



Invited Commentary

Assessing iodine intakes in pregnancy: why does this matter?

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The study by Condo *et al.*⁽¹⁾ in this issue of the *British Journal of Nutrition* assessed the utility of a forty-four-item FFQ for use in determining the iodine intake of pregnant Australian women. This is the first such study designed specifically for pregnancy. A strength of the study was the administration of the FFQ at two different time points in gestation, which allowed for assessment of the reproducibility of results. The study validated the FFQ against multiple standards, including spot and 24 h urinary iodine concentrations, measurements of serum thyroglobulin and thyroid function tests (although thyroid function tends to be poorly correlated with iodine intake), and 4-d weighed food records.

Why is the accurate ascertainment of iodine intake in pregnant women important? First, pregnant women and their fetuses are particularly vulnerable to the effects of iodine deficiency disorders. Adequate maternal iodine intake is essential for normal fetal neurodevelopment. Worldwide, iodine deficiency remains the leading preventable cause of intellectual impairments⁽²⁾. Severe iodine deficiency is associated with an increased risk for stillbirth, miscarriage, congenital anomalies and perinatal mortality⁽³⁾. Even mild iodine deficiency has recently been linked to lowered intelligence quotient and school performance^(4,5). Second, both iodine requirements and typical diets are different in pregnant compared with non-pregnant adults. Pregnant women need increased iodine intake due to increased thyroid hormone production, increased renal losses and transfer of iodine to the fetus⁽⁶⁾. In non-pregnant adults, the recommended daily iodine intake is 150 µg^(2,7,8). In Australia and New Zealand, the reference dietary intake for iodine in pregnancy is 220 µg/d, similar to the 220 µg/d RDA set by the US Institute of Medicine, and the 250 µg daily intake recommended by the WHO^(2,7,8). By contrast, the UK fails to recommend increased iodine intake in pregnancy, defining the reference nutrient intake as only 140 µg/d during gestation⁽⁹⁾.

Assessing the iodine status of individuals is challenging due to the lack of an individual biomarker. Although median urinary iodine concentrations can be used to assess the iodine status of populations, the marked day-to-day variability in typical iodine excretion means that ten urine samples are needed in order to estimate an individual's iodine status with reasonable precision⁽¹⁰⁾. Blood thyroglobulin measurements have been established as an index of population iodine status in school-aged children, but not in pregnant women. Iodine is found in

a wide variety of foods; however, in many regions, iodine content in food is both highly variable and unlabelled. Data from a well-validated FFQ could complement the use of biomarkers for population studies in pregnancy. A FFQ on iodine intake could also potentially inform recommendations for individual patients, although, given the many competing demands on provider time, a forty-four-item questionnaire may be impractical for use in the clinical setting.

Assessing iodine intake in pregnancy is currently of particular importance in Australia. Although historically iodine deficiency was recorded in Australia, by the 1980s, Australia appeared to be iodine sufficient, probably as a result of the use of iodophor cleansers by the dairy industry⁽¹¹⁾. Since the 1980s, the use of iodophors in the dairy industry has declined. Several studies performed in the last 15 years demonstrated mild-to-moderate iodine deficiency among pregnant women in different regions of Australia^(11–16). In response to these data, starting in October 2009, the use of iodised salt was mandated in Australia and New Zealand for making all breads except organic bread. Due to concerns that this approach might not be adequate to meet the increased iodine requirements of pregnancy, starting in 2010, the National Health and Medical Research Council recommended that all Australian women who are pregnant, breast-feeding or considering pregnancy should take a daily supplement of 150 µg of iodine⁽¹⁷⁾. The data from Condo *et al.*⁽¹⁾ suggest that this recommendation has not been universally adopted; only 75% of the pregnant women in their study have reported the use of iodine-containing supplements. This is consistent with recent surveys demonstrating poor knowledge about the importance of iodine in pregnancy among both pregnant women and their health care providers^(18,19). Reassuringly, the median spot urinary iodine concentration in the study by Condo *et al.*⁽¹⁾ was 212 µg/l, consistent with iodine sufficiency by WHO criteria⁽²⁾. Urinary iodine concentrations were significantly lower in the twenty-four women who did not report ingesting iodine-containing supplements. Another recent Australian study has similarly demonstrated iodine sufficiency among only those pregnant women who were ingesting iodine-containing supplements⁽²⁰⁾. FFQ along with urinary iodine measurements could be utilised to gain a better understanding of both current iodine status and iodine sources among pregnant and lactating Australian women.

Condo *et al.*⁽¹⁾ suggest that their FFQ might be adapted for use in industrialised countries other than Australia. The re-emergence of mild-to-moderate iodine deficiency has occurred in recent years in several developed regions. For example, endemic goitre was eliminated in the UK by the 1980s in what has been described as an 'accidental public health triumph,' through a combination of the increased use of iodine by the dairy industry and increased intakes of milk by the population^(21,22). However, probably due to more recent declines in milk drinking, studies now indicate mild iodine deficiency in UK adolescent girls and pregnant women^(23–25). Although the US population has been iodine-sufficient overall for decades, the most recent national surveys have demonstrated mild iodine deficiency among pregnant women⁽²⁶⁾, and daily iodine supplements have been recommended for women who are pregnant, lactating or planning a pregnancy^(27,28). The FFQ might be especially relevant for countries such as Denmark, which, similar to Australia, has mandated the use of iodised salt in breads, but where iodine deficiency in pregnancy may persist⁽²⁹⁾.

The most important limitation of the study of Condo *et al.*⁽¹⁾ was its inability to assess iodine intakes from iodised salt, the use of which was reported by 47% of the women in the study. Salt iodisation has been the mainstay of iodine deficiency prevention efforts globally, and is a critically important source of dietary iodine in many regions worldwide. Although supplement use was not included in the FFQ, it was assessed separately. Inclusion of information about supplements would be important for use of the FFQ as a clinical or research instrument in many settings. Development of the FFQ was informed by an up-to-date Australian food composition database based on analytical data⁽³⁰⁾. Unfortunately, such data, which would be required to adapt the FFQ for use in other regions, are not universally available. Development of accurate food composition data for iodine will be a necessary first step for the development of FFQ instruments to assess the intakes of iodine by pregnant women in other regions.

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