

IODIZED SALT AND IODINE UPTAKE IN SCHOOLCHILDREN AND PREGNANT WOMEN IN ROMANIA

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Endemic goiter occurred to different degrees throughout 2/3 of Romania, in the old known ring of the Carpathian Mountains and hill area, in north Moldavia and some districts of Transylvania.

The Ministry of Health proposed a control program in 1947 but an applicable legislation for iodized salt was not passed until 1956.

Following the implementation of iodine prophylaxis, the severe endemy of goiter was reduced and the endemic cretinism registered in the Carpathian region disappeared. There were several attempts of iodized salt prophylaxis on the voluntary basis. The main steps of iodine-deficiency correction using iodized salt in Romania are shown in Table 1.

Table 1. Iodine Prophylaxis in Romania

Year	Legislation of Iodized Salt	Iodine Compound	Distribution	Voluntary (V) / Compulsory (C)
1962	Government Decision 1056/1962	KIO ₃ , 15-25mg/1kg salt	23 counties	V
1986	Government Decision 1056/1962	KIO ₃ , 15-25mg/1kg salt	30 counties	V
1995	Government Decision 779 from Official Monitor 233 of Oct 10 th	KIO ₃ , 40-50mg/1kg salt	41 counties; household	V
2002	Government Decision 586 from June 5 th	KIO ₃ , 34±8.5mg/1kg salt	41 counties; household, baking industry food industry	C
2004		KIO ₃ , 34±8.5mg/1kg salt	41 counties; household, bakeries	C

Importantly, the reevaluation of iodine deficiency (ID) by epidemiological studies after 1990 revealed the persistence of goiter with an incidence of 1.09 – 26.45% in 20226 schoolchildren from all the districts.

The 1992 national study on urinary excretion of iodine in 31 counties showed values of 25.5 – 50.1 µg/l in 12 counties, 50 – 100 µg/l in 13 counties and above 100 µg/l in 6 counties.

In 1999 – 2000, similar national studies assessing 7089 schoolchildren showed that only 6 of the studied districts had median urinary iodine within the normal range while values indicating moderate to mild iodine deficiency were found in 24 other districts. All these data show the inefficacy of iodized salt prophylaxis model, so far.

In June 2002, the Romanian government approved a new legislation that regulates the universal iodization of salt (mandatory iodized salt for household and baking industry).

The continuing and adequate monitoring must be an important part of the iodine supplementation program (ISP). Thus, we studied the improvement of iodine uptake in schoolchildren and pregnant women after the reinforcement of iodized salt legislation using the measurement of urinary iodine concentration (UIC) through cerium-arsenic assay.

Representative groups of schoolchildren from mountain, hill and plain area districts were included.

We determined UIC of 4757 schoolchildren in 2004-2005, of 1747 schoolchildren in 2006-2008.

In 2004-2005 we determined UIC in 1575 pregnant women and in 2006 – 2008 in 788 pregnant women.

In 2004-2005 the median UIC in schoolchildren was 92.50 µg/l, in 2006 – 2008 the median UIC was 117.5 µg/l. We observe an increase of the median UIC compared to median UIC of 57.5 µg/l in 2001 – 2002. The proportion of schoolchildren with a UIC < 100 µg/l, < 50 µg/l and < 20 µg/l in 2006 – 2008 were 34%, 5% and 0%, respectively (Table 2).

Table 2. Median UIC and percentage of individuals with UIC below 100 µg/l, 50 µg/l and 20 µg/l in studied schoolchildren

Schoolchildren	n	Median	% <20	% <50	% <100
1999-2002	7045	57.50	2.27%	34.92%	73.27%
2004-2005	4757	92.50	0.29%	13.41%	53.27%
2006-2008	1742	117.50	0.00%	5.63%	34.16%

The median UIC in pregnant women was 57.5 $\mu\text{g/l}$ in 2004 – 2005 and 85 $\mu\text{g/l}$ in 2006 – 2008. The proportion of pregnant women with a UIC < 100 $\mu\text{g/l}$, < 50 $\mu\text{g/l}$ and < 20 $\mu\text{g/l}$ in 2006 – 2008 were 59%, 19% and 0.5%, respectively (Table 3).

Table 3. Median UIC and percentage of individuals with UIC below 100 $\mu\text{g/l}$, 50 $\mu\text{g/l}$ and 20 $\mu\text{g/l}$ in pregnant women

<i>Pregnant Women</i>	<i>n</i>	Median	% <20	% <50	% <100
1999-2002	814	50.00	2.77%	44.14%	83.86%
2004-2005	1575	57.50	1.99%	34.11%	78.06%
2006-2008	788	85.00	0.53%	19.72%	59.33%

Median UIC in representative groups of schoolchildren before and after the mandatory salt iodization legislation in 2002 shows an increase (Figure 1).

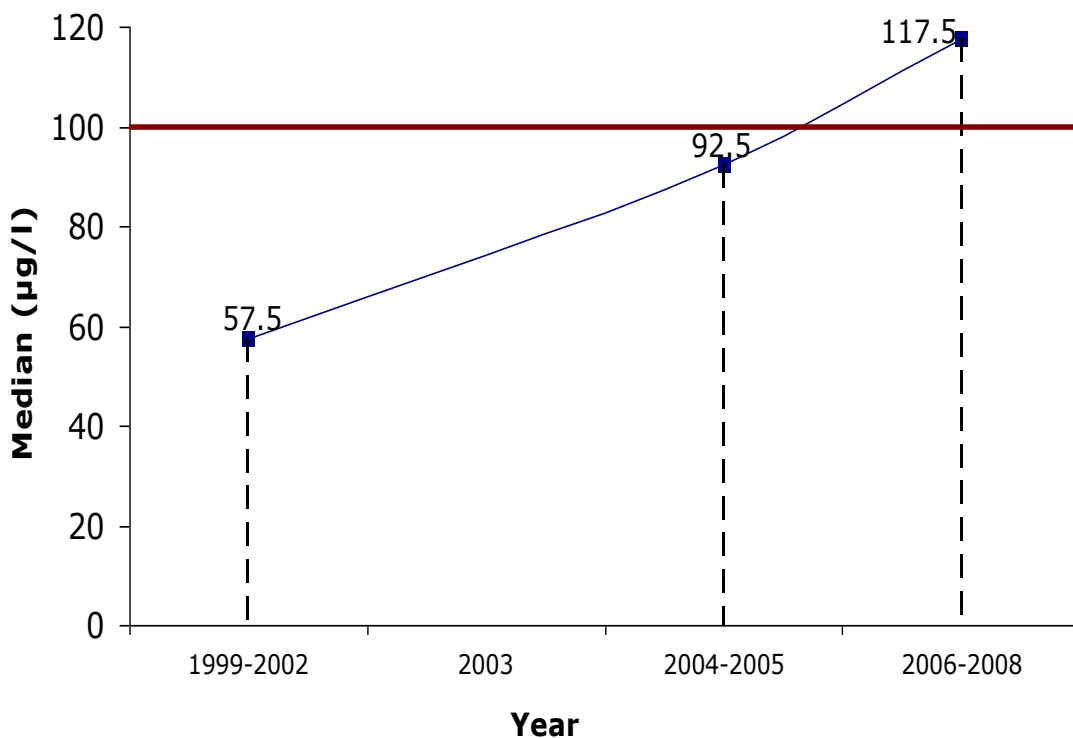


Figure 1. Normalization of median UIC in schoolchildren after the mandatory salt iodization legislation in 2002

Median urinary iodine concentration in pregnant women after the mandatory salt iodization legislation in 2002 did not reach the normal value (Figure 2).

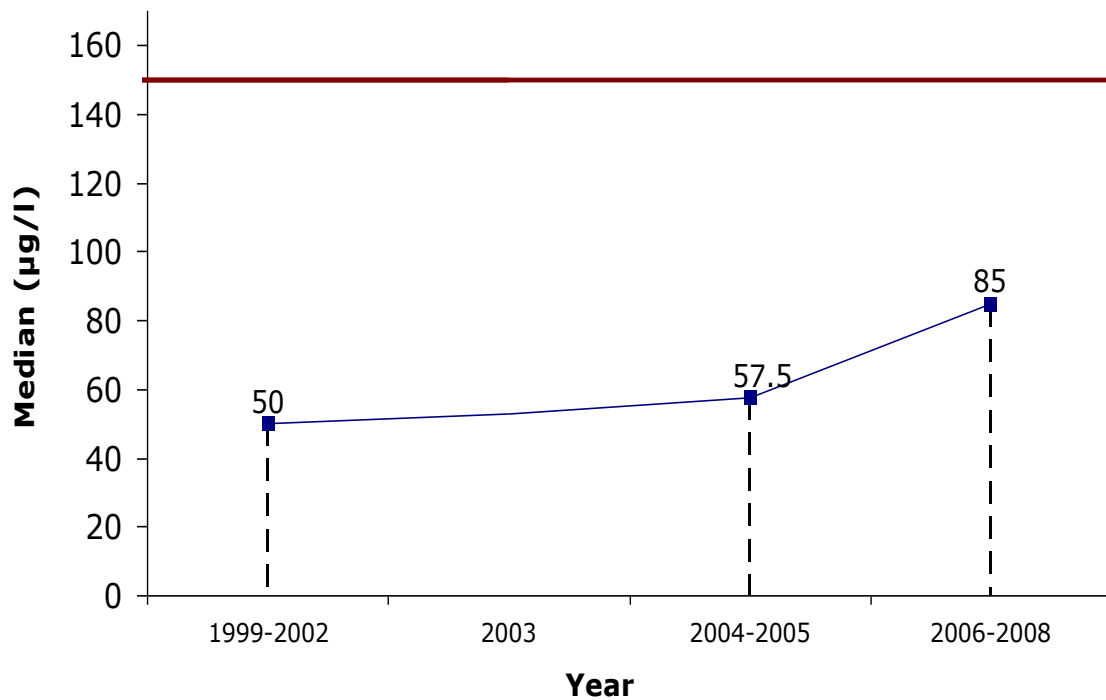


Figure 2. Median UIC in pregnant women before and after the mandatory salt iodization legislation in 2002.

We exemplify the new enforcement of iodide salt legislation in three mountain counties Cluj, Sibiu (Figure 3) and Bistrita (Figure 4) that previously showed a considerable iodine deficiency, as well as in two plain counties Timis and Bucharest (Figure 5).

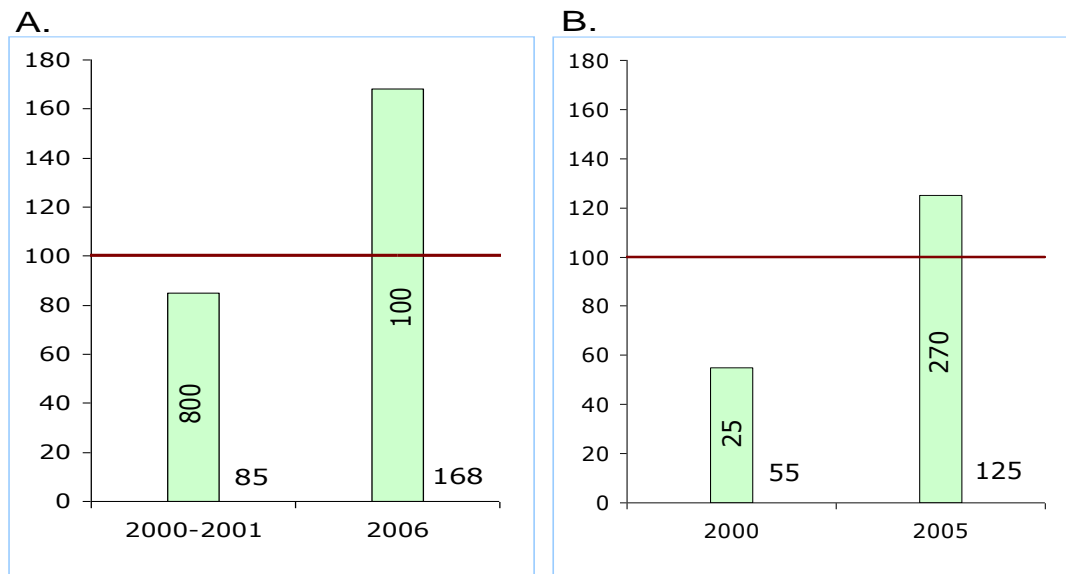


Figure 3. The median of UIC in schoolchildren before and after 2002 mandatory salt iodization legislation. **A.** Cluj, **B.** Sibiu

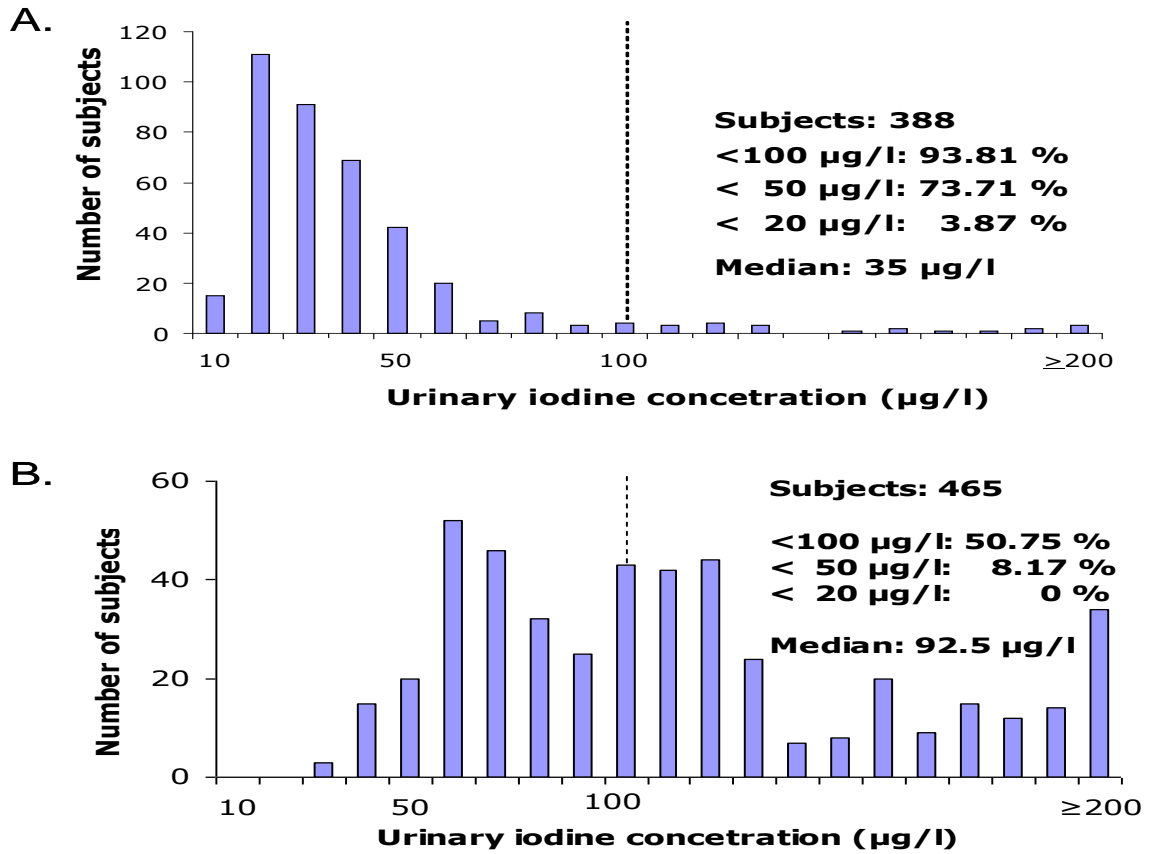


Figure 4. Frequency distribution of urinary iodine concentration in schoolchildren from Bistrita investigated in **A.** 2002. **B.** 2004-2005

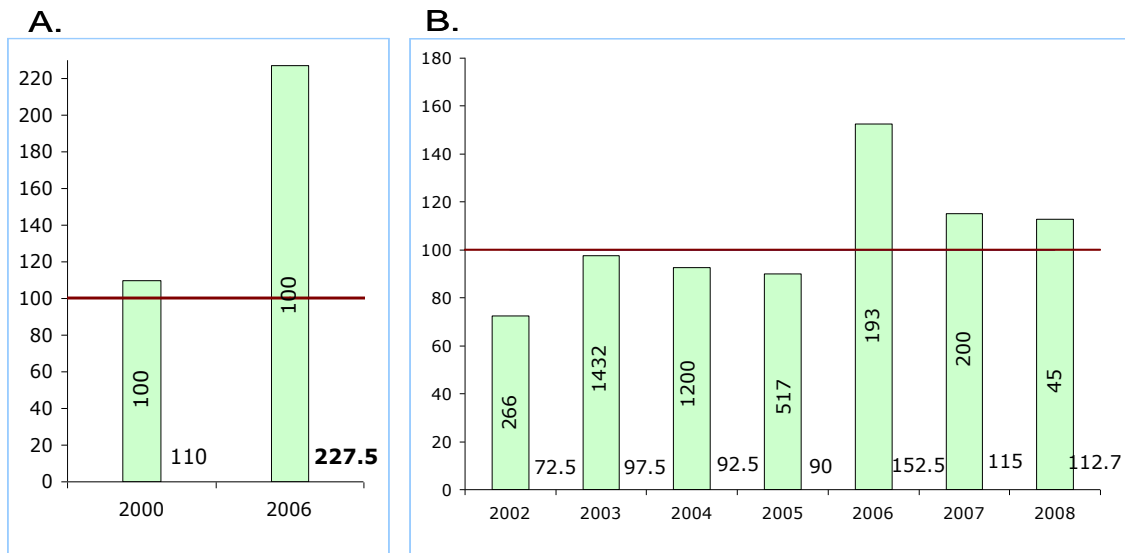


Figure 5. The median of UIC in schoolchildren before and after 2002 mandatory salt iodization legislation in two plain counties **A.** Timis, **B.** Bucharest

To conclude, we performed the reevaluation of the iodine status after the reinforcement of iodized salt legislation in Romania by estimation of the median urinary iodine of schoolchildren and pregnant women. The data obtained show that the median UIC values in schoolchildren are in the range recommended for normal iodine intake (100 -199 $\mu\text{g/l}$ - ICCIDD) (Figure 6), but the median UIC values in pregnant women from the districts included in the study (Figure 7) remain very low .

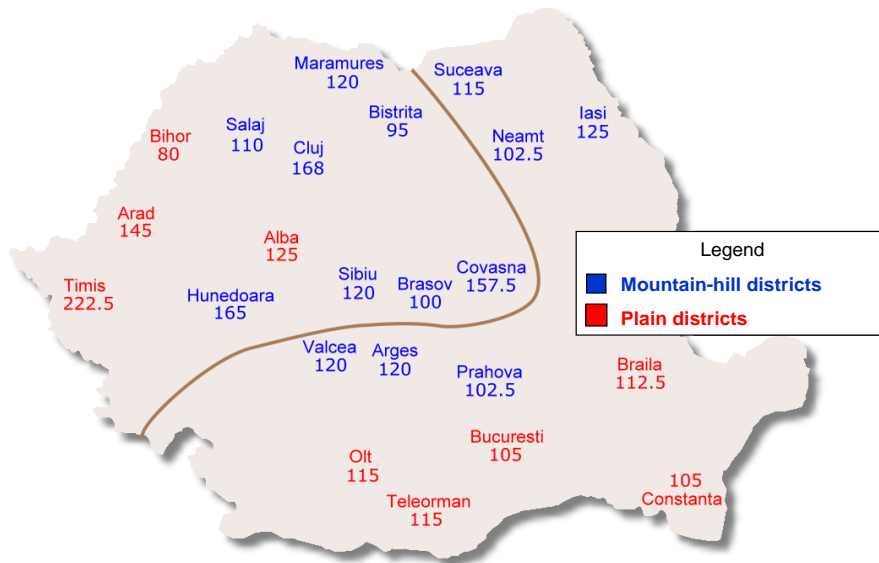


Figure 6. Median urinary iodine concentration ($\mu\text{g/l}$) of schoolchildren in 2005 - 2006 after the change of iodized salt legislation (23 districts, 4649 subjects)

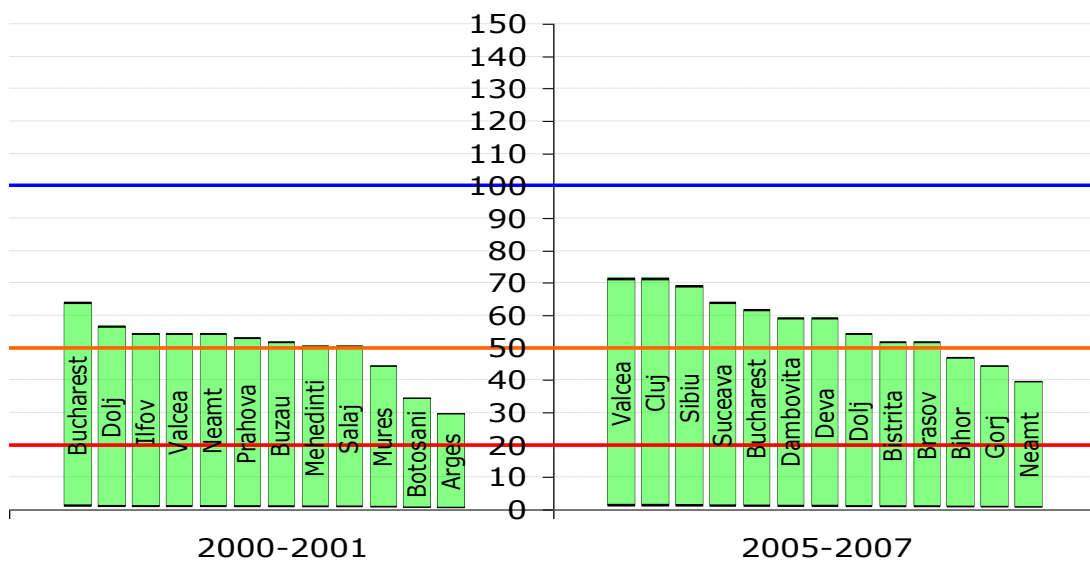


Figure 7. Urinary iodine concentration in pregnant women before and after the introduction of new legislation of salt iodization represented for each district included in the study

As it is well known that ID in pregnant women can result in stillbirths, miscarriages and congenital abnormalities the values obtained for the pregnant women suggest that there is an emergency situation that should be solved as soon as possible. Moreover, considering that iodine is vital for brain development and ID in children, results in a reduction of up to 15% in intellectual capacity and learning ability, we intend to extend our study by further controlling the thyroid function using measurement of TSH, FT4, T3 and thyroglobulin in pregnant women and in neonates (umbilical cord).

Keywords: iodine supplementation, Iodine Deficiency Disorders (IDD)