are producers in Ukraine (Artemsol) and Belarus (Mozyr-sol), which together are capturing as much as one-third of the Russian market. The competitive strengths of the different supply sources are determined for the most part by their distance from the main markets, because transport costs make up approximately 60% of the average landed price [10]. Russia has abundant salt reserves [11], but the domestic salt companies are facing major obstacles to their ability to compete due to the cost of shipping salt over long distances.

As described above for the period from 1997 to 2000, the momentum stimulated by the Gore–Chernomyrdin Commission collaboration led to a series of official measures toward the creation of a legislative basis for USI. It soon became apparent, however, that arriving at a comprehensive legislative framework would not proceed without obstacles. The decree on IDD control by the Head Sanitary Physician in May 1997 included a ban on the import and trade of noniodized consumer salt on Russian territory. In response, the Ministry of Justice raised the objection that this would violate the Russian Constitution, which then prohibited the Ministry of Health from putting the ban into effect. Because

the other decisions of the Ministry of Health were voluntary or self-binding in nature, no objections were voiced against the norms and specifications for iodized salt, nor was there disagreement about the directive by the Ministry of Health that the institutions under its jurisdiction should use only iodized salt. Further actions of the Ministry of Health included the request to its colleague ministries that they purchase iodized salt for canteens, schools, prisons, barracks, and other catering networks. In the end, however, the key missing element in reaching a complete USI statute was the lack of political will among all the constituents in decision-making for compulsory iodization of salt [1].

After the concluding Gore–Chernomyrdin Commission conference, the like-minded partners in Russia, including the Russian Salt Producers Association, government agencies, public health scientists, and the Confederation of Consumer Societies, continued their collaboration under a Public Coordination Council for elimination of IDD [13]. During the period from 2002 to 2007, the council continued with joint development of a proposal for a governmental law on IDD prevention based on USI as the principal strategy. However, during the period from 2003 to 2007, the Council of Ministers rejected the proposal twice, stating that USI would limit the freedom of consumer choice and that free entrepreneurship prevails over narrow legislation on one issue of food composition. Therefore, the official salt iodization directions up to the present in the Russian Federation remain an essentially voluntary approach based on the promotion of iodized table salt in combination with toleration of the sale of other food products that are iodine enriched. In addition, the enforcement of the recommendations of the Ministry of Health and the agreement to use only iodized salt in state catering institutions has remained poor.

To achieve true USI legislation under the Russian Constitution, the alternative to the previous proposal of a government decision through the Council of Ministers is that a federal law or an amendment of an existing law would be enacted by the Russian Parliament [12]. This is unlikely to be attainable under the current political landscape of decision-making. Because salt is a cheap product with a very small profit margin, the clout of the salt industry with politicians and officials is no match for the political influence of other companies that are positioning their products, such as iodine tablets, iodized water and iodized milk, iodcasein, etc., as alternatives for the USI strategy. Moreover, although the public health concept of USI as the single and most cost-effective solution for IDD has been increasingly understood among the main proponents, the key government scientific advisors continue to put emphasis on a so-called encompassing approach—which means including alternative iodine products—and persist in the opinion that elimination of IDD should be pursued by “consumer choice” and “free entrepreneurship” [14].

While the work on proposed legislation in the Coordination Council was ongoing, the Russian Ministry of Health issued a joint strategic review in 2003 on the use of iodized salt in the bread industry [15]. The report included comprehensive reviews of the biologic, technologic, and economic considerations that would underlie the adoption by the Russian bread industry of the exclusive use of iodized salt in bread production. In view of the continued political insistence on permissive legislation, a combination of promotion of voluntary iodization of salt supplies with the prescriptive use of iodized salt in bread baking can offer an approach to achieve the objective of elimination of IDD without mandatory USI, as shown by the experience in Belarus and other countries. An experimental study in Russia has demonstrated that the consumption of bread produced with iodized salt improves iodine status among schoolchildren (G. Gerasimov, personal communication). With the entry of the Global Alliance for Improved Nutrition (GAIN) into the global coalition for salt iodization [16], a focus on working with the bread industry would seem attractive for reaching the goal of elimination of IDD by 2015, the deadline for achievement of the Millennium Development Goals.

Tables 18 and 19 show the improvements in the supplies and quality of iodized salt that were taking place during the first years of this century. These data were collected as a special effort, because the reporting of iodized salt supplies and quality has not been initiated by either the Salt Producers Association or the Ministry of Health on a routine basis. The stalled rate of supply at approximately 150,000 to 160,000 MT/year during this period (table 18) illustrates the limitation of effective demand at the consumer and food industry retail level under a voluntary approach. In terms of the quality of iodized salt, however, the inspections by sanitary officials indicate continued improvement in meeting the agreed specifications (table 19).

Table 20 compares the key iodine nutrition data from surveys in selected administrative regions of Russia gathered by the Endocrinology Research Center in Moscow before and after 2000. The comparison

**Table 18. Net supply of iodized salt in the Russian Federation**

<table>
<thead>
<tr>
<th>Year</th>
<th>Supply (MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>25,000</td>
</tr>
<tr>
<td>1998</td>
<td>100,000</td>
</tr>
<tr>
<td>2000</td>
<td>131,000</td>
</tr>
<tr>
<td>2001</td>
<td>136,000</td>
</tr>
<tr>
<td>2004</td>
<td>157,000</td>
</tr>
<tr>
<td>2005</td>
<td>163,000</td>
</tr>
<tr>
<td>2006</td>
<td>160,000</td>
</tr>
<tr>
<td>2007</td>
<td>145,000</td>
</tr>
</tbody>
</table>

Source: Russian Association of Salt Producers

TABLE 18. Net supply of iodized salt in the Russian Federation
indicates that despite the restoration of the amount and the improvement in quality of iodized salt supplies, little impact on the iodine status of the population is yet visible. This is not surprising, because the sales and user rates of iodized salt have been stalled at approximately 30% for many years [12].

In conclusion, the Russian Federation emerged from the Soviet period with evidence of a re-emergent and significant iodine deficiency problem after a previously successful prophylactic approach, which included directed supplies of iodized salt to affected areas, but was abandoned after large-scale surveys in the late 1960s showed that goiter and cretinism had been overcome. Russia has abundant salt deposits and major salt companies that export salt to neighboring countries. Because the cost of transport accounts for a large share of the landed price of salt, the Russian companies face fierce competition, especially in the highly populated European part of Russia from salt producers in Ukraine and Belarus, which supply approximately 25% of the salt market in Russia. The Russian salt industry is united, it rebuilt its capacity during a period of significant economic hardship, and with some external assistance, all the companies possess the full technical and managerial capacity for quality salt iodization. Most of the period of the 1990s witnessed intense activity to develop a multisector partnership and the necessary frameworks for the USI strategy, consisting of supportive evidence, legislation, and regulation and product monitoring. The same period also revealed for the first time that mandatory decisions in the Russian Federation are politically opposed on the basis of the rights of free consumer choice and free enterprise, which are stated to be grounded in the constitution.

Although the current statutes include accepted norms for iodized salt quality and encouragement of its use in large catering institutions, progress toward attaining USI is hampered by the lack of compelling legislation. This situation has opened the doors for the aggressive promotion of so-called alternative products by local and foreign companies that have overwhelming financial clout to sway the opinions of politicians and other gatekeepers of legislation. The iodine status of the population is continuously tracked by small, localized surveys, and a formal national iodine survey is still being awaited. At the same time, the limited supply of iodized salt, which is stalled at approximately 30% of total consumption, is failing to raise the iodine consumption of the population to acceptable levels. The partners who are of like mind in supporting the goal of elimination of IDD are reassessing the principle approach and have started directing their collaboration toward efforts to engage the bread industry, as has been done in other European countries.


<table>
<thead>
<tr>
<th>Location or source</th>
<th>% of samples with improper iodine content</th>
</tr>
</thead>
<tbody>
<tr>
<td>All salt</td>
<td>16.7</td>
</tr>
<tr>
<td>Imported salt</td>
<td>15.8</td>
</tr>
<tr>
<td>Salt production companies</td>
<td>8.7</td>
</tr>
<tr>
<td>Trade outlets</td>
<td>14.6</td>
</tr>
<tr>
<td>Hospitals, schools, and kindergartens</td>
<td>18.7</td>
</tr>
</tbody>
</table>

Source: Russian Ministry of Health.

### TABLE 20. Comparative data on iodine deficiency before and after 2000: Iodine nutrition indicators in Russia, 1991–99 and 2000–05

<table>
<thead>
<tr>
<th>Administrative division</th>
<th>Goiter rate (%)</th>
<th>Median UI (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moscow Region</td>
<td>12–29</td>
<td>3–17</td>
</tr>
<tr>
<td>Belgorod Region</td>
<td>8–13</td>
<td>12–16</td>
</tr>
<tr>
<td>Komi Republic</td>
<td>6–15</td>
<td>7–30</td>
</tr>
<tr>
<td>Arkhangelsk Region</td>
<td>11–98</td>
<td>17–89</td>
</tr>
<tr>
<td>Volgograd Region</td>
<td>4–16</td>
<td>9–16</td>
</tr>
<tr>
<td>Krasnodar Region</td>
<td>10–23</td>
<td>0–8</td>
</tr>
<tr>
<td>Tartarstan Republic</td>
<td>48</td>
<td>4–12</td>
</tr>
<tr>
<td>Udmurtia Republic</td>
<td>16–48</td>
<td>5</td>
</tr>
<tr>
<td>Kirov Region</td>
<td>14–28</td>
<td>18–37</td>
</tr>
</tbody>
</table>

UI, urinary iodine
Source: Gerasimov [12].
**References and important documents**


**Serbia**

Historically, goiter and cretinism were significant public health problems in Yugoslavia. The earliest studies by Sahovic and coworkers identified endemic areas in Serbia and marked Badovinci, Josanica, and Novi Pazar as the most affected locales, with goiter prevalence rates of 86% to 90% and numerous cases of mental impairment, deaf-mutism, and cretinism. The Sandžak region, which straddles the border area of Serbia and Montenegro, was notorious for the large goiters of its population [1].

The first regulations on salt iodization were introduced in 1937, initially at a low level of 5 mg KI/kg salt, only for household salt directed to high-goiter areas. Upon full review of the situation during a Congress of Preventive Medicine in 1950, the iodization level was increased to 10 mg KI/kg salt in 1954 and expanded to all salt for human and animal consumption. Ten years later, epidemiologic surveys confirmed a fourfold reduction of goiter prevalence among school-age children [2]. Nevertheless, studies during the 1980s suggested that goiter, although in milder form, persisted in surveys of schoolchildren. This was confirmed to be due to low iodine status, since nongoitrous patients had a fairly high uptake of radioactive iodine in the thyroid gland [3]. The present legislation in Serbia mandates that all edible salt be iodized at 12 to 8 mg iodine/kg salt, while permitting the use of either potassium iodide or potassium iodate as a fortificant.

In 1992, the two remaining republics of Yugoslavia, Serbia and Montenegro, formed a federation called the Federal Republic of Yugoslavia, which in 2003 was transformed into the State Union of Serbia and Montenegro. Upon peaceful separation, Serbia became a sovereign state in 2006. However, due to the turmoil during the Balkan conflict and its aftermath of political instability, the National Commission for IDD (formerly, Goiter Control) stopped functioning for most of the present decade.

Since Serbia has no natural deposits of salt, all its salt requirements are imported. Two firms dominate the national salt supply: Interkomerc, a general food and household goods trading company located in Belgrade, and So Product, a salt processing and packing company located 30 km outside Belgrade. The variety of salt brands in the market shows active competition among the salt suppliers. So Product imports the basic salt,
mostly from Israel, Belarus, Austria, and Ukraine. The firm has a number of modern iodization and packaging lines, with an internal quality assurance system based on quantitative salt iodine analysis on a regular 2-hourly basis. Interkomerc imports iodized salt, mostly from Solana Tuzla (Bosnia and Herzegovina) but also from other sources in Romania, Greece, and Ukraine.

Studies of school-age children from 1998 to 2000 by the National Institute of Public Health, Belgrade, showed a median UI concentration of 158 µg/L and a decrease in goiter prevalence to 2.35% [4]. According to the MICSII report [5], adequately iodized salt was being used in 73% of the households in 2000. These findings confirmed the quantum improvement in iodine nutrition that had taken place during the preceding half-century.

To assess whether USI still persisted, the Institute of Public Health of Serbia (IPHS) carried out a national iodine survey from September to December 2007 [6], using the standard design of 30 clusters (primary schools), selected proportionate to school population size. In each cluster, 60 children in grades 1 to 6 were selected at random for thyroid volume measurements, and 30 of these children were chosen to give casual urine samples and bring salt samples from home for iodine analysis in the IPHS laboratory. Also, for each of the 30 schools, 12 pregnant women were sampled in prenatal health clinics, located near the schools, to give casual urine samples and bring salt samples from home. The IPHS laboratory participates successfully in EQUIP, and internal quality control demonstrated a precision of ± 5% for the UI assay.

No differences were found in the iodine content of 950 salt samples obtained from schoolchildren and 347 salt samples from pregnant women. The results are therefore combined in figure 43. Notably, all the household salt samples obtained in the survey were iodized. The median salt iodine content was 13.9 mg iodine/kg salt; 32.2% of the salt samples had ≥ 15 mg iodine/kg salt, and 76.1% of the measurements fell within the range of 12 to 18 mg iodine/kg salt that is mandated for import and wholesale.

The median UI concentration in the children was 195 µg/L; UI was < 100 µg/L in 9.4% of the children, 100 to 199 µg/L in 42.3%, and ≥ 200 µg/L in 48.2%. The thyroid ultrasound measurements [6] found elevated thyroid volume among 3.2% of the children (BSA reference).

The UI measurements of the children were converted to iodine consumption estimates using the Institute of Medicine formula [7]. The estimated median iodine consumption among all the children was 185 µg/day (95% CI, 176 to 192 µg/day). Iodine consumption was higher among children in urban than in rural areas (median, 192 vs. 171 µg/day; p < .01) and among boys than girls (median, 192 vs. 175 µg/day; p < .05). On average, the children’s diet provided 158% of their RDA. As expected, iodine consumption increased with age, from approximately 125% of RDA at 6 to 8 years to approximately 190% of RDA at 12 to 14 years (fig. 44).

The histogram of UI concentrations in pregnant women (fig. 45) had a median of 158 µg/L. UI was < 150 µg/L in 45.2% of the women, 150 to 249 µg/L in 32.0%, and ≥ 250 µg/L in 21.8%; 4.9% had UI ≥ 500 µg/L.

Physicians in Serbia commonly recommend dietary supplements to pregnant women, and 33.9% of the women in this survey reported using an iodine supplement. The UI concentration was significantly higher in women who used a supplement than in those who did not (median, 195 vs. 146 µg/L; p < .001) (fig. 46). Notably, the median UI in those who did not use a supplement fell below the range of sufficient UI recommended by WHO/UNICEF/ICCIDD.

Further in-depth analysis did not find a relationship between iodine levels in household salt and UI concentrations in either the children or the pregnant women who did not use supplements. The UI levels in pregnant women not using a dietary supplement were
substantially lower than those in the children (median, 146 vs. 195 µg/L), even though the iodine content in the salt from their households did not differ, suggesting much different dietary practices between these groups.

As was the case in 1999/2000 [2, 4], the results of the latest survey indicate that the population in Serbia enjoys optimum iodine nutrition, even with the low mandatory iodization levels by international standards. The absence of a direct relationship between the iodine content of household salt and the iodine status of either the children or the women indicates that the consumption of iodine from household salt contributes only a small part of the overall iodine intake. Thus, the use of iodized salt in the food industry is the major factor in improving dietary iodine consumption in Serbia.

Overall, the iodine nutrition status of pregnant women was just sufficient, due to the use of supplements by approximately one-third of the women. Pregnant women who were not using an iodine supplement had only borderline iodine status. This is a reason to recommend a modest upward revision of the mandated iodine range for iodization and to suggest that only potassium iodate should be used as a fortificant.

Inspectors of Sanitary Surveillance conduct regular sampling in the salt markets and food companies and submit the samples to IPHS for analysis to ensure a continued supply of quality iodized salt to the population. The salt iodine measurements indicate that quality assurance of the iodized salt supplies is functioning well. The IPHS functions as the de facto coordinating entity on behalf of the government, but it receives no specific budget allocation for this purpose. Knowledge of IDD and USI is part of the public history of Serbia and has been included in the regular educational curriculums of primary and secondary schools, as well as various professional training programs. The Ministry of Health has recently re-established a National IDD Commission, which is expected to review the latest information and give guidance on future policy.

References and important documents

During the second half of the previous century, Tajikistan was heavily dependent on direct subsidies from the central Soviet Government. In 1984, work started on a quadruple evaporation salt plant at Yavan, approximately 60 km east of Dushanbe, as part of a heavy industrialization scheme for the southern USSR. The factory design aimed at producing 120,000 to 180,000 MT/year of pure vacuum-dried salt (Extra salt) and included titanium evaporators with external forced circulation heat exchangers. The work was 60% on schedule, with one titanium evaporator installed, when construction was terminated in 1990. The project was taken over after independence by the Hurokvory Corporation of the Ministry of Food Supply, and Tajik engineers managed to partially finish the construction up to 60,000 MT/year capacity in theory. The actual salt output, however, has varied around 6,000 MT/year. The factory maintains proper quality assurance procedures in its iodized salt production, including laboratory measurements of iodine content by the WYD checker. Inspection of the records in 2007 showed adequate iodization performance.

Up to 2005, the remainder of the salt needs for the population of 6 to 7 million was supplied by two solar evaporation plants under local government administration, located in Asht, Soghd Oblast, and the north (Koni Namak) and in Voce, Khatlon Oblast, in the south (Khodja Mumin), each of which had a capacity of 15,000 to 20,000 MT/year. With the assistance of UNICEF, both plants acquired a wet-spray iodization unit and an iodine monitoring laboratory in 1998; additional equipment was donated by the Asian Development Bank--JFPR project in 2002. Due to maintenance problems and lack of investment, the Khodja Mumin company went bankrupt by 2009. Since 2006, the numerous salt deposits in Khatlon Oblast have been exploited by two small private processing companies, AO Dushanbe and Dilibar N, each producing 2,000 to 2,500 MT/year. The Koni Namak company in Asht exports iodized salt to markets in the neighboring Kyrgyz Republic and Uzbekistan.

After the USSR broke up in 1991, Tajikistan descended into civil war, which worsened the already dire poverty situation and landed Tajikistan in the bottom group of countries ranked by GDP. Historically, severe IDD was known to exist. For example during the 1930s, 5% of the people in the Vanch Valley of Pamir (now Gorno-Badakhshan) were diagnosed as cretins. As in other Soviet countries, the iodine nutrition situation improved after the central Soviet Ministry of Health ordinance in 1956 that directed the shipment of iodized salt from Ukraine to Tajikistan. A rapid assessment in April 1994 showed that goiter prevalence rates in school-aged children were as high as 42% in Dushanbe and 86% in Tursun-Zade, an area selected by local endocrinologists for its historically high IDD burden. The UI concentrations among these groups were 34 and 12 µg/L, respectively, thus confirming that iodine consumption had become severely deficient again [1].

In spite of the severely constrained economy, the Government of Tajikistan enacted an ordinance for a national program of IDD control in May 1997 that gave priority to salt iodization, along with goiter case detection, registration, and treatment. The former Russian GOST standard (23 ± 11 mg KI/kg salt) was adopted to give guidance to the industry and salt inspections in the markets by Sanitary–Epidemiologic Services. Health statistics at that time showed a thyroid disease case load of approximately 6,000 per 100,000 people, probably due to goiter morbidity. To further stimulate iodization, UNICEF donated 6,000 kg of potassium iodate to the three salt plants, reportedly leading to an output as high as 80% of the total salt supplies by 2000. Yet, the MICS in 2000 reported that only 20.2% of the salt tested by rapid test kit in the households of Tajikistan was adequately iodized.

Along with the other Central Asian republics, the Government of Tajikistan entered into an agreement with the Asian Development Bank to participate in the project to improve nutrition of poor mothers and children in Asian countries in transition, and a multisector delegation developed an action plan at the regional joint UNICEF–Asian Development Bank Almaty Forum in October 2001 [2]. The plan was directed at further development of the national salt iodization capacities, enactment and enforcement of laws, monitoring of the salt supplies and population status, and actions to ensure acceptance by the public and improve accountability by periodic public reporting. A salt situation analysis in 2002 [3] estimated the shortfall of the national supply of iodized salt at 12,200 MT/year, and the Asian Development Bank included additional

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iodization inputs for the three Tajik companies in the tender for iodization sprayers, potassium iodate, packaging equipment, and quality assurance requirements (WYD and titration). National communication planning was started in Tajikistan in 2002 upon the return of the Tajik participants from the regional communication planning workshop organized by the Asian Development Bank–UNICEF in Bishkek in February 2002, and planning of salt quality assurance and inspection mechanisms benefited from the participation by Tajik officials and salt industry staff in the joint Asian Development Bank–UNICEF Regional Conference on laws, regulation, and quality control held in Tashkent in June 2002. A draft law “On salt iodization” was submitted for consideration to Parliament in October 2002, and the President signed the law on 22 December 2002. The law banned the production and sale of noniodized salt for human consumption in Tajikistan, while the iodization standard was set at 40 ± 15 mg iodine/kg salt, in line with the Minsk agreement that had been cosigned by the Prime Minister of Tajikistan.

Unfortunately, the progress toward USI realization ran into a delay in 2003 from a reorganization of the Ministry of Health at the direction of the President, which weakened the follow-up by the Ministry of Health on a proposal for tax and tariff elimination on iodization inputs that was under consideration by the State Revenue Office and the President’s Office. Communication campaigns were started at that time in Dushanbe and pilot regions, with the involvement of a range of NGOs. The Ministry of Finance continued to resist tax and tariff elimination on the grounds of “fiscal policy.” After completing the reorganization, the Ministry of Health started to stimulate improved Sanitary–Epidemiologic Services practices of salt quality control and enforcement, and the Asian Development Bank project stepped up the communication efforts, as well as price monitoring and community mobilization in Kathlon pilot Oblast, where the MICS of 2000 had shown the lowest penetration of iodized salt.

The experience in Tajikistan in 2003/04 confirmed the crucial importance of involving NGOs in the communication campaigns because of their trust relationships and close connections with the communities. It was estimated that more than 300,000 people, many of whom were youths, volunteered in the communication campaign in the cities, oblasts, rayons (Djamoat), and neighborhoods (Makhallaya) through a broad range of NGOs. The NGO promotional actions ongoing at these diverse levels were strengthened by the simultaneous broadcasts in national and regional radio and television programs featuring national leaders, including the Minister of Health on several occasions. With the campaigns strongly focused on Kathlon Oblast, and the additional salt iodization inputs being put in operation, a sizable increase in the supply, acceptance, and use of iodized salt was anticipated. Therefore, the report by the Tajik Government at the Beijing meeting in October 2003 that 28% of the households used iodized salt was somewhat disappointing. The finding was derived from a National Micronutrient Status Survey in 2003, conducted by the Italian Nutrition Institute with UNICEF, Asian Development Bank, and WHO support, that found iodized salt in 52% of the households (with 28% of households having salt with ≥ 15 ppm iodine by rapid test kit [4].

The same survey also collected iodine status measurements among children aged 6 to 59 months and nonpregnant women aged 15 to 49 years. The results showed median UI concentrations of 94 µg/L in the women and 73 µg/L in the children, both of which are below the norm for adequate iodine status. In both the women and the children, iodine status was lowest in RRS (Regions of Republican Subordination) Oblast (78 µg/L for women and 58 µg/L for children) and Kathlon Oblast (66 µg/L for women and 65 µg/L for children). The survey findings on iodine status corresponded well with the findings on iodized salt use: noniodized salt was being used in 79% of households in Kathlon and 52% of households in RRS, as compared with 22% in Soghd and 19% in GBAO (Gorno-Badakshan Autonomous Oblast).

In 2004, UNICEF and the Asian Development Bank began to collaborate with a newly formed Association of Grain Processors and Salt Producers, which had registered as a not-for-profit NGO. The association initiated a “revolving” stock for potassium iodate after an in-kind donation of 1,350 kg by UNICEF. The UNICEF donation was used as a primer for replenishment with large purchase orders, financed by payments from smaller-sized commercial purchases by the salt companies. The initial amount of stock was projected to cover the expected purchases by the Tajik companies until the end of 2006.

The MICSIII survey took place in September and October 2005 and reported that 46% of the households in Tajikistan were using adequately iodized salt [5]. The rate of use was almost twice as high in the richest 20% of households as in the poorest 20% (62% vs. 33%), indicating that the higher price of iodized salt in the markets as compared with noniodized salt was a disincentive for poor households, despite the increased awareness stimulated by the communication campaigns. As had also been the case in the previous micronutrient survey, the use of adequately iodized salt was lowest in Kathlon and RRS oblasts, indicating that the leakage of noniodized salt from the open salt deposits persisted and continued to form a major barrier to the achievement of the USI goal.

In response, UNICEF and the Asian Development Bank in 2006 collaborated in the consolidation of approximately 80 small-scale salt harvesting operations in Katholic Oblast into 7 small producer cooperatives, 6 of which entered into a contract with the Khuja
Mumin factory on fixed price purchases, while the Khujumumin factory, in turn, committed its capacity for full iodization. The iodized salt was packaged in standard 2-kg bags, marked with the Healthy Food logo (as a sign of proper quality), and marketed at a price not different from that of noniodized salt. One small producer cooperative entered into a similar arrangement with an emerging private salt-processing company, AO Dushanbe, in Vose Rayon. At the same time, the Sanitary–Epidemiologic Services authorities in GBAO, RRS, and Kathlon oblasts strengthened the quality inspections at production. The Sanitary–Epidemiologic Services began to conduct salt tests at road checkpoints on the trunk roads leading from the Kathlon salt deposits to the major consumer markets. Added to the long-established three companies, two new salt factories capable of iodization, AO Dushanbe and LLC Dilovar, were established in Kathlon Oblast. Both factories self-procured their equipment for iodization and packaging.

An indication that progress to the USI goal was increasing came in 2007 from a large-scale salt-testing operation conducted by the Republican Sanitary–Epidemiologic Services in cooperation with the Endocrinology Center in Dushanbe. Observations by rapid test kit were conducted in 17,009 households and 3,478 market stalls. The results showed that 87% of the markets of Dushanbe, 93% of those in Soghd, 70% of those in Kathlon, and 91% of those in RRS had salt with iodine. The household results were 84% in Dushanbe, 89% in Soghd, 66% in Kathlon, and 84% in RRS.

During the period from 2004 to 2006, the Asian Development Bank project supported two expert consultants who were contracted by the Ministry of Health to organize the communication efforts in support of the USI goal. Communication materials were developed collaboratively with the involvement of subject specialists from the government and applied in coordination with marketing efforts by the salt industry. The major advantage of this campaign was that it mobilized more effective action to overcome the known barriers to achievement of USI in Kathlon Oblast. Civil society forums held in the rayons of Kathlon Oblast offered excellent examples of communication efforts to overcome barriers to achievement of USI from the leakage of noniodized salt to the markets. The governors (hukumats) of Khamadoni and Vose rayons in Kathlon issued bans on the production and sale of noniodized salt in their jurisdictions, and the offices of the public prosecutors announced punitive measures against those not complying with these bans. The mobilization through the forums drew the participation of large numbers of people. More than 6,700 households, approximately 5,000 pupils, 978 market vendors, more than 900 teachers, and more than 500 health personnel were involved in the various communication campaigns.

The USI mandate in Tajikistan had been strengthened in December 2002 by the enactment of a law on salt iodization, enabled by a government decree of 1 month earlier that launched the Health Strategy for Tajikistan, 2002–10. As was the case in the other Central Asian countries, Tajikistan in March 2004 adopted the common CIS standards for the definition, use, and inspection of potassium iodate and the end product in iodized salt manufacturing. Since then, however, no other main acts or subsidiary regulations have been enacted, nor did the Ministry of Finance relent in its opposition to the proposed waiver of the value-added tax (VAT) on the import of potassium iodate. In 2005, the Ministry of Health did issue an order for mandatory use of fortified foods in the state-sponsored purchases for hospitals and other health facilities under Ministry of Health supervision. The national legislation was matched at the local level by the efforts of the rayon governors, as mentioned above.

Because of the seasonality of salt production, the producer self-reports of iodized salt outputs during the period of the Asian Development Bank project fluctuated from a low of 22,500 MT in 2004 to a high of 38,600 MT in 2006. Overall, during the period from 2002 to 2007, Tajikistan reported producing iodized salt at a rate on average 30% to 35% above the national consumption projections. Even when the increasing exports to the Kyrgyz Republic and Uzbekistan are taken into account, the amount of production may seem somewhat optimistic. But it does indicate that the progress toward reaching USI in Tajikistan is no longer constrained by limited supply capacity.

In 2007, the Association of Grain Processors and Salt Producers began to anticipate problems with the potassium iodate revolving fund mechanism. The association had been financing its running costs from the initial donation by UNICEF and occasional additional support of the Asian Development Bank project, but it was realized that for sustained long-term operation, a self-financing mechanism was needed to provide for the costs of personnel, rental of storage facilities, and communication. Under Tajik law, the association was unable to fold these costs into the regular budget because of its not-for-profit status. The association had entered into a fixed-price “on call” contract at US$27/kg for the purchase of 1,500 kg of potassium iodate from Russia, with 900 kg outstanding in October 2007. VAT (20%), sales tax (4%), and sundry costs pushed the sales price up to US$34.62/kg, which made the companies wary of a further price increase due to the absorption of the association's handling costs. Nevertheless, the association made preparations to reregister itself as a for-profit NGO, which would require setting up a board with the companies as members and the chairman of the association as chairman who would direct a secretariat (the association).

The Tajikistan Living Standards Measurement
Survey [6], carried out in the last quarter of 2007 by the State Committee on Statistics with UNICEF and World Bank support, collected new formation with the rapid test kit about the use of iodized salt and found that 49% of the households in Tajikistan were using adequately iodized salt. A breakdown by household wealth indicators showed that the use of adequately iodized salt varied appreciably by wealth status as well as among poor households. Only 29% of the poor households in Kathlon and 33% of those in DRD (formerly RRS) had adequately iodized salt, as compared with 50% in GBAO and 61% in Soghd. Overall, noniodized salt was found in 15% of the households in this survey. The pattern was similar to that in previous surveys: noniodized salt was still being used in a sizable proportion of households in Tajikistan, and the lowest rate of use of adequately iodized salt was found in the poorest households in Kathlon and DRD.

To assess the iodine nutrition status of the population, a special iodine survey was also conducted in the fall of 2007, financed by combining the final tranche of the Asian Development Bank funding with UNICEF support. The survey collected urine samples from representative groups of school-age children and pregnant women. The iodine measurements in urine samples were performed in the Endocrinology Center in Dushanbe, after a technician was trained in a special workshop in Tashkent, Uzbekistan, organized by the CDC. The center did not make use of external quality exchange with the CDC-provided EQUIP program, however, and internal quality assurance data were not available. During the survey, the children and women were asked to bring a salt sample from home to the site of examination for rapid testing. The 2,988 tests indicated that 74.8% were adequately iodized, while 15.1% of the tests in this survey were negative for iodine, the latter finding being similar to that of the Living Standards Measurement Survey (LSMS) that was conducted at the same time. The results of the iodine nutrition indicators in children and women are shown in figures 47 and 48.

The median UI concentration in the children was 139 µg/L; 40% had UI < 100 µg/L, 45% of the UI values was in the range of 100 to 199 µg/L, and the remaining 15% UI values were ≥ 200 µg/L. Expressed in iodine intake estimates [7], the survey showed that the children’s diets typically supplied 94 µg iodine/day (fig. 47). Intakes below the RDA for iodine of 120 µg/day, set by the Institute of Medicine and endorsed by ICCIDD/UNICEF/WHO [8], were found among 67% of the children, and 36% of the children had a daily iodine intake below the EAR of 73 µg/day.

The iodine nutrition survey also collected representative data from pregnant women, who are arguably the most informative population group for the risk of brain damage in the fetus due to iodine deficiency. The median UI level among the pregnant women was 130 µg/L (fig. 48), and 58% of the values fell below the internationally agreed minimum UI level for pregnancy of 150 µg/L [8].

Comparison of the iodine status data from 2007 and 1994 shows a quantum leap in the dietary
iodine supply and the iodine situation in the population of Tajikistan. Notwithstanding the outstanding progress, however, the data from several large-scale salt testing surveys and the 2007 special iodine survey indicate that more progress is needed to reach USI and ensure optimum iodine nutrition.

A National Micronutrient Status Survey (NMSS) was conducted in October 2009 by the Ministry of Health and UNICEF with technical assistance from the Swiss Tropical and Public Health Institute, Basel [9]. The aims were to assess the micronutrient status of women and children, determine risk factors for deficiencies, and compare the findings with those from the 2003 NMSS. Thus, the same design features were used in this survey as in the 2003 NMSS. As in all previous surveys in Tajikistan where UI assessments were included, the report of the laboratory measurements for the 2009 NMSS did not include a reference to an external quality service for confirmation of accurate results.

A significant increase was found in the national percentage of households using adequately iodized salt (≥ 15 ppm) in the 2009 NMSS (58%) as compared with 2003 (28%), although the 2009 NMSS finding was lower than the 75% found in the special iodine survey conducted in 2007. The highest percentages were found in Soghd (94%) and Dushanbe (72%) and the lowest in DRD (27%) and GBAO (42%).

The findings of UI concentrations in the NMSS of 2009 are summarized in Table 21 and compared with the findings of the 2003 NMSS. The 2009 findings indicate a sizable improvement in UI at the low margin of the distributions (< 50 µg/L) among women and children, which extends to all the oblast strata. Nevertheless, the iodine status of both women and children remained marginal at best. The lowest iodine status was found in the cohorts of Kathlon and DRD, which is in line with the expectations from findings of previous surveys.

The persistent issue of the consumption of noniodized salt in poor households, especially (but not exclusively) in Kathlon Oblast, has repeatedly been demonstrated to be entwined with the underlying poverty of Tajik society, combined with the free access to and availability of raw, unprocessed, noniodized salt from the abundant deposits. The decrees enacted by the governors are helpful but seem to have little impact when they are not followed through with actions that effectively prohibit the trade in noniodized salt. The established formal trade channels in edible salt and the established practices in salt companies (now reduced to four) no longer appear to underlie the persistent failure to reach the target of 90% of households with adequately iodized salt in Tajikistan.

### References and important documents


Turkmenistan

The Guvlyduz salt factory near the Caspian Sea in the Balkan region of west Turkmenistan was established in 1976 and continued to produce iodized salt until 1992, despite the lack of mandatory legislation at that time [1]. An overview of the iodine status situation in Turkmenistan prepared for the Ashgabad Conference in 1994 [2] cited localized surveys in Ashgabad and Dashoguz that found goiter prevalence rates of 20% to 64% and median UI levels of 37 to 72 µg/L among groups of school-age children. The Guvlyduz factory reported production of edible salt at 50,000 to 60,000 MT/year, more than sufficient to cover the national salt consumption. A decree of 1994 stipulated that all Turkmen citizens are entitled to 5 kg of salt per year, free of charge.

The Ashgabad Conference in 1994 helped secure a commitment from the President for a program to eliminate IDD, and UNICEF began to collaborate in advocacy, capacity development, and legislation. In May 1996, the President signed a decree “On Salt Iodization and Flour Fortification with Iron,” stipulating that all locally produced and imported salt for edible purposes must be iodized, setting a level of 23 ± 11.5 mg iodine/kg salt as potassium iodate. Following the decree, both UNICEF and the government made several investments to improve the manufacturing and iodization technology and the packaging of iodized salt at the factory. The Guvlyduz factory accesses potassium iodate from the Khazar factory in Cheleken, which is also in the Balkan region and is located approximately 100 km south of the Guvlyduz factory.

In 2000, with USAID and UNICEF support, a population-representative iodine survey showed that iodine deficiency continued to exist in the three regions (Lebap, Mary, and Dashoguz) that are located at the furthest distance by railway transport from the national source at Guvlyduz (fig. 49), and the Demographic Health Survey in 2000 [3] estimated by rapid test kit that 75% of the households were using adequately iodized salt.

In response to the findings of the iodine survey, in January 2003 the State Standards Consortium raised the required standard to 40 ± 15 mg iodine/kg salt, thereby bringing it in line with the level adopted in the CIS countries. The State Customs Authority banned the import of noniodized edible salt, and the Ministry of Health tightened its oversight by strengthening the monthly salt inspections in institutions and retail outlets and obliging the regional State Sanitary Epidemiologic Centers to report on quantitative salt assays. By a decree of August 2003, the President exempted the Guvlyduz salt factory from all taxes and duties. Also, the factory tightened its iodized salt-processing methods and introduced staff responsibilities for the production and oversight of quality, with quantitative sampling at 2-hourly intervals, thereby ensuring more direct accountability for the continued quality of the iodized salt supplies.

In 2003, at the International Meeting for the Sustained Elimination of Iodine Deficiency Disorders in Beijing on 15–17 October, the Vice-Minister of Health announced that the official oversight data of the Government of Turkmenistan demonstrated full compliance with the mandatory supplying of the

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FIG. 49. Urinary iodine levels in school-age children by region, Turkmenistan, 2000
population with iodized salt according to the standards [4]. UNICEF supported a qualitative survey of knowledge about IDD and USI among consumers, schoolchildren, health workers, and teachers in the Ashgabad, Akhal, and Balkan regions in 2004, which showed high acceptance among the respondents for the exclusive supply and use of iodized salt and indicated that iodized salt was being routinely used in food preparation and consumption [5]. In the same year, in coordination with the IRLI laboratory network and ICCIDD, the laboratory manager of the iodine laboratory of Sofia, Bulgaria, assisted in reviving the iodine laboratory in the Mother and Child Health Research Center, which had fallen into disrepair due to staff turnover and reconstruction of the building.

A national iodine survey in mid-2004, led by the Mother and Child Health Research Center of the Ministry of Health, Ashgabad [6], with the assistance of a UNICEF consultant, used the standard 30 × 30 sampling design as recommended by ICCIDD, UNICEF, and WHO. The survey results (table 22) demonstrated optimum iodine nutrition in Turkmenistan. As was apparent also in the 2000 survey, UI levels decreased with increasing distance from the Guvlyduz salt plant.

Comparison of the 2004 and 2000 survey data indicates that iodine deficiency was overcome in Turkmenistan by true USI at a proper iodization standard. Upon external independent verification by WHO/ICCIDD experts, including an assessment of the soundness of 10 program functional indicators, the successful achievement in Turkmenistan was recognized by the Network for Sustained Elimination of Iodine Deficiency in November 2004 [7].

In summary, the iodine deficiency situation in Turkmenistan has been tackled by strong central direction and oversight of the mandatory production and supply of properly iodized salt from the single salt factory at Guvlyduz, which obtains potassium iodate from a nearby national source. The state income from national oil reserves permits the government to subsidize iodized salt production and supplies and to extend an entitlement to all citizens to free salt for household consumption. The state-run food control officials report full compliance with the iodized salt standards in the supply channels. All food companies and mass catering institutions use only iodized salt, and the iodine nutrition situation in the population, assessed among schoolchildren, has been shown to be optimal.

References and important documents

7. UNICEF. Regional Director to meet Turkmen President and present international recognition for Universal Salt Iodization. Media release 1 November 2004.

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of children</th>
<th>Median UI (µg/L)</th>
<th>UI 100–299 µg/L (%)</th>
<th>Salt samples conforming to national standard (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balkan</td>
<td>91</td>
<td>232</td>
<td>62</td>
<td>100</td>
</tr>
<tr>
<td>Ahal (including Ashgabat)</td>
<td>208</td>
<td>194</td>
<td>61</td>
<td>100</td>
</tr>
<tr>
<td>Mary</td>
<td>206</td>
<td>168</td>
<td>65</td>
<td>100</td>
</tr>
<tr>
<td>Lebap</td>
<td>205</td>
<td>160</td>
<td>62</td>
<td>100</td>
</tr>
<tr>
<td>Dashoguz</td>
<td>169</td>
<td>157</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>879</td>
<td>170</td>
<td>64</td>
<td>100</td>
</tr>
</tbody>
</table>

UI, urinary iodine
Ukraine

Ukraine, the second largest country in Europe, has a shared history with the other former Soviet republics of centralized prophylaxis during the 1950s and 1960s, including supplies of iodized salt directed to areas considered endemic for goiter and cretinism [1], mostly in western Ukraine [2]. The Soviet Ministry of Food Industry promoted the Artemsol salt company near Soledar in eastern Ukraine [3], and the Salt Industry Research and Development Institute of Ukraine was the major source of the machinery used for harvesting and processing of salt across the Soviet republics. When the USSR broke apart in 1991, the production and supply of iodized salt had already faded [2], and as in the other independent states, iodine deficiency and its consequences also made a comeback in Ukraine during the 1980s and 1990s [4, 5].

The meltdown of the Chernobyl nuclear power plant in 1986 contaminated vast surrounding areas of Ukraine, Russia, and Belarus with radioactive 131I fallout, followed by a strong increase in the incidence of thyroid cancer among children [6]. Although these traumatic events increased the public’s perception of the existing linkages between iodine, nuclear fallout, and thyroid cancer, it still remains more common in Ukraine for citizens to worry about goiter and thyroid disease than for them to consciously buy iodized salt with the purpose of preventing these consequences.

During the 1990s, UNICEF began to support efforts to achieve USI through two projects under the Early Childhood Care and Development program. One addressed the existing iodine deficiency situation by high-level advocacy, development of capacity for salt iodization, and planning of a national program (including legislation), whereas the other aimed at raising the awareness and purchase preference among the public, mainly through the media and the press [7]. In response to high-level advocacy, the Cabinet of Ministers adopted a decree in 1997 “On Measures of IDD Prevention” and formed a National IDD Coordination Council, consisting mostly of academicians. The decree was amended in 2001 to expand the national council by adding members from government ministries. Subsequently, no further council meetings have taken place. In the political situation at that time, most power was concentrated in the hands of a few, and decisions were most often made in an authoritarian fashion. Only scarce resources were available for the work of officials in government and institutions. With the serious downturn of the economy during the 1990s, the issues of survival for the latter group had become pre-eminent above considerations of improving the quality of life.

UNICEF’s support during the period from 1997 to 2002 included provision of iodization equipment and potassium iodate to the salt industry, and it also assisted in an arrangement with the salt industry to assist the Iodobrom company located in Crimea in the establishment of domestic potassium iodate production. In 2001, decrees by the Chief Sanitary Physician first banned the production and sale of noniodized salt in Ukraine and then, 7 months later, revoked the ban at the request of the Association for Protection of Consumer Rights. A national program for elimination of IDD in Ukraine for 2003–05, proposed by the Ministry of Health, was approved by the government in September 2002. The program document recognized that 14.6 million people were living in IDD-endemic areas, which was putting pregnant women at risk. However, despite the support for mandatory USI by UNICEF, the legislation still fell short of mandating USI. Nevertheless, the period from 2003 to 2005 witnessed the revival of iodized salt production capacity in Ukraine. The National Salt Industry Association (Ukrsil) reported that the iodized salt supplies of Ukraine had fallen to below 4,000 MT by 2001 [8]. In 2004, however, based on purchase orders from the salt industry customers, the supply of iodized salt had increased to more than 75,000 MT, of which 40,000 MT was for domestic consumption.

From October to December 2002, the Academy of Medical Sciences, with technical support from the US CDC, conducted the first-ever national micronutrient survey in Ukraine, including iodine status measurements among 15- to 49-year-old caretakers of 6- to 36-month-old children [9]. The survey used the recommended 30 × 30 PPS design and included UI measurements among adult caretakers of children registered at primary health clinics. The household salt in this survey had a median iodine content of 5.3 mg iodine/kg salt, with only 20% of samples having ≥ 15 mg iodine/kg salt. The median UI concentration of the nonpregnant females was 90 µg/L, with 57% below the 100 µg/L minimum cutoff point for school-age children.

In a secondary in-depth analysis, the UI concentrations of the women in this survey were converted to estimates of dietary consumption with the use of the Institute of Medicine formula [10]. The distribution of estimated iodine intakes (fig. 50) was strongly skewed, with a median of 128 µg/day, or 85% of the RDA for adult women of 150 µg/day, endorsed by WHO/UNICEF/ICCIDD. Iodine consumption estimates were below the RDA in 58% of the women.

Further analysis (table 23) demonstrates that the iodine intake among these women was strongly related to the salt iodine content in their households. Women in households using salt with iodine content < 15 mg iodine/kg salt had a significantly (p < .001) greater likelihood of consuming iodine below the RDA than those who used salt with ≥ 15 mg iodine/kg salt. Because salt with < 15 mg iodine/kg salt was used...
in 80% of the households at that time, the increased risk due to dietary iodine deficiency affected the large majority of women in Ukraine. On a positive note, the table also indicates that the median iodine consumption among the 20% of the women from the households using salt with iodine content ≥ 15 mg iodine/kg salt was adequate to satisfy their RDA.

Although the survey findings clearly exposed the significance of iodine deficiency and the potential benefit of promoting USI in Ukraine, the discussion of the survey results among influential academicians remained focused on an attempt to use the iodine status data for the purpose of defining areas within Ukraine that would benefit from iodized salt supplies, with the implicit assumption that other areas would not need them. Such a discussion neglects the principle that a PPS survey is not designed to represent individual clusters. More importantly, however, the approach ignores the essential epidemiologic understanding that the consequences of iodine deficiency, such as lowering of IQ, in an iodine-deficient population affect the entire distribution of values and not just the individuals below a certain threshold. This insight has not been grasped, or at least, not taken into account, by the medical-academic advisors in Ukraine.

Despite the objections to mandatory USI, UNICEF continued to support the national program from 2003 to 2005. Almost half of the respondents in a knowledge, attitudes, and practices (KAP) survey in 2002 reported that their store sold iodized salt, 30% said they didn’t know, and 22% said that their store did not sell iodized salt. The survey also revealed that 56% of the respondents considered iodized salt improper for food preservation, which is a widespread home-based practice in Ukraine. UNICEF also continued its strong support of and involvement in social marketing efforts to promote the use of iodized household salt. A pilot project in Kharkov Oblast, conducted jointly with the Sister Cities linkage between Kharkov and Cincinnati, Ohio, USA, led to the experience that a carefully planned combination of health communication, health worker education, and a decree by the Governor’s office can mimic an effective national program at the decentralized level. Monitoring data from Kharkov Oblast demonstrated a sizable increase in the public awareness of IDD and USI and a significant increase in the supply of iodized salt through the sales channels. The pilot experience also generated a package of very creative professional materials for mass communication (television, radio, magazines, and newspapers) that has proved very useful for the national public education efforts since then. The experience of Kharkov, located in eastern Ukraine, was used in Lvov Oblast in western Ukraine. Supported by strong advocacy, health worker education, widespread multisector partnership, and creative communication, and a resolution by the

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**TABLE 23. Likelihood of low (< RDA of 150 µg/day) iodine consumption among nonpregnant women in relation to iodine content of their household salt, Ukraine, 2002**

<table>
<thead>
<tr>
<th>Household salt iodine (mg iodine/kg salt)</th>
<th>Median intake (95% CI) — µg/day</th>
<th>Low intake</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median intake (95% CI) — µg/day</td>
<td>n</td>
</tr>
<tr>
<td>0–4.9</td>
<td>111 (101–124)</td>
<td>308</td>
</tr>
<tr>
<td>5–14.9</td>
<td>126 (114–138)</td>
<td>289</td>
</tr>
<tr>
<td>≥ 15</td>
<td>202 (172–234)</td>
<td>151</td>
</tr>
</tbody>
</table>

CI, confidence interval; RDA, Recommended Dietary Allowance

<sup>a</sup> p < .001

---

**FIG. 50. Histogram of estimated iodine intake in nonpregnant women 15 to 49 years of age, Ukraine, 2002**
Oblast Governor, the social marketing campaign in Lvov succeeded in raising the use of iodized salt in the households to 86%, leading to a sizable improvement of the iodine status among schoolchildren [11]. While recognizing that local decrees and programs are not a substitute for national legislation, the so-called Lvov IDD Elimination Model has been extended to other oblasts since then.

The period up to 2005, therefore, witnessed many activities to develop the elements that underlie the progress toward elimination of IDD, including support of USI legislation, raising the national consciousness of IDD and USI, building capacity in the salt-producing industry, communication for influencing public awareness, education of the academic understanding, and stimulation of the market for iodized salt in two oblasts and nationwide. The capacity in Ukraine to produce potassium iodate as well as iodized edible salt at that time was more than adequate to satisfy the national demand for salt by the food industry and by households, although the official stand of the Salt Producers Association remained passive. The MICS in 2005, however, showed that adequately iodized salt was being used in only 22% of households, one of the lowest rates in the CEE/CIS Region.

From late November 2004 to January 2005 in Ukraine, the “Orange Revolution” took place in the aftermath of the runoff vote of the presidential election, which was claimed to have been marred by massive corruption, voter intimidation, and direct electoral fraud. Nationwide protests focused on daily demonstrations in Kiev and succeeded in an annulment of the runoff results and the decision in the Supreme Court for a revote on 26 December. Under intense scrutiny by domestic and international observers, the second runoff was declared to be “fair and free.” The inauguration of the new President, Victor Yuschenko, on 23 January 2005 marked the beginning of high public expectations for a new and more democratic approach to national decision-making.

The history from 2005 onward has been described in detail in a recent review [12]. UNICEF continued to collaborate with national partners in advocating for the adoption of national USI legislation and promoting regional initiatives to increase the population’s iodine consumption through the iodization of all edible salt. A national advocacy meeting in 2005, conducted with the involvement of WHO, ICCIDD, and the CDC, reached a consensus that USI was the most efficient and cost-effective strategy to eliminate IDD in Ukraine. Also in 2005, the Minister of Health of Ukraine supported a resolution at the World Health Assembly on sustainable elimination of IDD through USI. A cost–benefit analysis performed in 2006 predicted more than 300,000 intellectually impaired newborns and costs of US$400 million for healthcare associated with IDD during the next 10 years under the status quo. Adoption of USI, on the other hand, would cost less than US$5 million for prevention throughout the population, or US$0.01 per person per year. The cost–benefit analysis was inserted in a high-level advocacy kit for members of parliament and high-level government officials. At the national commemoration of the 20th anniversary of the Chernobyl nuclear plant meltdown, UN Deputy Secretary General Kul Gautam of UNICEF spoke passionately of the imperative to enact USI to prevent thyroid problems in children. UNICEF Goodwill Ambassador Antoly Karpov appealed personally to the President and First Lady of Ukraine in a face-to-face meeting in November 2006.

Despite all advocacy and the compelling analyses, however, the proposed legislation became victim to the factious politicking in the Parliament of Ukraine. A draft law “On prevention of IDD,” introduced in December 2006 by four deputies of different parliamentary factions, was rejected in June 2007, on the grounds of a lack of scientific basis for the adoption of USI in Ukraine. In addition, the justification for rejection, written by the Parliamentary Health Committee, suggested the possibility of excessive iodine intake in certain regions and individuals, while it argued at the same time that a variety of other food products fortified with iodine and nutritional supplements could cover the iodine needs of the population. Obviously, the underlying reason for this position was not scientific or technical. After the contested presidential election at the end of 2004, two heated parliamentary elections added to an outbreak of serious and prolonged political infighting that distracted the high-level decision makers from addressing issues of national importance. In the eyes of the leaders of the Parliamentary Health Committee, the legislation proposal was considered a brainchild of the pro-president parliamentary faction, mainly conceived during a period when the opposition faction was boycotting the parliamentary meetings.

Surveys of consumer practices had shown that one of the obstacles to reaching USI was the absence of iodized salt in a sizable proportion of outlets in Ukraine. As part of the continuation of social marketing campaigns, special efforts were made to communicate the need for and the benefits of iodized salt among the major salt traders. This took place in combination with the distribution of informational posters and leaflets for public use through health promotion centers and NGOs in several oblasts in central and eastern Ukraine. In addition, mass media channels and public announcement locations were flooded with public service announcements about iodized salt. In five oblasts, the use of iodized salt in households was estimated to have increased to 40% by 2007, against a national average estimate of approximately 20% [12]. The experience suggests that a communication drive by itself, without the drive of a multisector partnership at the oblast level and a strong push by the Governor, can have only
a limited effect on the goal of reaching all households in an oblast. Moreover, Ukraine has 24 oblasts and an Autonomous Republic Crimea (plus two cities with “special status”). Rounding up the entire nation by a piecemeal approach would take many years, beyond the deadline imposed by the signature of Ukraine’s President on the global declaration of the goal.

Cognizant that most of the discussion and opposition to USI legislation was focusing only on the fraction of salt production for use in households, UNICEF supported a study in the fall of 2007 by the State Medical University in Donetsk, eastern Ukraine. The design was a randomized, double-blind, controlled trial of 2 weeks’ duration. Healthy pregnant women who were attending their routine prenatal consultation at a primary health center in Donetsk, were not using iodine supplements, and were living in a stable household together with a 6- to 12-year-old schoolchild, were the intermediaries for random enrolment of households in two groups: a “noniodized salt” control group (n = 80), in which the salt in the household was replaced with study-provided salt of the type commonly sold in Donetsk; and an “iodized salt” experimental group (n = 80), in which the salt in the households was replaced with salt iodized with potassium iodate at 40 mg iodine/kg salt. The household allocation was not known to the investigators or the participants. Urine samples from the pregnant women and schoolchildren and household salt samples were collected during household visits at baseline and 2-week follow-up. The baseline characteristics of the groups were comparable, except for consumption of sea fish by the children on the day before baseline.

At the start, the salt iodine content in the households was 10.2 mg iodine/kg salt, and the UI concentrations in the pregnant women (89 µg/L) and the schoolchildren (101 µg/L) did not differ significantly. In the experimental households, the salt iodine content during the 2-week trial period was 43.3 mg iodine/kg salt, which is significantly higher (p < .001) than that in the control households (11.4 mg iodine/kg salt). The final UI in pregnant women (141 µg/L; 95% CI, 123 to 163 µg/L) in the experimental households was significantly lower (p < .05) than that in the schoolchildren (169 µg/L; 95% CI, 147 to 194 µg/L), but the net consumption effect on the UI of the pregnant women (73 µg/L; 95% CI, 66 to 81) was significantly higher (p < .01) than the effect on the UI of their children (59 µg/L; 95% CI, 53 to 67 µg/L). Baseline UI concentration and consumption of sea fish were significant effect modifiers in both groups, and consumption of dairy products was a significant effect modifier in children. The key findings of the trial are illustrated in figure 51.

The findings of this study suggest two important conclusions. First, the baseline UI levels of pregnant women who were using common salt show that the typical dietary iodine intake in Donetsk is not sufficient to meet the RDA for pregnancy, despite the expert opinion held among academic government advisors that IDD is affecting the endemic areas in western Ukraine only. The second key conclusion is that the use of iodized salt at the regulated level for Ukraine (40 ± 15 mg iodine/kg salt) is not effective in raising the dietary iodine intake of the pregnant women in Donetsk to the RDA for pregnancy, thus suggesting that the promotion of iodized household salt alone is not sufficient for the prevention of fetal brain damage during the period when women are pregnant.

The reluctance in Ukraine to embrace USI is not limited to the influential expert advisors, however. The salt industry of Ukraine is an important source of iodized salt in a range of neighboring countries, many of which have decided for mandatory USI and have demonstrated success in eliminating iodine deficiency. Nevertheless, the industry has persistently remained in its basic initial position, voiced by the previous Director General of the Ukrsil Association: “If the customer requests, we will supply.” Although that has been proven true for the populations in neighboring countries, the salt industry in Ukraine, which is an important ally in national partnership coalitions of many countries, is reluctant to take a patriotic leadership role in its own country. Surprisingly, there is also outright opposition to mandatory USI among some national NGOs. In 2001, when the Cabinet of Ministers amended the decree “On measures of IDD prevention,” the NGO Women of Ukraine wrote an objection to the Chief Sanitary Physician. Since then, this NGO has also published several letters to argue against USI on the basis of “the right of free consumer choice,” an opinion that is also defended by another national NGO, the Association for Protection of Consumer Rights. In contrast, regional and local-level NGOs have played
large and decisive support roles in driving the oblast campaigns.

In conclusion, progress toward USI in Ukraine is troubled by a strong resistance among influential academic government advisors, an aloof position of the salt industry, opposition by some NGOs, and increased hostility among the legislators, who are encouraged by companies promoting so-called alternative products. A national partnership or coalition to drive and oversee progress has not been established, due to a lack of will to embrace participation by stakeholders outside the government. The salt industry is dominated by the Artemsol Company, which has the full capacity for adequate iodization and serves customers not only in Ukraine but also in various neighboring countries. Artemsol has proven that it will deliver quality iodized salt in response to specific purchase orders, but it has no inclination to be a partner in the promotion of a national USI strategy. The discussion among academicians continues to be beholden to an outdated notion of endemic areas, and lawmakers give preference to a voluntary approach that leaves the door open to other commercial products.

There may soon be an opportunity to relaunch the collaboration around a discussion with the Ministry of Health, academicians, and the Health Committee of Parliament on new ways to reach elimination of IDD using approaches proven to succeed in Europe. This could include the bread industry (as in, for example, Belarus, the Netherlands, and Denmark), special products for pickling, and/or different standards for different salt grades (as in, for example, Germany). This implies less ambitious overall goal setting and closer collaboration on business models with the various companies that command the use of iodized salt for manufacturing common products for the dietary consumption of the population in Ukraine.

References and important documents


Uzbekistan

Uzbekistan was among the countries characterized in the WHO Monograph on Endemic Goiter of 1960 [1] as “one of the most notorious goiter areas of the world,” and most administrative divisions of the Uzbek Soviet Republic were on the “List of endemic goiter regions of the USSR that require iodized salt supplies” of the Ministry of Health in Moscow [2]. The Fergana Valley and Andizhan Oblast in east Uzbekistan, which border on the Kyrgyz Republic, were notorious for their high prevalence of goiter [3]. The Institute of Endocrinology...
in Tashkent ranked only second to Moscow in scientific reputation during the Soviet period.

Prior to the breakdown of the Soviet economy, edible salt in Uzbekistan was supplied mainly from Ukraine, Russia, and Kazakhstan, packaged in 1-kg paper bags. Additional efforts, arranged through the healthcare system, included distribution of potassium iodide (Antistrumin) tablets through schools, and prenatal and maternity clinics. Upon independence in 1991, the hard currency earned from the export of cotton was used by the Uzbek Government for importing food, including salt, from neighboring countries. From 1991 onward, the government also embarked on stimulating the local manufacture of edible salt, and by 1993, about one-third of the salt consumption needs was reported to be produced in Uzbekistan [4]. The focus was firmly on establishing new salt supplies, and the iodization of salt was of secondary policy concern. In the 1990s, salt companies were established in Karakalpakstan, Navoi, and Surkhandarya, with part of the production shipped for processing in Tashkent City. Between 1997 and 1999, UNICEF donated eight spray iodization units and 16,400 kg of potassium iodate to stimulate the iodization of the local salt supplies [5]. UNICEF also offered support for the development of a national IDD program during that time, but high-level commitment to address the IDD situation was not apparent prior to the turn of the century. The same UNICEF report [5] mentions a survey of 1997/98 in 13 oblasts and Tashkent City by the Institute of Endocrinology, which showed increases in goiter rates to more than 40%, as compared with 15% in previous studies. The MICS of 2000 was the first nationally representative household survey and found that only 19.2% of the households were using adequately iodized salt.

In 2001, the Government of Uzbekistan accepted the invitation of the Asian Development Bank to participate in a project supported by JFPR that aimed to stimulate food fortification, especially USI, as the national strategy to reduce micronutrient malnutrition. At the regional joint UNICEF–Asian Development Bank Almaty Forum in October 2001, a multisector delegation led by the Chief Sanitary Physician started to make plans [6] aimed at developing the national salt iodization capacity, enactment and enforcement of laws, monitoring of the salt supplies and population status, and actions to ensure acceptance by the public and improve accountability through periodic public reports. The final agreement with the Asian Development Bank was signed by the Minister of Health in the spring of 2002, including the stipulation that enactment of a law on USI would be among the priorities for the near future.

A salt situation analysis supported by the Asian Development Bank in 2002 identified 10 salt companies that together supplied an estimated 30,000 MT/year of iodized salt, leaving a gap in production compared with the national needs of more than 50,000 MT [7]. In response, the Asian Development Bank included the needs for 10 Uzbek companies in an international tender for spray iodization technology, potassium iodate, packaging equipment, and quality assurance needs (WYD checkers and titration equipment), while entering into an agreement that one-third of the costs of the fortificant would be reimbursed by the beneficiary companies. Because of a shipping delay caused by the Gulf War, the delivery in Tashkent took place in the spring of 2003; the investments were operational by October 2003, and the agreed reimbursement was completed by the summer of 2004.

In continued collaboration with UNICEF, the Asian Development Bank project also stimulated the capacities for design and roll-out of a communication campaign. A joint regional workshop on communications and social marketing designs was conducted in Bishkek, Kyrgyzstan, in February 2002 [8], for delegates to develop generic plans with simultaneous attention to three efforts: advocacy and resource mobilization; alliance building and organizational motivation; and information, education, and communication to the public. The Asian Development Bank grant and additional UNICEF support were made accessible for national campaign plans after local adjustments of the generic plan had been made.

A major purpose of the Asian Development Bank grant project and the ongoing collaboration between the Asian Development Bank and UNICEF included the stimulation of political will among the national leadership for a principal USI law that would not only compel the production and import of iodized salt, but also be accompanied by regulations to agree on and ascertain the methods, norms, and procedures required for quality assurance in the supply channels. To reach the full constituencies for implementing national laws, the Asian Development Bank organized a regional workshop in Tashkent, Uzbekistan, in June 2002, which brought together more than 60 participants from government, the salt and flour industries, food control agencies, and metrology and standardization committees, as well as expert consultants from the Asian Development Bank and UNICEF [9]. The meeting’s objectives encompassed the full range of concerns to ensure and maintain the quality of fortified foods. Employees of industry were informed on the preparations needed before the receipt of project-sourced machinery, fortificant, and packaging and quality assurance equipment. Two technical groups worked in parallel for 2 days on model work plans for the acceleration of comprehensive quality assurance systems for the production, supply, and consumption of iodized salt. The recommendations from the groups are testimony for the raised awareness and understanding that the required enactment in each country of a mandatory law should be accompanied by equally important
follow-up action to establish effective quality assurance capacity in the companies as well as functional quality control capacity in the food inspections. The model legislation work plans were also an indication of the diverse regulatory standards that needed to be formulated and agreed upon for translating the new legislation into transparent and mutually agreed norms of conduct in input sourcing, fortified food inspections, local trading, and export transactions.

To further stimulate collaboration among the government and partner organizations in Uzbekistan, UNICEF worked with the Asian Development Bank to organize a National Salt Producers Workshop in October 2002 to share and expand on the justification and requirements for achieving USI [10]. More than 50 participants were from the salt industry (18 companies), complemented by a host of medical specialists and government officials. The meeting learned of the delays in progress toward the USI goal in Uzbekistan and agreed to make efforts to take advantage of the new inputs for iodizing salt. The following day was allocated to in-depth deliberations on a draft law proposal for USI and the necessities to assure and enforce iodized salt standards. The meeting proposed the formation of a Salt Producers Association to stimulate cohesive representation of interests and joint sourcing of future self-procurements. The resolutions of the meeting included an agreement to formally adopt the iodization level of 40 ± 15 mg iodine/kg salt that was agreed in Minsk and co-signed by the Prime Minister of Uzbekistan in 2001 and that was already being practiced in other CIS countries.

The management capacity of the assistance from the Asian Development Bank in Uzbekistan appeared to have limitations. The Ministry of Health was acting largely in isolation, and the Expert Working Group, tasked to guide the USI efforts, tended not to use the full range of national expertise available. In early 2003, the Vice-Premier chaired a special Project Steering Committee meeting that addressed the issues in collaboration. The Ministry of Health was instructed to assume true leadership, be inclusive of the full range of expertise in the country, and no longer remain in a reactive mode. Specifically, the Ministry of Health was to initiate a request for elimination of the taxes and tariffs on future imports of iodization technology and basic input requirements and consult with international experts on the draft USI law that was being reviewed at that time by 21 ministries and government agencies, include NGOs in the communication efforts, expand the Technical Working Group beyond the health professions, and strengthen the monitoring of the project’s efforts and outcomes.

Later in 2003, Uzbekistan was among the invited participants in the International High-Level Meeting on Accelerating Sustained IDD Elimination held in Beijing on 15–17 October. The Uzbek delegation was led by the Deputy Prime Minister, who in her speech referred to the ongoing efforts to enact USI legislation and mentioned that this effort was being pressed forward by a special Council for Coordination. By the end of 2003, a communication campaign had been launched in pilot regions, but the salt iodization level agreed in Minsk in May 2001 (40 ± 15 mg iodine/kg salt), although announced at the Beijing meeting as having been accepted in principle, had yet to be formally adopted.

As part of the communication plans, a large-scale salt-testing campaign was conducted in Uzbekistan by pupils in grades 5 to 11 on IDD Day in the fall of 2003. The rapid tests of household salt in 10,000 schools, coordinated between the Asian Development Bank, UNICEF, and the ministries of Health and Education, were accompanied by lessons about the dangers of IDD and the benefits of using iodized salt. A UNICEF report on the campaign mentioned that of the almost 6 million samples tested, 56% were positive for the presence of iodate. The salt testing campaign indicated that a sizable increase had taken place in the iodized salt supplies in Uzbekistan. A Producers Association had also emerged, mainly due to the government-led attempt to strengthen the sector and stimulate the quality and quantity of the national iodized salt supplies. The logical next step would be to augment the salt companies’ political will by stimulating access to information for the promotion of self-sustained iodized salt production and supply, and to this end, the Asian Development Bank, together with UNICEF, organized a first Regional Workshop for Salt Producers in Bishkek, Kyrgyz Republic, on 12–13 July 2004 [11]. The workshop included a promotional "Expo" part that allowed external companies to showcase their products of iodization and packaging equipment, fortificant, and other input materials. Speakers from the European Salt Producers Association (Eu Salt) and the Russian Salt Producers Association presented the mandate, structure, and activities of the organized salt industry in Europe. The staff of the China Salt Company and the Lonestar Corporation, which had been selected in the competitive bidding by the Asian Development Bank, participated actively in the exposition and the proceedings of the workshop. The recommendations adopted by the salt producers’ workshop give testimony of the acceptance by the major salt industry leaders in the region of the joint collaborative national approach to addressing the deficiency of dietary iodine in the population and their political will to continue collaborating with like-minded organizations through improvement of information exchanges and national USI legislation.

As the first period of the Asian Development Bank project came near its end, self-reporting by salt producers in Central Asia and Mongolia indicated that more than 80% of the project goal to realize 66% iodization of the national salt requirements was being achieved. For all the Central Asian republics, the increases in
iodized salt supplies by 2004 were in theory sufficient to reach 33.5 million people, or 35% of the total population, with additional dietary iodine, thus helping to protect the brains of an additional 500,000 newborns in the region against damage that might have occurred otherwise. According to UNICEF data, the proportion of households using adequately iodized salt had risen in the participant countries by a quantum leap from 26% in 2001 to 63% in 2004 [12].

Whereas the first period of the Asian Development Bank–JFPR project had served to convince the partners in participating countries of the feasibility of the USI strategy and the key importance of managing USI by multisector collaboration at the highest political level, the follow-up project of the Asian Development Bank–managed project was aimed at achieving the 90% consumption target based on in-country actions in quality iodized salt production, strengthened incentives and regulations for production and trade, and continued building of awareness and acceptance among the partners and in society. As was the case in 2001, the Asian Development Bank follow-up project was initiated at an Almaty Forum, held in October 2004. Despite the continued postponement in Uzbekistan of the enactment of the draft USI law, Uzbekistan was also invited to the follow-up project, although the disbursement of funding for the next planned period was made contingent on the actual enactment of a USI law.

An in-depth salt situation analysis, conducted in 2005 by the Center for Social and Marketing Research with support from UNICEF [13], located the four major salt deposits that provided the national supply of salt in Uzbekistan as follows (fig. 52): Karambet and Barsa-Kelmes in Karakalpakstan (west Uzbekistan), Lavlakan in Navoi Oblast (south), and Khujakion in Surkhandarya Oblast (center). The study identified 65 salt companies, of which 9 were classified as major (reporting > 2,000 MT in 2004). The aggregate volume of the salt supplies by the local companies was estimated at 90,000 to 100,000 MT (half of which was iodized), while the total national demand estimate was 245,000 MT. The report suggested that more than 50% of the salt was purchased in unofficial markets. Analyses by the Institute of Endocrinology of the iodine content of salt samples collected in 800 randomly selected households indicated that about one-third of the samples were noniodized, one-third were inadequately iodized, and one-third were adequately iodized at that time. The salt situation report finally commented on the still ongoing discussions on the merits of a draft USI law. The major technical objections included the absence of mandatory USI legislation in some European countries, the United States, and Canada; an opinion by unnamed Russian experts that it was not necessary to pass mandatory salt iodization laws, since iodine can be added to animal fodder; and a local expert opinion that iodized salt was contraindicated for people with certain thyroid disorders. The report introduced the argument that elimination of IDD should be approached from a consumer rights perspective, a notion that had not been included in the draft law that was circulated at that time [13].

The long period of deliberation on the draft law was related to an extraordinarily cumbersome process of review, approval, and concurrence that included 21 different government ministries and expert entities, some of which had veto power. The Ministry of Justice remained long opposed, citing concerns about the “right of consumer choice.” Expert advice changed several times in an attempt to strike a balance between USI as the single “mass” strategy and proposals for clinical treatment and “group” prevention by provision of potassium iodide tablets for high-risk susceptible groups. The ministries of Economy and Trade also took a long time to withdraw their veto against the proposal, which kept changing the text details during the successive consultations. The course of events indicated that the Ministry of Health, the focal ministry to drive the consultative process, was too weak among the Cabinet of Ministers to manage it expeditiously.

The Asian Development Bank and UNICEF collaborated in November 2005 in a second Regional Conference for Salt Producers, held in Tashkent again, which aimed at consolidating the mechanisms of commercial

![FIG. 52. Salt supplies in Uzbekistan from the major deposits to different regions Source: Center for Social and Marketing Research “Ekspert-Fikri” [15]](image-url)
procurement for self-sustained salt iodization among the salt companies in Central Asia. Activities at the meeting addressed the promotion of trade among the participant countries and with the outside world. The sessions stressed the issue of quality assurance of the salt supplies as a joint task for producers and officials and emphasized the roles and responsibilities of the stakeholders when beginning production. The meeting provided the salt, fortificant, and equipment firms an opportunity to showcase their products and services, establish and strengthen the interactions of the salt producers with reputable international suppliers of fortificant and equipment, and consider the routine enforcement needs in international trade. Several speakers stressed the significance of the changes of the national laws that had already been enacted in the other countries for mandatory USI—a detail that was not lost on the hosting government of Uzbekistan. International suppliers of salt iodization equipment (SERRA, Spain), test kits (MBI, India), and potassium iodate (Ajay-SQM, Chile; L-Pharma, Kazakhstan; and Iodobrom, Ukraine) offered consultations and presented an interactive exhibition to the attending country groups and associations.

The MICSIII in Uzbekistan, conducted in early 2006, reported that 53% of households had adequately iodized salt; the highest proportion was found in Tashkent City (73%) and the lowest in the distant western and eastern parts of the vast country (43% to 44%). In July 2006, the World Bank office in Tashkent circulated an economic analysis of malnutrition and nutrition interventions in Uzbekistan [14] that indicated the high costs due to the prevalence rates of stunting, underweight, iron-deficiency anemia, and vitamin A and iodine deficiencies. Among the nutrition indicators examined, iodine deficiency was estimated as the greatest contributor to national economic loss, at 2.9% of GDP. The potential economic gain from reaching USI was projected at US$83 million, and USI was one of the most cost-effective strategies among the nutrition interventions considered. Although the estimates in this study of the economic losses attributed to each nutrition issue were severalfold higher than similar estimates that had just been published in the global Vitamin and Mineral Deficiency (VMD) campaign [15], the analysis succeeded in stimulating a productive high-level dialogue with government, and UNICEF began to support a working group, across productive high-level dialogue with government, and emphasized the roles and responsibilities of the stakeholders when beginning production. The meeting provided the salt, fortificant, and equipment firms an opportunity to showcase their products and services, establish and strengthen the interactions of the salt producers with reputable international suppliers of fortificant and equipment, and consider the routine enforcement needs in international trade. Several speakers stressed the significance of the changes of the national laws that had already been enacted in the other countries for mandatory USI—a detail that was not lost on the hosting government of Uzbekistan. International suppliers of salt iodization equipment (SERRA, Spain), test kits (MBI, India), and potassium iodate (Ajay-SQM, Chile; L-Pharma, Kazakhstan; and Iodobrom, Ukraine) offered consultations and presented an interactive exhibition to the attending country groups and associations.

In July 2006, the World Bank office in Tashkent circulated an economic analysis of malnutrition and nutrition interventions in Uzbekistan [14] that indicated the high costs due to the prevalence rates of stunting, underweight, iron-deficiency anemia, and vitamin A and iodine deficiencies. Among the nutrition indicators examined, iodine deficiency was estimated as the greatest contributor to national economic loss, at 2.9% of GDP. The potential economic gain from reaching USI was projected at US$83 million, and USI was one of the most cost-effective strategies among the nutrition interventions considered. Although the estimates in this study of the economic losses attributed to each nutrition issue were severalfold higher than similar estimates that had just been published in the global Vitamin and Mineral Deficiency (VMD) campaign [15], the analysis succeeded in stimulating a productive high-level dialogue with government, and UNICEF began to support a working group, across the government and the private sector and under the Cabinet of Ministers, to develop a national plan for nutrition investments, which included USI.

In preparing for the acceptance of a USI law, the Sanitary–Epidemiologic Services of the Ministry of Health had been offering guidance and standards for proper iodization. But the inspection by Sanitary–Epidemiologic Services of salt in the markets was constrained by the requirement that permission for enforcement had to be obtained in each case from local authorities. Recognizing the limitations in the official food control system, in combination with the continued shadow market for noniodized salt, UNICEF initiated collaboration among the Associations of Consumer Rights Protection, the Institute of Endocrinology, and the National Sanitary–Epidemiologic Inspection of the Ministry of Health [16]. In 2004/05, experts of the Federation of Consumer Rights Associations conducted 5-day seminars in all 14 provinces of Uzbekistan and trained more than 3,000 of their staff members, chairmen of local communities, Women's Council activists, employees of salt companies, salt traders, and Sanitary–Epidemiologic Services staff members in a comprehensive curriculum of USI and iodized salt supply issues. The curriculum had didactic, mobilization, and normative elements that were used during 5,503 monitoring raids in the shops, mass catering, bakeries, and other consumer outlets of the provinces (table 24).

The raids showed that the majority of salt products (62%) were being provided to traders without a certificate of conformity. Half of the samples tested with a rapid test kit were not iodized. Of the 377 salt samples sent for further investigation to the local Sanitary–Epidemiologic Services, the tax agency, or an antimonopoly committee, 282 (75%) led to enforcement actions. In total, the raids resulted in 167 MT of salt being removed for reiodization or destruction, and 10 fines were imposed for violation of the regulations. To reinforce the momentum generated by the joint action in grassroots enforcement, UNICEF helped to produce posters that are used in point-of-sales outlets of Uzbekistan to remind consumers of the characteristics on packages when they purchase salt (fig. 53).

The mid-term review of the second phase of the Asian Development Bank project took place in October 2006 in Cholpon-Ata, Kyrgyzstan. The purpose was to jointly examine the progress and analyze the obstacles, with a view to identify and discuss key strategic actions for each country for the remaining 1.5 years of the project. In preparation for the workshop, the Ministry of Health of each country prepared a summary of lessons learned during the previous period and proposed actions and their expected outcomes for the upcoming months. Uzbekistan reported that the draft law had passed a review in Parliament, and in anticipation of enactment, the plan was to follow through by supporting the National Salt Manufacturers Association to build its membership and strengthen its capacity to assist its members by training technicians in practical methods for quality assurance of iodized salt during production. The plan also included a temporary national salt industry expert to strengthen the focus of the association’s agenda and actions. In view of price fluctuations in the world market, the Ministry of Health would set out to collaborate in potassium iodate procurement, with the aim of devising a sustainable...
arrangement for access to fortificant by the salt producers. The final work plan also included advocacy for subsidiary decrees or acts to reduce government taxes on potassium iodate and/or procurements of salt iodization requirements. To increase awareness and consumption, quality control of imported salt by customs and rapid testing by NGOs of salt brands offered for sale in poor communities would be promoted, followed by exposure and publicity of noncompliant salt. To further sustain public awareness, the project planned an extension of the previous work with the Ministry of Education to insert essential knowledge of IDD and the mandate for USI in college and high school curriculums and in other relevant educational curriculums, including those for healthcare professionals.

The final version of the law “On preventing iodine deficiency diseases” was adopted by the Legislative Chamber on 27 December 2006, approved by the Senate on 29 March 2007, and signed by the President in May 2007. The articles of the law defined a combination of approaches, including "saturation of the consumer market with iodized salt and iodized foodstuffs," "preventive supply with iodine-containing medications," state control of the quality and safety of iodized salt, awareness building and maintenance, various training needs, and monitoring, method development, and international collaboration. The Cabinet of Ministers; the Ministry of Health; the State Agency of Standardization, Metrology and Certification; and local state authorities were made responsible for managing the approach. Mass prevention was stipulated to be carried out through the use of iodized salt and iodized foodstuffs, while individual prevention should consist of Ministry of Health arrangements for diagnosis and treatment of iodine deficiency diseases. With regard to the budget, the law stipulates that funding shall be carried out by means that are not forbidden by the law. Persons with medical or other contraindications against the use of iodized salt should be provided with access to noniodized salt. Thus, in contrast to the principal laws enacted several years earlier in Turkmenistan, Kazakhstan, the Kyrgyz Republic, and Tajikistan, the

<table>
<thead>
<tr>
<th>Location</th>
<th>Salt samples obtained</th>
<th>Samples without certificate</th>
<th>Tested by National Sanitary–Epidemiologic Inspection</th>
<th>Test results sent to take measures</th>
<th>Samples addressed</th>
<th>Recall of defective product (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tashkent City</td>
<td>418</td>
<td>287</td>
<td>Iodized</td>
<td>102</td>
<td>95</td>
<td>85,000</td>
</tr>
<tr>
<td>Tashkent</td>
<td>428</td>
<td>223</td>
<td>Not iodized</td>
<td>3</td>
<td>3</td>
<td>8,500</td>
</tr>
<tr>
<td>Andizhan</td>
<td>106</td>
<td>43</td>
<td></td>
<td>28</td>
<td>23</td>
<td>1,019</td>
</tr>
<tr>
<td>Bukhara</td>
<td>99</td>
<td>29</td>
<td></td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dzhizzak</td>
<td>189</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navoi</td>
<td>66</td>
<td>—</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Namangan</td>
<td>1,201</td>
<td>827</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Samarkand</td>
<td>409</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syrdarya</td>
<td>56</td>
<td>1</td>
<td>16</td>
<td>40</td>
<td></td>
<td>5,000</td>
</tr>
<tr>
<td>Surkhandarya</td>
<td>516</td>
<td>233</td>
<td>408</td>
<td>63</td>
<td>63</td>
<td>485</td>
</tr>
<tr>
<td>Fergana</td>
<td>500</td>
<td>251</td>
<td>65</td>
<td>133</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khorezm</td>
<td>189</td>
<td>118</td>
<td>114</td>
<td>75</td>
<td>2</td>
<td>468</td>
</tr>
<tr>
<td>Kashkadarya</td>
<td>1,442</td>
<td>1,292</td>
<td>305</td>
<td>425</td>
<td>5</td>
<td>60,000</td>
</tr>
<tr>
<td>Karakalpakstan</td>
<td>150</td>
<td>124</td>
<td>19</td>
<td>131</td>
<td>91</td>
<td>6,200</td>
</tr>
<tr>
<td>Total</td>
<td>5,769</td>
<td>3,578</td>
<td>1,562</td>
<td>1,592</td>
<td>377</td>
<td>166,672</td>
</tr>
</tbody>
</table>

FIG. 53. Point-of-sale poster to remind consumers in Uzbekistan of their right to properly iodized salt

TABLE 24. Results of joint monitoring raids in salt sales outlets of Uzbekistan, September 2006
Government of Uzbekistan elected not to ban the import and sale of noniodized salt, while leaving the door open for the supply and promotion of alternative commercial food products and supplements.

A presidential decree of early 2007 waived the import tax on salt iodization equipment. In the spring of 2007, the Ministry of Health released information that in Uzbekistan, 19 companies were producing salt and another 28 firms were engaging in packaging, labeling, and sales of salt purchased from the primary producers. The 13 salt companies, selected in succession for Asian Development Bank support since 2002, provided about two-thirds of the national salt supplies. The Salt Producers Association, which had been formed with government initiative was not granted an import license for potassium iodate, and it ceased to play a further role. The government’s decision was that centralized potassium iodate purchases were to be arranged under Uzmedimport, the official Ministry of Health agency for drug supply management.

Working with the GAIN-sponsored wheat flour fortification project, the Asian Development Bank project in May and June 2007 was among the supporters of youth festivals in five oblasts that promoted fortified foods. The local organization involved the Kamalot NGO, and the festivals were covered on national television and in local newspapers. Also in 2007, UNICEF organized a massive awareness campaign in schools along the lines of the previous campaign in 2003, but without salt tests. The campaign distributed 3.2 million leaflets with consumer information about fortified flour on the front side and iodized salt on the back. The leaflets had a tear-off section that the parents could use to report their observations of fortified products back to the teachers. Teachers of students in grades 5 to 11 were stimulated to give lessons on fortified foods as part of Health Week.

As reported at the final Almaty Forum that concluded the Asian Development Bank project [17], more salt quality inspections were conducted in the markets and shops of Uzbekistan than in any other participating country. More than 51,000 titration and 4,200 WYD tests indicated that nearly 90% of the salt for sale to consumers was iodized according to the GOST standard by the end of the project. Producer reports showed that 60% to 65% of salt consumed nationally was iodized [17].

A Nutrition Investment Strategy Plan, Uzbekistan, was completed in 2008 and encompassed a set of programmatic activities to support fortification primarily through private companies, complemented by targeted public health services to be delivered by the Ministry of Health [18]. The plan states that one of the objectives is to “expand salt iodization levels to sustainably reach 85% of the population and virtually eliminate iodine deficiency disorders.” The plan is budgeted to last 6 years. A UNICEF review in July 2009 noted that the percentage of households using iodized salt did not change from the 2006 level [19]. The underlying reasons given for the continued status quo were that the law did not explicitly state USI achievement and that the roles of the Ministry of Health and Sanitary–Epidemiologic Services had not been clearly defined because of lack of bylaws, subsidiary acts, and decentralized decrees. The Uzbek Government adopted the Nutrition Improvement Strategy in 2009, thus postponing the goal of virtual elimination of IDD to 2015, when progress toward achieving the Millennium Development Goals will be assessed.

In conclusion, after independence in 1991, Uzbekistan had to develop its own salt production and supply systems, which made iodization of secondary importance for some time. After 2000, numerous events and efforts in succession have led to the enactment of a principle Law on IDD Elimination that gives priority to developing a government-led approach to “flood the markets” with properly iodized salt. The USI goal in Uzbekistan has been moved to achieve the use of iodized salt in 85% of households by the Millennium Development Goals deadline. National action toward this goal under government responsibility has been inserted in the nutrition improvement strategy, which is principally driven by economic considerations. The numerous, mainly small-scale salt companies in Uzbekistan are not united, and they depend for their access to potassium iodate on the Ministry of Health, which has limited authority for food control and enforcement. Although public awareness is high, this has not translated into an effective insistence on being supplied with the proper product. The Institute of Endocrinology has a high reputation, but a national, population-representative iodine survey has not been conducted.

References and important documents


