Senegal struggles to control iodine deficiency

Iodine status is borderline in rural women and children and just half of households have access to iodized salt

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Personal digital assistants (PDAs) steamlined data collection in the Senegal iodine survey

Background

With an estimated annual salt production of 450,000 tons, Senegal is West Africa's largest salt producer. The country easily meets its domestic salt needs estimated at 45,000 tons and exports the remainder to Europe and other African countries. Of the domestic production, one large and one medium size producers account for an estimated 280,000 tons, primarily for export, while thousands of artisanal salt harvesters produce the remaining 170,000 tons. An estimated 80,000 tons

THE INTERNATIONAL COUNCIL FOR CONTROL OF IODINE DEFICIENCY DISORDERS (ICCIDD) is a nonprofit, nongovernmental organization dedicated to sustained optimal iodine nutrition and the elimination of iodine deficiency throughout the world. Its activities have been supported by the international aid programs of Australia, Canada, Netherlands, USA, and also by funds from UNICEF, the World Bank and others.

produced by artisanal salt harvesters is iodized, primarily in the context of small cooperatives called economic interest groups (EIGs) that are supported by the government through training and equipment [1]. The iodization status of the remaining 90,000 tons is uncertain.

Senegal mandated in 1995 the iodization of culinary salt and then in 2000 the iodization of all salt produced in and entering the country. The Senegalese government in 2006 has created a National Committee for Salt Iodization that brings together the Ministry of Industry, Ministry of Trade, Ministry of Health, Crafts Ministry, Consumer Associations, as well as technical and financial partners including the World Food Programme, World Health Organization, Micronutrient Initiative, the Global Alliance for Improved Nutrition, and United Nations Children's Fund. The National Committee's major goal is to support EIGs in the production of quality and adequately iodized salt. In this regard, it is committed to cover the remaining 90,000 tons of production with the current EIG model.

The 2005 Demographic and Health Survey (DHS) [2] served as the baseline for the recent salt iodization efforts in Senegal. Using the rapid test kit, the survey demonstrated that 64% of household salt was iodized. In 2007, a survey conducted in two Southern regions with previously poor iodization coverage and low iodine status showed substantial improvements in these indicators [3]. In order to be able to evaluate the impact of the salt iodization program on iodized salt coverage and iodine status on a national scale, the National Committee decided in 2010 to implement the first country-wide survey on iodine deficiency disorders (IDD) [4]. The survey was made possible through financial and technical support from the Micronutrient Initiative.

Survey methods

The country (see map) was divided into two strata: One for regions with traditionally poor iodine status (Tambacounda, Kédougou, Kolda and Sédhiou; the 'endemic zone') and one for the rest of the country (the 'control zone'). The Ziguinchor region was not surveyed because of poor security. The survey population was women of reproductive age, defined as ages 15-49 years, including those who reported to be pregnant during the interviews, and children of primary school age (ages 6-12 years). Statistical power calculations showed that a sample of 1500 households in the endemic and 2000 in the control zones was needed to determine household salt iodization coverage (using the rapid test kit) and other endpoints with adequate precision. In a subsample of 700 households, salt samples were collected to determine salt iodine concentrations, and samples were collected among women and children to determine urinary iodine concentrations (UIC). The subsampling was performed with the use of personal digital assistants (PDA) as a function of the number of family members present in the household. PDAs were also used to administer two questionnaires and collect responses as well as the location of the household using global positioning systems [5]. UIC and salt titration analyses were performed at the Université Cheikh Anta Diop, Dakar, Senegal.

Results: salt iodization

Data were collected between 15 October and 6 November, 2009. Of the 3768 households surveyed, 1506 (40%) were in the endemic zone and 2262 (60%) in the control zone, while 1729 (46%) households were in urban and the remaining 2039 (54%) in rural areas.

Figure 1: Household availability of iodized salt in Senegal by area of residence

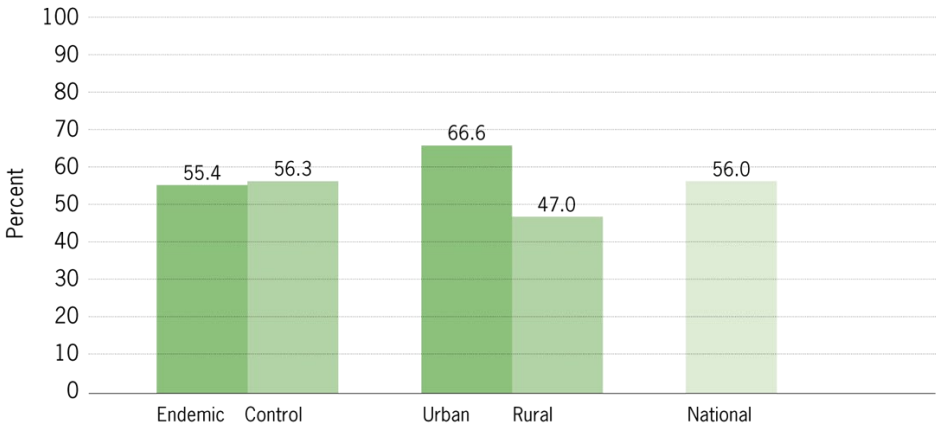
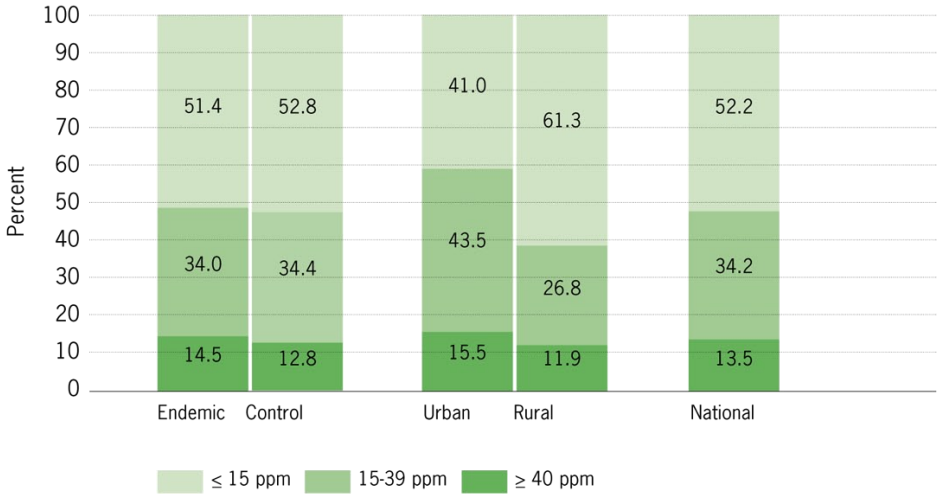


Figure 2: Salt iodine concentrations in Senegal by area of residence



The households surveyed were inhabited by 31,397 persons, including 6309 children aged 6-12 years (20%) and 7980 women of reproductive age (25%); of the latter, 302 women were pregnant at the time of the survey. In the subsample, data was available for 695 households; of those, 310 (45%) were in the urban and 282 (41%) in the endemic areas. Salt was available in 97.2% of households surveyed. Nearly 80% of salt was packaged in bulk; this proportion was higher in endemic (92.0%) than control (69.8%) and in rural (85.3%) than urban (70.8%) areas.

Rapid test kit results indicated that 56.0% of Senegalese households have iodized salt (Figure 1). The availability was similar in endemic and control areas, and higher in urban than rural areas. The titration analyses from the subsample revealed that the median national iodine concentration was 15 ppm and varied significantly between urban (19 ppm) and rural (12 ppm), but not between endemic (15 ppm) and control (14 ppm) areas (data not shown). The analyses also showed that 34.2% of salt was iodized between 15-39 ppm, and 13.5% at ≥ 40 ppm, yielding a proportion of salt iodized at ≥ 15 ppm of 47.7% (Figure 2).

Results: urinary iodine concentrations

Among children aged 6-12 years, the national median urinary iodine concentration (UIC) was 104 µg/l (Table 1). In all, 47.8% of children had UIC < 100 µg/l and 19.4% had UIC <50 µg/l. In urban and control areas, the median UIC was ≥ 100 µg/l, whereas it was < 100 µg/l in rural and endemic areas. Among non-pregnant women aged 15-49 years, the national median UIC was 92 µg/l (Table 2). Overall, 54% of women had UIC < 100 µg/l and 24.1 had UIC <50 µg/l. Similar to the children, the median UIC was ≥ 100 µg/l in the urban and control areas.

Discussion and Policy Implications

This survey was conducted out of the strong commitment of the National Committee for Salt Iodization to ensuring that >90% of the salt used in Senegalese households is iodized. Even though important progress has been made towards this goal since the implementation of the legislation on iodized in 1995, it appears that household iodized salt coverage has in fact decreased slightly in recent years from 64% (as shown in the 2005 DHS) to 56% in the current survey [2] .

The urinary iodine data indicates that non-pregnant women of reproductive age are mildly iodine deficient. There is a strong rationale for ensuring that women of reproductive age have adequate iodine status. This is because iodine deficiency during pregnancy, especially in its severe form, impairs maternal thyroid hormone metabolism and may thus impair fetal brain development [6], and increase risks of fetal and perinatal mortality [7, 8]. The survey showed that the iodine status of school-aged children is of borderline sufficiency on the national level and that those living in rural and the Southern endemic zones are mildly iodine deficient. Such deficiencies status may impair cognition and school performance [9, 10] and ensuring an equitable coverage of adequately iodized salt, the most feasible and sustainable measure to prevent such deficiencies, should thus be of priority.

On the basis of this survey, program managers must continue to seek improvements of the national salt iodization program, as the country is still far from the goal of Universal Salt Iodization, defined as >90% availability of household iodized salt. Promising strategies include finding more effective ways to support EIGs, such as by developing viable business models and sustainable systems for vital supplies such as potassium iodate. Furthermore, increasing the coverage of the current EIG system to cover the estimated 90,000 tons of salt with uncertain iodization levels is crucial.

Even though the household coverage of iodized salt (56.0%) was similar to the proportion of adequately iodized salt (47.7%), which may indicate that iodization, once performed, generally equals or exceeds the 15 ppm level, optimizing iodization practices to prevent deficiency or excessive levels should remain a programmatic goal. To complement these efforts, the enforcement of national legislation on mandatory salt iodization needs to be strengthened to limit the commercialization of non-iodized salt. Operational assessments are needed to learn where current efforts are falling short of expectations.

The opinions and statements in this article are those of the authors, and may not reflect official policies of UNICEF or the Micronutrient Initiative. Correspondence to: Banda Ndiaye, bndiaye@micronutrient.org

Table 1: Urinary iodine concentrations of children aged 6-12 years in Senegal

	Area of residence		Area of residence		National
	Endemic	Control	Urban	Rural	
Median (µg/l)	92	114	141	83	104
% < 20 µg/l	4.2	3.8	1.7	5.9	4.0
% 20-49 µg/l	18.9	13.1	8.7	21.1	15.4
% 50-99 µg/l	31.7	26.2	20.7	34.9	28.4
% 100-199 µg/l	27.2	33.8	39.7	23.9	31.1
% 200-299 µg/l	12.8	13.8	17.7	9.9	13.4
% ≥ 300 µg/l	5.3	9.2	11.7	4.2	7.6

Table 2: Urinary iodine concentrations of non-pregnant women aged 15-49 years in Senegal

	Area of residence		Area of residence		National
	Endemic	Control	Urban	Rural	
Median (µg/l)	79	100	115	73	92
% < 20 µg/l	5.5	4.0	2.1	6.7	4.6
% 20-49 µg/l	26.2	15.4	12.3	25.8	19.6
% 50-99 µg/l	27.4	30.6	27.1	31.3	29.4
% 100-199 µg/l	24.1	33.0	34.2	25.5	29.5
% 200-299 µg/l	13.9	11.4	17.6	7.9	12.4
% ≥ 300 µg/l	3.0	5.6	6.7	2.7	4.6

Senegalese women and children benefit from iodized salt