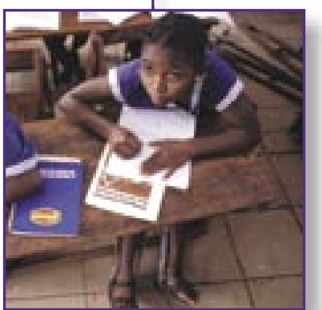



Iodine status worldwide

WHO Global Database on Iodine Deficiency





World Health Organization
Geneva

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WHO Global Database on Iodine Deficiency

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2004

WHO Library Cataloguing-in-Publication Data

Iodine status worldwide : WHO Global Database on Iodine Deficiency / editors: Bruno de Benoist ... [et al.]

1Iodine 2.Deficiency diseases – epidemiology 3.Goiter – epidemiology 4.Nutrition surveys 5.Databases, Factual I.World Health Organization II.De Benoist, Bruno.

ISBN 92 4 159200 1 (NLM classification: WD 105)

Front cover photos from WHO photo library.
Photographers: Kelly T, Julio Vizcarra, James Nalty, Carlos Gaggero, Jean-Marc Giboux.

Designed by minimum graphics
Printed in Malta

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Preface

In 1960, the World Health Organization (WHO) published the first global review on the extent of endemic goitre. This review, covering 115 countries, was instrumental in focusing attention on the scale of the public health problem of Iodine Deficiency Disorders (IDD). It was only in the mid 1980s that the international community committed themselves to the elimination of IDD, through a number of declarations and resolutions.

WHO subsequently established a global database on iodine deficiency which now holds surveys dating back from the 1940s to the present day. Its objective is to assess the global magnitude of iodine deficiency, to evaluate the strategies for its control and to monitor each country's progress towards achieving the international community's goal of IDD elimination.

In 1993, WHO published the first version of the WHO Global Database on Iodine Deficiency with global estimates on the prevalence of iodine deficiency based on total goitre prevalence (TGP), using data from 121 countries.

Since then the international community and the authorities in most countries where IDD was identified as a public health problem have taken measures to control iodine deficiency, in particular through salt iodization programmes – the WHO recommended strategy to prevent and control IDD. As a result, it is assumed that the iodine status of populations throughout the world has improved over the past decade. The WHO Global Database on Iodine Deficiency is therefore being revised and updated to reflect the current situation of iodine deficiency worldwide.

Until the 1990s TGP was the recommended indicator for assessing iodine status. However, goitre responds slowly to a change in iodine status and today urinary iodine (UI) is recommended as a more sensitive indicator of recent changes in iodine nutrition. The methodology used for this updated version of global iodine status thus rests on UI data and only uses TGP to make a comparison with the data published in 1993.

This report provides general information on iodine deficiency, its health consequences and current control interventions (Chapter 1). The methodology used to generate estimates at national, regional and global levels is described in Chapter 2. The estimates of iodine deficiency at national, regional and worldwide levels are given in Chapter 3 followed by a critical analysis of the methodology used. Annex 1 provides detailed information on the status of iodine deficiency, UI and TGP, for each country for which data are available.

The objective of this report is to provide an updated analysis of the iodine deficiency situation in the world at the beginning of the 21st century. It forms part of WHO's work to track the progress made by each country to meet the goal of IDD elimination. We hope that this report will help governments recognize the progress made in improving iodine nutrition over the past decade, and also to be aware that iodine deficiency is still a public health problem in some countries. In order to reach the goal of IDD elimination continued efforts are needed on the part of health authorities. It will also require that control programmes are sustained and strengthened.

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Acknowledgements

The WHO Global Database on Iodine Deficiency is maintained at the Department of Nutrition for Health and Development. Update of the database and overall revision of iodine status worldwide was made possible through financial support by UNICEF. WHO gratefully acknowledges the contribution of UNICEF towards the publication of this report.

The database was developed and managed by Henrietta Allen and Maria Andersson under the coordination of Bruno de Benoist. Grace Rob was assisting in data management. Bruno de Benoist, Maria Andersson, Bahi Takkouche and Ines Egli were engaged in data analysis and preparation of the report.

WHO wishes to thank the numerous individuals, institutions, governments, and non-governmental and international organizations who provided data to the global database. Without continual international collaboration in keeping the global database up-to-date, this compilation on worldwide patterns and trends in iodine deficiency would not have been possible. Special thanks are due to ministries of health of the WHO Member States; WHO Regional Offices; WHO Country Offices; the Nutrition section, UNICEF, New York, NY, USA; UNICEF Regional Offices; UNICEF Country Offices; the International Council for the Control of Iodine Deficiency Disorders.

The following individuals provided technical comments and valuable advice to improve the clarity of the text:

Fereidoun Azizi, Shahid Beheshti University of Medical Sciences, Teheran, Islamic Republic of Iran; Zu-pei Chen, Tianjin Medical University, Tianjin, China; Nita Dalmiya, Nutrition section, UNICEF, New York, NY, USA; Ian Darnton-Hill, Nutrition Section, UNICEF, New York, NY, USA; François Delange, ICCIDD, Brussels, Belgium; John T Dunn[a], ICCIDD, Charlottesville, VA, USA; Pieter Jooste, Medical Research Council, Cape Town, South Africa; Aldo Pinchera, ICCIDD, Pisa, Italy; Eduardo Pretell, ICCIDD, Lima, Peru; Claudia Stein, WHO, Geneva, Switzerland; Kevin Sullivan, Rollins School of Public Health of Emory University, Atlanta, GA, USA; Charles Todd, European Commission, Brussels, Belgium.

Editorial assistance was provided by Kai Lashley. The support provided by the staff of the Department of Nutrition for Health and Development, WHO, Geneva, especially Trudy Wijnhoven and Anna Wolter, is also much appreciated.

[a] deceased

Abbreviations

CDC	Centers for Disease Control and Prevention
FAO	Food and Agricultural Organization of the United Nations
ICCIDD	International Council for Control of Iodine Deficiency Disorders
IDD	Iodine deficiency disorders. The spectrum of clinical, social and intellectual consequences of iodine deficiency.
IIH	Iodine-induced hyperthyroidism
MI	The Micronutrient Initiative
ppm	Parts per million
SAC	School-age children (6–12 years)
TGP	Total goitre prevalence. Prevalence of enlarged goitres in a population (usually school-age children).
TSH	Thyroid stimulating hormone
UI	Urinary iodine
UL	Upper limit
UN	United Nations
UNICEF	The United Nations Children's Fund
USI	Universal salt iodization
WHO	World Health Organization

1. Introduction

1.1 Iodine deficiency disorders: a public health problem

Iodine deficiency is a major public health problem for populations throughout the world, particularly for pregnant women and young children. They are a threat to the social and economic development of countries. The most devastating outcomes of iodine deficiency are increased perinatal mortality and mental retardation – iodine deficiency is the greatest cause of preventable brain damage in childhood which is the primary motivation behind the current worldwide drive to eliminate it.

1.1.1 Etiology

The main factor responsible for iodine deficiency is a low dietary supply of iodine (*1*). It occurs in populations living in areas where the soil has a low iodine content as a result of past glaciation or the repeated leaching effects of snow, water and heavy rainfall. Crops grown in this soil, therefore, do not provide adequate amounts of iodine when consumed.

1.1.2 Health consequences

Iodine is present in the body in minute amounts, mainly in the thyroid gland. Its main role is in the synthesis of thyroid hormones. When iodine requirements are not met, thyroid hormone synthesis is impaired, resulting in hypothyroidism and a series of functional and developmental abnormalities grouped under the heading of "Iodine Deficiency Disorders (IDD)" as shown in Table 1.1.

Goitre is the most visible manifestation of IDD. Endemic goitre results from increased thyroid stimulation by thyroid stimulating hormone (TSH) to maximize the utilization of available iodine and thus represents maladaption to iodine deficiency (*5*, *6*). However, the most damaging disorders induced by iodine deficiency are irreversible mental retardation and cretinism (*2*, *7*, *8*). If iodine deficiency occurs during the most critical period of brain development (from the fetal stage up to the third month after birth), the resulting thyroid failure will lead to irreversible alterations in brain function (*9*, *10*). In severely endemic areas, cretinism may affect up to 5–15% of the population. A meta-analysis of 19 studies conducted in severely iodine deficient areas showed that iodine deficiency is responsible for a mean IQ loss of 13.5 points in the population (*10*). While cretinism is the most extreme manifestation, of considerably greater significance are the more subtle degrees of mental impairment leading to poor school performance, reduced intellectual ability and impaired work capacity (*7*).

Table 1.1 ***The spectrum of IDD across the life-span***

Fetus	Abortions Stillbirths Congenital anomalies Increased perinatal mortality Endemic cretinism Deaf mutism
Neonate	Neonatal goitre Neonatal hypothyroidism Endemic mental retardation Increased susceptibility of the thyroid gland to nuclear radiation
Child and adolescent	Goitre (Subclinical) hypothyroidism (Subclinical) hyperthyroidism Impaired mental function Retarded physical development Increased susceptibility of the thyroid gland to nuclear radiation
Adult	Goitre, with its complications Hypothyroidism Impaired mental function Spontaneous hyperthyroidism in the elderly Iodine-induced hyperthyroidism Increased susceptibility of the thyroid gland to nuclear radiation

Source: Adapted with permission of the publisher, from Hetzel (*2*), Laurberg et al. (*3*) Stanbury et al. (*4*).

1.1.3 Indicators for assessment and monitoring

Several indicators are used to assess the iodine status of a population: thyroid size by palpation and/or by ultrasonography, urinary iodine (UI) and the blood constituents, TSH or thyrotropin, and thyroglobulin.

Until the 1990s total goitre prevalence (TGP)[1] was recommended as the main indicator to assess IDD prevalence. However, TGP is of limited utility in assessing the impact of salt iodization. In endemic areas, TGP may not return to normal for months or years after correction of iodine deficiency. During this period, TGP is a poor indicator because it reflects a population's history of iodine nutrition but not its present iodine status. TGP is still useful to assess the severity of IDD at baseline and has a role in evaluating the long term impact of control programmes.

As UI is a more sensitive indicator to recent changes in iodine intake, it is now recommended over TGP (*12*). Most countries have started to implement IDD control programmes, and a growing number of countries are consequently monitoring iodine status using UI .

TSH levels in neonates are particularly sensitive to iodine deficiency however difficulties in interpretation remain and the cost of implementing a TSH screening programme is high. The value of thyroglobulin as an indicator of global IDD status has yet to be fully explored.

While IDD affects the entire population, a school-based sampling method is recommended for UI and TGP as the most efficient and practical approach to monitor IDD as this group is usually easily accessible and can be used as a proxy for the general population (*12*). School-age refers to children aged 6–12 years, hereafter referred to as school-age children unless otherwise noted. Iodine deficiency is considered to be a public health problem in populations of school-age children where the median UI is below 100 µg/l (see table 2.1) or goitre prevalence is above 5% (*12*).

1.2 Control of IDD

The recommended strategy for IDD control is based on correcting the deficiency by increasing iodine intake through supplementation or food fortification. Four main components are required to implement the strategy: correction of iodine deficiency, surveillance including monitoring and evaluation, inter-sectorial collaboration and advocacy and communication to mobilize public health authorities and educate the public.

1.2.1 Correcting iodine deficiency

1.2.1.1 Iodine supplementation

The first iodine supplements were in the form of an oral solution of iodine such as Lugol, which was given daily. After the Second World War, considerable progress was made in reducing IDD with iodized oil – initially using the intramuscular form and in the 1990s, using the oral form. For example, iodized oil was used with success in Papua New Guinea and thereafter in China, several countries in Africa and Latin America and in other severely endemic areas.

The oral form of iodized oil has several advantages over the intramuscular form: it does not require special storage conditions or trained health personnel for the injection and it can be given once a year. Compared to iodized salt, however, it is more expensive and coverage can be limited since it requires direct contact with each person. With the introduction of iodized salt on a large scale, iodized oil is now only recommended for populations living in severely endemic areas with no access to iodized salt.

1.2.1.2 Food fortification with iodine

Over the past century, many food vehicles have been fortified with iodine: bread, milk (*13*), water (*14*) and salt. Salt is the most commonly used vehicle. It was first introduced in the 1920s in the United States (*15*) and in Switzerland (*16*). However, this strategy was not widely replicated until the 1990s when the World Health Assembly adopted universal salt iodization (USI) (the iodization of salt for both human and livestock consumption) as the method of choice to eliminate IDD. In 2002, at the Special Session on Children of the United Nations (UN) General Assembly, the goal to eliminate IDD by the year 2005 was set.

USI was chosen as the best strategy based on the following facts: (i) salt is one of the few commodities consumed by everyone; (ii) salt consumption is fairly stable throughout the year; (iii) salt production is usually in the hands of few producers; (iv) salt iodization technology is easy to implement and available at a reasonable cost (0.4 to 0.5 US cents/kg, or 2 to 9 US cents per person/year); (v) the addition of iodine to salt does not affect its colour, taste or odour; (vi) the quality of iodized salt can be monitored at the production, retail and household levels; and (vii) salt iodization programmes are easy to implement.

In order to meet the iodine requirements of a population it is recommended to add 20 to 40 parts per million (ppm) of iodine to salt (assuming an average salt intake of 10 g per capita/day) (*17*). There are two forms of iodine fortificants, potassium iodate and potassium iodide. Because iodate is more stable under extreme climatic conditions it is preferred to iodide, especially in hot and humid climates (*17*). For historical reasons, North America and some European countries use potassium iodide while most tropical countries use potassium iodate.

1.2.1.3 Safety in approaches to control iodine deficiency

Iodine fortification and supplementation are safe if the amount of iodine administered is within the recommended range. For more than 50 years iodine has been added to salt and bread without noticable toxic effects (*18*). However, a rapid increase in iodine intake can increase the risk of iodine toxicity in individuals who have previously had chronic iodine deficiency.

[1] In this report "total goitre prevalence" is used instead of "total goitre rate" (TGR) to be in agreement with the terminology that is universally used in epidemiology (*11*).

Iodine-induced hyperthyroidism (IIH) is the most common complication of iodine prophylaxis and it has been reported in almost all iodine supplementation programmes in their early phases (*4*). For programmes using iodized salt, there is less information. IIH occurs in the early phase of the iodine intervention and primarily affects the elderly who have longstanding thyroid nodules. However, it is transient and its incidence reverts to normal after one to ten years. Monitoring of salt quality and iodine status of populations, and training of health staff in identification and treatment of IIH are the most effective means for preventing IIH and its health consequences (*19*).

1.2.2 Monitoring and evaluating the IDD control programmes

1.2.2.1 Monitoring iodine levels of salt

Governments usually set the level at which salt should be iodized. Monitoring aims to ensure that the salt industry complies with the regulations set by the government and that the iodine levels are re-adjusted if necessary. Iodine levels are monitored (at a minimum) at the factory and household levels, and if possible at the retail level. If iodized salt is imported it is monitored at the point of entry into the country. The monitoring process at the factory level is the salt producer's or importer's responsibility and is regularly supervised by the relevant public authorities. In most cases the Ministry of Health carries out the monitoring at the household level.

Iodine content in salt is best measured by titration. Field test kits have been developed. They only give qualitative results, indicating if iodine is present or not. Because of this, they are of limited use, moreover their reliability has recently been questioned. However, they are can still be useful for training educating and for advocacy purposes for the public and staff.

1.2.2.2 Monitoring of iodine status

When salt is adequately iodized, it is likely that a population's iodine status will improve and the thyroid function of that population will normalize. Monitoring the population's iodine status is nevertheless necessary since dietary habits may change in some segments of the population or the iodine level of salt may not be sufficient to meet the requirements of some groups, in particular pregnant women.

Indicators used to monitor iodine status are described in section 1.1.3.

1.2.3 Increasing awareness of public health authorities and the general public

WHO has played a pioneer role in mobilizing the international community and public health authorities by providing strategic guidance and technical support. In 1990, the World Health Assembly adopted a resolution urging Member States to take the appropriate measures to eliminate IDD. This goal was reaffirmed in a series of subsequent international fora including: the 1990 World Summit for Children (New York), the Joint WHO/Food and Agricultural Organization of the United Nations (FAO) and the International Conference on Nutrition in 1992 (Rome) and the Special Session on Children of the UN General Assembly in 2002 (New York).

This commitment catalysed the involvement of a large number of additional actors. The United Nations Children's Fund (UNICEF) was one of the first organizations to assist countries in establishing salt iodization programmes and still now plays a leading role in this regard. The International Council for the Control of Iodine Deficiency Disorders (ICCIDD) played an instrumental role in providing technical support. Other important actors were the bilateral co-operation agencies, non-governmental organizations (NGOs) such as the Micronutrient Initiative, the salt industry, and donor foundations such as Kiwanis International and the Bill and Melinda Gates Foundation.

1.2.4 Reinforcing the collaboration between sectors

1.2.4.1 Network for sustainable elimination of iodine deficiency

Effective IDD control demands collaboration and clearly the salt industry has a major role to play by iodizing salt and ensuring its delivery to regions worldwide. To facilitate the participation and co-ordination of the salt industry as well as other sectors in IDD control, the Global Network for Sustained Elimination of Iodine Deficiency was established in 2002. Further information on this network can be obtained on the Internet: http://www.sph.emory.edu/iodinenetwork/.

In most countries where iodine deficiency is a public health problem, a national multi-sectoral IDD body has been established, usually chaired by the Ministry of Health (20). Its main roles are to design and supervise the implementation of an IDD control plan and to coordinate the activities of the various sectors and partners involved. It acts in concert with the national and international partners involved in IDD control.

1.2.4.2 International resource laboratory network

Where iodine deficiency is a public health problem, laboratory facilities to measure the indicators required to monitor the programme are often insufficient or lacking altogether. To overcome this problem, the International Resource Laboratories for Iodine (IRLI) Network has been created, under the coordination of the Centers for Disease Control and Prevention (CDC), WHO, UNICEF, the Micronutrient Initiative and ICCIDD. The main role of this network is to provide technical support to national laboratories which may need assistance through regional or subregional resource laboratories in monitoring their IDD control programmes. In every WHO region at least one resource laboratory has been identified. Further information can be obtained at IRLI's web site: http://www.cdc.gov/nceh/dls/iodinelabnetwork.htm.

1.2.5 Sustaining IDD control programmes

In order to achieve the global goal set for 2005, IDD control programmes and monitoring need to be constantly sustained due to the fact that IDD simply re-appears if salt iodization is interrupted. This may happen when the responsible public health authorities are demobilized or if the salt industry fails to effectively monitor iodine content. In order to assess the sustainability of control programmes and track their progress towards the IDD elimination goal, criteria have been established by WHO (Table 1.2).

Table 1.2 ***Criteria for monitoring progress towards sustainable IDD elimination***

Indicators	Goals
Salt Iodization coverage	
■ Proportion of households consuming adequately iodized salt[a]	>90%
Urinary iodine	
■ Proportion of population with urinary iodine levels below 100 µg/l	<50%
■ Proportion of population with urinary iodine levels below 50 µg/l	<20%
Programmatic indicators	At least 8 of the 10
■ National body responsible to the government for IDD elimination. It should be multidisciplinary, involving the relevant fields of nutrition, medicine, education, the salt industry, the media, and consumers, with a chairman appointed by the Minister of Health;	
■ Evidence of political commitment to USI and elimination of IDD;	
■ Appointment of a responsible executive officer for the IDD elimination programme;	
■ Legislation or regulation of USI;	
■ Commitment to regular progress in IDD elimination, with access to laboratories able to provide accurate data on salt and urinary iodine;	
■ A programme of public education and social mobilization on the importance of IDD and the consumption of iodized salt;	
■ Regular data on iodized salt at the factory, retail and household levels;	
■ Regular laboratory data on urinary iodine in school-age children, with appropriate sampling for higher-risk areas;	
■ Co-operation from the salt industry in maintenance of quality control; and	
■ A database for recording results or regular monitoring procedures particularly for salt iodine, urinary iodine and, if available, neonatal thyroid stimulating hormone (TSH), with mandatory public reporting.	

Source: WHO et al. (*12*).

[a] Adequately iodized salt refers to at least 15 ppm at household level

2. Methods

This report provides estimates of the current worldwide situation of iodine nutrition based on UI data collected between 1993 and 2003. It is a continuation of the previous report on the global prevalence of IDD published by WHO in 1993 (*21*). For comparison purposes with the IDD estimates in 1993 (*21*), the present report provides estimates of IDD based on TGP in addition to UI.

2.1 Data sources – The WHO Global Database on Iodine Deficiency

The estimates presented are based on the data available in the WHO Global Database on Iodine Deficiency, accessible on the Internet: http://www3.who.int/whosis/micronutrient/. This database compiles country data on UI and TGP and presents it in a standardized and easily accessible format.

Data are collected from the scientific literature and through a broad network of collaborators, including WHO regional and country offices, United Nations organizations, non-governmental organizations, ministries of health, other national institutions, and research and academic institutions. MEDLINE and regional databases (African Index Medicus, Index Medicus for the WHO Eastern Mediterranean Region, Latin American and Caribbean Center on Health Sciences Information, Pan American Health Organization Library Institutional Memory Database, Index Medicus for South-East Asia Region) are systematically searched. Articles published in non-indexed medical and professional journals and reports from principal investigators are also systematically looked for. Data are extracted from reports written in any language.

For inclusion in the database, a complete original survey report providing details of the sampling method used is necessary. Studies must have a population-based sample frame and must use standard UI and TGP measuring techniques (*21*). Only TGP data measuring goitre by palpation are included. Until recently no international reference values for thyroid size measured by ultrasonography were available, and thus results from surveys using this technique have not yet been included (*22*).

When a potentially relevant survey is identified and the full report obtained, all data are checked for consistency as part of routine quality control. When necessary, the authors are contacted for clarification or additional information. Final data are extracted and entered into a standard data form. The full archived documentation and correspondence are available on request.

As of June 2003, the database contained 389 UI surveys and 409 goitre surveys. Surveys received at WHO after this date were not included in this analysis but are available in the online database and will be included in future analysis.

2.2 Selection of survey data

Data collected between 1993 and 2003, available to WHO in June 2003, were reviewed for WHO's 192 Member States. Data on UI and TGP were selected for each country using two variables: the administrative level for which the population sample is representative (national or subnational) and the population groups surveyed (school-age children or other).

2.2.1 Administrative level

Surveys were first selected according to the administrative level. Surveys are considered as national level when they are carried out on a nationally representative sample of the population group surveyed, or as sub-national level when they are carried out on a sample representative of a given administrative level: region, state, province, district or local.

Whenever available, data from the most recent national survey were used in preference to sub-national surveys. WHO recommends that iodine status is regularly assessed (*12*). Thus, if a national survey was 5 years old or more, and more recent sub-national data were available, preference was given to the sub-national data.

In the absence of national data, sub-national data were used. When two or more sub-national surveys of the same sub-national level had been carried out in different locations in a country during the analysis period, the survey results were pooled into a single summary measure, using a weighted sample size for each survey. When, in a few cases, sample size information was missing for one sub-national survey, it was assumed to have a number of subjects equal to the average sample size of the other surveys included in the pooling. For one country, sample size information was missing from all data pooled, and thus unweighted average was computed. Exceptionally, data from different sub-national levels were pooled, for example a survey carried in the capital city, classified as local, with a district level survey.

2.2.2 Population groups

WHO recommends that iodine deficiency surveys examine school-age children from 6 to 12 years (*12*). When data for this age group were not available, data of the next closest age group were used in the following order of priority: data from the children closest to school age, adults, the general population, preschool-age children, other population groups.

2.3 Classification of iodine nutrition

Median UI of the distribution was used to classify countries into different degrees of public health significance. Since UI values from populations are usually not normally distributed, the median rather than the mean is used as a measure of central tendency (*12*). The WHO cut-off points applied for classifying iodine nutrition into different degrees of public health significance are shown in Table 2.1. Median UI below 100 µg/l define a population which has iodine deficiency.

If a national median UI was not available for the severity classification the following methods were applied to derive median UI from various UI data.

1. When UI means were the only available data, UI medians were derived through simple linear regression using the equation:

   Median = 1.128 + 0.864 * Mean

   This equation was obtained from a model based on surveys available in the database which presented both median UI and mean UI. To perform this linear regression, disaggregated data were introduced for each survey, i.e. sub-samples of the same survey stratified by age, sex or region. A total of 351 regression points were identified. The relation is shown in Figure 2.1.

2. When only disaggregated UI medians were presented (e.g. UI medians for each age, sex or region), aggregated total median UI was estimated using the following procedure:

   Step 1: disaggregated UI means from disaggregated UI medians were derived, assuming linearity through linear regression using the equation:

   Mean = 7.447 + 1.081 * Median

   These were obtained from the 351 pairs of points used in paragraph 1.

   Step 2: the average of the means thus obtained was computed, weighted by the sample size of each group.

   Step 3: median UI corresponding to the total survey population through linear regression was calculated using the equation:

   Median = 1.128 + 0.864 * Mean

   explained in paragraph 1 above.

   Proceeding in this manner was necessary because medians, unlike means, when pooled directly, give rise to erroneous results when the distribution of data is not normal but skewed as in the case of UI.

3. When the proportion of UI values below 100 µg/l (% UI <100 µg/l) was the only available information on UI, median UI was derived through a quadratic regression using the following equation:

Table 2.1 ***Epidemiological criteria for assessing iodine nutrition based on median UI concentrations in school-age children***

Median UI (µg/l)	Iodine intake	Iodine nutrition
< 20	Insufficient	Severe iodine deficiency
20–49	Insufficient	Moderate iodine deficiency
50–99	Insufficient	Mild iodine deficiency
100–199	Adequate	Optimal iodine nutrition
200–299	More than adequate	Risk of iodine-induced hyperthyroidism within 5–10 years following introduction of iodized salt in susceptible groups
≥ 300	Excessive	Risk of adverse health consequences (iodine induced hyperthyroidism, auto-immune thyroid diseases)

Source: WHO et al. (*12*).

Median = 277.670 – 4.96 * (% UI <100 µg/l) + 0.0254 * (% UI <100 µg/l)²

The quadratic regression model was computed from 408 pairs of points obtained from surveys, performed all over the world and included in the database, where data were available on both medians and proportions of UI values below 100 µg/l for the same population group. All populations groups used in the computation above were mutually exclusive. The quadratic regression was the model that best described the relation between median UIs and proportions of UI values below 100 µg/l (r^2 = 0.83) and was preferred to the simple linear regression model (r^2 = 0.76). The relation is shown in Figure 2.2.

Note that when the equation above is used, a proportion of UI values below 100 µg/l of 50% yield a median figure of 102 µg/l, instead of the expected value of 100 µg/l. In this case, no attempt to modify the intercept or the slope of the equation was made in order to make it fit predicted values. Instead, this caveat is mentioned in the "notes" section of Table 4.1, where applicable.

Countries with high medians (>300 µg/l) were given zero per cent as a proportion of UI values below 100 µg/l, and not the value predicted by the equation.

2.4 Population coverage, proportion of population and the number of individuals with insufficient iodine intake

2.4.1 Population coverage

The coverage of the estimates for a given WHO region was calculated as the sum of the populations of countries with data divided by the total population of the region. The same procedure was used to calculate global coverage.

2.4.2 Proportion of population and the number of individuals with insufficient iodine intake

National, regional and global populations (school-age children and general population) with insufficient iodine intake was estimated based on each country's proportion of population with UI below 100 µg/l. The following method was used:

1. The number of subjects with insufficient iodine intake at the country level was calculated by applying the proportion of population with UI below 100 µg/l to the national population of both children aged 6–12 years and general population (all age groups including children aged 6–12 years). The population figures are based on the year 2002 (*23*).

   If the proportion of population with UI values below 100 µg/l was not presented, it was computed from median UI, using the simple linear regression equation based on the data points presented in Figure 2.2:

   % UI <100 µg/l = 86.3 – 0.324 * Median

   The 95% confidence intervals of for the proportion of a population with UI below 100 µg/l for each country are presented as a measure of uncertainty (Table A3.1).

2. The number of subjects with insufficient iodine intake at the regional level was calculated by summing the number of individuals with UI below 100 µg/l in each country of the region and dividing the sum by the total population of all countries with available data. The calculations were made for both WHO and UN regions.

3. The global estimate was calculated by summing the number of individuals with insufficient iodine intake in each region and dividing the sum by the total population of all countries with data available.

Figure 2.1 Relation between median UI (µg/l) and mean UI (µg/l) with linear regression line

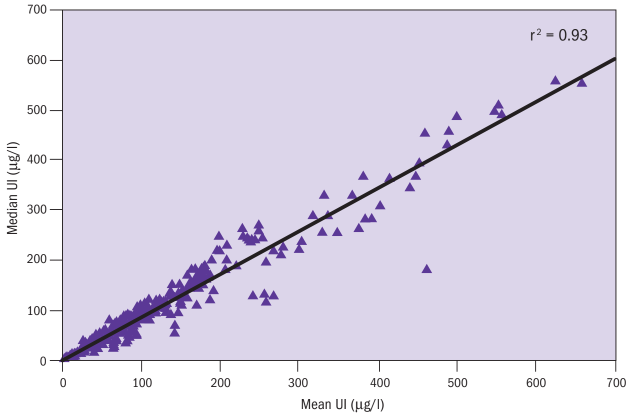
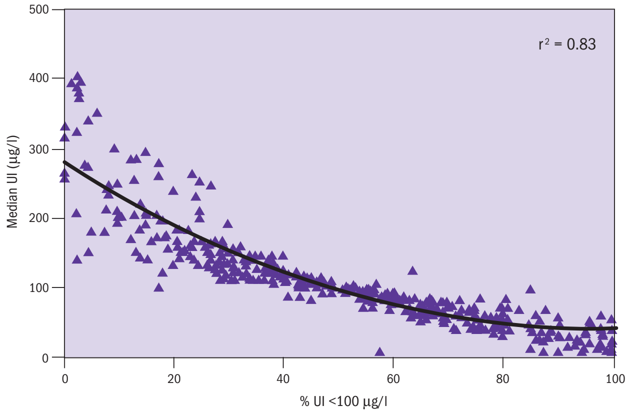


Figure 2.2 Relation between median UI (µg/l) and proportion (%) of UI values below 100 µg/l with quadratic regression curve



2.5 TGP

TGP was computed from data in school-age children. In order to compare present TGP data, with the 1993 TGP estimates which were generated for the general population (*21*), it was necessary to calculate current TGP estimates for the general population. To that end, an algorithm was developed from surveys available in the database that measured prevalence in both population groups.

Eight countries were found to have carried out such surveys between 1993 and 2003: Burkina Faso, Ethiopia, France (the island of Réunion), Guinea-Bissau, India, Islamic Republic of Iran, Italy and the Philippines. A total of 23 pairs of points corresponding to different population subgroups were included.

Assuming linearity in the data range, the equation of the linear regression model that predicts TGP in the general population from school age children TGP is:

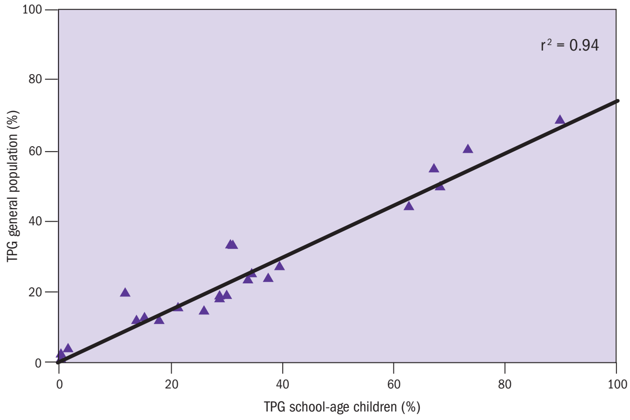
General population TGP (%) = 0.954 + 0.742 * school-age children TGP (%)

The graph that displays the relation between the two sets of prevalences is shown in Figure 2.3 above.

Goitre prevalences by country, region (both WHO and UN) and worldwide were derived for the general population, applying the algorithm described above at country level, following the same procedure as described for UI calculations (section 2.5.2).

Along with the point estimates of TGP, 95% confidence intervals of TGP for each country are presented as a measure of uncertainty (Table A3.2).

Figure 2.3 Relation between general population TGP and school-age children TGP with linear regression line



3. Results and discussion

3.1 Results

Regional and worldwide estimates of iodine status are based on data from 192 WHO Member States (Annex 1). Estimates by WHO region are presented in this chapter; estimates by UN region appear in Annex 2. National estimates of iodine status for each WHO Member State are presented in Annex 3.

3.1.1 Population coverage

3.1.1.1 UI surveys

Data on UI collected between 1993 and 2003 were available from 126 countries. Sixty-six countries have no data on UI.

Table 3.1 presents the population coverage for the age group 6–12 years based on UI data by WHO region. The number of countries with national and, if not available, sub-national UI survey data is shown in Table 3.2. Figure 3.1 shows the worldwide coverage of national and sub-national UI surveys.

Overall, the available UI data covers 92.1% of the world's 6–12 year old population. Regional population coverage varies from 83.4% in the Eastern Mediterranean to 98.8% in South-East Asia.

Table 3.1 ***Population coverage[a] by UI surveys carried out between 1993 and 2003, by WHO region***

WHO region[b]	Total number of school-age children (millions)[c]	School-age children covered (millions)	Coverage (%)
Africa	128.9	116.9	90.7
Americas	109.0	98.8	90.6
South-East Asia	242.4	239.4	98.8
Europe	81.2	70.5	86.8
Eastern Mediterranean	87.1	72.6	83.4
Western Pacific	199.4	183.0	91.8
Total	**848.0**	**781.2**	**92.1**

[a] School-age children (6–12 years).
[b] 192 WHO Member States.
[c] Based on population estimates for the year 2002 (*23*).

Table 3.2 ***Type of UI survey data by WHO region***

WHO region[a]	National	Sub-national	No data
Africa	17	17	12
Americas	13	7	15
South-East Asia	7	2	2
Europe	21	17	14
Eastern Mediterranean	11	4	6
Western Pacific	6	4	17
Total	**75**	**51**	**66**

[a] 192 WHO Member States.

Figure 3.1 Type of UI survey data

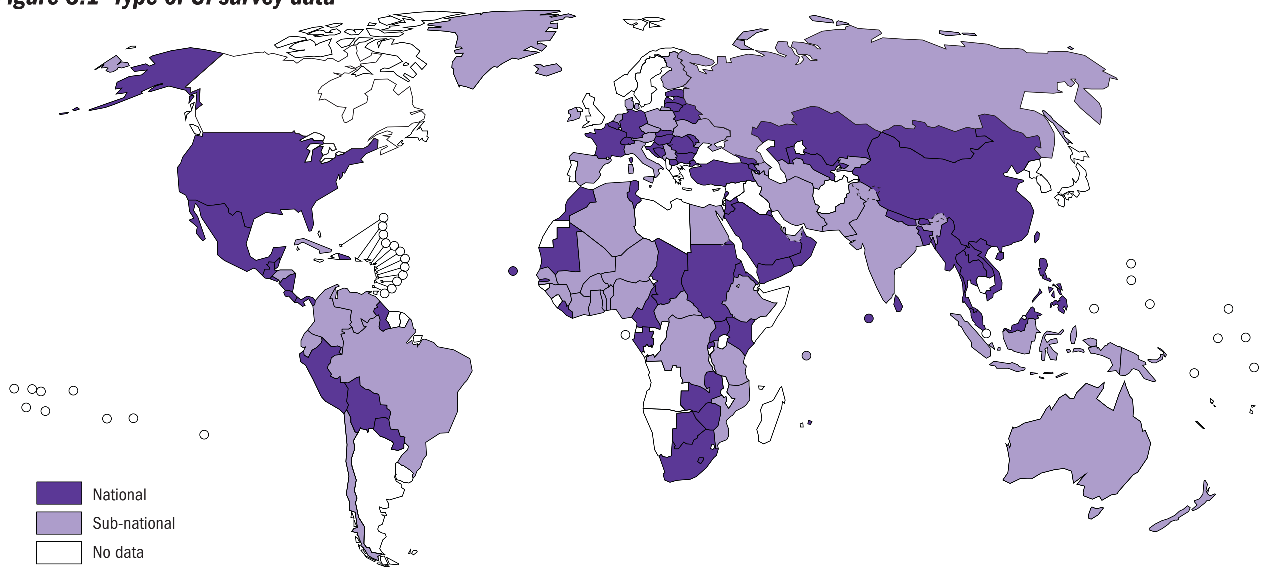


Figure 3.2 Type of TGP survey data

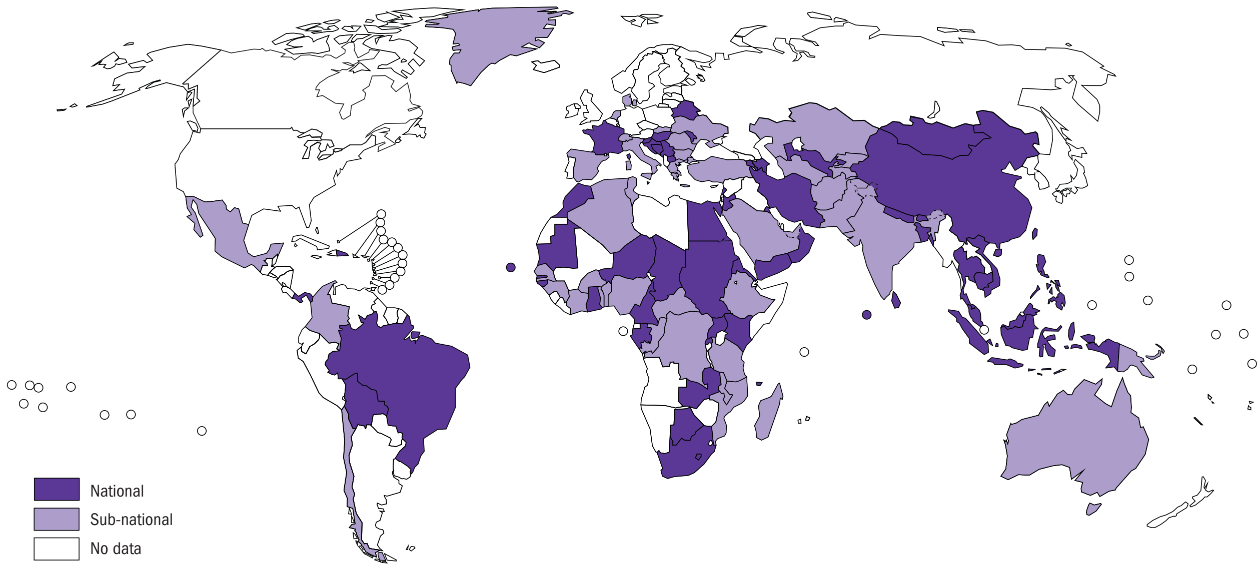


Table 3.3 ***Population coverage[a] by TGP surveys carried out between 1993 and 2003, by WHO region***

WHO region[b]	School-age children (millions)[c]	School-age children covered (millions)	Coverage (%)
Africa	128.9	117.6	91.2
Americas	109.0	50.7	46.5
South-East Asia	242.4	232.1	95.7
Europe	81.2	46.9	57.8
Eastern Mediterranean	87.1	76.5	87.8
Western Pacific	199.4	184.0	92.3
Total	**848.0**	**707.7**	**83.5**

[a] School-age children (6–12 years).
[b] 192 WHO Member States.
[c] Based on population estimates for the year 2002 (23).

Table 3.4 ***Type of TGP survey data by WHO region***

WHO region[a]	National	Sub-national	No data
Africa	18	17	11
Americas	4	3	28
South-East Asia	7	1	3
Europe	12	15	25
Eastern Mediterranean	10	5	6
Western Pacific	6	2	19
Total	**57**	**43**	**92**

[a] 192 WHO Member States.

Of the 126 countries with data available on UI, 75 have nationally representative surveys covering 45.7% of the school-age children population.

3.1.1.2 TGP surveys

Data on goitre collected between 1993 and 2003 were available from 100 countries. Table 3.3 presents the population coverage for the age group 6–12 years based on TGP data by WHO region. Table 3.4 presents the number of countries with national and, if not available, sub-national surveys. Figure 3.2 shows the worldwide coverage of national and sub-national TGP surveys.

Population coverage for TGP surveys is 83.5%, ranging from 46.5% in the Americas to 95.7% in South-East Asia. Of the 100 countries with data available on TGP, 57 had nationally representative surveys, covering 43.4% of the school-age children population.

3.1.2 Classification of countries by degree of public health significance of iodine nutrition based on median UI

In Figure 3.3, countries are classified into six different degrees of public health significance with respect to their iodine nutrition estimated from median UI. Table 3.5 shows the number of countries classified by degree and by WHO region.

In 54 countries the population has insufficient iodine intake as indicated by a median UI below 100 µg/l. These countries are classified as iodine deficient: one country is severely deficient, 13 are moderately deficient and 40 mildly deficient. In 43 countries, the population have adequate iodine intake with a median UI between 100 and 199 µg/l. Iodine nutrition of these countries is considered as optimal. In 24 countries, median UI is between 200

Figure 3.3 Degree of public health significance of iodine nutrition based on median UI

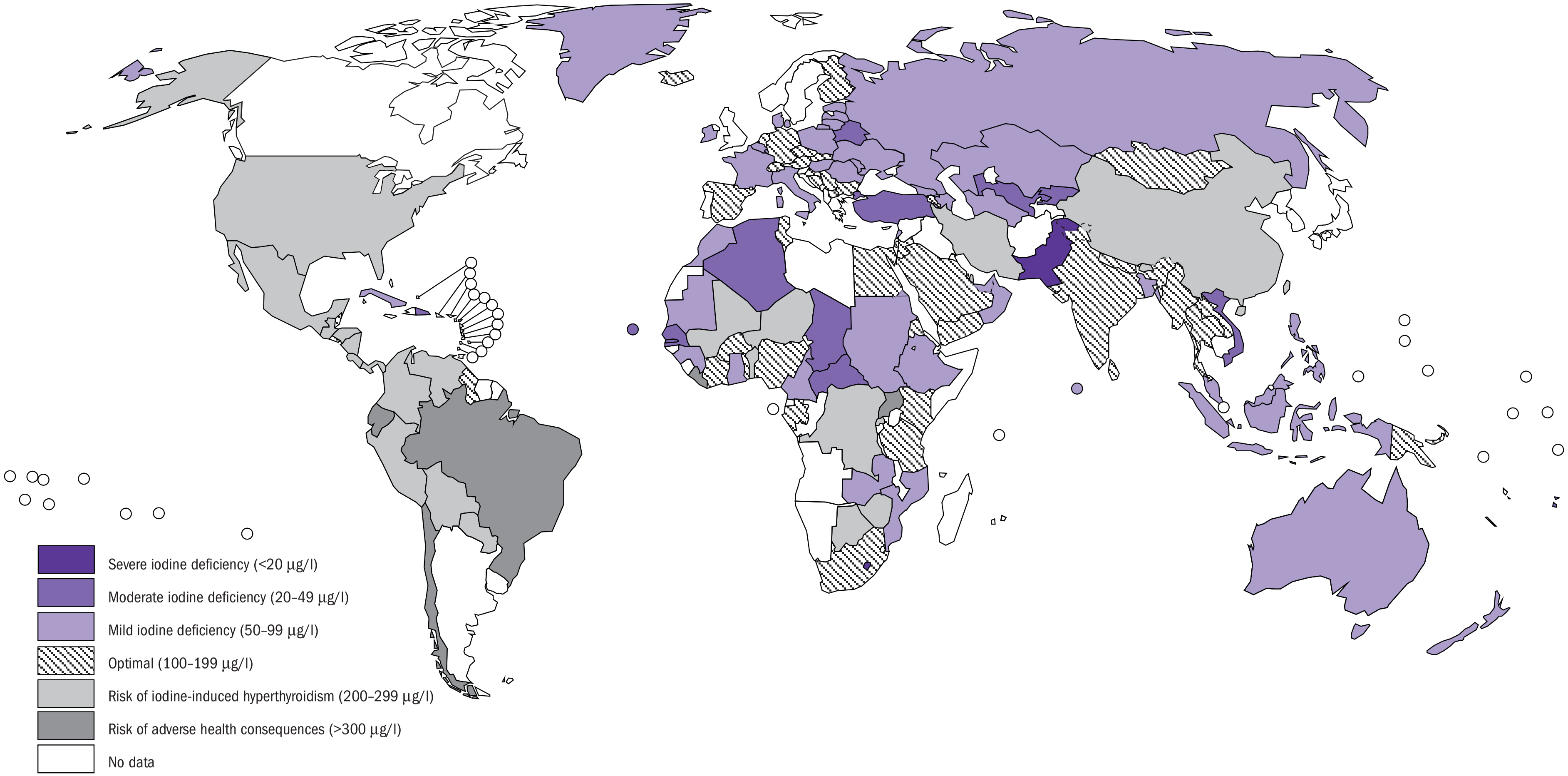


Table 3.5 ***Number of countries classified by degrees of public health significance of iodine nutrition based on median UI in school-age children by WHO region, 2003***

WHO region[a]	Classification of iodine nutrition: Severe iodine deficiency (Median UI <20 µg/l)	Moderate iodine deficiency (Median UI 20–49 µg/l)	Mild iodine deficiency (Median UI 50–99 µg/l)	Optimal iodine nutrition (Median UI 100–199 µg/l)	Risk of IIH in susceptible groups (Median UI 200–299 µg/l)	Risk of adverse health consequences (Median UI ≥300 µg/l)	No data
Africa	0	6	8	11	7	2	12
Americas	0	1	1	3	12	3	15
South-East Asia	0	0	3	5	1	0	2
Europe	0	4	19	15	0	0	14
Eastern Mediterranean	1	0	5	6	3	0	6
Western Pacific	0	2	4	3	1	0	17
Total	**1**	**13**	**40**	**43**	**24**	**5**	**66**

[a] 192 WHO Member States.

and 299 µg/l indicating that the population has more than adequate iodine intake. In these countries, there is a risk of iodine-induced hyperthyroidism in susceptible groups. In 5 countries, there is excessive iodine intake as shown by a median UI above 300 µg/l. In these countries, there is a risk of iodine-induced hyperthyroidism and other adverse health consequences.

3.1.3 Proportion of population and number of individuals with insufficient iodine intake

The proportion of the population and the number of individuals (school-age children and general population) with insufficient iodine intake (defined as proportion of population with UI below 100 µg/l) by WHO region is presented in Table 3.6.

Table 3.6 ***Proportion of population, and number of individuals with insufficient iodine intake in school-age children (6–12 years), and in the general population (all age groups) by WHO region, 2003***

WHO region[a]	Insufficient iodine intake (UI <100 µg/l): School-age children: Proportion (%)	School-age children: Total number (millions)[b]	General population: Proportion (%)	General population: Total number (millions)[b]
Africa	42.3	49.5	42.6	260.3
Americas	10.1	10.0	9.8	75.1
South-East Asia	39.9	95.6	39.8	624.0
Europe	59.9	42.2	56.9	435.5
Eastern Mediterranean	55.4	40.2	54.1	228.5
Western Pacific	26.2	48.0	24.0	365.3
Total	**36.5**	**285.4**	**35.2**	**1988.7**

[a] 192 WHO Members States.
[b] Based on population estimates in the year 2002 (*23*).

It is estimated that the iodine intake of 36.5% (285 million) school-age children worldwide is insufficient. Extrapolating the proportion of school-age children to the general population, it is estimated that nearly two billion individuals have insufficient iodine intake.

The most affected region is South-East Asia where 96 million children have a low iodine intake. Africa and the Western Pacific follow, both with an estimated 50 million children with a low iodine intake. Europe and the Eastern Mediterranean harbour about 40 million children each, and the Americas have 10 million. The highest proportions are found in Europe (59.9%) and South-East Asia (39.9%) while the lowest are found in the Americas (10.1%) and the Western Pacific (26.2%).

3.1.4 TGP

Goitre prevalence in the general population is presented with the purpose of comparing the current estimate with that of 1993 (*21*) (Table 3.7).

Globally, the TGP in the general population is estimated

Table 3.7 ***Change in total goitre prevalence between 1993 and 2003, by WHO region***

WHO region[a]	TGP (%) General population: 1993	2003	% change
Africa	15.6	28.3	+ 81.4
Americas	8.7	4.7	– 46.0
South-East Asia	13.0	15.4	+ 18.5
Europe	11.4	20.6	+ 80.7
Eastern Mediterranean	22.9	37.3	+ 62.9
Western Pacific	9.0	6.1	– 32.2
Total	**12.0**	**15.8**	**+ 31.7**

[a] 192 WHO Member States.

to be 15.8%, varying between 4.7% in the Americas to 28.3% in Africa. When comparing current TGP estimates with the 1993 estimates, TGP has increased by 31.7% worldwide. This masks a decrease in two regions of 46.0% in the Americas and 32.2% in the Western Pacific. All other regions experienced an increase in TGP ranging from 18.5% in South-East Asia to 81.4% in Africa.

3.2 Discussion

Data gathered in the WHO Global Database on Iodine Deficiency permit a description to be made of the magnitude, severity and distribution of iodine deficiency worldwide and facilitates decisions on the most effective strategy to eliminate iodine deficiency.

3.2.1 Population coverage

Estimates of iodine nutrition were calculated based on UI data available from 126 countries representing 92.1% of the world's population of school-age children (Table 3.1). The current estimates are thus believed to be a true reflection of the situation. The remaining 66 countries lacking data, or lacking recent data, represent only 7.9% of the world's school-age population. However, the risk of iodine deficiency is unlikely to be a public health problem in many of these countries.

3.2.2 Limitations of data sources

Estimates presented are subject to several limitations. Sixty percent of the 126 countries with data have nationally representative surveys; the remainder have only one or several sub-national surveys. The lack of nationally representative surveys may lead to substantial bias. Under estimation may occur when parts of a country which may have an in-adequate iodine intake, have not been surveyed. Over estimation may occur when the population of one or more endemic regions is over-sampled. The data for some countries are still weak which makes their classification and accurate analysis of their national situation difficult. For example, for India and Spain the only available data are sub-national, which pooled show optimal iodine nutrition. In the absence of national representative data the entire country has therefore been classified accordingly, when in fact the situation might be very different. Thus, the methods used for pooling sub-national survey results into one summary measure are not perfect. Nevertheless, they are regarded as the best estimate in the absence of nationally representative data.

The data compiled in the database are extracted from final publications and reports, which present data in various formats and with varying degrees of analysis. The models developed to standardize the data and derive one measure from another are a potential source of error. Raw data sets are not available in the database and thus render any further verification impossible.

When the proportion of population with UI below 100 µg/l was missing for a particular country, the equation presented in section 2.3 was used to produce a value for this variable from the value of the median. Because the model is based on real data, no manipulation (changes in slope or intercept) was carried out in the equation that predicts the proportion of population below 100 µg/l from the median UI, to adapt it to expected predictions. The results may then slightly depart from expected values. In accordance with current knowledge on modelling, in the case that the predicted results lead to mistaken classification, this was mentioned in the "notes" section of Annex 3, Table A3.1. This problem only arose for one country, for which the predicted value of the proportion of population with UI below 100 µg/l was 50.1% (hence classifying this country as iodine deficient) while the median was 109 µg/l.

These limitations highlight the need to improve data quality. It is important for countries to conduct nationally representative surveys on a regular basis and ensure representative samples. Standardized data collection and presentation will also aid the comparison of countries and regions, allow for more precise monitoring and a lower level of uncertainty around future global estimates of iodine nutrition.

3.2.3 Classification of countries by degree of public health significance of iodine nutrition based on median UI

Iodine nutrition is optimal in 43 countries (Table 3.5). The number of countries with iodine deficiency as a public health problem decreased from 110 to 54 between 1993 (using TGP as an indicator) and 2003 (using UI). Nevertheless, in 54 countries, located in all regions of the world, the iodine intake of the population is insufficient and iodine deficiency with its impact on health and development is still a public health concern. In these countries USI needs to be strengthened and fully implemented.

Iodine intake is more than adequate, with a median UI between 200 and 299 µg/l, in 24 countries. Here attention should be drawn to the emerging risk of iodine-induced hyperthyroidism in susceptible groups following introduction of iodized salt.

Five countries have a median UI equal to or above 300 µg/l indicating an excessive iodine intake and are therefore exposed to the risk of hyperthyroidism and iodine toxicity. Elevated median UI is most likely due to high levels of iodine added to salt. Salt quality monitoring should be re-inforced to ensure that the level of salt fortification with iodine is not too high but is adequate to ensure optimal iodine nutrition.

Sixty-six countries have no data on UI and iodine nutrition can therefore not be classified. Even though iodine deficiency is unlikely in many of these countries, urinary iodine surveys should be performed in order to investigate the level of iodine intake and evaluate the effectiveness of pre-existing salt iodization programmes. There is evidence that iodine deficiency may be re-emerging in countries that were previously thought to be iodine sufficient, like Australia and New Zealand (Annex 3, Table A3.1).

3.2.4 Proportion of population and the number of individuals with insufficient iodine intake

Overall, one third of the world's school-age children population has UI below 100 μg/l indicating insufficient iodine intake (Table 3.6). This group is therefore exposed to the risk of iodine deficiency.

For the six WHO regions the proportion of the population with UI below 100 μg/l ranges from 10% (in the Americas) to 60% (in Europe).

Noteworthy is the correlation between household coverage of iodized salt and prevalence of low iodine intake. The proportion of households consuming iodized salt increased from 10% in the 1990s (*20*) to 66% in the year 2003 (*24*).

The Americas has the highest number of households consuming iodized salt (90%) and the lowest proportion of its population with an insufficient iodine intake. In contrast, the European Region which has the lowest household consumption of iodized salt (27%), has the highest proportion of its population with an insufficient iodine intake (*20*). These results, however, should not mask the fact that there are large variations both between countries within regions, and within countries themselves.

WHO recommends that school-age children are surveyed to assess iodine status because they are readily accessible and their iodine status is an acceptable proxy for the iodine status of the general population. Results of surveys of school-age children were thus extrapolated to the general population (Table 3.6). However, it has recently been recognized that national systems to monitor the impact of USI also need to include other vulnerable groups, especially pregnant women. Data for this population group may be considered for future global analysis as more data become available.

3.2.5 TGP

The worldwide TGP of 15.8% is above the 5% cut-off used to signal a public health problem (*12*). Its increase of 31.7% between 1993 and 2003 is inconsistent with current iodine status based on UI. This has several possible explanations.

First, there is a time lag between the implementation of a salt iodization programme and the disappearance of clinically detectable goitre (*25*). This time-lag may be further increased when USI is only partially implemented.

Second, 70% of the TGP surveys in the analysis period 1993–2003 were carried out between 1993 to 1998, which was prior to extensive implementation of USI programmes. In fact, when analysis is restricted to surveys carried out in the last five years, TGP shows a decrease of 28.9% compared to 1993. Analysis of data available in the WHO database also shows that between 1993 and 1998 TGP was the main indicator used to assess iodine deficiency, while UI was measured only in a few countries. The shift in indicators from TGP to UI over the last decade resulted in less TGP data covering the last five years since many countries only measured UI in their most recent surveys.

Third, in areas affected by mild iodine deficiency, the sensitivity and specificity of TGP measured by palpation are poor (*26*). Ultrasonography is a promising method to overcome the inherent limitations of the clinical assessment of thyroid volume as iodine status improves. New international reference values are now available allowing comparison between countries (*22*). In spite of its limitations for global trend analysis TGP measured by palpation remains a practical indicator for baseline assessment, especially in severely endemic areas (*12*, *27*).

3.3 Conclusion

In conclusion, there has been substantial progress in the last decade towards the elimination of iodine deficiency. Improved iodine nutrition reflects the validity of the strategy adopted by WHO based on salt iodization complemented with iodine supplementation in remote areas not reached by iodized salt or in population groups who are severely deficient. It reflects the efforts made by countries to implement effective IDD control programmes and is proof of the successful collaboration between all the partners in IDD control, in particular the health authorities and the salt industry.

Having said that, every effort needs to be made to ensure that programmes continue to cover at-risk populations if the goal of eliminating IDD is to be reached. Current iodine deficiency estimates based on UI provide the baseline for future global estimates. The challenge now is to improve the quality of the data in order to trigger appropriate and timely interventions and to track progress more accurately and rapidly.

With regard to the WHO Global Database on Iodine Deficiency and the measurement of iodine nutrition, attention must be drawn to the following issues.

- It is important that each country carries out nationally representative surveys on a regular basis. Efforts should be made to ensure that samples are representative (i.e. to make sure that no region of a given country is deliberately excluded from the sampling procedure). Countries where evaluation data are missing introduce considerable uncertainty as to the impact of the iodization efforts.

- National data may not reflect the presence of pockets of iodine deficiency in some parts of the country. Additional closer monitoring might be required.
- UI is the most reliable indicator to assess, monitor and evaluate iodine status in a population. At the assessment stage, clinical detection of goitre may be useful but it should always be associated with the measurement of urinary iodine. Neonatal TSH screening may be useful if a reliable system is already in place and the resources are available.
- To improve the reliability of goitre data, thyroid volume can be measured by ultrasonography. For comparison between countries and regions results from surveys measuring thyroid size by ultrasound should apply the new international reference values for thyroid volume measured by ultrasonography (*22*).
- Efforts to enforce a standardized approach in presenting data are important for cross-comparisons between countries and regions. This will reduce the level of uncertainty of future global estimates of iodine deficiency. It will also aid in the monitoring of IDD and management of USI programmes.
- The quality of data also depends on the capacity of national laboratories to carry out reliable measurements of UI. The IRLI network provides country support.

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ANNEX 1

WHO Member States grouped by WHO and UN regions

Table A1.1 ***WHO Member States grouped by WHO region***

Africa

Algeria
Angola
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Cape Verde
Central African Republic
Chad
Comoros
Congo
Côte d'Ivoire
Democratic Republic of the Congo
Equatorial Guinea
Eritrea
Ethiopia
Gabon
Gambia
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mozambique
Namibia
Niger
Nigeria
Rwanda
Sao Tome and Principe
Senegal
Seychelles
Sierra Leone
South Africa
Swaziland
Togo
Uganda
United Republic of Tanzania
Zambia
Zimbabwe

Americas

Antigua and Barbuda
Argentina
Bahamas
Barbados
Belize
Bolivia
Brazil
Canada
Chile
Colombia
Costa Rica
Cuba
Dominica
Dominican Republic
Ecuador
El Salvador
Grenada
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Suriname
Trinidad and Tobago
United States of America
Uruguay
Venezuela

South-East Asia

Bangladesh
Bhutan
Democratic People's Republic of Korea
India
Indonesia
Maldives
Myanmar
Nepal
Sri Lanka
Thailand
Timor Leste

Europe

Albania
Andorra
Armenia
Austria
Azerbaijan
Belarus
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Georgia
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Luxemburg
Malta
Monaco
Netherlands
Norway
Poland
Portugal
Republic of Moldova
Romania
Russian Federation
San Marino
Serbia and Montenegro
Slovakia
Slovenia
Spain
Sweden
Switzerland
Tajikistan
The former Yugoslav Republic of Macedonia
Turkey
Turkmenistan
Ukraine
United Kingdom of Great Britain and Northern Ireland
Uzbekistan

Eastern Mediterranean

Afghanistan
Bahrain
Djibouti
Egypt
Iran (Islamic Republic of)
Iraq
Jordan
Kuwait
Lebanon
Libyan Arab Jamahiriya
Morocco
Oman
Pakistan
Qatar
Saudi Arabia
Somalia
Sudan
Syrian Arab Republic
Tunisia
United Arab Emirate
Yemen

Western Pacific

Australia
Brunei Darussalam
Cambodia
China
Cook Islands
Fiji
Japan
Kiribati
Lao People's Democratic Republic
Malaysia
Marshall Islands
Micronesia (Federated States of)
Mongolia
Nauru
New Zealand
Niue
Palau
Papua New Guinea
Philippines
Republic of Korea
Samoa
Singapore
Solomon Islands
Tonga
Tuvalu
Vanuatu
Viet Nam

Table A1.2 ***WHO Member States grouped by UN region and subregion***

Africa

Eastern Africa

Burundi
Comoros
Djibouti
Eritrea
Ethiopia
Kenya
Madagascar
Malawi
Mauritius
Mozambique Rwanda
Seychelles
Somalia
Uganda
United Republic of Tanzania
Zambia
Zimbabwe

Middle Africa

Angola
Cameroon
Central African Republic
Chad
Congo
Democratic Republic of The Congo
Equatorial Guinea Gabon
Sao Tome and Principe

Northern Africa

Algeria
Egypt
Libyan Arab Jamahiriya
Morocco
Sudan
Tunisia

Southern Africa

Botswana
Lesotho
Namibia
South Africa
Swaziland

Western Africa

Benin
Burkina Faso
Cape Verde
Côte d'Ivoire
Gambia
Ghana
Guinea
Guinea-Bissau
Liberia
Mali
Mauritania
Niger
Nigeria
Senegal
Sierra Leone
Togo

Asia

Eastern Asia

China
Democratic People's Republic of Korea
Japan
Mongolia
Republic of Korea

South-central Asia

Afghanistan
Bangladesh
Bhutan
India
Iran (Islamic Republic of)
Kazakhstan
Kyrgyzstan
Maldives
Nepal
Pakistan
Sri Lanka
Tajikistan
Turkmenistan
Uzbekistan

South-eastern Asia

Brunei Darussalam
Cambodia
Timor Leste
Indonesia
Lao People's Democratic Republic
Malaysia
Myanmar
Philippines
Singapore
Thailand
Viet Nam

Western Asia

Armenia
Azerbaijan
Bahrain
Cyprus
Georgia
Iraq
Israel
Jordan
Kuwait
Lebanon
Oman
Qatar
Saudi Arabia
Syrian Arab Republic
Turkey
United Arab Emirates
Yemen

Europe

Eastern Europe

Belarus
Bulgaria
Czech Republic
Hungary
Poland
Republic of Moldova
Romania
Russian Federation
Slovakia
Ukraine

Northern Europe

Denmark
Estonia
Finland
Iceland

Ireland
Latvia
Lithuania
Norway
Sweden

Southern Europe
Albania
Andorra
Bosnia and Herzegovina
Croatia
Greece
Italy
Malta
Portugal
San Marino

Western Europe
Austria
Belgium
France
Germany
Luxembourg
Monaco
Netherlands
Switzerland

Latin America and the Caribbean
Caribbean
Antigua and Barbuda
Bahamas
Barbados
Cuba
Dominica
Dominican Republic
Grenada
Haiti
Jamaica
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Trinidad and Tobago

Central America
Belize
Costa Rica
El Salvador
Guatemala
Honduras
Mexico
Nicaragua
Panama

South America
Argentina
Bolivia
Brazil
Chile
Colombia
Ecuador
Guyana
Paraguay
Peru
Suriname
Uruguay
Venezuela

Northern America
Canada
United States of America

Oceania
Australia-New Zealand
Australia
New Zealand

Melanesia
Fiji
Papua New Guinea
Solomon Islands
Vanuatu

Micronesia
Kiribati
Marshall Islands
Micronesia (Federated States of)
Nauru
Palau

Polynesia
Cook Islands
Samoa
Tonga
Tuvalu
Niue

ANNEX 2

Results by UN region

Table A2.1 ***Population coverage[a] by UI surveys carried out between 1993 and 2003, by UN region***

UN region[b]	School-age children (millions)[c]	School-age children surveyed (millions)	Coverage (%)
Africa	**154.6**	**139.8**	**90.4**
Eastern Africa	52.1	43.1	82.7
Middle Africa	19.1	15.6	82.0
Northern Africa	28.7	27.9	97.3
Southern Africa	8.3	7.9	95.4
Western Africa	46.4	45.2	97.5
Asia	**521.7**	**488.8**	**93.7**
Eastern Asia	164.8	148.8	90.3
South-central Asia	246.5	241.2	97.8
South-eastern Asia	79.0	75.8	95.9
Western Asia	31.5	23.0	73.2
Europe	**59.1**	**50.3**	**85.2**
Eastern Europe	25.2	25.2	100.0
Northern Europe	8.6	2.0	23.1
Southern Europe	10.6	8.5	79.7
Western Europe	14.7	14.7	100.0
Latin America and the Caribbean	**76.6**	**69.2**	**53.7**
Caribbean	4.5	2.4	53.0
Central America	22.4	22.4	100.0
South America	49.7	44.5	89.5
Northern America	**32.4**	**29.6**	**91.2**
Oceania	**3.7**	**3.5**	**94.0**
Australia–New Zealand	2.3	2.3	100.0
Melanesia	1.3	1.2	90.2
Micronesia	0.04	0	0.0
Polynesia	0.05	0	0.0
Total	**848.0**	**781.2**	**92.1**

[a] School-age children (6–12 years).
[b] Based on 192 WHO Member States.
[c] Based on population estimates for the year 2002 (*23*).

Table A2.2 ***Type of UI survey data by UN region***

UN region[a]	National	Sub-national	No data
Africa	**20**	**18**	**15**
Eastern Africa	7	3	7
Middle Africa	3	2	4
Northern Africa	3	2	1
Southern Africa	3	1	1
Western Africa	4	10	2
Asia	**26**	**8**	**13**
Eastern Asia	2	0	3
South-central Asia	8	4	2
South-eastern Asia	6	1	4
Western Asia	10	3	4
Europe	**16**	**14**	**11**
Eastern Europe	6	4	0
Northern Europe	3	4	3
Southern Europe	3	3	7
Western Europe	4	3	1
Latin America and the Caribbean	**12**	**7**	**14**
Caribbean	1	1	11
Central America	7	1	0
South America	4	5	3
Northern America	**1**	**0**	**1**
Oceania	**0**	**4**	**12**
Australia–New Zealand	0	2	0
Melanesia	0	2	2
Micronesia	0	0	5
Polynesia	0	0	5
Total	**75**	**51**	**66**

[a] Based on 192 WHO Member States.

Table A2.3 ***Population coverage[a] by TGP surveys carried out between 1993 and 2003, by UN region***

UN region[b]	School-age children (millions)[c]	School-age children surveyed (millions)	Coverage (%)
Africa	**154.6**	**140.5**	**90.9**
Eastern Africa	52.1	46.1	88.4
Middle Africa	19.1	16.4	85.8
Northern Africa	28.7	27.9	97.3
Southern Africa	8.3	7.9	95.4
Western Africa	46.4	42.2	91.1
Asia	**521.7**	**487.4**	**93.4**
Eastern Asia	164.8	148.8	90.3
South-central Asia	246.5	246.5	100.0
South-eastern Asia	79.0	69.9	88.6
Western Asia	31.5	22.2	70.6
Europe	**59.1**	**26.1**	**44.2**
Eastern Europe	25.2	9.2	36.4
Northern Europe	8.6	0.5	5.5
Southern Europe	10.6	9.4	88.2
Western Europe	14.7	7.1	48.4
Latin America and the Caribbean	**76.6**	**50.7**	**66.2**
Caribbean	4.5	1.3	28.4
Central America	22.4	16.1	72.0
South America	49.7	33.3	67.0
Northern America	**32.4**	**0**	**0.0**
Oceania	**3.7**	**2.9**	**79.3**
Australia–New Zealand	2.3	1.9	81.7
Melanesia	1.3	1.0	80.7
Micronesia	0.040	0	0.0
Polynesia	0.054	0	0.0
Total	**848.0**	**707.7**	**83.5**

[a] School-age children (6–12 years).
[b] Based on 192 WHO Member States.
[c] Based on population estimates for the year 2002 (UN 2003).

Table A2.4 ***Type of TGP survey data by UN region***

UN region[a]	National	Sub-national	No data
Africa	**21**	**18**	**14**
Eastern Africa	6	5	6
Middle Africa	3	3	3
Northern Africa	3	2	1
Southern Africa	3	1	1
Western Africa	6	7	3
Asia	**24**	**9**	**14**
Eastern Asia	2	0	3
South-central Asia	7	7	0
South-eastern Asia	6	0	5
Western Asia	8	3	6
Europe	**9**	**10**	**22**
Eastern Europe	3	4	3
Northern Europe	0	1	9
Southern Europe	5	3	5
Western Europe	1	2	5
Latin America and the Caribbean	**4**	**3**	**26**
Caribbean	1	0	12
Central America	1	1	6
South America	2	2	8
Northern America	**0**	**0**	**2**
Oceania	**0**	**2**	**14**
Australia–New Zealand	0	1	1
Melanesia	0	1	3
Micronesia	0	0	5
Polynesia	0	0	5
Total	**57**	**43**	**92**

[a] Based on 192 WHO Member States.

Table A2.5 ***Number of countries classified by degrees of public health significance of iodine nutrition based on median UI in school-age children, by UN region, 2003***

UN region[a]	Classification of iodine nutrition						
	Severe iodine deficiency (Median UI <20 µg/l)	Moderate iodine deficiency (Median UI 20–49 µg/l)	Mild iodine deficiency (Median UI 50–99 µg/l)	Optimal iodine nutrition (Median UI 100–199 µg/l)	Risk of IIH in susceptible groups (Median UI 200–299 µg/l)	Risk of adverse health consequences (Median UI ≥300 µg/l)	No data
Africa	**0**	**6**	**10**	**13**	**7**	**2**	**15**
Eastern Africa	0	0	3	4	2	1	7
Middle Africa	0	2	1	1	1	0	4
Northern Africa	0	1	2	2	0	0	1
Southern Africa	0	1	0	2	1	0	1
Western Africa	0	2	4	4	3	1	2
Asia	**1**	**4**	**12**	**12**	**5**	**0**	**13**
Eastern Asia	0	0	0	1	1	0	3
South-central Asia	1	2	4	3	2	0	2
South-eastern Asia	0	1	3	3	0	0	4
Western Asia	0	1	5	5	2	0	4
Europe	**0**	**1**	**15**	**14**	**0**	**0**	**11**
Eastern Europe	0	1	6	3	0	0	0
Northern Europe	0	0	5	2	0	0	3
Southern Europe	0	0	1	5	0	0	7
Western Europe	0	0	3	4	0	0	1
Latin America and the Caribbean	**0**	**1**	**1**	**3**	**11**	**3**	**14**
Caribbean	0	1	1	0	0	0	11
Central America	0	0	0	2	6	0	0
South America	0	0	0	1	5	3	3
Northern America	**0**	**0**	**0**	**0**	**1**	**0**	**1**
Oceania	**0**	**1**	**2**	**1**	**0**	**0**	**12**
Australia–New Zealand	0	0	2	0	0	0	0
Melanesia	0	1	0	1	0	0	2
Micronesia	0	0	0	0	0	0	5
Polynesia	0	0	0	0	0	0	5
Total	**1**	**13**	**40**	**43**	**24**	**5**	**66**

[a] Based on 192 WHO Member States.

Table A2.6 ***Proportion of population, and number of individuals with, insufficient iodine intake in school-age children (6–12 years) and the general population, by UN region, 2003***

	Insufficient iodine intake (UI <100 µg/l)			
	School-age children		General population	
UN region[a]	Prevalence (%)	Total number (millions)[b]	Prevalence (%)	Total number (millions)[b]
Africa	**42.7**	**59.7**	**43.0**	**324.2**
Eastern Africa	45.1	19.4	45.2	98.2
Middle Africa	32.4	5.1	32.7	26.3
Northern Africa	50.7	14.1	50.6	88.2
Southern Africa	31.6	2.5	31.2	15.4
Western Africa	41.1	18.6	41.4	96.2
Asia	**38.3**	**187.0**	**35.6**	**1239.3**
Eastern Asia	16.3	24.2	16.3	212.2
South-central Asia	43.2	104.1	41.9	631.9
South-eastern Asia	61.2	46.4	60.5	312.6
Western Asia	53.2	12.2	55.8	82.6
Europe	**53.1**	**26.7**	**52.7**	**330.8**
Eastern Europe	60.0	15.1	59.9	180.6
Northern Europe	59.3	1.2	59.2	13.0
Southern Europe	47.8	4.1	49.2	58.8
Western Europe	43.6	6.4	42.6	78.5
Latin America and the Caribbean	**10.3**	**7.1**	**10.0**	**47.4**
Caribbean	69.8	1.7	66.2	13.2
Central America	9.9	2.2	9.7	13.5
South America	7.3	3.3	6.6	20.8
Northern America	**9.5**	**2.8**	**9.5**	**27.6**
Oceania	**59.4**	**2.1**	**64.5**	**19.2**
Australia–New Zealand	73.0	1.7	72.8	17.0
Melanesia	32.7	0.4	33.9	2.2
Micronesia	–	–	–	–
Polynesia	–	–	–	–
Total	**36.5**	**285.4**	**35.2**	**1988.7**

– No data.

[a] Based on 192 WHO Member States.

[b] Based on population estimates for the year 2002 (UN 2003).

Table A2.7 ***TGP in the general population[a] by UN region, 2003***

UN region[b]	Total goitre prevalence (%)
Africa	**26.8**
Eastern Africa	29.5
Middle Africa	23.3
Northern Africa	25.3
Southern Africa	29.1
Western Africa	25.9
Asia	**14.5**
Eastern Asia	5.3
South-central Asia	23.8
South-eastern Asia	8.4
Western Asia	20.4
Europe	**16.3**
Eastern Europe	27.2
Northern Europe	12.1
Southern Europe	10.9
Western Europe	10.7
Latin America and the Caribbean	**4.7**
Caribbean	4.9
Central America	8.7
South America	2.9
Northern America	**–**
Oceania	**12.9**
Australia–New Zealand	15.3
Melanesia	4.4
Micronesia	–
Polynesia	–
Total	**15.8**

– No data.

[a] Estimated from TGP data from school-age children (6–12 years).

[b] Based on 192 WHO Member States.

ANNEX 3

National estimates of iodine status

Table A3.1 **Country data on UI and national estimate of iodine nutrition**

Member State	Population year 2002[a]		Survey data											Population with insufficient iodine intake	
	6–12 years (000)	General (000)	Date of survey (years)	Level of survey	Population group and age (years)	Sample size	Median UI (µg/l)	Proportion of population with UI <100 µg/l (%)	95% CI of proportion of population with UI <100 µg/l (%)	Notes	Bibliographic references[b]	Classification of iodine intake	Classification of iodine nutrition	6–12 years (000)	General population (000)
Afghanistan	4197	22 930	No data												
Albania	434	3141	No data												
Algeria	4993	31 266	1994 P	Local	SAC (6–11)	169	27	77.7	71.4–84.0	Survey in endemic area. Baseline data before intervention. % <100 µg/l calculated from median.	1348	Insufficient	Moderate iodine deficiency	3879	24294
Andorra	6	69	No data												
Angola	2594	13 184	No data												
Antigua and Barbuda	10	73	No data												
Argentina	4792	37 981	No data												
Armenia	346	3072	1998	National	Pre-SAC (0–5)	2596	146	31.8	30.0–33.6	Median calculated from % <100 µg/l.	3329	Adequate	Optimal iodine nutrition	110	977
Australia	1872	19 544	2000, 2001	State, local	SAC (4–18)	802	77	71.5	68.4–74.6	Medians and % <100 µ g/l from two surveys pooled.	3379, 3598	Insufficient	Mild iodine deficiency	1339	13974
Austria	650	8111	1994	Local	SAC (6–15)	589	111	49.4	46.3–54.3	Thyromobile study. % <100 µg/l calculated from median.	1319	Adequate	Optimal iodine nutrition	327	4080
Azerbaijan	1268	8297	2001 P	Regional	SAC (8–14)	347	54	74.4	69.8–79.0	% <100 µg/l calculated from median.	3413	Insufficient	Mild iodine deficiency	943	6173
Bahamas	42	310	No data												
Bahrain	97	709	1999	National	SAC (8–12)	749	204	16.2	13.6–18.8	Median calculated from % <100 µg/l.	1142	More than adequate	Risk of IIH in susceptible groups	16	115
Bangladesh	25 239	143 809	1993	National	SAC (5–11)	2054	54	70.7	68.7–72.7	Median calculated from % <100 µg/l.	642	Insufficient	Mild iodine deficiency	17844	101673
Barbados	26	269	No data												
Belarus	862	9940	1995–1998	National	SAC (6–18)	11 562	45	80.9	80.2–81.6		3181	Insufficient	Moderate iodine deficiency	697	8041
Belgium	846	10 296	1998	National	SAC (6–12)	2585	80	66.9	65.1–68.7		1336	Insufficient	Mild iodine deficiency	566	6888
Belize	44	251	1994–1995	National	SAC (7–14)	1656	184	26.7	24.6–28.8	% <100 µg/l calculated from median.	3133	Adequate	Optimal iodine nutrition	12	67
Benin	1302	6558	1999	Local	SAC (6–12)	433	289	8.3	5.7–10.9	Thyromobile study. % <100 µg/l calculated from median.	2535	More than adequate	Risk of IIH in susceptible groups	108	544
Bhutan	409	2190	1996	National	SAC (6–11)	333	230	24.0	19.4–28.6		2649	More than adequate	Risk of IIH in susceptible groups	98	526
Bolivia	1546	8645	1996	National	Women 15–49 and children <5	508	250	19.0	15.6–22.4		3339	More than adequate	Risk of IIH in susceptible groups	294	1643
Bosnia and Herzegovina	357	4126	1999	National	SAC (7–14)	1945	111	52.4	50.2–54.6	Medians and % <100 µg/l pooled separately from two surveys (Republica Srpska and Federation of Bosnia & Herzegovina). Pooled % <100 µg/l higher than 50% in spite of pooled median higher than 100 µg/l.	2994 3453	Adequate	Optimal iodine nutrition	187	2162
Botswana	321	1770	1994	National	SAC (8–10)	287	219	15.3	11.1–19.5	Medians from disagregated data by districts pooled. % <100 µ g/l calculated from median.	2805	More than adequate	Risk of IIH in susceptible groups	49	271
Brazil	23 198	176 257	2000	State	SAC (6–12)	1013	360	0.0	0.0–0.0		3350	Excessive	Risk of adverse health consequences	0	0
Brunei Darussalam	49	350	No data												
Bulgaria	599	7965	1996	National	SAC (6–14)	1028	111	42.9	39.9–45.9		3017	Adequate	Optimal iodine nutrition	257	3417
Burkina Faso	2608	12 624	1999	Local	SAC (6–12)	391	114	47.5	42.6–52.4	Thyromobile study.	2535	Adequate	Optimal iodine nutrition	1239	5997

Table A3.1

Member State	Population year 2002[a] 6–12 years (000)	Population year 2002[a] General (000)	Survey data: Date of survey (years)	Level of survey	Population group and age (years)	Sample size	Median UI (μg/l)	Proportion of population with UI <100 μg/l (%)	95% CI of proportion of population with UI <100 μg/l (%)	Notes	Bibliographic references[b]	Classification of iodine intake	Classification of iodine nutrition	Population with insufficient iodine intake 6–12 years (000)	Population with insufficient iodine intake General population (000)
Burundi	1361	6602	No data												
Cambodia	2585	13 810	No data												
Cameroon	3007	15 729	1993	National	SAC (6–18)	757	52	91.7	89.7–93.7		1431	Insufficient	Mild iodine deficiency	2757	14 424
Canada	2840	31 271	No data												
Cape Verde	85	454	1996	National	SAC (6–12)	302	52	77.4	72.7–82.1		1622	Insufficient	Mild iodine deficiency	66	351
Central African Republic	729	3819	1993–1994	Province	General population	319	21	79.5	75.1–83.9	% <100 μg/l calculated from median.	1351	Insufficient	Moderate iodine deficiency	579	3036
Chad	1638	8348	1993–1994	National	SAC (10–20)	1141	29	99.6	99.2–100.0		390	Insufficient	Moderate iodine deficiency	1632	8314
Chile	2046	15 613	2001	Local urban	SAC (6–18)	371	984	0.2	0.0–0.7	Median calculated from mean.	3335	Excessive	Risk of adverse health consequences	4	31
China	148 422	1 302 307	2002	National	SAC (8–10)	11 766	241	16.2	15.5–16.9	% <100 μg/l calculated from median.	3579	More than adequate	Risk of IIH in susceptible groups	24 044	210 974
Colombia	6514	43 526	1994–1998	National urban	SAC (8–12)	7363	249	6.4	5.8–7.0	Median calculated from % <100 μg/l.	3296	More than adequate	Risk of IIH in susceptible groups	417	2786
Comoros	137	747	No data												
Congo	727	3633	No data												
Cook Islands	2	18	No data												
Costa Rica	595	4094	1996	National	SAC	538	233	8.9	6.5–11.3		1634	More than adequate	Risk of IIH in susceptible groups	53	364
Cote d'Ivoire	3067	16 365	1999–2000	Local	SAC (4–16)	400	162	33.8	29.2–38.4	% <100 μg/l calculated from median.	3239	Adequate	Optimal iodine nutrition	1036	5531
Croatia	351	4439	2002	National	SAC (6–12)	927	140	28.8	25.9–31.7		3429	Adequate	Optimal iodine nutrition	101	1278
Cuba	1119	11 271	1995	National rural	SAC (6–12)	3027	95	51.0	49.2–52.8		1512	Insufficient	Mild iodine deficiency	571	5748
Cyprus	87	796	No data												
Czech Republic	810	10 246	2000 P	Regional	SAC (6, 10, 13)	714	119	47.7	44.0–51.4	Median calculated from mean. % <100 μg/l calculated from median.	515	Adequate	Optimal iodine nutrition	386	4887
Democratic People's Republic of Korea	2825	22 541	No data												
Democratic Republic of the Congo	10 011	51 201	1995	Local	SAC (6–14)	305	267	0.0	0.0–0.0	Medians from disaggregated data by zones pooled. % <100 μg/l calculated from median.	3601	More than adequate	Risk of IIH in susceptible groups	0	0
Denmark	473	5351	1997–1998	Regional	Adults (18–65)	4616	61	70.8	69.5–72.1	% <100 μg/l calculated from median.	3205	Insufficient	Mild iodine deficiency	335	3789
Djibouti	129	693	No data												
Dominica	11	78	No data												
Dominican Republic	1292	8616	1993	National	SAC (6–14)	837	39	86.0	83.7–88.4	Median calculated from % <100 μg/l.	771	Insufficient	Moderate iodine deficiency	1111	7410
Ecuador	1978	12810	1999	Local	SAC	630	420	0.0	0.0–0.0	Thyromobile study. % <100 μg/l calculated from median.	3615	Excessive	Risk of adverse health consequences	0	0
Egypt	11 373	70 507	1998	State	SAC (6–10)	706	148	31.2	27.8–34.6	Median calculated from % <100 μg/l.	2639	Adequate	Optimal iodine nutrition	3548	21 998
El Salvador	1033	6415	1996–1997	National	SAC (6–14)	2394	>150	4.6	3.8–5.4		3108	Adequate	Optimal iodine nutrition	48	295
Equatorial Guinea	90	481	No data												
Eritrea	794	3991	1998	National	SAC (6–12)	2100	168	25.3	23.4–27.2	Median calculated from % <100 μg/l.	3122	Adequate	Optimal iodine nutrition	201	1010
Estonia	112	1338	1995	National	SAC (8–10)	1840	65	67.0	64.9–69.2		1225	Insufficient	Mild iodine deficiency	75	896

Table A3.1

Member State	Population year 2002[a]		Survey data											Population with insufficient iodine intake	
	6–12 years (000)	General (000)	Date of survey (years)	Level of survey	Population group and age (years)	Sample size	Median UI (µg/l)	Proportion of population with UI <100 µg/l (%)	95% CI of proportion of population with UI <100 µg/l (%)	Notes	Bibliographic references[b]	Classification of iodine intake	Classification of iodine nutrition	6–12 years (000)	General population (000)
Ethiopia	13 685	68 961	2000 P	District	SAC	512	58	68.4	64.4–72.4	Means from disaggregated data by regions pooled. Median calculated from mean. % <100 µg/l calculated from median.	3199	Insufficient	Mild iodine deficiency	9360	47 169
Fiji	123	831	1994	District	SAC	479	34	75.4	71.5–79.3	Medians from disaggregated data by site pooled. % <100 µg/l calculated from median.	3236	Insufficient	Moderate iodine deficiency	93	626
Finland	448	5197	1997	Local	Adults (30–42)	342	164	35.5	30.4–40.6	% <100 µg/l calculated from median.	3605	Adequate	Optimal iodine nutrition	159	1845
France	5128	59 850	1996	National	Adults (35–60)	12 014	85	60.4	59.5–61.3	Medians from disaggregated data by sex pooled. % <100 µg/l calculated from median.	1269	Insufficient	Mild iodine deficiency	3097	36 149
Gabon	245	1306	2001	National	SAC (6–12)	NS	190	38.3		% <100 µg/l calculated from median.	3611	Adequate	Optimal iodine nutrition	94	500
Gambia	248	1388	1999	National	SAC (8–12)	594	42	72.8	69.2–76.4	% <100 µg/l calculated from median.	2595	Insufficient	Moderate iodine deficiency	180	1011
Georgia	494	5177	1998	National	NS	NS	62	80.0		Median calculated from % <100 µg/l.	3699	Insufficient	Mild iodine deficiency	395	4142
Germany	6022	82414	1999	National	SAC (6–12)	3065	148	27.0	25.4–28.6		3126	Adequate	Optimal iodine nutrition	1626	22 252
Ghana	3712	20471	1994	District		292	54	71.3	66.1–76.5		1772	Insufficient	Mild iodine deficiency	2647	14 596
Greece	759	10970	No data												
Grenada	12	80	No data												
Guatemala	2309	12036	1995	National	SAC, women	814	222	14.4	12.0–16.8	% <100 µg/l calculated from median.	3091	More than adequate	Risk of IIH in susceptible groups	333	1733
Guinea	1567	8359	1999	Region	SAC (8–19)	1234	91	63.6	60.9–66.3	Medians and % <100 µg/l from disagregated data by prefectures pooled.	2617	Insufficient	Mild iodine deficiency	997	5316
Guinea-Bissau	283	1449	No data												
Guyana	104	764	1997 P	National	SAC (5–14)	342	162	26.9	22.2–31.6	% <100 µg/l from disagregated data by sex pooled. Median calculated from % <100 µg/l.	3094	Adequate	Optimal iodine nutrition	28	205
Haiti	1459	8218	No data												
Honduras	1262	6781	1999	Local	SAC	609	240	31.3	27.6–35.0	Thyromobile study. % <100 µg/l calculated from median.	3394	More than adequate	Risk of IIH in susceptible groups	395	2122
Hungary	817	9923	1994–1997	National	SAC (7–11)	2814	80	65.2	63.4–67.0	% <100 µg/l from disagregated data by county pooled.	3041, 3684 3683, 3682 3681	Insufficient	Mild iodine deficiency	533	6470
Iceland	32	287	1998 P	Local	Elderly (66–70)	89	150	37.7	27.6–47.8	% <100 µg/l calculated from median.	1251	Adequate	Optimal iodine nutrition	12	108
India	16 1973	1 049 549	1993–1993, 1995, 1996, 1996 P, 1997, 1997 P, 1998, 1998 P, 1999, 2000 P, 2001 P, 2001, 2002	State, district	SAC	17 321	133	31.3	30.6–32.0	Medians and % <100 µg/l from 20 state and district surveys, pooled at district level.	1158, 1162 1159, 1164 1161, 1160 1215, 1166 1163, 3538 1165, 3539 3456, 3584 3585, 3578 3577, 3565 3545, 3534	Adequate	Optimal iodine nutrition	50 698	328 509
Indonesia	30 322	217 131	1996 P	District	SAC (8–10)	544	65	63.7	59.7–67.7		1183	Insufficient	Mild iodine deficiency	19 315	138 313
Iran (Islamic Republic of)	11 208	68 070	1996	National	SAC (8–10)	2917	205	14.9	13.6–16.2		3317	More than adequate	Risk of IIH in susceptible groups	1670	10 142

Table A3.1

	Population year 2002[a]		Survey data												Population with insufficient iodine intake	
Member State	6–12 years (000)	General (000)	Date of survey (years)	Level of survey	Population group and age (years)	Sample size	Median UI (µg/l)	Proportion of population with UI <100 µg/l (%)	95% CI of proportion of population with UI <100 µg/l (%)	Notes	Bibliographic references[b]	Classification of iodine intake	Classification of iodine nutrition	6–12 years (000)	General popu-lation (000)
Iraq	4498	24 510	No data												
Ireland	375	3911	1999	Local	Adults (22–61)	132	82	60.8	52.5–69.1	% <100 µg/l calculated from median.	3608	Insufficient	Mild iodine deficiency	228	2378
Israel	795	6304	No data												
Italy	3866	57 482	1992–1994, 1993–1995, 1994 P, 1997 P, 1998 P, 1999 P	Region, local	SAC (6–15)	11 226	94	55.7	54.8–56.6	Medians from nine local and regional surveys pooled. % <100 µg/l calculated from median.	2058, 1291 3419, 1273 1287, 1286 2059, 1272	Insufficient	Mild iodine deficiency	2154	32 018
Jamaica	381	2627	No data												
Japan	8482	127 478	No data												
Jordan	917	5329	2000	National	SAC (8–10)	2601	154	24.4	22.8–26.1		2534	Adequate	Optimal iodine nutrition	224	1300
Kazakhstan	1991	15 469	1999	National	Women (15–49)	951	97	53.1	49.9–56.3	Medians from disaggregated data by region pooled.	3056	Insufficient	Mild iodine deficiency	1057	8214
Kenya	6050	31540	1994	National	SAC (8–10)	3042	115	36.7	35.0–38.4	% <100 µg/l from disaggregated data by district pooled.	391	Adequate	Optimal iodine nutrition	2220	11575
Kiribati	10	87	No data												
Kuwait	278	2443	1997	National	SAC (6–9)	341	147	31.4	26.5–36.3	Median calculated from % <100 µg/l.	3135	Adequate	Optimal iodine nutrition	87	767
Kyrgyzstan	787	5067	1994	Region	SAC (7–11)	221	30	88.1	83.8–92.4	Survey in 4 out of 7 States (Oblasts). The 4 States considered endemic. % <100 µg/l calculated from median.	3230	Insufficient	Moderate iodine deficiency	693	4464
Lao People's Democratic Republic	1038	5529	2000	National	SAC (8–12)	900	162	26.9	24.0–29.8	Median calculated from % <100 µg/l.	770	Adequate	Optimal iodine nutrition	279	1487
Latvia	200	2329	2000	National	SAC (8–10)	599	59	76.8	73.4–80.2		3058	Insufficient	Mild iodine deficiency	154	1789
Lebanon	510	3596	1997	National	SAC (7–15)	586	95	55.5	51.5–59.5	% <100 µg/l calculated from median.	3222	Insufficient	Mild iodine deficiency	283	1996
Lesotho	331	1800	1999	National	SAC (8–12)	500	26	100.0	–		3481	Insufficient	Moderate iodine deficiency	331	1800
Liberia	631	3239	1999	National	SAC (6–11)	2060	321	3.5	2.7–4.3		1242	Excessive	Risk of adverse health consequences	22	113
Libyan Arab Jamahiriya	765	5445	No data												
Lithuania	334	3465	1995	National	SAC	2087	75	62.0	59.9–64.1	% <100 µ g/l calculated from median.	3613	Insufficient	Mild iodine deficiency	207	2148
Luxembourg	40	447	1994	Local	SAC (6–15)	124	90	57.4	48.7–66.1	Thyromobile study. % <100 µg/l calculated from median.	1319	Insufficient	Mild iodine deficiency	23	257
Madagascar	3231	16916	No data												
Malawi	2315	11871	No data												
Malaysia	3717	23965	1995	National	SAC (8–10)	11 362	91	57.0	56.1–57.9	Medians from three state surveys pooled. % <100 µg/l calculated from median.	2637, 2637 2840	Insufficient	Mild iodine deficiency	2118	13660
Maldives	58	309	1995	National	SAC (6–12)	316	67	65.5	60.3–70.7		2650	Insufficient	Mild iodine deficiency	38	202
Mali	2636	12 623	1999	Local	SAC (6–12)	352	203	34.1	29.2–39.1	Thyromobile study.	2535	More than adequate	Risk of IIH in susceptible groups	899	4304
Malta	37	393	No data												
Marshall Islands	6	52	No data												
Mauritania	514	2807	1995	National	SAC (6–14)	240	55	69.8	64.0–75.6	Median calculated from % <100 µg/l.	392	Insufficient	Mild iodine deficiency	359	1959
Mauritius	147	1210	1995	National	Adults	225	154	4.4	1.7–7.1	Median calculated from mean.	395	Adequate	Optimal iodine nutrition	6	53

Table A3.1

Member State	Population year 2002[a]		Survey data										Classification of iodine intake	Classification of iodine nutrition	Population with insufficient iodine intake	
	6–12 years (000)	General (000)	Date of survey (years)	Level of survey	Population group and age (years)	Sample size	Median UI (µg/l)	Proportion of population with UI <100 µg/l (%)	95% CI of proportion of population with UI <100 µg/l (%)	Notes	Bibliographic references[b]				6–12 years (000)	General population (000)
Mexico	15 671	101 965	1999	National	SAC (5–12)	585	235	8.5	6.2–10.8	Median calculated from % <100 µg/l.	2997		More than adequate	Risk of IIH in susceptible groups	1332	8667
Micronesia (Federated States of)	19	108	No data													
Monaco	3	34	No data													
Mongolia	407	2559	2001	National	SAC (4–16)	2748	102	48.9	47.0–50.8		3227		Adequate	Optimal iodine nutrition	199	1252
Morocco	4385	30 072	1993	National	SAC (6–12)	281	75	63.0	57.4–68.7	Median calculated from mean.	491		Insufficient	Mild iodine deficiency	2762	18945
Mozambique	3587	18 537	1998	Province	SAC	567	69	65.4	61.5–69.3		2872		Insufficient	Mild iodine deficiency	2346	12123
Myanmar	7352	48 852	2001	National	SAC (6–11)	3345	136	38.2	36.6–39.9		3076		Adequate	Optimal iodine nutrition	2809	18662
Namibia	385	1961	No data													
Nauru	2	13	No data													
Nepal	4430	24 609	1997–1998	National	SAC (6–11)	1450	144	35.1	32.6–37.6		1083		Adequate	Optimal iodine nutrition	1555	8638
Netherlands	1395	16 067	1995–1996	Local	SAC (6–18)	937	154	37.5	34.4–40.6	Thyromobile study. % <100 µg/l calculated from median.	3204		Adequate	Optimal iodine nutrition	523	6025
New Zealand	419	3846	1996–1999	Local	SAC (8–10)	282	66	79.7	75.0–84.4		3597		Insufficient	Mild iodine deficiency	334	3065
Nicaragua	1007	5335	2000	National	SAC (6–9)	886	271	0.0	0.0–0.0	% <100 µg/l calculated from median.	3109		More than adequate	Risk of IIH in susceptible groups	0	0
Niger	2357	11 544	1998	Region	SAC	944	270	0.0	0.0–0.0	% <100 µg/l calculated from median.	3611		More than adequate	Risk of IIH in susceptible groups	0	0
Nigeria	23 677	120 911	1998	State	SAC (8–12)	537	147	38.8	34.7–42.9	% <100 µg/l calculated from median.	3604		Adequate	Optimal iodine nutrition	9187	46914
Niue	0	2	No data													
Norway	427	4514	No data													
Oman	450	2768	1993–1994	National	SAC (8–11)	951	91	49.8	46.6–53.0		481		Insufficient	Mild iodine deficiency	224	1379
Pakistan	27 695	149911	1993–1994	Region	SAC (8–10)	1500	16	90.4	88.9–91.9		492		Insufficient	Severe iodine deficiency	25037	13 5519
Palau	2	20	No data													
Panama	436	3064	1999	National	SAC (6–12)	604	235	8.6	6.4–10.8	Median calculated from % <100 µg/l.	3098		More than adequate	Risk of IIH in susceptible groups	37	263
Papua New Guinea	1048	5586	1996	Local	SAC (8–10)	627	181	27.7	24.2–31.2	Medians from disaggregated data by site pooled. % <100 µg/l calculated from median.	723		Adequate	Optimal iodine nutrition	290	1547
Paraguay	1013	5740	1999	National	SAC (6–12)	5864	294	13.4	12.5–14.3		3167		More than adequate	Risk of IIH in susceptible groups	136	769
Peru	4201	26767	1999	National	SAC	4936	230	11.8	10.9–12.7	% <100 µg/l calculated from median.	3147		More than adequate	Risk of IIH in susceptible groups	496	3158
Philippines	13 388	78580	1998	National	SAC (6–12)	10 616	71	65.3	64.4–66.2		2536		Insufficient	Mild iodine deficiency	8742	51313
Poland	3437	38622	1999	Local	SAC (6–15)	873	84	64.0	60.8–67.2	Thyromobile study. Median calculated from mean.	2574		Insufficient	Mild iodine deficiency	2200	24718
Portugal	774	10049	No data													
Qatar	72	601	1996	Local	SAC (6–15)	59	203	30.0	26.3–33.7	Median calculated from mean.	3614		More than adequate	Risk of IIH in susceptible groups	22	180
Republic of Korea	4640	47430	No data													
Republic of Moldova	455	4270	1996	National	SAC (8–10)	516	78	62.0	57.8–66.2		3332		Insufficient	Mild iodine deficiency	282	2648
Romania	1836	22387	2000–2001	National	SAC (6–16)	7358	68	64.2	63.1–65.3	Median from disaggregated data by county pooled. % <100 µg/l calculated from median.	3544		Insufficient	Mild iodine deficiency	1178	14373

Table A3.1

Member State	Population year 2002[a]: 6–12 years (000)	Population year 2002[a]: General (000)	Survey data: Date of survey (years)	Level of survey	Population group and age (years)	Sample size	Median UI (µg/l)	Proportion of population with UI <100 µg/l (%)	95% CI of proportion of population with UI <100 µg/l (%)	Notes	Bibliographic references[b]	Classification of iodine intake	Classification of iodine nutrition	Population with insufficient iodine intake: 6–12 years (000)	Population with insufficient iodine intake: General population (000)
Russian Federation	11 779	144082	1999, 2000, 2001, 2002	Local	SAC (7–12)	3401	93	56.2	54.5–57.9	Medians from eight local surveys pooled. % <100 µg/l calculated from median.	1191, 743 1222, 1143 1139, 3610 3610, 3610	Insufficient	Mild iodine deficiency	6620	80974
Rwanda	1593	8272	1996	National	SAC (5–19)	1246	298	0.0	0.0–0.0	% <100 µg/l calculated from median.	2558	More than adequate	Risk of IIH in susceptible groups	0	0
Saint Kitts and Nevis	6	42	No data												
Saint Lucia	22	148	No data												
Saint Vincent and the Grenadines	18	119	No data												
Samoa	33	176	No data												
San Marino	2	27	No data												
Sao Tome and Principe	28	157	No data												
Saudi Arabia	4063	23520	1994–1995	National	SAC (8–10)	4590	180	23.0	21.8–24.2		490	Adequate	Optimal iodine nutrition	934	5410
Senegal	1898	9855	1996–1997	Region	SAC (10–14)	1054	45	75.7	73.1–78.3		1633	Insufficient	Moderate iodine deficiency	1437	7460
Serbia and Montenegro	976	10535	1998–1999	Region	SAC (7–15)	1515	158	20.8	18.8–22.8		3062	Adequate	Optimal iodine nutrition	203	2191
Seychelles	15	80	No data												
Sierra Leone	876	4764	No data												
Singapore	450	4183	No data												
Slovakia	496	5398	2002	National	SAC	1744	183	15.0	13.3–16.7		558	Adequate	Optimal iodine nutrition	74	810
Slovenia	144	1986													
Solomon Islands	89	463	No data												
Somalia	1850	9480	No data												
South Africa	7070	44759	1998	National	SAC (7–11)	8254	177	29.0	28.0–30.0	% <100 µg/l calculated from median.	2618	Adequate	Optimal iodine nutrition	2050	12980
Spain	2712	40977	1995, 2000, 2000 P, 2001 P, 2002 P	Regional, province	SAC	3154	109	50.1	49.3–52.7	Medians from five regional and provincial surveys pooled. % <100 µg/l calculated from median. % <100 µg/l borderline, while median is 109 µg/l due to the equation used for the estimation (see section 2.3).	2091, 3607 3581, 3606 3580	Adequate	Optimal iodine nutrition	1383	20898
Sri Lanka	2236	18910	2000–2001	National	SAC (8–10)	2630	145	30.6	28.8–32.4		404	Adequate	Optimal iodine nutrition	684	5786
Sudan	5797	32878	1997	National	SAC	3544	75	62.0	60.4–63.6	Medians from disaggregated data by zones pooled. % <100 µg/l calculated from median.	2937	Insufficient	Mild iodine deficiency	3594	20385
Suriname	60	432	No data												
Swaziland	213	1069	1998	Local	SAC (6–18)	170	170	34.5	27.4–41.7	Medians from disaggregated data by sites pooled.	2589a	Adequate	Optimal iodine nutrition	73	369
Sweden	807	8867	No data												
Switzerland	576	7171	1999	National	SAC (6–12)	600	115	39.5	35.6–43.4		2662	Adequate	Optimal iodine nutrition	228	2833
Syrian Arab Republic	3039	17381	No data												
Tajikistan	1108	6195	No data												
Thailand	7414	62193	2000	National	Pregnant women	3557	150	34.9	33.3–36.5		3554	Adequate	Optimal iodine nutrition	2588	21705
The former Yugoslav Republic of Macedonia	213	2046	2002	National	SAC (7–11)	1216	199	11.8	10.0–13.6		3609	Adequate	Optimal iodine nutrition	25	241
Timor Leste	147	739	No data												
Togo	927	4801	1999	Local	SAC (6–12)	381	116	42.8	37.8–47.8	Thyromobile study.	2535	Adequate	Optimal iodine nutrition	397	2055

Table A3.1

	Population year 2002[a]		Survey data												Population with insufficient iodine intake	
Member State	6–12 years (000)	General (000)	Date of survey (years)	Level of survey	Population group and age (years)	Sample size	Median UI (µg/l)	Proportion of population with UI <100 µg/l (%)	95% CI of proportion of population with UI <100 µg/l (%)	Notes	Bibliographic references[b]	Classification of iodine intake	Classification of iodine nutrition	6–12 years (000)	General population (000)
Tonga	17	103	No data												
Trinidad and Tobago	147	1298	No data												
Tunisia	1364	9728	1996–1997	National	SAC (6–9)	94	164	26.4	17.5–35.3	Median calculated from % <100 µ g/l.	2485	Adequate	Optimal iodine nutrition	360	2568
Turkey	10 119	70318	1997–1999	National	SAC (9–11)	5948	36	74.6	73.5–75.7	% <100 µg/l calculated from median.	3426	Insufficient	Moderate iodine deficiency	7549	52457
Turkmenistan	821	4794	1999	Local	SAC (8–10)	65	64	65.6	54.1–77.2	% <100 µg/l calculated from median.	3620	Insufficient	Mild iodine deficiency	539	3145
Tuvalu	1	10	No data												
Uganda	5226	25004	1999	National	SAC (6–12)	293	310	11.9	8.2–15.6	% <100 µg/l from disaggregated data by district pooled.	2582	Excessive	Risk of adverse health consequences	622	2975
Ukraine	4114	48902	1991–1996, 1996–1999	Local	SAC (5–20)	3506	50	70.1	68.6–71.6	Medians and % <100 µg/l from two local surveys pooled.	1238, 3600	Insufficient	Mild iodine deficiency	2884	34280
United Arab Emirates	361	2937	1994	Region	SAC (9–13)	258	91	56.6	50.6–62.7	Survey in six endemic zones.	483	Insufficient	Mild iodine deficiency	205	1662
United Kingdom of Great Britain and Northern Ireland	5349	59068	No data												
United Republic of Tanzania	7282	36276	1996	State	SAC (8–9)	586	127	37.7	33.8–41.6		1772	Adequate	Optimal iodine nutrition	2745	13676
United States of America	29 589	291038	1988–1994	National	SAC (6–11)	3058	237	9.5	8.5–10.5	% <100 µg/l calculated from median.	1523	More than adequate	Risk of IIH in susceptible groups	2811	27649
Uruguay	388	3391	No data												
Uzbekistan	4316	25705	1998	National	SAC (7–10)	800	36	97.4	96.3–98.5	Median calculated from % <100 µg/l.	570	Insufficient	Moderate iodine deficiency	4204	25037
Vanuatu	38	207	No data												
Venezuela	3869	25226	2000, 2001	State	SAC	1040	286	0.0	0.0–0.0	Medians from disaggregated data by district from three state surveys pooled. % <100 µg/l calculated from median.	3168 3168 3168	More than adequate	Risk of IIH in susceptible groups	0	0
Viet Nam	12 520	80278	1993	National	SAC (8–12)	3062	40	84.0	82.7–85.3	Median calculated from % <100 µg/l.	1076	Insufficient	Moderate iodine deficiency	10517	67434
Yemen	4065	19315	1998	National	SAC (6–12)	974	173	30.2	27.3–33.1	% <100 µg/l calculated from median.	1561	Adequate	Optimal iodine nutrition	1228	5833
Zambia	2176	10698	1993	National	SAC	2505	60	72.0	70.2–73.8		394	Insufficient	Mild iodine deficiency	1567	7703
Zimbabwe	2555	12835	1999	National	SAC (6–14)	847	245	14.8	12.4–17.2		2641	More than adequate	Risk of IIH in susceptible groups	378	1900

[a] (UN 2003)

[b] Numeric references correspond to those on the WHO web site [http://www3.who.int/whosis/micronutrient/].

CI Confidence interval; NS Non specified; P Published; SAC School-age children

Table A3.2 ***Country data on TGP***

Member State	Survey data							
	Date of survey (yrs)	Level of survey	Population group and age (yrs)	Sample size	TGP (%)	95% confidence interval of TGP (%)	Bibliographic references[a]	Notes
Afghanistan	1995	Province	Pre-SAC (1–5)	1553	9.9	8.4–11.4	493	
Albania	No data							
Algeria	1994 P	Local	SAC (6–11)	169	65.0	57.8–72.2	1348	Survey in endemic area. Baseline data before intervention.
Andorra	No data							
Angola	No data							
Antigua and Barbuda	No data							
Argentina	No data							
Armenia	1998	National	Women (15–45)	2569	30.2	28.4–32.0	3329	
Australia	2001	Local	SAC (11–18)	577	19.4	16.2–22.6	3598	
Austria	No data							
Azerbaijan	1996	National	Adults	904	11.1	9.1–13.2	827	
Bahamas	No data							
Bahrain	1999	National	SAC (8–12)	1600	1.7	1.1–2.3	1142	
Bangladesh	1993	National	SAC (5–11)	12 862	49.9	49.0–50.8	642a	
Barbados	No data							
Belarus	1995–98	National	SAC (6–18)	11 562	33.4	32.5–34.3	3181	
Belgium	No data							
Belize	No data							
Benin	1995	Province	SAC (7–13)	10 560	19.6	18.8–20.4	393	
Bhutan	1996	National	SAC (6–11)	1200	14.0	12.0–16.0	2649	
Bolivia	1994	National	NS	360	4.5	2.4–6.6	3612	
Bosnia and Herzegovina	1999	National	SAC (7–14)	9183	25.7	24.8–26.6	2994, 3453	TGP from two surveys (Republica Srpska and Federation of Bosnia & Herzegovina) pooled.
Botswana	1994	National	SAC (8–10)	4268	16.5	15.4–17.6	2805	
Brazil	1994–1996	National	SAC (6–14)	178 774	4.0	3.9–4.1	3599	
Brunei Darussalam	No data							
Bulgaria	1998, 2001	Region, local	SAC (6–11)	9045	27.4	26.5–28.3	1086, 3016	TGP from one regional (endemic) and one local survey pooled.
Burkina Faso	1995	Local	General population (0–45)	210	55.2	48.5–61.9	1349	
Burundi	No data							
Cambodia	1996–1997	National	SAC (8–12)	35 418	17.0	16.6–17.4	1076	
Cameroon	1995	National	SAC (8–18)	NS	10.3		401	
Canada	No data							
Cape Verde	1996	National	SAC (6–12)	1200	25.5	23.0–28.0	1622	
Central African Republic	1993–1994	Province	General population	3090	60.9	59.2–62.6	1351	
Chad	1993–94	National	SAC (10–20)	1171	63.0	60.2–65.8	390	
Chile	2001	Local urban	SAC (6–18)	3712	6.4	5.6–7.2	3335	
China	2002	National	SAC (8–10)	38 894	5.8	5.6–6.0	3579	
Colombia	1994–1998	National urban	SAC (8–12)	19 530	6.5	6.2–6.9	3296	
Comoros	1994	National	SAC (8–11)	2249	13.6	12.2–15.0	396	
Congo	1995	District	General population	2620	12.0	10.8–13.2	2279	
Cook Islands	No data							
Costa Rica	No data							
Cote d'Ivoire	1997	Local	SAC (6–15)	419	44.8	40.0–49.6	3120	
Croatia	1999	National	SAC (7–11)	2054	16.1	14.5–17.7	2941	
Cuba	No data							
Cyprus	No data							

Table A3.2

	Survey data							
Member State	**Date of survey (yrs)**	**Level of survey**	**Population group and age (yrs)**	**Sample size**	**TGP (%)**	**95% confidence interval of TGP (%)**	**Bibliographic references[a]**	**Notes**
Czech Republic	No data							
Democratic People's Republic of Korea	No data							
Democratic Republic of the Congo	1995	Local	SAC (6–14)	313	28.4	23.4–33.4	3601b	TGP from disaggregated data by region pooled.
Denmark	1997–1998	Region	Adults (18–65)	4649	12.1	11.2–13.0	3003	TGP from disaggregated data by region pooled.
Djibouti	No data							
Dominica	No data							
Dominican Republic	1993	National	SAC (6–14)	837	5.3	3.8–6.8	771	
Ecuador	No data							
Egypt	1995	National	Women	1629	21.4	19.4–23.4	486	
El Salvador	No data							
Equatorial Guinea	No data							
Eritrea	1998	National	SAC (6–12)	3270	36.7	35.1–38.4	3122	
Estonia	No data							
Ethiopia	2000 P	District	SAC	2485	53.3	51.3–55.3	3199	
Fiji	No data							
Finland	No data							
France	1996	National	Adults (35–60)	12 014	12.9	12.3–13.5	1269	TGP from disaggregated data by sex pooled.
Gabon	2001	National	SAC (6–12)	3280	17.1	15.8–18.4	3611	
Gambia	1999	National	SAC (8–12)	3010	16.3	15.0–17.6	2595	
Georgia	No data							
Germany	No data							
Ghana	1991–1994	National	NS	27 000	23.8	23.3–24.3	388	TGP from disaggregated data by district pooled.
Greece	1995 P, 1999 P	Local, region	SAC (9–15)	5129	17.5	16.5–18.5	2539, 3430	TGP from one local and one regional survey pooled.
Grenada	No data							
Guatemala	No data							
Guinea	1999	Region	SAC (8–19)	1234	59.0	56.3–61.7	2617	
Guinea-Bissau	1995	National	SAC (6–12)	5480	32.6	31.4–33.8	397	
Guyana	No data							
Haiti	No data							
Honduras	No data							
Hungary	1994–1997	National	SAC (7–11, male)	299 351	11.6	11.5–11.7	3027	TGP from disaggregated data by county pooled.
Iceland	No data							
India	1992–1993, 1993, 1995 P, 1995, 1996, 1996 P, 1997, 1997 P, 1997–1998, 1998, 1998–1999, 1999, 2000 P, 2001 P 2001, 2002	State, district	SAC	84 407	17.9	17.6–18.2	1434, 1158, 1169 1168, 1162, 1159 1164, 1161, 1160 1215, 1166, 1163 3586, 3538, 1165 3576, 3539, 3456 3584, 1432, 3585 3578, 3566, 3534	TGP from 24 state and district surveys pooled at district level.
Indonesia	1995-1998	National	SAC (6–12)	1 156 367	9.8	9.8–9.9	1085	
Iran (Islamic Republic of)	1996	National	SAC (8–10)	36 178	54.6	54.1–55.1	3317	TGP from disaggregated data by province pooled.
Iraq	No data							
Ireland	No data							
Israel	No data							
Italy	1992–1994, 1993–1995, 1994, 1998 P, 1999 P	Region, local	SAC	12 744	13.9	13.3–14.5	2058, 1291, 3419 3419, 1319, 3435 1287, 1286, 2059	TGP from nine local and regional surveys pooled.

Table A3.2

Member State	Survey data							
	Date of survey (yrs)	Level of survey	Population group and age (yrs)	Sample size	TGP (%)	95% confidence interval of TGP (%)	Bibliographic references[a]	Notes
Jamaica	No data							
Japan	No data							
Jordan	2000	National	SAC (8–10)	2601	33.5	31.7–35.3	2534	
Kazakhstan	2000–2001	District	SAC (9–15)	3369	36.7	35.1–38.3	3055	TGP from disaggregated data by site pooled.
Kenya	1994	National	SAC (8–10)	20 916	15.5	15.0–16.0	391	
Kiribati	No data							
Kuwait	1997	National	SAC (6–9)	799	0.0	–	3135	
Kyrgyzstan	1994	Region	SAC (7–11)	440	49.1	44.4–53.8	3230	Survey in 4 out of 7 States (Oblasts). (The 4 States considered endemic.)
Lao People's Democratic Republic	No data							
Latvia	No data							
Lebanon	1993	National	SAC (7–15)	7319	25.7	24.7–26.7	485	
Lesotho	1999	National	SAC (8–12)	500	4.9	3.0–6.8	3481	
Liberia	No data							
Libyan Arab Jamahiriya	No data							
Lithuania	No data							
Luxembourg	No data							
Madagascar	1995	Local	SAC (6–11)	3635	22.8	21.4–24.2	398	
Malawi	1996	Region	SAC	9434	28.1	27.2–29.0	400	Survey in seven endemic districts.
Malaysia	1995	National	SAC (8–10)	2814	4.0	3.3–4.7	2637, 2840	TGP from two state surveys pooled.
Maldives	1995	National	SAC (6–12)	2834	23.6	22.0–25.2	2650	
Mali	No data							
Malta	No data							
Marshall Islands	No data							
Mauritania	1995	National	SAC (6–14)	4820	30.9	29.6–32.2	392	
Mauritius	No data							
Mexico	2002 P	Region	SAC (6–14)	673	10.4	8.1–12.7	12	
Micronesia (Federated States of)	No data							
Monaco	No data							
Mongolia	2001	National	SAC (5–16)	2455	23.0	21.3–24.7	3227	
Morocco	1993	National	SAC (6–12)	1594	22.0	20.0–24.0	491	
Mozambique	1998	Province	SAC	5684	14.3	13.4–15.2	2872	
Myanmar	No data							
Namibia	No data							
Nauru	No data							
Nepal	1997–1998	National	SAC (6–11)	15 542	40.0	38.8–40.2	1083	
Netherlands	1995–1996	Local	SAC (6–18)	937	1.8	1.0–2.7	3204	Thyromobile study.
New Zealand	No data							
Nicaragua	No data							
Niger	1994	National	SAC (10–15)	8933	35.8	34.8–36.8	384	
Nigeria	1995	State	SAC (6–14)	590	29.1	25.4–32.8	3601	TGP from disaggregated data by state pooled.
Niue	No data							
Norway	No data							
Oman	1993–1994	National	SAC (8–11)	2996	10.0	8.9–11.1	481	
Pakistan	1993–1994	Region	SAC (8–10)	6000	84.9	84.0–85.8	492	
Palau	No data							
Panama	1999	National	SAC (6–12)	2959	10.2	9.1–11.3	3098	
Papua New Guinea	1996	Local	SAC (8–10)	627	4.6	3.0–6.2	723	

Table A3.2

Member State	Survey data							
	Date of survey (yrs)	Level of survey	Population group and age (yrs)	Sample size	TGP (%)	95% confidence interval of TGP (%)	Bibliographic references[a]	Notes
Paraguay	No data							
Peru	No data							
Philippines	1993	National	SAC (7–14)	4579	5.4	4.8–6.1	715	
Poland	No data							
Portugal	No data							
Qatar	No data							
Republic of Korea	No data							
Republic of Moldova	1996	National	SAC (8–10)	3313	36.7	35.1–38.3	3332	
Romania	1995	Local	SAC	1010	12.8	10.7–14.9	1093	
Russian Federation	No data							
Rwanda	1996	National	SAC (5–19)	6886	25.9	24.9–26.9	2558	
Saint Kitts and Nevis	No data							
Saint Lucia	No data							
Saint Vincent and the Grenadines	No data							
Samoa	No data							
San Marino	No data							
Sao Tome and Principe	No data							
Saudi Arabia	2001 P	Region	SAC	940	24.0	21.3–26.7	567	
Senegal	1995–1996, 1996–1997	Region	SAC (10–14)	2346	28.7	26.9–30.5	1633, 1562	TGP from two regional surveys pooled.
Serbia and Montenegro	1998	National	SAC (9–18)	1421	1.3	0.7–1.9	763	Refugees survey.
Seychelles	No data							
Sierra Leone	No data							
Singapore	No data							
Slovakia	1989–1995	Region	SAC (6–15)	1923	4.4	3.5–5.3	1099	TGP from disaggregated data by age and sex pooled.
Slovenia	1994	National	SAC (13)	1740	79.0	77.1–80.9	3391	TGP measured by ultrasonography: 6.3%.
Solomon Islands	No data							
Somalia	No data							
South Africa	1998	National	SAC	2377	40.9	38.9–42.9	2618	
Spain	1995, 2000, 2002 P	Province	SAC (6–16)	2745	10.4	9.3–11.5	2091, 3581 3580	
Sri Lanka	2001	National	SAC (8–10)	6733	20.9	19.9–21.9	404	
Sudan	1997	National	SAC	40 922	22.0	21.6–22.4	2937	
Suriname	No data							
Swaziland	1998	Local	SAC (6–18)	778	5.4	3.8–7.0	2589	Survey in one endemic site within each of Swazilands 4 regions.
Sweden	No data							
Switzerland	1994, 1995	Local	SAC (6–17)	514	14.5	11.5–17.5	1212, 1207	TGP from two local surveys pooled.
Syrian Arab Republic	No data							
Tajikistan	1999	Local	SAC	NS	68.7		3705	
Thailand	2000	National	SAC (6–12)	3 953 730	2.2	2.19–2.21	2555	
The former Yugoslav Republic of Macedonia	2002	National	SAC (7–11)	1222	5.8	4.5–7.1	3609	
Timor Leste	No data							
Togo	1995	Region	SAC (10–19)	791	32.6	29.3–35.9	387	
Tonga	No data							
Trinidad and Tobago	No data							

Table A3.2

	Survey data							
Member State	Date of survey (yrs)	Level of survey	Population group and age (yrs)	Sample size	TGP (%)	95% confidence interval of TGP (%)	Bibliographic references[a]	Notes
Tunisia	1993	District	SAC (8–10)	1675	36.3	34.0–38.6	1559	
Turkey	1995	Province	SAC (6–12)	6906	30.3	29.2–31.4	3428	
Turkmenistan	1999	Local urban	SAC (8–10)	65	25.0	14.5–35.5	3620	
Tuvalu	No data							
Uganda	1999	National	SAC (6–12)	2870	60.2	58.4–62.0	2582	
Ukraine	1996–1999	Local	SAC (8–12)	2675	55.6	53.7–57.5	3600	
United Arab Emirates	1994	Region	SAC (9–13)	4778	40.4	39.0–41.8	483	Survey in six endemic zones.
United Kingdom of Great Britain and Northern Ireland	No data							
United Republic of Tanzania	1995	Local	SAC (6–14)	713	44.0	40.4–47.6	3601	TGP from disaggregated data by district pooled.
United States of America	No data							
Uruguay	No data							
Uzbekistan	1998	National	Pre-SAC, SAC (0–17)	19 895	73.0	72.4–73.6	570	TGP from disaggregated data by province plus Tashkent city pooled.
Vanuatu	No data							
Venezuela	No data							
Viet Nam	1993	National	SAC (8–12)	3062	21.9	20.4–23.4	1076	TGP from disaggregated data by province pooled.
Yemen	1998	National	SAC (6–12)	2984	16.8	15.5–18.1	1561	
Zambia	1993	National	SAC	2505	31.6	29.8–33.4	394	
Zimbabwe	No data							

[a] Numeric references correspond to those on the WHO web site [http://www3.who.int/whosis/micronutrient/].

CI Confidence interval; NS Non specified; P Published; SAC School-age children

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ISBN 92 4 159200 1