Papua New Guinea's commitment to USI pays off

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Severe consequences of iodine deficiency, including endemic cretinism, were identified in Papua New Guinea (PNG) as early as in the 1950s. The situation was so serious that ethical clearance was given for the first ever trials using iodized oil injections for the management of IDD to be conducted in the country in 1957 (1). The trials resulted in a drastic decline in the goiter rate, however a national program to provide iodized oil injections to the population was not initiated. Surveys in the 1980s and 1990s showed widespread iodine deficiency, with goiter rates in women and school-age children ranging from 0.5 to 54.2% across different regions.

Mandating USI

The Government of Papua New Guinea made a commitment to eliminate iodine deficiency as a public health problem by signing the World Summit for Children declaration in 1990. The country adopted universal salt iodization (USI) as the main strategy for the elimination of IDD. The Pure Food Standards of the PNG Pure Food Act of 1970 (with later amendments) mandates the addition of potassium iodate to table salt so that it provides no less than 40 mg/kg of iodine, and to all other edible salt to provide no less than 30 mg/kg of iodine. These iodization standards are higher than the global recommendation (>20–40 mg/kg at the point of production), recognizing that salt consumption is relatively low in PNG (variously estimated at 1.9–9.6 g per capita per day) (2).

Embedding iodine in the family and child health agenda

Political commitment to USI was consolidated in several major policy documents including consecutive National Health Plans (NHPs) for 1996–2000, 2001–2010, and 2011–2020. USI also features in the PNG Vision 2050 document, launched in 2009, whose objective is for PNG to become "a Smart, Wise, Fair, Healthy and Happy Society by 2050" (3). The current NHP (2011–2020) focuses on improved service delivery and primary health care to achieve eight Key Result Areas (KRAs) and reach the goal of "a healthy and prosperous nation for all, both now and for future generations" (4). The elimination of IDD as a public health problem is embedded in three of the eight KRAs.

Implementation and monitoring of the USI strategy is also fully integrated into the new National Nutrition Policy (NNP 2014–2023). Combating micronutrient deficiencies, including iodine deficiency, is one of the plan's seven objectives. The plan also stresses the need for adequate nutrition and support during the first 1000-day 'window of opportunity' and the extended period that includes adolescence. It highlights the consequences of inadequate nutrition during the first 1000 days of a child's life (from conception to second birthday), which may include brain damage, stunted stature, impairment or delays in meeting cognitive developmental milestones, poor mental capacity, diminished learning ability, and poorer educational performance. The NNP calls for political commitment at the highest level to reduce the short- and long-term impact of hidden hunger and malnutrition, two major obstacles to reaching the goals of Vision 2050 and achieving the KRAs outlined in the current National Health Plan.

Elimination of IDD is the responsibility of a multi-sectoral national committee established under the Food Sanitation Council and coordinated by a senior executive in the National Department of Health. The IDD program is integrated into the Family Health program for resource allocation. Assessment of iodine status in PNG is undertaken by the Micronutrient Laboratory set up in 2003 at the University of Papua New Guinea.

TABLE 1 **Availability of salt in households (%HH) in small surveys conducted between 2012 and 2014.**

Demographic characteristics	Household coverage (% HH)	Percent of households with adequate levels of iodine in salt	
Mini-surveys (2012 – 2014)		≥30 ppm	≥15 ppm
Gouno Lufa district, 2012	100.0	2.4	76.2
Kubalia district, 2013	89.5	17.6	58.8
Lorengau district, 2014	100.0	25.0	59.1

Changes in household use of iodized salt

The implementation of USI in 1995 significantly improved the availability and use of iodized salt in most parts of the country. The 2005 National Nutrition Survey (5)

Girl sells sweet potatoes, a local staple, at a market in Madang, PNG.

reported that all salt found in households contained some iodine (>0 ppm), and 92.5% was iodized adequately according to the global standard (≥15 ppm), and 81.6% according to the national standard (≥30 ppm). High household use of iodized salt was also reported at the regional level (except in the Southern Region, where 76.1% of salt was iodized at ≥15 ppm, and 50.3% at ≥30 ppm) and in both urban and rural areas. A total of 8 brands of salt were available nationally, of which 6 were imported brands.

Importantly, a considerable proportion of households in that survey (38.1% overall) did not have any salt at the time of data collection; this proportion was higher in the Southern Region (49.6%), and in rural areas (41.5%). It is not clear whether some households never buy salt and miss out on the benefits of iodization, or whether they buy salt day-to-day and had run out on the day of the survey.

Several mini-surveys conducted across several districts between 2012 and 2014 reported that almost all households had access to salt with at least some iodine (6–8). Although about 60% of the salt was iodized at 15 ppm or more, a significantly lower proportion met the national standard of ≥30 ppm *(Table 1)*.

Iodine levels in salt at the point of sale

Iodine content in salt collected from retail outlets was measured in the 2005 NNS, and more recently in the mini-surveys between 2010 and 2014 (5–8). The recent surveys show that the variety of salt brands available in the National Capital District (the capital city of PNG) has increased. About half to two-thirds of the salt was iodized at ≥15 ppm, but only about a third was iodized at ≥30 ppm, the level expected at the point of production.

Urinary iodine

In 2005, the median urinary iodine concentration (MUIC) in women of reproductive age in Papua New Guinea was 170.0 µg/L, with 71.1% of UICs above 100 µg/L (6). At the regional level, the median UIC ranged from 129.5 to 290.0 µg/L, suggesting that iodine nutrition was adequate in all regions. However, the median UIC was significantly lower in the households without any salt than where salt was present (111.4 vs. 203.5 µg/L). In 8 out of 97 of the sampling clusters, none of the households had salt on the day of the survey. In these households, the median UIC was only 79.5 µg/L, indicating mild iodine deficiency. By comparison, women from the clusters with salt in the household had a median of 182.55 µg/L.

But mini-surveys conducted in recent years in various subpopulations (pregnant women, lactating mothers, infants, and school-age children) appear to reflect consistently adequate iodine intakes among all groups with the exception of school-age children in one of the districts *(Table 2)* (5-10).

Recommendations and next steps

The latest surveys showing that, by and large, Papua New Guinea has reached optimal iodine nutrition reflect the tremendous progress made since the implementation of USI. Yet, a significant proportion of salt (even in the NCD) remains inadequately iodized. In addition, the relatively high proportion of households with no salt suggests that there may be pockets of the population that are not reaping the benefits of USI and are, therefore, still at risk of IDD. While the overall findings are optimistic, they also highlight the need for ongoing monitoring and assessment of the implementation of USI and iodine status to ensure that the achievements made in the last decade are being sustained. In particular, more systematic monitoring at a sub-national level may be necessary to identify the pockets unreached by USI. However, routine and systematic monitoring requires adequate funding. The situation is complicated by the fact that systematic monitoring of imported salt at the points of entry is lacking, which could explain why some of the salt on the market is not iodized to the national standard (≥30 ppm).

Salt brands available in Papua New Guinea have increased in recent years.

Although national policies and strategies recognize the importance of salt iodization as a strategy to eliminate IDD, more efforts are needed from all national stakeholders to actively implement it. The current status of the salt iodization program in PNG can, therefore, be characterized as "existent but needing strengthening." Sustaining progress requires greater political commitment to USI, regular and routine reviews of the program, more systematic monitoring, and active enforcement of national legislation to ensure that salt iodization becomes truly universal.

TABLE 2 Urinary iodine concentration (UIC) in different population groups measured in small surveys between 2005 and 2014 in Papua New Guinea

Location	Subjects	N	Median UIC (µg/L)	Adequate iodine status criteria
NCD, 2005	Non-pregnant women	86	170	≥100 µg/L
	Pregnant women	212	180	≥150 µg/L
NCD, 2007	Infants	100	254	≥100 µg/L
	Lactating mothers	100	125	
Aseki-Menyamya district, 2011	Children 6-12 yrs	207	150	≥100 µg/L
Gouno Lufa district, 2012		132	50	
Kubalia district, 2013		192	172	
Lorengau district, 2014		233	215	

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