To address the re-emergence of iodine deficiency in Australia, in 2009 it became mandatory for bread manufacturers to use iodized salt in the baking process at levels of 25–65 mg per 1 kg of salt, so that 100 g of bread contained 48 μg of iodine. Additionally, the National Health and Medical Research Council recommended all pregnant and lactating women take daily supplements containing at least 150 μg of iodine. Two recent studies looked at the effect of these two interventions on iodine intakes in pregnant Australian women.

I. The impact of iodine supplementation and bread fortification on urinary iodine concentrations in a mildly iodine deficient population of pregnant women in South Australia

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This prospective study assessed iodine status of South Australian women during pregnancy, the use of iodine-containing multivitamins and the impact of fortification of bread with iodized salt. Women (n = 196) were recruited at the beginning of pregnancy and urine collected at 12, 18, 30, 36 weeks gestation and 6 months postpartum. The use of a multivitamin supplement was recorded at each visit, and spot UICs were measured. Iodine-containing multivitamins were used by 47% of women during pregnancy, while 23% used no multivitamins and 30% used dietary multivitamins without iodine.

Use of supplements containing iodine predicted higher UIC at 36 weeks gestation and in the postpartum period (Figure 1). The proportion of women with UIC above the WHO recommendations of 150 μg/L in pregnancy was assessed according to the use of supplementation at each time point. At 30 and 36 weeks gestation, more women who used iodine containing dietary supplements had UICs >150 μg/L (37 and 43%) compared to those not using iodine supplements (19 and 25%).

The median UIC for pregnant women was 82 μg/L indicating mild iodine deficiency. The consumption of iodine supplements was associated with a significantly higher UIC than nonconsumption (median = 89 vs. 75 μg/L). Overall, there was an improvement in iodine status after mandatory iodine fortification of bread. The median UIC of pregnant women not using an iodine-containing multivitamin during pregnancy was 68 μg/L prior to bread fortification, and 84 μg/L afterward.

Figure 1: Urinary iodine concentrations during pregnancy and 6 months postpartum according to the use of iodine-containing multivitamins in Australian women.

Groups that do not share superscript letters are significantly different.
The data indicates that overall women in this region of Adelaide are mildly iodine deficient in the absence of supplementation but iodine-containing multivitamins designed for pregnancy lead to iodine sufficiency in the 3rd trimester and postpartum for many women. Furthermore the fortification of bread significantly increased UIC but not to a level compatible with iodine sufficiency, suggesting that supplements are still required by most Australian women during pregnancy.

Post-fortification, iodine-containing supplements were being taken by 60% and 66% of women in 2011 and 2012, with the most common dosage being 250 μg/day (45%), followed by 150 μg/day (30%).

The mild iodine deficiency pre-fortification (median UIC = 88 μg/L) has steadily improved to 146 μg/L in 2011 and 166 μg/L in 2012 (n = 95) (Table 1). However, only women taking iodine-containing supplements had an adequate median UIC (2011: 178 μg/L; 2012: 202 μg/L). While in non-supplement users, median UIC remained insufficient (2011: 109 μg/L; 2012: 124 μg/L).

Despite fortification of bread salt, dairy foods remained major contributors to total iodine intake. In 2012, most dietary iodine was provided from milk and dairy sources (58%), followed by breads and cereals (20%), tap water (8%), iodized salt (4.5%), seafood (3%), and eggs (3%). Overall knowledge regarding health implications of iodine deficiency was poor.

The study suggests iodine intakes have improved in Australian pregnant women following introduction of the mandatory iodine fortification of bread. But there is a need for public health education given the lack of knowledge regarding iodine nutrition among women. Ongoing monitoring of the iodine status of pregnant women is essential to ensure that fortification and supplementation strategies achieve optimal iodine intakes, without the risk of exes.

Table 1: Median urinary iodine concentrations (μg/L) of pregnant women in New South Wales, Australia.

<table>
<thead>
<tr>
<th></th>
<th>2008 (Pre-fortification)</th>
<th>2011 (Post-fortification)</th>
<th>2012 (Post-fortification)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 110</td>
<td>n = 106</td>
<td>n = 95</td>
</tr>
<tr>
<td>All</td>
<td>88</td>
<td>146</td>
<td>166</td>
</tr>
<tr>
<td>Taking iodine-containing supplements</td>
<td>–</td>
<td>178</td>
<td>202</td>
</tr>
<tr>
<td>Non-supplement users</td>
<td>–</td>
<td>109</td>
<td>124</td>
</tr>
</tbody>
</table>
Iodine deficiency in Aboriginal teenagers

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In the 2003-4 Australian National Iodine Nutrition Survey, school children in the south-eastern states (where the majority of the Australian population live) had median urinary iodine concentrations (UIC) in the mild deficiency range. However, there was no specific sample of indigenous Australians in that survey. In this study, the participants (n=376) were part of the Aboriginal Birth Cohort Study and were aged 16–20 years at the time of the survey. They lived in urban (the city of Darwin) and rural areas of sparsely-settled tropical north of Australia.

In spot samples, the median UIC was highest in the boys living in Darwin (77 μg/L) (Figure 1). Among the other groups – Darwin girls and rural boys and girls – median UIC was lower (47-55 μg/L). Median UIC in girls who were pregnant or had a young infant was similar to non-pregnant girls. Mandatory fortification of salt (45mg/kg salt) used in bread commenced in Australia in late 2009. Remeasuring iodine concentrations in this group will provide an assessment of whether this important initiative has had an impact on indigenous Australians living in remote areas.

Iodine status of populations is defined by categorising the median UIC. Because iodine excretion reflects recent intake, and high concentrations of iodine are found in a limited range of foods, the iodine concentration in a random urine sample, or even a 24-hour urine sample, may not reflect the habitual iodine intake of the individual. Therefore, a survey that collects a urine sample on a single day from each subject cannot be used to estimate the proportion of the population who have high and low intakes over the longer term, because the day-to-day variation within individuals expands the tails of the distribution outwards.

Collecting a second sample on a sub-set of participants permits a correction to the population distribution to remove the within-person variance. Therefore, a second spot urine sample was collected in a subsample of the rural participants (Figure 2). After correction, the 10th percentile increased from 13 to 20 μg/L, the 90th percentile decreased from 101 to 77 μg/L and the highest value decreased from 470 to 234 μg/L. A greater proportion had concentrations <100 μg/L than would have been assessed using the spot urine data, but there were fewer with very low values.

In a population with a median UIC in the sufficient range, this correction of the tails would lead to a decrease in the proportion at either extreme of the distribution.