Renewed commitment to iodized salt in Laos
IDD has long been recognized as a significant public health problem in Lao PDR. Surveys conducted in 1989–1990 in five northern and four southern provinces reported significantly elevated goiter rates in school-age children, and a nationwide survey in 1993 found that an astounding 95% of children were iodine deficient. In response, Lao PDR introduced Universal Salt Iodization (USI) in 1995, and by 2000 the goiter rate had dropped from 40% to only 9%. In 2006, the National Nutrition Survey confirmed that this achievement had been sustained: 90% of households in Lao PDR were consuming salt with some iodine (above 5 ppm by quantitative analysis) while 73.9% were using salt that was iodized adequately (with at least 15 ppm of iodine). In the same survey, the median urinary iodine concentration (UIC) in non-pregnant women aged 15–49 years was 205.4 µg/L, with 87% of UICs above 100 µg/L, clearly showing that the population had reached optimal iodine nutrition. But by 2011, the situation had taken a turn for the worse. The Social Indicator Survey, covering 18,674 households nationwide, reported that the coverage of iodized salt had dropped to 79.5%, below the coverage in 2006.

National survey of 2013

With support from UNICEF and the Iodine Global Network, a National School-Based Survey of Iodized Salt Use and Iodine Nutrition was conducted between November and December 2013. The survey included 2,858 children (51.1% girls and 48.9% boys), mostly from the Central region (49.7%), followed by the Northern (30.0%) and Southern (20.3%) regions. The majority of children (74.6%) lived in rural areas. The survey collected demographic data, information about salt purchasing behaviors in the household, and about the salt brands used in the home. All children brought a salt sample from home for rapid testing, and in a third of all samples iodine was quantified with a WYD Checker. Urinary iodine was measured in spot urine samples from 966 children.

Trends in population coverage, preferences, and quality of iodized salt

Almost 90% of the iodized household salt was bought in plastic (LDPE) packs labeled as “iodized salt.” Salt was purchased either at a local shop (over 40%), a local market (30.1%), from traders coming to the house (16.8%), or at a distant market in another district (3%). Three-quarters of households purchased salt in small packs (0.5–1 kg), but some (16.5%) preferred the bulk, 12 kg bags. The eight producers from the Lao Salt Production Group (LSPG) dominated the national market (85.3%, compared to 89% in 2005). Other producers provided only 2.5% of salt, while 3.2% of the households used imported salt, almost always in the provinces bordering Vietnam.

Rapid testing showed that iodine was present in 89.1% of all salt samples, and in just two out of 17 provinces (Savannakhet and Champasak, both in the Southern region) less than 80% of salt tested positive for iodine. But the RTK results correlated poorly with the iodine levels quantified with a WYD Checker; the latter showed that as much as 34% of all salt was not iodized at all (0 mg/kg), 29% contained between 0.1 and 14.9 mg of iodine per kg of salt, and 26% contained 15 to 39.9 mg/kg. The mean iodine content in household salt was 15.9 mg/kg (95% CI 14.5–17.2), and the national coverage of adequately iodized salt was only 37% (95% CI 34–40%), compared to 68% in 2005, demonstrating yet another downward step change.

Only 70% of the salt from the LSPG producers was iodized (compared to 90% in 2005), and only 40% was iodized adequately. Interestingly, imported salt was much less common than in 2005 (3.2% compared to 8.4%), and more of the imported salt contained iodine. But overall, the proportion of salt samples with iodine levels below 15 mg/kg was universally high (ranging from 21% in Oudomxay to 87% in Vientiane, and 93% in Savannakhet), showing that also the quality of iodized salt has deteriorated since the surveys of 2005 and 2011–2012.
Iodine nutrition status of the Lao population

In 2013, the national median UIC was 103 µg/L, which is only half the median reported in 2006 (205.4 µg/L measured in non-pregnant women of reproductive age) and only just above the lower cut-off for adequate iodine status (100 µg/L).

The iodine content of household salt and urban/rural residence were the two strongest predictors of iodine nutrition in children. Adjusted for other factors, every additional 10 mg/kg of iodine predicted a 6.7% improvement in iodine status. The UICs of children from rural areas were on average 40% lower than their urban counterparts. Since this remarkable urban-rural divide was independent of brand and salt purchasing habits, it may exist due to different dietary patterns (e.g. higher total food intake and better nutritional quality of foods in the urban households).

Notably, although the median UIC suggests that iodine nutrition in Lao’s population is technically sufficient, the cohort of children from rural households using salt with less than 15 mg of iodine per kg were at increased risk of iodine deficiency. Importantly, this subgroup included 51% of all children in this study, or 57% of all rural children. Controlling for other factors, especially household salt purchasing behavior, salt producer/brand, and child gender/age, the most affected provinces were in the Southern region of the country.

Why is the Laotian iodized salt program faltering?

Since iodized salt is the main source of dietary iodine in the Lao population, it is likely that this rather dramatic drop in UIC was caused by a problem within the supply chain. Indeed, salt iodization was all but suspended during the first 6 months of 2013 due to shortages of KIO₃, making it difficult for the population to remain iodine replete. A continuous supply of affordable potassium iodate (KIO₃) to salt processors is essential to ensure high-quality iodization. To meet this demand, a Potassium Iodate Revolving Fund (PIRF) was set up in 2006. Lao salt producers would purchase their KIO₃ supply from the stock buffer and pay a modest mark-up to the Fund to cover handling expenses. In return, the PIRF would replenish the buffer stock when needed against the funds accumulated from these payments. But the 2011 meltdown of the Fukushima nuclear reactor in Japan increased the price of KIO₃ worldwide, and the PIRF was confronted with the challenge of exploring cheaper sources of the fortificant.

After competitive bidding in 2012, the next purchase order was awarded to a new supplier in China. A new import permit and a safety guarantee had to be created, and eventually this switch caused a lengthy delay before the KIO₃ buffer stock could be replenished. In effect, the Lao salt producers ran out of their fortificant around January 2013, and the new supply did not become available until June or July. Naturally, this shortage period had a negative impact on the quality of iodized salt for all producers (Table 1).

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Salt iodine content by salt brand, Lao PDR 2013</th>
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<tbody>
<tr>
<td>Salt brand</td>
<td>n</td>
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<tr>
<td>Oudomxay</td>
<td>23</td>
</tr>
<tr>
<td>Khoksath</td>
<td>250</td>
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<tr>
<td>Veunkham</td>
<td>160</td>
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<tr>
<td>Other domestic</td>
<td>21</td>
</tr>
<tr>
<td>Boten</td>
<td>36</td>
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<tr>
<td>Vietnam import</td>
<td>31</td>
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<tr>
<td>Kengkik</td>
<td>158</td>
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<tr>
<td>Nateuy</td>
<td>140</td>
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<tr>
<td>Banbor</td>
<td>71</td>
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<td>Songkhone</td>
<td>7</td>
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</table>

*Weighted data
The vast majority of salt factories in Lao PDR are well-equipped and have a strong capacity for quality assurance and quality control (QA/QC) of their iodized salt production and supply. The reason why salt iodization failed or was executed poorly was a temporary shortage of potassium iodate, which meant that the factories could not maintain their commitment to the USI mandate. The stockout was caused by an unfortunate set of circumstances, leading to a temporary disruption of salt iodization across the country.

At the same time, Lao’s salt producers experienced temporary shortages of the WVD Iodine Checker solutions, showing how strongly they rely on the Provincial Health Office for their supply. Stellar examples of high-quality management and operations, solid collaboration among partners, professional QA data collection, and USI monitoring were found in some of the salt factories and Provincial Health Offices, but not everywhere. In provinces where performance had suffered (e.g. the Savannakhet Municipality and Province), the difficulties were not caused by a systemic failure, but rather by a weakened commitment to the expected roles in the partnership.

Concerned about these alarming findings, Lao’s stakeholders (the Food and Drug Directorate within the Ministry of Health, the Commerce Department of the Ministry of Industry & Commerce, and the LSPG Secretariat) are now working together to strengthen the management and oversight of the Potassium Iodate Revolving Fund, and to streamline the surveillance and service provision for salt factories as part of the USI strategy. These improvements are expected to be completed by early 2015, when the IDD elimination efforts through USI will be fully integrated into the new national nutrition policy, inspired by the global Scaling Up Nutrition movement.

In 2013, children from rural areas had 40% poorer iodine status than their urban counterparts.