



GAIN-UNICEF USI Partnership Project

Final Report

Annex 3: Country Summaries

Bangladesh

Executive Summary

Universal salt iodization (USI) was made mandatory in Bangladesh in 1989, and additional regulations were passed in 1995. The Control of Iodine Deficiency Disorders Project (CIDDP) was established in order to build and support an industrial capacity for quality iodization. In the early 1990's, 267 salt iodization facilities were established serving both large and medium scale producers as well as 42 thousand small-scale salt farmers. Capacity was built for 7 national and 8 regional laboratories to provide external quality assurance. By 2005 ~80% of salt contained iodine, about half with adequate levels. In 2009, the CIDDP adopted a new 5-year Plan of Action and several years later set an objective to achieve 75% coverage with adequately iodized salt through a range of activities, many supported by the Partnership. These included:

- **Legislation:** Submitted draft amendments to revise legislation with provisions to: apply to salt imports and processed foods; deter trade in non-packaged raw salt; and strengthen penalties for non-compliance. The Government ruled that the proposed amendments constituted more than a revision and required passage of new legislation – and a new draft has been submitted and is pending. The Partnership provided support to strengthen enforcement of current regulations through local salt ordinances and mobile courts. These resulted in legal actions cancelling registration of 66 small producers.
- **Support to Producers:** The private sector has shouldered KIO₃ procurement costs since 2008. However, steep rises in the global price as well as burden of duties and taxes presented barriers to sustainability. The Partnership supported the establishment of a revolving fund and a centralized procurement system, which removed freight costs and value added tax. The Partnership also supported refurbishing 200 salt iodization plants as well as providing 50% cost sharing for producers purchasing equipment to improve salt quality such as dryers and centrifuges.
- **Quality Assurance:** Manuals developed by the Partnership were adopted by both industry and institutional laboratories. The project provided incentives to improve iodization quality via an industry recognition program which included: monthly salt quality monitoring; sharing information on performance; bi-annual performance review meetings; identifying top performing producers, and reward events with associated media and communications.
- **Public Education:** National radio and TV broadcast was coordinated with social mobilization in 20 high-vulnerability districts. More than half a million citizens participated in IDD education and promotional events including 1200 primary school teachers, 228 religious leaders and thousands of children, families and retailers mobilized via RTK-led salt testing activities. Awareness in 20 districts of iodized salt reached 72%.

Despite CIDDP and Partnership efforts, the coverage of salt with any iodine declined from 81% to 65% between 2005 and 2015, while the coverage of adequately iodized salt remained unchanged at ~50%. Evaluation surveys found that higher quality salt in sealed retail packs (as opposed to coarse “open” salt) was the most significant predictor of adequate iodine content in salt – and households purchasing this higher quality packed salt were much more likely to have optimal iodine status. There were no data on iodine status at the end of the project, but only at the mid-point in 2011 which suggested that, at the national level, the iodine status of women and school-aged children as optimal. Legislation and other incentives to upgrade processing and shift the market to higher quality salt in sealed consumer packs may offer higher returns for future program investment, and ensure that Bangladesh remains on track to eliminate iodine deficiency.

Current status

The following tables provide the key results and current status of HHIS and iodine status in Bangladesh. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in Bangladesh – project start and project end

HH Salt Project start - quantitative					Project end - quantitative				
Domain	2005 HHIS any iodine	2005 HHIS ≥ 15 ppm	Year	Sample size	Domain	2015 HHIS any iodine	2015 HHIS ≥ 15 ppm	Year	Sample size
National	81.0%	51.2%	2004-5	3,521	National	64.7%	50.5%	2015	1,498
Urban	92.8%	71.0%	2004-5	815	Urban	73.4%	68.9%	2015	501
Rural	77.9%	45.2%	2004-5	2,706	Rural (all)	61.7%	44.3%	2015	997

Project start - semi-quantitative				Project end - semi-quantitative			
Domain	HHIS (RTK) Iodine Present*	Year	Sample size	Domain	HHIS (RTK) Iodine Present*	Year	Sample size
National	84.3%	2006	62,463	National	69.0%	2015	1,498
Urban	91.5%	2006	18,138	Urban	78.7%	2015	501
Rural	81.2%	2006	43,735	Rural (all)	65.7%	2015	997

* Adequate iodine by RTK is known to be unreliable (in-publication, Gorstein et al 2015). Data presented in 2006 MICS report are ambiguous, could be interpreted as salt with any iodine, however they are presented as having iodine ≥ 10 ppm

Project start - Iodine nutrition status (SAC)				Project end - Iodine nutrition status (SAC)			
Domain	Median UIC ($\mu\text{g/l}$)	Year	Sample size	Domain	Median UIC ($\mu\text{g/l}$)	Year	Sample size
National	163.0	2004-5	2,447	National	145.7	2011-12	1,154
Urban	229.0	2004-5	573	Urban	136.3	2011-12	388
Rural	141.0	2004-5	1,874	Rural	146.2	2011-12	390
				Slum	173.5	2011-12	376

Project start - Iodine nutrition status (WRA)				Project end - Iodine nutrition status (WRA)			
Domain	Median UIC (µg/l)	Year	Sample size	Domain	Median UIC (µg/l)	Year	Sample size
National	139.0	2004-5	1,774	National	122.6	2011-12	1,276
Urban	226.0	2004-5	554	Urban	151.1	2011-12	433
Rural	122.0	2004-5	1,847	Rural	112.8	2011-12	452
				Slum	154.9	2011-12	388

Data sources:

2004-5: National IDD/USI survey 2004-5 published as: Yusuf et al. Asia Pac J Clin Nutr (2008)17 (4):620-628

2006: National MICS 2006 "An iodine-testing solution was used, checking for iodine and potassium iodate".

2011-12: National Micronutrient Status Survey 2011-12. Final report

2015: National Salt Iodization Survey in Bangladesh 2015, Centre for Nutrition and Food Security, ICDDR,B (Including 3 Strata: Urban/Slum, Rural Other, and Rural Low Performing). Final report

China

Executive Summary

While China has documented >90% coverage of adequately iodized salt since 2006, program monitoring indicated two issues of potential concern. First, 68 million people in 8 provinces did not consume adequately iodized salt, suggesting that a large segment of the population was not being protected against IDD. Second, some clinicians began to express concerns that iodized salt was leading to excessive intake of iodine and could be implicated in an increase in thyroid disease. The Partnership Project support focused on both sustaining the current achievement of USI while addressing these two concerns.

- *Provincial Standards and Campaigns:* In target provinces with low coverage of adequately iodized salt, the Partnership supported development and pilot implementation of provincial standards, tailored to the provincial environment, along with public education campaigns. These include low coverage in Tibet, Qinghai, Hainan and Xingjian with high consumption of local raw salt and poor distribution systems as well as areas like Guangdong where there is sophisticated salt industry but also leakage on non-iodized salt. Public education activities along with salt subsidies appear to have contributed to improvement to >90% adequately iodized salt in these target provinces. Subsidies in areas with easily available raw salt may need to be sustained in some regions.
- *Developing Data on Iodine Stats:* Analysis of iodine intake in 4 coastal provinces with concerns of excessive iodine intake showed Median Urinary Iodine Concentration (MUIC) of school children and adults was adequate or above adequate – and there was no indication of excess. These studies enabled segmented and focused approach to developing: national protocols for risk assessment; provincial standards for iodine content in salt; and a framework for supporting surveillance systems. Results of studies, concluding fears about excess iodine were overstated, were published and communicated to government officials, doctors, media and residents. Although China has decreased iodine levels in salt since 2012, and surveys find moderately lower MUIC, these concerns persist.
- *Building Laboratory Analysis Capacity:* With programs in different regions of the country working simultaneously to both increase coverage of iodized salt as well as decrease iodine intake, monitoring requires a diverse range of technical skills. The Partnership supported technical trainings on iodine analysis in salt, drinking water and processed foods; determination of urinary iodine concentration; and over-all laboratory quality control and monitoring.
- *Preparing for Long-Term Sustainability:* The upcoming privatization of China's state-owned salt monopoly, a key component of successful USI in China, presents challenges. The Partnership has supported policy dialogue and other activities such as a study tour to Canada to consider optimal strategies to implement mandatory regulation in a free-enterprise context. Stakeholders generally agree that while legal mandate must be maintained, a more open industry will require modifications to overall program design and implementation, including establishment of more robust regulatory food control, monitoring and enforcement to complement on-going nutrition status and program surveillance.

The successful experience of USI in China suggests that while international indicators are useful, additional criteria and indicators that take local factors into account are also necessary. For example, the China CDC has been exploring the utility of UIC of pregnant and lactating women, reproductive age women and infants as core indicators of population iodine status; Thyroglobulin (Tg) as an indicator of thyroid function; along with the consumption of all sources of iodine and sodium in the diet, including household iodized salt to track the performance of its USI program. China will continue to lead the way in providing clarity on the design, implementation and refinement of its efforts to achieve optimal iodine nutrition for its entire population.

Current status

The following table provide the key results and current status of HHIS and iodine status in China. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in China – project start and project end

Project start - quantitative						Project end - quantitative				
Country	Domain	2002 HHIS any iodine	2002 HHIS adequate*	Year	Sample size	Domain	2014 HHIS any iodine	2014 HHIS adequate**	Year	Sample size
China	National	95.2%	92.9%	2002	N/A	National	96.3%	91.5%	2014	48,408

* The 2002 survey figure is based on iodine > 15 ppm. The survey also presented data on the % iodine 20-50 ppm (China standard) which was 88.8%.

** The minimum acceptable ppm used to define adequate iodine at household level in 2014 was 15, 18 or 21ppm depending on provincial standard adopted and date of its adoption.

		Project start - Iodine nutrition status (SAC)			Project start - Iodine nutrition status (PW)			Project end - Iodine nutrition status (SAC)			Project end - Iodine nutrition status (PW)			
Country	Domain	Median UIC (µg/l)	Year	Sample size	Median UIC (µg/l)	Year	Sample size	Domain	Median UIC (µg/l)	Year	Sample size	Median UIC (µg/l)	Year	Sample size
China	National	238.6	2011	14,975	184.4	2011	13,932	National	197.9	2014	48,975	154.6	2014	19,500

2011 and 2014: Data from National IDD surveys, approval from National Health and Family Planning Commission (NHFP) and Endemic Disease Control Center, confirmed by UNICEF Beijing. High water iodine areas (where non-iodized salt is permitted) were excluded from both surveys.

Data sources:

2002: Ministry of Health. 2002 National IDD Survey.

2014: Data from National IDD survey, approval from National Health and Family Planning Commission (NHFP) and Endemic Disease Control Center, confirmed by UNICEF Beijing. High water iodine areas (where non-iodized salt is permitted) were excluded from the survey

Egypt

Executive Summary

Despite an unstable political environment, the coverage of households with adequately iodized salt increased over the Partnership Project to almost 75% in 2015. This improvement is largely due to the Partnership support for a participatory process to revitalize the National Micronutrient Committee and establishment of a National IDD Secretariat (NIDDS) in 2009. With support of relevant Ministries and Government agencies, international partners and the salt industry, the NIDDS coordinated the USI planning process and directly supported a range of activities that sustained high levels of existing coverage and enabled further progress:

- *Legislation:* NIDDS secured support for modifying legislation to close loopholes for animal and industrial salt supply; specified ranges of iodine content; and extend the iodization mandate and penalties to small producers/re-packers. Future regulatory reform includes reviewing the licensing regulations for salt re-packers, and storage areas/warehouses, which are the main source of non-iodized salt in the country. Current advocacy efforts are working to require placement of a newly developed and tested iodization logo on all salt packages.
- *Technical Assistance to Industry:* Close collaboration with the salt producer's association (SAG) opened channels to ensure the full participation of industry in USI capacity building activities. SAG, including the five main large-scale salt producers and its "salt branch" including smaller enterprises, is now the major channel for KIO₃ distribution. Industry collaborated in the development of a customized QA/QC manual including recommendations, which have been adopted by all producers. WYD checkers introduced with the Partnership support are now being procured by MOH and distributed to smaller scale industries. NIDDS coordinated a participatory process to develop a cost-sharing plan to gradually shift KIO₃ financing to private producers prior to expiration of current MOH subsidy by 2020.
- *Building Capacity of Regulatory Agency:* After a series of capacity building activities, the Ministry of Health's Department of Food Inspection is now conducting regular inspections at the point of production. With inputs from other major Ministries, especially the Ministry of Industry, the Partnership supported development of a Management Information System (MIS) to provide up-to-date information aiming to improve efficiency of regulatory activities and making information on KIO₃ distribution and stocks, and on salt iodization easily accessible from one single source. The MIS tool is now fully developed and tested but awaiting upgrades to the government server.
- *Public Education:* The Partnership worked closely with the NIDDS to coordinate a marketing and social mobilization campaign in 7 highly vulnerable Governorates targeting consumers, salt retailers, NGOs and community and political leaders. Local committees including participants from government, industry and civil society supported planning and implementation. The campaign included: radio spots featuring a salt iodization song; community health workers conducting home visits; and regular community meetings to the local political structure, the salt supply chain and consumers.

The recent history of Egypt suggested that progress in any health or public sector program would have been a challenge. The fact that the USI program was able to maintain high levels of performance and even increase its reach to protect the population from iodine deficiency, is a remarkable accomplishment. Both GAIN and UNICEF worked well in Egypt, collaborating closely as a model example of partnership with different agencies, under the leadership of the MoH and the IDD secretariat. The USI program advanced considerably during the partnership project and has sufficient momentum to push towards the sustainable elimination of IDD.

Current status

The following table provide the key results and current status of HHIS and iodine status in Egypt. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in Egypt – project start and project end

Country	Domain	HHIS Project start - quantitative*				HHIS Project end - quantitative				
		2007 HHIS any iodine	2007 HHIS ≥ 15 ppm	Year	Sample size	Domain	2015 HHIS any iodine	2015 HHIS ≥ 15 ppm	Year	Sample size
Egypt	National	83.9%	69.1%	2006-7	3,599	National	92.5%	74.7%	2014-15	2,914
	Metropolitan	94.4%	85.7%	2006-7	900	Metropolitan	95.4%	82.9%	2014-15	368
	Lower Egypt	76.4%	58.6%	2006-7	900	Lower Egypt		74.6%	2014-15	1,293
	Upper Egypt	87.1%	65.2%	2006-7	900	Upper Egypt		72.6%	2014-15	1,253

*National estimate is unweighted and therefore not truly representative of the national situation

Country	Domain	Project start - semi-quantitative				Domain	Project end - semi-quantitative			
		HHIS (RTK) Iodine Present	HHIS (RTK) Iodine Adequate*	Year	Sample size		2014 HHIS any iodine	2014 HHIS ≥ 15 ppm	Year	Sample size
Egypt	National	97.8%	78.7%	2008	3,599	National	90.9%	N/A	2014	9,099

* Adequate iodine by RTK is known to be less reliable than by quantitative assessment methods (in-publication, Gorstein et al 2015)

Country	Domain	Project start - Iodine nutrition status (SAC)*			Domain	Project end - Iodine nutrition status (SAC)		
		Median UIC ($\mu\text{g/l}$)	Year	Sample size		Median UIC ($\mu\text{g/l}$)	Year	Sample size
Egypt	National	174.1	2006-7	3,599	National	170.0	2014-15	3,248
	Metropolitan	193.7	2006-7	900	Metropolitan	200.0	2014-15	587
	Lower Egypt	159.7	2006-7	900	Lower Egypt	160.0	2014-15	1,364
	Upper Egypt	182.4	2006-7	900	Upper Egypt	160.0	2014-15	1,297

* 2007 National estimate includes all Frontier governorates. The 2015 survey only included the New Valley Frontier Governorate (as part of Rural Upper Egypt)

Data sources:

2006-7: National Iodine Nutrition Survey Egypt 2006-2007. The 2006-7 survey included 5 frontier governorates as a separate stratum (data not shown for this stratum however data from these governorates are included in the weighted national estimate).

2008: Egypt DHS 2008.

2014: Egypt DHS 2014 (excluded North and South Sinai Governorates). Tables for key report findings August 2015. Security concerns meant that 4 frontier governorates were not included in the 2014-15 survey, the only accessible frontier governorate (New Valley) in the 2014-15 survey was included in the upper rural stratum (and is also a component of the - weighted - national estimate).

Ethiopia

Executive Summary

Ethiopia was selected as one of the target countries for the USI Partnership Project because of its large population, high prevalence of iodine deficiency, and low household coverage of iodized salt. While over 80% of Ethiopian households had access to iodized salt via Eritrean sea salt producers prior to 1998, the Eritrean-Ethiopian War resulted in political tensions and border closures for many products, including salt. This led to household coverage of iodized salt plummeting. Some surveys indicated household coverage to be as low as 4.7% in 2008 (NNP baseline survey, Ethiopian Public Health Institute 2008). In 2005, the Ethiopian Health and Nutrition Research Institute (EHNRI) -- now called the Ethiopian Public Health Institute (EPHI) -- estimated that over 83% of school children had mild to severe iodine deficiency, as measured by urinary iodine concentration (UIC). Goiter rates of 40% in children and 36% in mothers were also found, which were indicative of severe iodine deficiency.

- The Partnership supported the National Universal Salt Iodization (USI) Program in Ethiopia since 2009 through technical and financial assistance working with Government, the salt industry, civil society, and consumers to increase the availability and access to adequately iodized salt. GAIN and UNICEF's role in partnership with the Federal Ministry of Health (FMoH); the Food, Medicine, and Health Care Administration and Control Authority (FMHACA); and the private sector has been critical in pushing forward the national USI program. Many of the efforts of the Partnership were complemented by the Micronutrient Initiative.
- *Enacting Legislation:* The Partnership was instrumental in working with the National Technical Committee (NTC) to draft the legislation and revised salt standards for iodized salt which was adopted and implemented in February 2011. The success of this activity was due to timely advocacy and technical support the Partnership and other USI partners provided and a motivated Ethiopian Prime Minister and other high level officials who were very interested in addressing malnutrition and micronutrient deficiencies in the country.
- *Building Capacity of Regulatory Agencies:* A 2012 MOU with FMHACA elaborated government commitment to enforce the new salt regulations along with an agreement on a capacity building plan. In partnership with FMHACA, the Partnership developed enforcement and reporting protocols, built inspection capacity in production regions, and established a system for registering salt producers to track production, iodization progress, and inspection visits. The Partnership led training of FMHACA inspectors, provided 47 WYD devices and 8 new I-Check devices for robust quantitative iodine analysis, and built human and technical laboratory capacity for titration analysis. As FMHACA announced initiation of enforcement activities in 2012, salt producers were motivated to iodize using all means at their disposal, mainly manual spraying and mixing.
- *Building Capacity of Industry:* When mandatory regulations were instituted in 2011, iodization capacity among Ethiopia's 400 small-scale producers was estimated at 15% of national requirements. To build iodization capacity, the Partnership worked closely with the industry cartel, Afdera Salt Producers Mutual Support Association (ASPMSA) to: develop and disseminate standard operating procedures and quality control protocols; conducted extensive training; provided both mechanized and manual iodization equipment; and developed sustained access to on-going supply of KIO_3 . A KIO_3 revolving fund and supply system was developed in collaboration with Pharmaceutical Fund and Supply Agency (PFSA), which provides procurement and logistics. ASPMSA distributes and collects payment from producers as part of its role in enforcing production quotas. As of 2015, the revolving fund and cost recovery mechanism are working well without external resources. In 2015, the Partnership procured and partially financed a number of mechanized iodization machines with the capacity to iodize up to 24% of the national salt supply. For the longer term, a range of stakeholders proposed, and the government has recommended, investment in a central iodization facility (CIF). Discussion and negotiations technical and design aspects, ownership structure, funding and other related issues are ongoing.

- *Public education:* The Partnership supported multi-channel communication program including broadcast and print media along with social mobilization channeled via road shows and health workers. Based on research in 2012 identifying factors that constrain salt producers and distributors from iodizing salt, the original strategy targeting national consumer awareness shifted to salt production areas and to producers, who resisted government control and regulation. Advocacy to regional government, leading producers and ASPMSA, opened trusted channels for activities targeting salt producers, local government and consumers in salt production areas creating widespread awareness and commitment among producers.
- *Updated evidence on USI and iodine status:* Results from the 2014 National Salt Iodization Coverage Survey and from the 2015 National Micronutrient Survey report that coverage of iodized salt has increased significantly during the time of the Partnership’s engagement: 2014 quantitative salt iodine assessment shows that 95.2% of households now have access to salt with some iodine and 42.7% of households have access to salt that is adequately iodized to national standards¹. This increased coverage of iodized salt has improved children’s iodine status, mental development, and physical growth. This has been demonstrated through a 2015 randomized cluster trial of children <36 months in 60 villages in Amhara, Ethiopia.² Children with iodized salt access had significantly higher scores at reassessment on three of the four Bayley-III subscales.³

There has been a dramatic improvement in the iodine status in Ethiopia. A survey in 2005 found that school age children were severely iodine deficient, with a population median urinary iodine (MUIC) of 24.5µg/l, while in 2015 a national survey indicated that this population group now had a MUIC of 105.6 µg/l, indicating iodine sufficiency. These results validate the importance of salt iodization to improve children's lives in Ethiopia and provides evidence that the USI program has already had success with significant contribution from the Partnership. Moving forward, further investments are required to build more robust and sustainable delivery, quality assurance and regulatory monitoring systems to improve the quality of iodized salt in the country. The efforts underway to consolidate the salt industry with the establishment of a CIF will ameliorate the challenges associated with industry fragmentation.

¹ Results from the 2015 survey are based on rapid test kit analysis of salt iodine and indicate that 84.6% of households use salt with some iodine and 33.9% use salt with adequate iodine.

² Bougma K, et al. 2015. Iodized salt improves child’s iodine status, mental development, and physical growth in a cluster randomized trial in Ethiopia. *The FASEB Journal*. 29: 28.6.

³ Standards of measurement used to assess the motor, language, and cognitive development of children aged 0-3.

Current status

The following table provide the key results and current status of HHIS and iodine status in Ethiopia. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in Ethiopia – project start and project end

		HHIS Project start - semi-quantitative						HHIS Project end - quantitative*			
Country	Domain	2005 HHIS any iodine	2005 HHIS $\geq 15\text{ppm}$	Year	Sample size	Domain	2014 HHIS any iodine	2014 HHIS $\geq 15\text{ppm}$	Year	Sample size	
Ethiopia	National	54.3%	19.9%	2005	13,721	National	95.2%	42.7%	2014	5,605	

*Unclear if national estimate is weighted and therefore fully representative of the national situation

		HHIS Project start - semi-quantitative						Project end - semi-quantitative			
Country	Domain	2005 HHIS any iodine	2005 HHIS $\geq 15\text{ppm}^*$	Year	Sample size	Domain	2015 HHIS any iodine	2015 HHIS $\geq 15\text{ppm}^*$	Year	Sample size	
Ethiopia	National	54.3%	19.9%	2005	13,721	National	84.6%	33.9%	2015	3,232	

* Adequate iodine by RTK is known to be less reliable than by quantitative assessment methods (in-publication, Gorstein et al 2015)

		Project start - Iodine nutrition status (SAC)					Project end - Iodine nutrition status (SAC)			Project end - Iodine nutrition status (WRA)		
Country	Domain	Median UIC ($\mu\text{g/l}$)	Year	Sample size	Domain	Median UIC ($\mu\text{g/l}$)	Year	Sample size	Median UIC ($\mu\text{g/l}$)	Year	Sample size	
Ethiopia	National	24.5	2005	NA	National	105.6	2015	1,836	98.3	2015	1,879	

Data sources:

2005: Salt Ethiopia DHS 2005 Final Report Table1.6, p. 151. UIC data National IDD Survey (FNB 2007 28(4) 391-8)

2014: ENMS - EPHI presentation.

2015: Ethiopian National Nutrition Program End-Line Survey (Final report Sept 2015) Table 25

Ghana

Executive Summary

Ghana has large areas of easily accessed natural salt deposits along the coast and its volume of annual salt exports exceeds its domestic salt consumption. A significant share of production originates among thousands of small-scale farmer operators. The Partnership supported a range of efforts to expand and improve the quality of iodization – both for export or national consumption. A significant focus was on the development of business-oriented models to harness the collective inputs from small-scale salt producers, but also made contributions in a number of program areas:

- *Program Management & Coordination:* Expanding responsibilities for the USI program from the Ministry of Health to the Ministries of Trade & Industry and Ministry of Local Government. Currently, government finances much of its own program coordination.
- *Technical Assistance to Industry:* Supported a private local company in establishing and operating KIO₃ distribution and revolving fund, which sold KIO₃ to small and medium scale producers sufficient to reach >20% of population with iodized salt. Developed QA/QC recommendations, which were adopted by the 7 largest salt works. While the focus of the program was to achieve a high coverage of households with adequately iodized salt, Ghana was actually able to improve its iodine nutrition status through the use of iodized salt in commonly consumed food products that contain salt. These include bouillon cubes which are consumed regularly by the majority of the population, as well as many other food sources that contain salt. Although working with the processed food industry was not identified as a challenge area, the Environmental Health and Sanitation Officers both monitored and promoted the use of iodized salt by the food industry, food vendors, and restaurants.
- *Piloting Small Producer Salt Bank:* Develop a cooperative production and business model with potential to expand to Ghana's thousands of small salt producers that use traditional salt production methods of substandard salt with impurities, high moisture content, as well as manual iodization methods which supply poorly iodized salt. Crucial lessons were learned, but producer participation lagged, management issues were complex, revenue below expectations, and the project was not sustained.
- *Capacity Building for Regulatory Agencies:* The Partnership worked to strengthen government capacity and performance by: reforming national technical regulations; developing local USI regulations in 8 of 13 salt production districts; and building capacity of FDA to enforce mandatory requirements. Although the program mobilized local and national political partners, FDA enforcement remains weak due to capacity as well as political interference and corruption. The long term solution therefore is modernization of salt industry. The challenge for modernization, however, is large investment needed and political will to revamp the salt industry.
- *Public Education:* A range of public media and social mobilization activities sustained 80% public awareness from 2010 to 2015.

Household coverage of salt with any iodine dropped 22% and coverage with adequately iodized salt dropped 18.5% during the project period. This decrease in coverage and quality coincides with the end of initial donor financed potassium iodate as well as a significant spike in global KIO₃ prices. Project monitoring found a 100% increase in the purchase of salt in sealed packets, suggesting the Ghanaian consumer is moving to higher quality salt from more modern producers. Ghana's newly ratified USI III Strategy focused on this market change and aims to secure investment to centralize and modernize the salt industry.

Current status

The following table provide the key results and current status of HHIS and iodine status in Ghana. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in Ghana – project start and project end

		Project start - quantitative						Project end - quantitative			
Country	Domain	2011 any iodine (>=5ppm)	2011 HHIS ≥15ppm	Year	Sample size	Domain	2015 any iodine (>=5ppm)	2015 HHIS ≥15ppm	Year	Sample size	
Ghana	National	83.5%	47.8%	2009-10	1,254	National	61.9%	29.3%	2015	1,563	
	Urban	86.0%	59.3%	2009-10	513	Urban	60.7%	31.4%	2015	1,321	
	Rural	81.8%	39.9%	2009-10	741	Rural	64.0%	25.2%	2015	541	

		Project start - semi-quantitative						Project end - semi-quantitative for iodine present			
Country	Domain	HHIS (RTK) Iodine Present	HHIS (RTK) Iodine Adequate*	Year	Sample size	Domain	HHIS (RTK) Iodine Present	HHIS (RTK) Iodine Adequate*	Year	Sample size	
Ghana	National	58.5%	32.4%	2006	5,939	National	63.9%	42.6%	2015	961	
	Urban	73.5%	44.6%	2006	2,692	Urban	64.4%	46.3%	2015	582	
	Rural	46.1%	22.2%	2006	3,247	Rural	63.0%	35.6%	2015	379	

* Adequate iodine by RTK is known to be unreliable (in-publication, Gorstein et al 2015)

		Project start - Iodine nutrition status (SAC)*		
Country	Domain	2011 Median UIC (µg/l)	Year	Sample size
Ghana	National	129.6	2009-10	989
	Urban	175	2009-10	415
	Rural	98.5	2009-10	573

		Project start - Iodine nutrition status (WIFA)					Project end - Iodine nutrition status (WIFA)		
Country	Domain	2011 Median UIC (µg/l)	Year	Sample size	Domain	2015 Median UIC (µg/l)	Year	Sample size	
Ghana	National	108.1	2009-10	1,356	National	201.6	2015	1,214	
	Urban	146.5	2009-10	568	Urban	220.8	2015	758	
	Rural	85.3	2009-10	788	Rural	169.0	2015	456	

Data sources:

2006: MICS Survey Ghana 2006

2009-10: National Food Fortification Survey 2009-2010 (Extracted tables from draft report, national, urban and rural data are unweighted)

2010: National Food Fortification Survey 2010 (Extracted tables, national data unweighted)

2015: National Iodine Survey Ghana 2015 (Extracted tables from data analysis plan, national, urban and rural data are weighted)

India

Executive Summary

India was one of the first countries in the world to initiate a Universal Salt Iodization (USI) program back in 1962. The current National Iodine Deficiency Disorders Control programme (NIDDCP) aims to assure equitable availability of adequately iodized salt for the entire population to achieve optimal iodine status, prevent IDD, and all of its consequences. With the reinstatement of national mandatory regulation for USI in 2005, iodization was integrated into India's expanding industrial capacity and consumer market for processed and refined salt. A recent national survey indicates that almost 95% of all edible salt contains some iodine, while just under 80% is adequately iodized. This is a dramatic increase from just ten years ago when just over half of salt contained any iodine. The same national survey noted that the iodine status among women of reproductive age is optimal. The Partnership supported a range of activities contributing to these significant achievements.

- *Program Coordination:* The Partnership supported a national leadership and coordination platform, National Coalition for Sustained Iodine Intake (NCSII), which regularly convened high-level government officials. In 2009-10, the Partnership worked closely with the NCSII to mobilize advocacy and technical support to avert threats to mandatory iodization pending at the Supreme Court. Decentralized coordination bodies along with USI cells have been established in high priority states. USI cells provide laboratory analysis, sensitize the supply chain, document trade dynamics and, along with local authorities, implement an innovative non-punitive inspection at key points in the distribution chain.
- *Developing Government Capacity:* Building commitment and capacity of India's Salt Department and Salt Commissioner has opened legal, technical and high-level advocacy channels to both government and industry. The Partnership engaged regulators, traders and iodized salt producers at national and regional levels in order to help strengthen the supply chain of adequately iodized salt. The Partnership invested in the development of the Salt Department including: an MIS system providing real time access to salt production, distribution, quality and iodization data; iodine analysis capacity at the Department's network of 32 laboratories; and training personnel at 300 Department 300 locations.
- *Developing Opportunities for Industry:* The Partnership supported formation of the India Salt Services Cooperative Federation (ISSCF), a platform mobilizing 450 government and industry stakeholders in activities to encourage innovative collaborative approaches to industry modernization, mechanization and consolidation. The proposed Technology Upgrade Fund can provide investment support to SMEs in upgrading technology upgrades and consolidating operations.
- *Targeting High Risk Populations:* Households with limited access to iodized salt are predominantly, rural, low income and reside in Southern India states that are largely supplied by small producers of low quality raw salt, mainly from Tamil Nadu. To improve access among these vulnerable segments, the Partnership secured inclusion of iodized salt in PDS and ICDS in several states. To improve uptake in PDS, the Partnership provided technical assistance to Tamil Nadu's state salt company and undertook sensitization and capacity building along the PDS supply chain to enable a doubling of the iodized salt supply.

Beyond the fact that salt coverage between 2009 and 2015 showed important improvements, the Partnership activities sustained and possibly accelerated industry trends expanding market share for higher quality and iodized salt - two thirds of the national supply is currently refined salt, ~90% of which offers adequate levels of iodine. Future USI programming will work to sustain current achievements, support increased market shares for higher quality refined and washed salt, and continue to increase and monitor access among the poor, particularly in Southern India where coverage is 62%.

Current status

The following table provide the key results and current status of HHIS and iodine status in India. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in India – project start and project end

		Project start - semi-quantitative			
Country	Domain	2009 HHIS (RTK) Iodine Present	2009 HHIS (RTK) Iodine Adequate*	Year	Sample size
India	National	90.7%	71.1%	2009	45,058
	Urban	94.9%	83.2%	2009	19,888
	Rural	89.0%	66.1%	2009	25,170
	National (2005-6)	51.0%		2005-6	

Project end - semi-quantitative for iodine present						Project end - quantitative			
Country	Domain	2015 HHIS (RTK) Iodine present	2015 HHIS (RTK) Iodine Adequate*	Year	Sample size	2015 HHIS Iodine present quantitative	2015 HHIS ≥ 15 ppm quantitative	Year	Sample size
India	National	94.9%	77.1%	2015	5,702	92.0%	78.1%	2015	5,682
	Urban	97.1%	81.8%	2015	2,840	95.4%	86.4%	2015	2,835
	Rural	92.8%	72.5%	2015	2,862	88.6%	69.8%	2015	2,847

* Adequate iodine by RTK is known to be unreliable (in-publication, Gorstein et al 2015)

Salt with any iodine present (> 0 ppm)– based on RTK analysis

Adequately iodized salt (≥ 15 ppm) – based on RTK in 2005 and 2009, and titration analysis in 2015

		Project end - Iodine nutrition status (WRA) 2015		
Country	Domain	Median UIC ($\mu\text{g/l}$)	Year	Sample size
India	National	158.0	2015	2,406
	Urban	167.9	2015	1,194
	Rural	148.5	2015	1,212

* There were no nationally representative UIC data in India at start of project

Data Source/ Notes

2005-6: Ministry of Health and Family Welfare. National Family Health Survey, 2005-6 (Table0.17)

2009: Coverage Evaluation Survey India 2009

2015: National Iodine and Salt Intake Survey India 2015

Indonesia

Executive Summary

At the start of the Partnership Project, 92% of salt in Indonesia was iodized, but only 63% contained adequate iodine levels in accordance with standards. While Indonesia has a large salt industry, much of its salt production is from medium and small scale producers with little processing capacity and the resulting low quality raw salt presents steep challenges. Moreover, although national mandatory regulations have been issued, Indonesia's decentralized governing structure transfers significant policy-making and financing to the district level, where there is little awareness or capacity. Consequently, Partnership activities emphasized improving iodization quality targeting key districts in the three main salt producing provinces.

- *Program Policy & Coordination:* Salt iodization has been included in national surveys as well as all nutrition, health and development plans. Indonesia is one of the few countries to explicitly link USI to the broader nutrition and development agenda. Program coordination for USI was streamlined under a single umbrella body for food fortification. Since 2013, the Government allocated its own funds for national activities and is no longer dependent on external donor funding.
- *Develop Local Regulatory Structures:* The Partnership supported the implementation of the Ministry of Home Affairs (*Bappenas*) decree to mandate provincial and district governments to control non-iodized salt supply. Along with provincial governments, the Partnership worked in 7 key salt producing districts of Central Java to build local capacity to promulgate iodization laws and create IDD-teams to monitor and enforce. While producers in two districts were prosecuted and imprisoned, the actual impact of activities on coverage and quality is unknown.
- *Partnering with Civil Society:* To supplement government monitoring, the Partnership developed capacity of the national Salt Producer Association to work with District IDD-teams and to train retail vendors to promote iodized salt in local markets. The Partnership recruited and developed capacity of the Indonesian Consumer Protection Organization to conduct independent market monitoring in one district each in East Java, Central Java, South Sulawesi and Jakarta.
- *Technical Assistance to Industry:* In collaboration with the national Salt Producer Association, the Partnership worked to improve quality systems and sourcing equipment as well as establishing a KIO_3 revolving fund in Central Java. Support was provided to 41 large and medium scale producers to develop and implement standard operating procedures; establish quality control teams; and utilize salt testing min-labs. Coverage of quality iodization was essentially unchanged 2008-2015.
- *Public Education and Social Mobilization:* Activities targeting retailers and consumers in 8 salt producing across two provinces included materials for billboards, salt trucks and vender kiosks. Retailers in 4 districts were supplied with salt testing capacity. Social mobilization included pilot "Village Free of Non-Iodized Salt Movement" in one district of Central Java, providing alternative access to iodized salt through "health kiosks."

The Partnership aimed to improve coverage of adequately iodized salt to >90%. However, both iodization coverage and quality remained essentially unchanged between 2008 and 2015. These results may reflect the impact of the 'People's Salt Empowerment Programme' administered by the Ministry of Marine and Fisheries which more than doubled the production of raw non-iodized from smaller artisanal producers. Without the efforts of the Partnership, particularly by sustaining the good performance of large producers through technology transfer and improving the performance of medium and medium-large producers through QMS, the coverage of iodized salt might indeed have declined. Data on UIC indicate optimal iodine status of women and school-age children in the country despite the fact that USI coverage has not been achieved. One possible explanation for this is that women and children are obtaining iodine from sources other than table salt, including iodized salt in commonly consumed processed foods and iodine in ground (source of drinking) water.

Current status

The following table provide the key results and current status of HHIS and iodine status in Indonesia. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in Indonesia – project start and project end

		Project start - quantitative						Project end - quantitative			
Country	Domain	2007 any iodine (>=5ppm)	2007 HHIS ≥15ppm	Year	Sample size	Domain	2013 any iodine (>=5ppm)	2013 HHIS ≥15ppm	Year	Sample size	
Indonesia	National	92.2%	62.8%	2007	2,674	National	92.3%	55.1%	2013		
	Urban	97.2%	72.0%	2007		Urban	93.6%	59.3%	2013		
	Rural	89.5%	57.8%	2007		Rural	91.2%	51.4%	2013		

		Project start - semi-quantitative						Project end - semi-quantitative			
Country	Domain	HHIS (RTK) Iodine Present	HHIS (RTK) Iodine Adequate*	Year	Sample size	Domain	HHIS (RTK) Iodine Present	HHIS (RTK) Iodine Adequate*	Year	Sample size	
Indonesia	National	86.0%	62.3%	2007	257,065	National	91.1%	77.1%	2013		
	Urban	91.2%	70.4%	2007		Urban	92.5%	81.2%	2013		
	Rural	82.2%	56.3%	2007		Rural	89.8%	73.4%	2013		

* Adequate iodine by RTK is known to be unreliable (in-publication, Gorstein et al 2015)

		Project start - Iodine nutrition status (SAC)					Project end - Iodine nutrition status (SAC)			Project end - Iodine nutrition status (WRA)			Project end - Iodine nutrition status (PW)		
Country	Domain	Median UIC (µg/l)	Year	Sample size	Domain	Median UIC (µg/l)	Year	Sample size	Median UIC (µg/l)	Year	Sample size	Median UIC (µg/l)	Year	Sample size	
Indonesia	National (30 Kab)	224	2007	8,473	National	223.3	2013	6,154	192.1	2013	13,233	172.0	2013	578	
	Urban				Urban	244.9	2013		206.1	2013		185.6	2013		
	Rural				Rural	198.8	2013		177.0	2013		164.5	2013		

Data sources:

2007: Riskesdas (Basic Health Research Survey) Indonesia 2007.

2013: Riskesdas Indonesia 2013.

Madagascar

Executive Summary

The Government of Madagascar made salt iodization mandatory in 1995. By 2009, coverage of iodized salt was about 72%, while about 56% was adequately iodized. In parallel, the prevalence of goiter dropped from 45% in 1992 to 6% in 2001. However, the 2009-2013 political crisis, associated donor sanctions, government budget cuts and subsequent deterioration of public programs have led to a degradation of the salt industry and a reduction in the coverage of USI. The Partnership support for Madagascar began in 2013 and preliminary results of a national survey conducted soon thereafter found household coverage with adequately iodized salt had fallen to only 24% - along with median UIC of 46 µg/l amongst women of reproductive age. Based on these data, the Partnership supported two major activities to accelerate the program and increase access to adequately iodized salt.

- *Piloting Small Producer Cooperatives:* While ~80% of national consumption is supplied by one large and a handful of medium size producers, ~20% is produced by a large number of small producers in the South Region, also home to the poorest highest risk populations. The Partnership supported capacity building of CoReSEL, a small-scale salt producer cooperative created by the Ministry Health and the World Bank in 2004. From 2013-2015 CoReSEL more than doubled its small producer membership, worked to improve salt production quality, and purchased part of their production for iodization and packaging under the CoReSEL brand name with an iodization logo. While CoReSEL met objectives for volume of purchase and iodization, sales reached only ~70% of projections, mainly due to competition from lower priced non-iodized salt fraudulently using the iodized salt logo. Lessons learned and next steps are currently being considered, including shifting program focus to improving performance of the 80% of national supply from large and medium-scale producers.
- *Addressing Concerns of Academia and Policy Makers:* False information linking iodized salt consumption with hypertension emerged from the medical community in early 2012 and was reported to lead to an increased demand for non-iodized salt, especially in urban and educated segments. In addition to supporting a national survey to clarify iodine status, the Partnership supported a communication effort to limit the negative impact of the misinformation and re-launch communication for iodized salt. In 2014 a consensus statement on the need to simultaneously promote consumption of iodized salt and limit over-all sodium intake was jointly issued by the Ministers of Health, Interior, Industry, Private Sector and Small and Medium Enterprises, Commerce and Consumer Affairs and Education. Upon finalization of survey results, the government is committed to a national event convening public and private stakeholders to present the evidence and make recommendations to revitalize the overall USI programme.

Although the work of the Partnership was limited to three years, it helped raise iodine and USI back on the public health and nutrition agenda. There will be a workshop on salt iodization in the first quarter of 2016 which will gather the line ministries involved in the USI program, the private sector and external experts from UNICEF and Iodine Global Network (IGN). The aim of the workshop will be to present the evidence generated by the survey and formulate recommendations for the revitalization of the USI program. The initial work of the Partnership has also been leveraged to build the capacities of the public health laboratories to better support the monitoring and evaluation the USI program.

Current status

The table below presents household coverage of iodized salt as reported by the most recent representative survey (DHS 2008-2009) and a recent Iodine Survey, conducted in 2015.

Coverage of Iodized Salt		Iodine Status (UIC - median)
Any iodine (> 0 ppm)	Adequate iodine (≥ 15 ppm)	
71.5% (2008-09)	52.6% (2008-09)	Not available
	24.0% (2015)	46 µg/l (WRA - 2015)

Data sources:

Madagascar Demographic and Health Survey, 2008-09.

Madagascar National Iodine Survey, 2015 – *preliminary results only (see Country Report)*

Niger

Executive summary

A land-locked country facing political instability along with periodic food and nutrition crisis, Niger imports virtually all its salt supply, mainly from Ghana and Algeria. Consequently, coverage of iodized salt fluctuates along with the iodization performance of producers in those nations. A National Inter-Sectoral IDD Committee (NIDDC), inactive since its inception in 1998, was revitalized in 2012 with regular participation by 4 key Ministries and the Office of the President, along with representatives of private sector, consumer organizations and international agencies and NGOs. Based on 2012 surveys documenting iodine levels in household salt, tracing salt flows, and identifying key players along the supply chain, NIDDC adopted a USI Roadmap 2013-2015 including a range of Partnership supported activities:

- *Legislation:* Evidence-based advocacy raised awareness among a range of government officials and in 2014 secured mandatory salt iodization decree. The decree applied all salt, including imports and salt intended for industrial use, a major source of leakage from Algeria.
- *Informing Players in the Supply Chain:* Meetings with Niger's 8 main salt importers and 32 wholesalers raised awareness and secured commitments to purchase salt only from a certified iodized salt producer in Ghana - once the Ministry Trade identified the appropriate suppliers.
- *Building Regulatory Capacity:* NIDDC held 8 regional workshops to clarify roles and responsibilities for customs, health, and local officials. Nearly 300 relevant officials from Ministry of Trade and Agriculture were trained. Customs and border agents were provided with 10,000 rapid test kits, 6 iChecks and other support equipment. However, while levels of iodine in imported salt regularly were checked, no sanctions were applied to non-iodized salt.
- *Public Education:* National education campaigns were largely channeled through health workers communicating USI issues as part of nutrition sensitization events. Awareness of the importance of iodized salt was confirmed in about 1/3rd of salt retailers and about half of consumers.

These achievements did not succeed in improving the supply of adequately iodized salt. However, the project generated relevant evidence and renewed commitment that will enable NIDDC to move towards USI including: advocating for the creation of a government budget line for USI activities; strengthening the salt border control monitoring system; and expanding regional activities with neighboring countries to influence the quality of imported salt at the point of production. There is increasing recognition that iodized salt in condiments, in particular, bouillon and tomato paste, can potentially make major contribution to iodine intake, but this has yet to be included as part of the Niger National IDD program. NIDDC recognizes that controlling salt trade across Niger's porous borders remains an overall governance challenge that applies to all products that the nation imports.

Current status

The following table provide the key results and current status of HHIS in Niger.

Table: Status of HHIS coverage in Niger – project start and project end

		Project start - semi-quantitative				Project end - semi-quantitative			
Country	Domain	2006 HHIS any iodine	2006 HHIS ≥15ppm*	Year	Sample size	2014 HHIS any iodine	2014 HHIS ≥15ppm*	Year	Sample size
Niger	National	78.3%	46.0%	2006	7,660	65.2%	19.7%	2014	4,456
	Urban	78.8%	43.5%	2006	1,300				
	Rural	78.2%	46.5%	2006	6,360				

Project end - quantitative					
Country	Domain	2014 HHIS any iodine	2014 HHIS ≥15ppm	Year	Sample size
Niger	National	68.6%	6.2%	2014	3,741
	Urban	67.7%	4.5%	2014	1,876
	Rural	69.4%	8.0%	2014	1,865

Data sources:

2006: DHS Survey Niger 2006, Final Report, Table1.7, p. 182

2014: National SMART survey Niger 2014 (RTK on full sample, titration on sub-sample)

Nigeria

Executive Summary

The goal of the Partnership funds in Nigeria was to support efforts towards the sustainable elimination of iodine deficiency disorders as a public health problem through salt iodization and increasing *national coverage* of households using adequately iodized salt to at 90%. In order to achieve this goal, four complementary program components were essential for success: Quality Assurance & Quality Control at supply points, Behaviour Change Communication, Monitoring & Enforcement/ compliance, Advocacy and repositioning of the Nigerian Industry Standards award scheme. These components strengthened the national level for improved regulatory capacity and capability. Taken together, these four components helped to build and support the capacity and systems that should be in place for sustainable salt iodization programs.

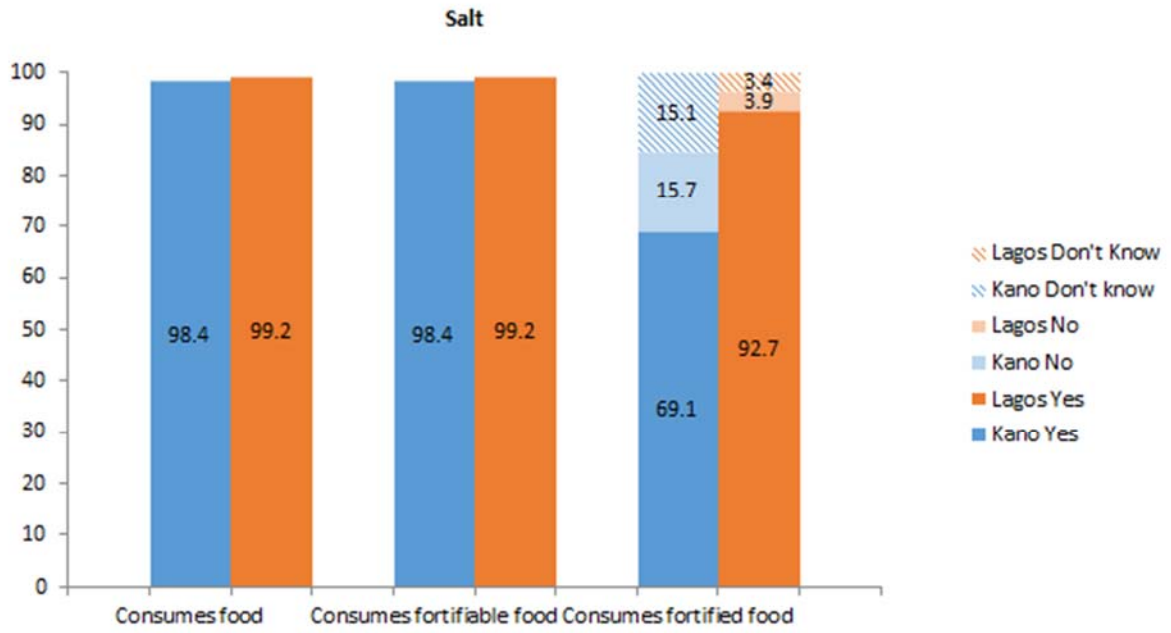
In a span of one year the GAIN successfully achieved the development of QAQC protocols and plans, trained 30 regulatory inspectors and QAQC managers on best practices for sampling and analyzing salt samples at the factory and retail levels with the use of iCheck test kits, donated 10 iCheck test kits to regulatory agencies for periodic monitoring activities, supported monitoring activities at retail level in 17 states and 7 factories, reached over 10 million people with messages on the benefits of iodized salt through a social marketing campaign in 2 States. To ensure an increase in sustainable consumption of adequately fortified staple foods and products with essential vitamins and minerals among the Nigerian population, GAIN identified the need to support the Standards Organization of Nigeria (SON) in one of its programs, the Nigerian Industrial Standards (NIS), aimed at ensuring that manufactured products conform with the relevant regulations, policies and industrial standards before selling them to the public. This is done through regulatory monitoring that includes supervision of the processes (quality assurance and auditing, and which are responsibility of the industry and the government, respectively). The aim of this project component was to support better structures and processes which encourage and incentivize compliant fortification among key food processors starting with salt. The recently concluded FACT survey which was carried out in 2 of the most populous states in Nigeria –Lagos and Kano, indicates that 64% of salt samples collected at the household level were adequately iodized and 69.1% of the sample population consume iodized salt. In Kano State of Northern Nigeria, over 50% of respondents at risk of living in poverty are still able to access iodized salt.

Recommended focus areas for the future include:

- Operationalizing the revamped NIS Awards renamed as the Nigerian Quality Awards (NQA)
- Building the capacity of industry, through technical assistance, to put in-place Salt Iodization processes in-line with global best practices
- Supporting the robust use of the Information Management System for USI currently in place
- Supporting consumer groups to carry out consumer education on purchase and utilization of iodized salt

Current status

Figure: 2015 Fortification Assessment Coverage Tool (FACT) survey results for iodized salt (any iodine)



Pakistan

Executive Summary

Soon after the Partnership Project was initiated in Pakistan, an IDD Control Act and National Implementation Plan was finalized. However, the Constitutional Amendments of 2011 essentially annulled Federal iodization standards, regulations and enforcement mechanisms as they decentralized health and food control functions to the Provincial level. In this new environment, the Partnership Project supported a process to clarify stakeholder roles and responsibilities, develop commitment and leadership.

- *Re-establishing Legislation:* After intensive advocacy, a new Federal IDD Control Act was presented to the National Assembly in 2015. Parliamentarians requested a number of clarifications, and the requested amendments are currently being finalized for resubmission in 2016. In parallel, the Partnership conducted advocacy and supported submission of IDD legislation in all Provincial assemblies. To date these have been enacted in Sindh and Gilgi-Baltistan, and final approval is expected in Punjab with a year. The Partnership partnered with Government health agencies as well as NGOs like the Network for Consumer Protection to advocate to policy makers at Federal and Provincial levels. Extensive media advocacy secured excellent coverage in print and electronic media.
- *External Quality Control:* The Partnership supported activities to build the capacity to monitor and enforce iodization regulations – once they are promulgated. Meanwhile, a network of IDD focal points, supported by staff from the Micronutrient Initiative (MI) visit each of the nation’s 1500 salt producers on a biweekly basis collecting data on iodization, providing technical assistance and collecting salt samples for analysis. The Partnership built the capacity for iodine analysis at the Pakistan Standard and Quality Control Authority laboratories in Punjab and Sindh.
- *Technical Assistance to Industry:* The Partnership worked with the 20 largest salt producers to: secure consensus on a capacity building plan; customize training materials and tools; conduct training workshops; and follow-up with individual producers with technical assistance. A production level evaluation following these training activities found 90% of salt being iodized, but only 36% adequately.
- *KIO₃ Revolving Fund:* Along with MI and WFP, the Partnership developed and seeded a revolving fund for KIO₃ distribution. Currently, MI handles KIO₃ import; logistics to the District level are by a private firm; and distribution and payment from salt producers is by focal points from local IDD committees. Despite withdrawal of KIO₃ subsidy, a full market mechanism is not yet considered feasible due to: high import duties and taxes, limited capacity of local institutions to import and ensure supply chain management, continuing lack of clarity regarding potential profits of KIO₃ distribution, and uncertainty of producer demand.
- *Public Education:* District IDD committees raised awareness of local officials, community and religious leaders and local salt producer and distributors. Commercial promotions targeted large salt customers including food processors, airlines, hotels and Utility Stores. To raise population awareness, the Partnership supported training and materials distributed via a number of channels: health care facilities, Lady Health Worker outreach, primary schools, and teaching institutes. A National survey showed improved knowledge about iodized salt improved.

While iodized salt coverage improved in districts with active involvement of local authorities in monitoring of USI activities, at the Provincial level for the country’s two most populous provinces where 2014 data are available, Sindh and Punjab, coverage of adequately iodized salt remained relatively unchanged in Sindh (38% to 36%) and slightly improved in Punjab (34% to 49%). This lack of significant improvement was largely attributed to erosion of the regulatory framework as well as withdrawal of KIO₃ subsidies.

Current status

The following table provide the key results and current status of HHIS and iodine status in Pakistan. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in Pakistan – project start, project mid-line and project end

	HH Salt Project start - semi-quantitative		HH Salt Project mid-point - semi-quantitative		
Domain	HHIS (RTK) Iodine Present*	Year	2011 HHIS any iodine	2011 HHIS $\geq 15\text{ppm}$	Year
National	17%	2002	69.1%	55.8%	2011 NNS
Sindh			51.8%	37.8%	2011 NNS
Punjab			58.0%	34.0%	2011 MICS

* 2002 survey report unavailable. Believe this estimate of 17 % is for household salt with any iodine however it is unclear

** Adequate iodine by RTK is known to be unreliable (in-publication, Gorstein et al 2015)

	Project end - semi-quantitative for iodine present				Project end - quantitative		
Domain	2014 HHIS any iodine	2014 HHIS $\geq 15\text{ppm}$ **	Year	Sample size	2014 HHIS any iodine	2014 HHIS $\geq 15\text{ppm}$	Year
National							
Sindh	64.1%	36.2%	2014 MICS	16,769	Data from 2014 MICS sub sample are unreliable however suggest coverage with adequately iodised salt of <20% in both Sindh and Punjab		
Punjab	68.8%	49.2%	2014 MICS	38,119			

	Project start - Iodine nutrition status (SAC)*		Project start - Iodine nutrition status (WRA)*	
Domain	2002 % UIC $\geq 100 \mu\text{g/l}$	Year	2002 % UIC $\geq 100 \mu\text{g/l}$	Year
National	36.3%	2002	23.7%	2002
Urban	39.9%	2002	23.7%	2002
Rural	36.0%	2002	23.7%	2002

* Median UIC estimates are not available from the 2002 report. However, if the percent of WRA with UIC $\geq 100\mu\text{g/l}$ is less than 50% then the population median UIC must be below $100\mu\text{g/l}$ and indicates deficiency among the population, which appears to be the situation for National, urban and rural populations of SAC and WRA.

	Project mid point - Iodine nutrition status (SAC)*				Project mid point - Iodine nutrition status (WRA)*			
Domain	2011 % UIC \geq 100 $\mu\text{g/l}$	2011 Median UIC ($\mu\text{g/l}$)	Year	Sample size	2011 % UIC \geq 100 $\mu\text{g/l}$	2011 Median UIC ($\mu\text{g/l}$)	Year	Sample size
National	63.3%	124.2	2011	1,222	52.3%	104.5	2011	1,276
Urban	61.8%	117.2	2011	524	43.7%	94.6	2011	433
Rural	64.1%	129.9	2011	698	56.9%	112.7	2011	452

There were no end-of-project data on iodine status

Data sources:

2002: National Nutrition Survey Pakistan 2002

2011: National Nutrition Survey Pakistan 2011. Report tables ambiguous regarding household coverage with salt that has any and adequate iodine.

2011: Provincial MICS Punjab 2011 Fig Nu.4 p 19 (Used as 2011 coverage for reporting since comparable with 2014 MICS Punjab survey)

2014: Provincial MICS Sindh and Punjab 2014 (draft report chapter and published key findings)

Philippines

Executive Summary

Although mandatory salt iodization was passed in 1995 and a centralized industry with 4 national firms owning 24 facilities producing 80% of the national supply, by 2008 only ~25% of household salt was adequately iodized. In response to Partnership advocacy, in 2010 National Nutrition Council (NNC) began to actively coordinate the USI program and formed a multi-sectoral Technical Working Group (TWG). The TWG facilitated the National Salt Iodization Strategic Plan 2011-2016, which outlined roles and responsibilities of members to implement a range of activities:

- *Technical Assistance to Industry:* Based on a survey indicating low awareness and knowledge, all major iodized producers received education and capacity building including: training based on adapted QA/QC manual; dosing pumps to improve homogeneity; WYD checkers for quantitative quality control; and software to track iodization. Evaluation found improvement at production level with ~30% to >80% adhering to standard limitations. However, reports indicate this was not sustained. The Partnership also supported smaller producers, including Tamaraw Salt Producers Cooperative, aiming to consolidate production volume and marketing to improve iodization along with over-all quality and sales. Activities have been sustained, but iodization performance has not improved.
- *Support to Regulatory Agency:* Bureau of Food & Drugs (BFAD), charged with both business licensing and enforcement identified a series of obstacles. To address these capacity gaps, BFAD regional offices and food inspectors received training along with WYD iodine checkers. Since BFAD database includes only registered businesses, the Partnership compiled a national list of all salt producers along with violations found during independent monitoring. To lighten workload, burden of issuing of License-to-Operate and related training were shifted from DOH to Department of Science and Technology. The Partnership also supported less onerous licensing process, relaxing GMP requirements. To incentivize producers, tax benefits for investments in iodization equipment were provided to registered companies. However, industry has not availed themselves of incentives, believing greater benefits in remaining unregistered with BFAD. After significant advocacy and capacity building, in 2015 BFAD initiated monitoring of major producers, finding widespread violations, but prosecutions have not been reported.
- *Public Education:* IDD and USI education was integrated into school curricula and lesson plans were distributed to 1000 schools supported by desk calendars, posters and a slogan competition. A partnership with NNC and 48 lady mayors championed iodization as part of a larger SUN campaign. Promotional tools included an audio-visual presentation, desk calendars distributed to government offices, refrigerator magnets distributed to 2,000 households and radio spots airing in 4 major stations of Mindanao. Market promotions launched in 2015 include a mandatory seal for iodized salt and partnership with a super market chain to exclusively sell and quality assure iodized salt. These activities are ongoing and impact on awareness or coverage is unknown.

At the close of the project iodized household salt coverage and quality remained unchanged. Although there is evidence that some large scale food industries are now using iodized salt in their products which may be helping to protect some of the population from iodine deficiency. Despite significant investments in Government and industry capacity, BFAD failed to capitalize on opportunities and salt producers failed to sustain quality improvement. A major constraint is the lack of a strategic directive from DOH, which would enable more proactive in enforcement. Two major ongoing initiatives launched in 2015, BFAD monitoring of major producers and mandatory quality seal for salt packages will clarify future directions.

Current status

The following table provide the key results and current status of HHIS and iodine status in the Philippines. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in the Philippines – project start and project end

		Project start - quantitative				Project end - quantitative			
Country	Domain	2008 Any iodine (≥ 5 ppm)	2008 HHIS ≥ 15 ppm Quantitative	Year	Sample size	2013 Any iodine (≥ 5 ppm)	2013 HHIS ≥ 15 ppm Quantitative	Year	Sample size
Philippines	National	51.2%	25.2%	2008	6,926	52.4%	26.2%	2013	7,984
	Urban					52.8%	31.5%	2013	3,492
	Rural					52.0%	20.2%	2013	4,492
		Project start - semi-quantitative			Project end - semi-quantitative for iodine present				
Country	Domain	2008 HHIS (RTK) Iodine Present	Year	Sample size**	2013 HHIS (RTK) Iodine present	Year	Sample size		
Philippines	National	81.1%	2008	36,439	79.9%	2013	35,486		
	Urban				78.8%	2013	14,365		
	Rural				79.7%	2013	17,952		

		Project start - Iodine nutrition status (SAC)			Project start - Iodine nutrition status (LW)			Project start - Iodine nutrition status (PW)		
Country	Domain	2008 SAC Median UIC ($\mu\text{g/l}$)	Year	Sample size	2008 LW Median UIC ($\mu\text{g/l}$)	Year	Sample size	2008 PW Median UIC ($\mu\text{g/l}$)	Year	Sample size
Philippines	National	132	2008	3,805	81	2008	837	105	2008	443
		Project end - Iodine nutrition status (SAC)			Project end - Iodine nutrition status (LW)			Project end - Iodine nutrition status (PW)		
Country	Domain	2013 SAC Median UIC ($\mu\text{g/l}$)	Year	Sample size	2013 LW Median UIC ($\mu\text{g/l}$)	Year	Sample size	2013 PW Median UIC ($\mu\text{g/l}$)	Year	Sample size
Philippines	National	168.0	2013	22,588	77	2013	1,460	105.0	2013	1,095

Data sources:

2008: National Nutrition Survey FNRI 2008 (extract from Facts and Figures presentation) and additional analyses conducted under GAIN contract

2013: National Nutrition Survey FNRI 2013 (extract from 3 different presentations on UIE SAC, UIE Pregnant women and HH iodized salt)

Senegal

Executive Summary

Senegal's large salt industry, exporting most national production, is comprised of one large industrial processor, several medium scale facilities and >15 thousand small enterprises, disproportionately supplying high-risk consumers. Although mandatory iodization began in 1995, a 2010 survey found half household salt contained no iodine, and almost all iodized salt offered <15ppm. The strategy developed by the National Nutrition Commission (CLM) targets small producers, responsible for about 20% of the national supply and mostly organized into government sponsored economic interest groups (GIE).

- *Program Coordination:* Considerable Partnership effort focused on developing capacity and integrating responsibilities of CLM with the National USI Committee. CLM advocacy secured visible high-level support: the Prime Minister issued instructions to prioritize IDD and members of parliament regularly question ministries on progress towards USI. Increased resources enabled CLM to reach salt production areas with 6 full-time staff that facilitated the work of 8 regional USI committees and 16 local committees.
- *Support to Small Scale Producers:* The Partnership targeted GIEs with support to produce, quality assure and market iodized salt including: training using technical manual specially tailored to needs of small producers; seeding of a revolving fund to provide easier access to KIO₃; building business and financial skills of GIEs; and opening new sales channels to the processed food industry. Large industries have not responded with purchases from GIEs and a large proportion of iodized salt offers substandard quality. From 2014 and 2015 production from program supported GIEs increased from 89,209 to 124,195 tons, about one-quarter of estimated national salt production.
- *Public Education:* Mass media campaigns conducted in 2012 targeted the general population while quarterly social mobilization events reached all salt production communities. Ministry of Education included IDD in school curricula and supported a range of activities to strengthen knowledge among students and teachers, particularly in salt production areas. Population awareness almost doubled to 39% 2010-2014, much higher, 60%, in salt production communities. The current 5-year communication strategy focuses on activities to enhance consumer awareness and capacity building for 200 small producers in marketing and negotiation.
- *Building Regulatory Capacity:* 48 local government authorities were trained on their role in monitoring and financing. An inspection manual was adopted by Ministry of Commerce and Ministry of Trade. Inspection checks points were equipped, trained and now conduct regular quality checks at point on import, roadside controls in distribution, roadside markets and production sites. For one quarter in 2015, Ministry of Commerce reports 68 tons of non-adequately iodized salt impounded from production sites and distribution channels.

USI activities achieved a significant increase to 81% coverage of iodized salt. However, the proportion of adequately iodized salt decreased slightly from 48% to 37%, and is particularly low, 11%, in salt producing areas. However, Ministry of Commerce and Ministry Trade found 92% of salt in the distribution channel and 83% of salt at the production level (from medium and large scale producers) met iodization standard. The significant gulf between these supply-chain results and household surveys suggests considerable leakage from GIE members into the local markets. New approaches to motivate and build capacity among small-scale producers to produce higher quality salt and iodization, including options to consolidate/restructure the industry continue to be explored.

Current status

The following table provide the key results and current status of HHIS and iodine status in Senegal. These data and their implications on the program are described in further detail in the report.

Table: Status of HHIS coverage and Iodine status in Senegal – project start and project end

Project start - quantitative *						Project end - quantitative				
Country	Domain	HH with non-iodised or inadequately iodised salt	2010 HHIS $\geq 15\text{ppm}$	Year	Sample size	Domain	2014 HHIS Any iodine	2014 HHIS $\geq 15\text{ppm}$	Year	Sample size
Senegal	National	52.3%	47.7%	2010	695	National	81.3%	37.2%	2014	1,552
	Urban	41.0%	59.0%	2010	310	Urban	89.6%	53.3%	2014	524
	Rural	61.3%	38.7%	2010	385	Rural	72.0%	19.0%	2014	1,028

* National, urban and rural estimates from project start appear to be unweighted

Project start - semi-quantitative						Project end - semi-quantitative for iodine present			
Country	Domain	2005 HHIS (RTK) iodine Present	2005 HHIS (RTK) Iodine Adequate**	Year	Sample size	Domain	2014 HHIS (RTK) iodine present	Year	Sample size
Senegal	National	64.1%	41.3%	2005	7,412	National	67.8%	2014	1,760
	Urban	78.6%	57.5%	2005	3,590	Urban	83.2%	2014	
	Rural	59.5%	24.2%	2005	3,822	Rural	51.3%	2014	

** Adequate iodine by RTK is known to be unreliable (in-publication, Gorstein et al 2015)

		Project start - Iodine nutrition status (SAC)			Project start - Iodine nutrition status (WRA)			Project end - Iodine nutrition status (WRA)			
Country	Domain	2010 SAC Median UIC ($\mu\text{g/l}$)	Year	Sample size	2010 WRA Median UIC ($\mu\text{g/l}$)	Year	Sample size	Domain	2014 WRA Median UIC ($\mu\text{g/l}$)	Year	Sample size
Senegal	National	104.4	2010	655	92.2	2010	613	National	98.0	2014	1,456
	Urban	141.3	2010	300	114.7	2010	284	Urban	115.6	2014	468
	Rural	82.6	2010	355	72.8	2010	329	Rural	79.5	2014	988

Data sources:

DHS 2005, Final Report, Table0.8, p. 194

2010: National Iodine Survey 2009-10. Quantitative data at project start not presented in a way that allows for assessment of any iodine. By RTK any iodine was 56% national, 66.7% urban, 47.0% rural

2014: National Iodine Survey Senegal 2014. Median UIC for PW was 85.7 $\mu\text{g/l}$ at national level (n = 278)

Sudan

Executive Summary

IDD is a severe public health problem in Sudan with surveys finding goiter rates ~25% and Median Urinary Iodine Concentration of 9.8 ug/dl. Efforts to iodize salt, beginning in 2007 via MOU between Federal Ministry Health and international partners, focused on increasing consumption without sufficient attention to weakness of the supply-side: industrial capacity to iodize stood at 20%, only 3 of 18 states had mandatory iodization laws, and consequently in 2010 coverage was <10% of households. With the initiation of Partnership support, leadership and coordination structures were expanded and the program re-focused on the supply-side:

- *Program Coordination:* National Micronutrient Alliance was reactivated including participation from Ministry of Industry, Sudan Standards Metrology Organization, Consumer Protection Association and the salt industry - reflecting a greater focus on the supply chain. A Plan of Action 2013-2015 outlining stakeholder roles and responsibilities was adopted, including agreement on the objective of 50% coverage by 2015. More recently the Vice President set a target of 100%, which is included in both Ministry of Health and Ministry of Industry's plans of action for 2015-2017.
- *Legislation & Regulation:* The Partnership assisted in the development of draft regulations and supported state level advocacy, which led to the adoption of mandatory legislation in 10 states, including the Red Sea State, where almost all the national salt supply originates. Quality assurance and monitoring guidelines were developed and disseminated to relevant public agencies. However, to date regulatory bodies are not motivated to inspect producers and apply iodization standards.
- *Support to Industry:* In 2013, after sensitization and training events, iodization machines along with a one-year supply of KIO_3 were provided to Sudan's 18 medium scale and 1 large salt plants. The objective was to sustain iodization with gradual withdrawal of subsidized KIO_3 enabled by advocacy to producers along with securing tax-free status for KIO_3 imports. With new dosifiers and supply of KIO_3 , production of adequately iodized salt rose to 55% but declined equally precipitously to 20% within a year - with household coverage measured at only 7.5%. In 2015 only 4 of 18 iodization machines were functioning and KIO_3 procurement is well below expectations.
- *Public Education:* Social mobilization activities were conducted in 18 states beginning in June 2013 and ending in June 2014. However, since a consistent supply of iodized salt was not established, expenditures on a national campaign are delayed in order to ensure a balance of supply to satisfy any created awareness and demand.

For the future, the USI program will focus on: building capacity of salt producers to maintain iodization capacity and sustainably procure KIO_3 ; and increase capacity and motivation of food inspectors to enforce the law, especially among producers in the Red Sea State. With Partnership support, advocacy to GIAD, a large industrial group, has secured commitment to fully integrate iodization into a large modern salt refining and packaging facility scheduled to initiate operations in 2016.

Current status

Iodine Deficiency Disorders (IDD) are a serious public health problem in Sudan. The national prevalence of goiter has been estimated at 22 percent with State level estimates ranging from 5.4 percent to 42 percent (FMOH, 1997). It has recently been estimated that less than ten percent of households in Sudan consume adequately iodized salt (FMOH, 2010). Of the nearly 200K MT of salt produced in 2014, only 7.6% was reported to be adequately iodized.