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# THE PREVALENCE OF ANAEMIA IN WOMEN

## A tabulation of available information

Second edition

### TABLE OF CONTENTS

	Page
1. Introduction . . . . .	2
2. What is nutritional anaemia? . . . . .	3
3. Causes of nutritional anaemia in women . . . . .	3
4. Anaemia and safe motherhood . . . . .	4
5. Materials and methods . . . . .	5
5.1 Definitions of anaemic and deficient . . . . .	5
5.2 Sources of information . . . . .	6
5.3 Criteria for inclusion . . . . .	6
5.4 Methods of estimation . . . . .	6
5.5 Description of the tabulations . . . . .	8
6. The prevalence picture . . . . .	9
6.1 The present day situation . . . . .	9
6.2 Comparison with previous estimates . . . . .	9
7. Tabulations of available information . . . . .	13
7.1 List of countries, by geographical region . . . . .	14
7.2 List of countries, alphabetically . . . . .	15
7.3 Abbreviations . . . . .	16
7.4 Haemoglobin concentration . . . . .	17
7.5 Serum Iron, Serum Folate and Serum Vitamin B <sub>12</sub> . . . . .	51
8. List of data sources . . . . .	73

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## 1. INTRODUCTION.

Anaemia is one of the most frequently observed nutritional deficiency diseases in the world today. It is especially prevalent in women of reproductive age, particularly during pregnancy when it is often a contributory cause of maternal death.

Anaemia is a disorder characterized by a blood haemoglobin concentration lower than the defined normal level, and is usually associated with a decrease in the circulating mass of red blood cells. This may result from decreased generation of red blood cells, or from their premature destruction, or from loss through chronic blood loss or haemorrhage.

One common etiological classification of anaemias identifies 3 main causative groups of anaemia - nutritional, marrow disease, and haemolytic. Nutritional anaemias are by far the most common type of anaemia worldwide, and mainly include iron, folate and B<sub>12</sub> deficiencies. Iron deficiency anaemia is itself caused by insufficient dietary intake of iron, chronic gastro-intestinal tract bleeding especially from hookworm, malabsorption conditions, and infection. Other significant causes of anaemia that vary in their significance from country to country include malaria, congenital haemolytic diseases such as sickle cell anaemia and thalassaemia. In Africa, for example, the five commonest causes of anaemia include iron deficiency, folate deficiency, malaria, sickle cell disease, and AIDS.

Data collected indicate that a total of 2 170 million people <sup>1</sup> (men, women and children) are anaemic, according to WHO criteria. Prevalence rates are higher in developing than in industrialized countries but in the latter still reach levels of public health significance (above 10%) in pregnant women. The most affected groups, in approximate descending order are pregnant women, preschool-age children, low-birth-weight infants, other women, the elderly, school-age children and adult men. In developing countries, prevalence rates in pregnant women are commonly in the range of 40% to 60%; among other women, 20% to 40%; and in school-age children and adult men, around 20%. Around half of those with anaemia are suffering from iron-deficiency anaemia. However, many more are likely to be iron deficient, i.e., having deficient body-iron stores, but without frank anaemia; the latter are therefore considered to be at risk of iron deficiency anaemia. Folate deficiencies and other causes mentioned above account for the major proportion of remaining anaemias.

Anaemia can affect psychological and physical behaviour. Even very mild forms influence the sense of wellbeing, lessen resistance to fatigue, aggravate other disorders and affect work capacity. For pregnant women anaemia can result in severe morbidity and reduces the resistance to blood loss with the result that death may result from the blood loss associated with normal delivery.

The tabulations contained in this document are drawn from the Maternal Health and Safe Motherhood Programme's anaemia database and represent an attempt to bring together all readily available information on the prevalence of the condition in women. The tabulations, which were originally compiled as part of a wider review of maternal mortality and morbidity were first published in 1982 <sup>2</sup>. The estimates of global prevalence among pregnant and non-pregnant women made at that time have been widely quoted, and have served as the definitive estimates for the last ten years. The increased interest engendered by the Safe Motherhood Initiative and the intensified interest and action on micronutrient malnutrition have encouraged us to carry out a new search and issue an updated version of the tabulations and estimates. This Second Edition comprises data available until the end of 1991 and supersedes all earlier editions. We hope they will prove useful to all those working in the field of women's health.

The tabulations are as complete as it was possible to make them. There will inevitably be gaps where additional information exists of which we were not aware. Anyone having such information is strongly encouraged to send it to the Maternal Health and Safe Motherhood Programme or the Nutrition Programme, World Health Organization, 1211 Geneva 27, Switzerland, thus enabling us to improve the database.

This document is one of a series of informal information-exchange documents. Companion documents give information on Maternal Mortality Ratios and Rates (document number WHO/MCH/MSM/91.6), on the Coverage of Maternity Care (document number WHO/FHE/89.2), on the Frequency and Mortality of Unsafe Abortion (document number WHO/MCH/90.14), and on the Prevalence of Low Birth Weight (document number WHO/MCH/92.2).

## 2. WHAT IS NUTRITIONAL ANAEMIA?

Nutritional anaemia is caused by malnutrition in its widest sense. WHO has defined it as follows:

"Nutritional anaemia is a condition in which the haemoglobin content of the blood is lower than normal as a result of a deficiency of one or more essential nutrients, regardless of the cause of such deficiency."

Haemoglobin is the red pigment present in solution in the red corpuscles of the blood, and its primary function is to transport oxygen to all parts of the body. Iron, folic acid, other vitamins and trace elements are all required for the formation of haemoglobin, which takes place in the bone marrow. These substances are ingested from food; green vegetables and such staples as potatoes and yams are important sources of folic acid, and most cereals, meat, and again vegetables, contain iron. In normal circumstances not all the iron ingested and absorbed daily from the small intestines is needed immediately. The excess is usually stored in the bone marrow so that during periods of additional need it can be used to increase the rate of formation of haemoglobin to satisfy increased bodily needs. One such period of physical stress is pregnancy.

Anaemia is the end-result of severe nutrient deficiency of one or more haematopoietic factors, usually iron, less frequently folate or vitamin B<sub>12</sub>. Haemoglobin concentration, by which anaemia is diagnosed, is a relatively insensitive index of milder degrees of nutrient depletion, so that by the time a woman becomes anaemic she is already suffering from a marked degree of nutrient deficiency. Because a low haemoglobin content of the blood is more easily detected than the underlying deficiencies, it has come to be used as an index of haematopoietic nutritional status.

## 3. CAUSES OF NUTRITIONAL ANAEMIA IN WOMEN.

The overall cause of nutritional anaemia or rather the nutrient deficiencies which are manifested in low haemoglobin concentration is an imbalance between the absorption of nutrient factors and the body's needs. Such an imbalance can arise in a number of ways:

- by low nutrient intake;
- by poor absorption or utilization;
- by increased nutrient losses and/or demands.

In many developing countries nutrient intake is low simply because food intake is low. In addition to those who actually go hungry there are millions more who suffer a lack of specific nutrients in their diet. Important differences in haemoglobin values may frequently be found at different social and income levels, pointing to dietary shortcomings related to cost, as well as dietary and cooking habits.

The amount of nutrient absorbed by the body depends not only on the amount ingested, but also on its absorbability. Iron absorption, for example, is higher from the iron in foods of animal origin and not all folate is in a form in which it is absorbable by the body. It is the total composition of a

meal that will decide the level of absorption; iron absorption is, for example, enhanced in the presence of animal foods or vitamin C and inhibited in a meal accompanied by tea or containing high levels of bran. In countries where cereals constitute a major proportion of the diet, iron absorption is poor due to the presence of large amounts of phytates in cereals. Iron deficiency anaemia will be widespread even though intakes are theoretically adequate. Diseases of the intestine such as coeliac disease, tropical sprue and the widely prevalent parasitic enteropathies probably all decrease nutrient absorption.

Women in their reproductive years have a particularly high demand for haemotopoietic nutrients. When not pregnant or lactating, regular menstrual losses constitute a continuing drain of nutrients which have to be replaced. On average a healthy woman loses 25 to 30 ml of blood each month. This is equivalent to an average daily blood loss of 0.5 mg of iron. A FAO/WHO Expert Group<sup>3</sup> has calculated that non-pregnant women require a daily absorption of 2.4 mg of iron compared to 1.1 mg required by an adult man. Nutrient requirements in pregnancy, which are discussed below, are much greater. During lactation, iron, folate and vitamins are passed to the baby in the breastmilk, to the detriment of the mother.

Apart from nutritional deficiency of iron and folic acid, there are other causes of anaemia. Malaria, sickle cell disease, bacterial infections, blood loss from obstetric causes (following delivery, abortion or ectopic pregnancy) or from intestinal parasites such as hookworms, are all important causes. In malaria red blood corpuscles are rapidly destroyed, and at a rate faster than the body can replace them. In the case of bacterial infections normal bone marrow function is suppressed so that even if the relevant nutrients are all present in the body their conversion to haemoglobin cannot take place until the infection is brought under control. In the course of blood loss from the causes mentioned above, red corpuscles and hence haemoglobin are lost. If the haemorrhage is very heavy, the haemoglobin concentration will fall and will remain low until the lost red cells are replaced.

Behind the medical causes of anaemia, socio-economic factors play an important role. The extent of poverty in developing countries largely explains why severe anaemia is so common and why its effects are so serious throughout most of the third world. Hardships imposed by poor nutrition, water shortages, food taboos, inadequacies in food production and storage, absence of effective systems of social security all combine to undermine women's health and cause anaemia as well as a host of other debilitating diseases.

#### 4. ANAEMIA AND SAFE MOTHERHOOD

During pregnancy, growth of the fetus and of the placenta, and the larger amount of circulating blood in the expectant mother, lead to an increase in the demand for nutrients, especially iron and folic acid. The fact that most women in the third world start pregnancy with depleted body stores of these nutrients means that their extra requirement is even higher than usual.

The total iron needed during the whole of pregnancy is estimated at about 1 000 mg. The daily requirements for iron, as well as folate, are six times greater for a woman in the last trimester of pregnancy than for a non-pregnant woman. This need cannot be met by diet alone, but is derived at least partly from maternal reserves. In a well-nourished woman about half the total requirement of iron may come from iron stores. When these reserves are already low - due to malnutrition and/or frequent pregnancies - anaemia results. It has been estimated that even when food intake is adequate it may take two years to replenish body iron stores after a pregnancy.

The early stages of anaemia in pregnancy are often symptomless. However, as the haemoglobin concentration falls, oxygen supply to vital organs declines, and the expectant mother begins to complain of general weakness, tiredness, dizziness, and headaches. Pallor of the skin and of the mucous membranes, as well as the nail beds and tongue, may not become noticeable until the

haemoglobin drops to 70g/L. With a further fall in haemoglobin concentration to 40g/L, most tissues of the body become starved of oxygen, and the effect is most marked on the heart muscles, which may fail altogether. Death from anaemia is the result of heart failure, shock, or infection that has taken advantage of impaired resistance to disease in the patient. Anaemia was the primary cause of death responsible for an upsurge in maternal deaths among women in two refugee camps in Somalia in 1987<sup>4</sup>. Of the 44 deaths recorded, 42 were associated with anaemia.

Fortunately the deprivation suffered by such refugee women is rare, but anaemia is given as one of the causes of maternal death in most countries with high maternal mortality (see table below).

**Table 1. Maternal mortality from anaemia in selected countries.**

Country	Deaths per 100 000 live births
Kenya*	82
Malawi	48
Nigeria	34
Senegal	35
Bangladesh*	54
Bhutan	55
India*	27
India*	37
Pakistan	194

\* community studies

Source: C.AbuZahr & E.Royston. Maternal mortality. A global factbook. WHO, 1991.

While less severe anaemia may not be a direct cause of maternal death, it can contribute towards death from other causes, particularly haemorrhage. Anaemic mothers do not tolerate blood loss to the same extent as healthy women. During childbirth a healthy mother may tolerate a blood loss of up to one litre. In an anaemic mother, a loss of as little as 150 ml can be fatal.

Anaemic mothers are poor anaesthetic and operative risks because anaemia lowers resistance to infection and wounds may fail to heal promptly after surgery, or may break down altogether. In Papua New Guinea, for example, the higher death rate from obstetric haemorrhage reported in the coastal region compared to the highlands is thought to be associated with higher coastal prevalence of anaemia<sup>5</sup>. A review of the symptoms associated with maternal deaths in a study in Tangail, Bangladesh, led researchers to conclude that anaemia had played a secondary role in nearly every case<sup>6</sup>. In Malawi, a study of maternal deaths at Kamuzu Hospital, Lilongwe, found that anaemia was a contributory factor in 23% of the deaths<sup>7</sup>.

## **5. MATERIALS AND METHODS.**

### **5.1 Definitions of anaemic and deficient**

There is no single haemoglobin value that will separate all anaemic from all non-anaemic individuals, or all nutritionally deficient from all nutritionally sufficient individuals, because what is normal for one individual may not be so for another. The percentage below a certain cut-off point, or index value, can, however, identify the population that is likely to be deficient.

The indices suggestive of anaemia and nutritional deficiency used by WHO<sup>8</sup> have been used in these tabulations unless otherwise stated. These are haemoglobin, serum iron, serum folate and serum vitamin B<sub>12</sub> concentrations.

Levels of haemoglobin below which anaemia is likely to be present:

**Haemoglobin (at sea level)**

Adult women, non-pregnant	< 120g/L
Adult women, pregnant	< 110g/L

Levels below which there is probable deficiency for:

Serum iron*	< 0.50 mg/L
Serum folate concentration (ng/ml)	< 3 ng/ml
Serum vitamin B <sub>12</sub> (pg/ml)	< 100 pg/ml

### 5.2 Sources of information

This update has been limited to studies carried out since 1970 and thus overlaps with earlier WHO reviews of anaemia in women in developing countries. Information on the year the study took place is frequently omitted and therefore the year of publication may be the only clue. This time the review includes data from developed countries. Although the focus of the majority of studies is on pregnant women a special effort has been made to include data on non-pregnant women.

Reports were originally identified through a thorough search of library databases (Medline, Healthplan, Popline, Lilacs and Nutrition Abstracts and Reviews), and by tracing back references. The attached tabulations are based on articles that were available in the WHO library, in Swiss libraries and in other reference centres. Not all articles could be traced.

### 5.3. Criteria for inclusion.

(a) **Size of sample.** The general rule was to include only information from samples of at least 300 women if they were heterogeneous or of 100 women if they were homogenous. However, where data were lacking smaller samples were also taken into consideration.

(b) **Supplementation.** Only data that were understood to relate to women that had not received any special supplementation are included.

(c) **Study population.** "Pregnant women" is taken to mean a group of women at differing stages of pregnancy, most usually in the second or third trimester, unless otherwise noted. "All women" includes pregnant, non-pregnant and lactating women. If the author used the appropriate haemoglobin norm for each subgroup these were retained, otherwise the norm for non-pregnant women was used. Whenever a study was not specific about who was included it was put in the "All women" category. Unless indicated the data refer to women of reproductive age.

### 5.4 Methods of calculation

(a) **Percentage below the norm.** If a survey report did not give a mean value or the percentage below the norm, these values were estimated if at all possible. Such estimates are given in the tabulations together with the letter "E". Where the report quoted a mean and standard deviation and/or the proportion below some given level, it was possible to estimate the percentage falling below the norm by assuming that the values were normally distributed. Occasionally, when a report gave percentages below or above given levels without giving a mean or a frequency distribution, the mean

\* Many scientists have identified iron deficiency by other criteria. Serum ferritin, which bears a linear relationship to the body iron stores is frequently used.

was estimated in a similar manner. In practice, the distribution of most haematological values is assumed to be negatively skewed, which would tend to make estimates based on the normal value slight underestimates.

(b) **Conversion factors.** Data presented in other metric measurements have been standardized while molar weights have been converted using the following conversion factors:

Haemoglobin:	$\text{mmol/L} \times 16.11 = \text{g/L}$
	(cut-off 7.45mmol/L for non-pregnant women and 6.83mmol/L for pregnant women).
Serum iron:	$\mu\text{mol/L} \times 0.056 = \text{mg/L}$
	(cut-off 8.96 $\mu\text{mol/L}$ ).
Serum folate:	$\text{nmol/L} \times 0.44 = \text{ng/ml}$
	(cut-off 6.80nmol/L).
Serum vitamin B <sub>12</sub> :	$\text{pmol/L} \times 1.36 = \text{pg/ml}$
	(cut-off 73.80pmol/L).

Haematocrit (PCV) values were also used to make estimates of haemoglobin values, using a factor of 0.3 (cut-off 33%).

(c) **Corrections of haemoglobin concentration for differences in altitude.** In conformity with WHO collaborative studies the corrections used were those developed by Hurtado \*. Because oxygen levels decrease with increasing altitude, haemoglobin levels rise in order to compensate and should be adjusted for comparative purposes. The mean absolute values of haemoglobin appearing in the tabulations are non-adjusted values, but the percentage falling below the norm are based on norms adjusted for altitude.

(d) **Means and medians.** When dealing with skewed distributions such as that of haemoglobin levels it is more meaningful to use the median as a representative measure. In practice, however, very few reports give medians, so that in order to maintain comparability the mean value has been used throughout these tabulations. When only the median was available this has been quoted, followed by the letter "M". For serum folate or vitamin B<sub>12</sub> the geometric mean has sometimes been the only indicator of central tendency. This is indicated in the tabulations by the letter "G".

(e) **Percentage anaemic by country or region.** The regional estimates presented in Table 2 and shown in the map are based on the analysis of data collected from a variety of sources (national, survey, hospital and maternities) and presented in the tabulations. National estimates were derived from the partial information contained in the country tabulations, using a model in order to take into account specific country factors. Input to the model included climate, altitude, socio-economic distribution of the population, coverage of prenatal care, percentage of institutional deliveries, urban/rural differentials, per capita calorie consumption and GNP per capita. Recent surveys were given greater statistical weighting in making the country estimates. \*\*

Country data were aggregated by weighting national prevalence estimates according to population to derive both global and regional estimates in Table 2. Assumptions had to be made for countries where no data were available, which were assumed to have similar anaemia prevalence as countries in the same region and/or having similar development/health indicators.

(f) **Demographic data.** The total number of women and the number of births are United Nations Population Division estimates for 1988. The number of pregnant women was estimated using

\* Because of the partial and incomplete nature of the data available, it was considered preferable to publish regional and global estimates only rather than estimates for individual countries.

the following formula:

$$W_p = LB \times 0.75 \times PWF$$

where  $W$  = number of pregnant women

$LB$  = number of live births and

$PWF$  = pregnancy wastage factor (estimated at 10%)

Only survey results based on reliable measurements were included. For example, data obtained by the Tallquist method or by clinical assessments such as "pallor" were excluded.

### 5.5 Description of the tabulations.

The data in the tabulations were extracted from sources that are listed in the final column by 4-digit numbers which correspond to the accession number assigned to each piece of information on the WHO/WAN bibliographic database. A list of all the references used in the tabulations is attached.

(a) **Data Sets.** Each line represents a single data set. In some instances several data sets are derived from one study, e.g. relating to two points of time.

(b) **Comparisons.** Some cautious comparisons and conclusions can be drawn from the data presented, but the tabulations are not suitable for statistical manipulation. Only a very few prevalence studies are based on nationally or regionally representative samples.

(c) **Geographic regions.** Countries are arranged according to geographic and climatic regions rather than by WHO regions. The classification used is that employed by the United Nations. All countries with a population greater than 300 000 are listed even where no data are available.

(d) **Note Section.** The note section contains additional information and explanations. An "\*" in any of the columns refers the reader to a comment in the note section. In addition "i", "f" or "v" has been used in the serum tabulations for notes specific to iron, folate or vitamin  $B_{12}$ .

## 6. THE PREVALENCE PICTURE.

### 6.1 The present day situation.

On the basis of the data presented in the tabulations it is possible to estimate that over half the pregnant women in the world have a haemoglobin level indicative of anaemia (see Table 2 and Map, p. 11). For developing countries only, the figure rises to 55%, or to 60% if China is excluded, as it was in previous estimates. Even among the much better nourished populations of the developed countries nearly one in every five pregnant women is anaemic.

As is to be expected, the picture is slightly better for non-pregnant women. Nevertheless, over one third of all women in the world suffer from anaemia. In developing countries the equivalent figure is as high as 44% (very slightly more if China is excluded), and 13% in developed countries.

The situation is particularly acute in parts of Asia. In Southern Asia, a populous area including Afghanistan, Bangladesh, India and Pakistan, which accounts for 29% of the world's births, there are over 24 million women who are both pregnant and anaemic. This indicates that three quarters of all pregnant women in the region, are at an increased risk of obstetric complications and hence of maternal death. Not surprisingly, 58% of these same women are anaemic even when not pregnant. In 1985-86 a national study of nearly 4 000 pregnant women in India<sup>7</sup>, found a mean Hb level of 90g/L, with 88% of pregnant women having a Hb level below the norm of 110g/L. In Sri Lanka the situation is particularly acute among women working on the tea estates.

In Africa as a whole, one half of all pregnant women are anaemic, as are over 40% of non-pregnant women. Western Africa is the most affected. The prevalence there is estimated to be 56% for pregnant and 47% for non-pregnant women. Southern Africa, on the other hand, has the lowest rates of all the subregions of the developing world due, according to some observers, to the widespread use of iron cooking pots by indigenous peoples. (Prevalence among South Africans of Indian origin is much higher.) The remaining regions of Africa have a fairly uniform prevalence of between 47% and 54% for pregnant women and 41% and 43% for non-pregnant women.

In Latin America overall prevalence is somewhat lower, at nearly 40% for pregnant women and 30% for non-pregnant women. The highest levels are to be found in the Caribbean; studies in Jamaica and Trinidad and Tobago and elsewhere found over 60% of pregnant women to be anaemic. In South America prevalence is somewhat lower. In Bolivia, Chile and Colombia fewer than 30% of pregnant women are anaemic. The highest figures in this region were found in Guyana, with two thirds of pregnant women anaemic.

Levels in the developed countries are also surprisingly high, with an average of 18% of pregnant women and 12% of non-pregnant women anaemic. The highest levels are to be found in Eastern Europe, but even in the USA almost one fifth of all pregnant women are affected. By comparison, only 8% of pregnant women in Denmark are classified as anaemic.

### 6.2 Comparison with previous estimates

Comparisons of the present estimates with those made earlier must be treated with caution, because it is not apparent which of the changes are real and which are due to better information which has become available in the meantime<sup>1,10</sup>. Moreover, the global estimates made ten years ago excluded China, for which no data were available at that time.

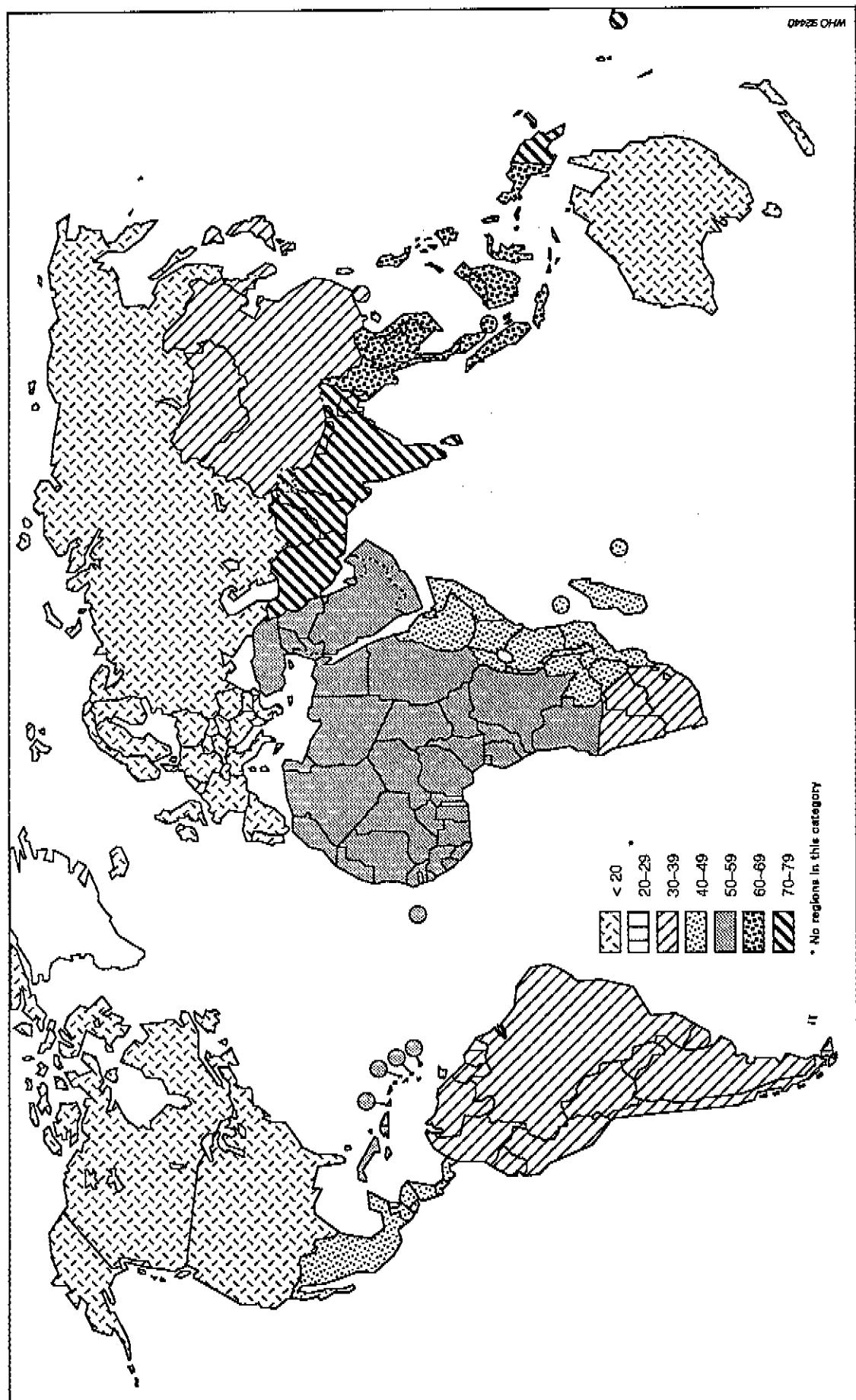
Table 2.  
Estimated prevalence of anaemia in women  
(around 1988)

REGION	Pregnant women Hb below norm		Non-pregnant women Hb below norm		All women Hb below norm	
	%	(000s)	%	(000s)	%	(000s)
WORLD	51	58 270	35	399 250	37	457 520
DEVELOPING COUNTRIES	56	55 750	43	363 800	44	419 550
DEVELOPED COUNTRIES*	18	2 520	12	35 460	13	37 970
AFRICA	52	11 450	42	47 940	44	59 400
Eastern	47	3 380	41	13 540	42	16 920
Middle	54	1 290	43	5 330	45	6 620
Northern	53	2 240	43	11 450	45	13 690
Southern	35	380	30	2 500	30	2 880
Western	56	4 170	47	15 120	48	19 290
ASIA*	60	40 140	44	294 960	45	335 100
Eastern*	37	7 290	33	105 760	33	113 060
South-eastern	63	6 300	49	47 230	50	53 530
Southern	75	24 760	58	133 180	60	157 940
Western	50	1 790	36	8 790	38	10 570
LATIN AMERICA	39	4 030	30	28 640	31	32 670
Caribbean	52	340	36	2 790	37	3 130
Central	42	1 210	39	9 550	39	10 760
South	37	2 480	25	16 310	26	18 790
NORTHERN AMERICA	17	570	10	7 050	11	7 620
EUROPE	17	920	10	12 100	11	13 020
OCEANIA*	71	130	66	780	67	910
USSR**	15	640	12	7 770	12	8 420

\* Japan, Australia and New Zealand have been excluded from the regional estimates, but are included in the total for developed countries.  
Figures may not add to totals due to rounding.

\*\* Data collected prior to recent political changes.

WHO regional estimates of prevalence of nutritional anaemia (around 1988) — Pregnant women with Hb below norm (%)



The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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**7.**

**ANAEMIA IN WOMEN**

**TABULATIONS OF AVAILABLE INFORMATION**

**7.1 ALL COUNTRIES WITH MORE THAN 300 000 INHABITANTS OR WITH DATA IN ANAEMIA DATABASE, BY REGION**

<b>AFRICA</b>	Dominican Republic	Pakistan
<b>EASTERN AFRICA</b>	Grenada	Sri Lanka
Burundi	Guadeloupe	<b>WESTERN ASIA</b>
Comoros	Haiti	Bahrain
Djibouti	Jamaica	Cyprus
Ethiopia	Martinique	Iraq
Kenya	Montserrat	Israel
Madagascar	Puerto Rico	Jordan
Malawi	Saint Kitts and Nevis	Kuwait
Mauritius	Saint Lucia	Lebanon
Mozambique	St. Vincent & the Grenadines	Oman
Reunion	Trinidad & Tobago	Qatar
Rwanda	Turks and Caicos Islands	Saudi Arabia
Somalia		Syrian Arab Republic
Uganda		Turkey
United Rep. of Tanzania		United Arab Emirates
Zambia		Yemen
Zimbabwe		
<b>MIDDLE AFRICA</b>		
Angola	Honduras	<b>EUROPE</b>
Cameroon	Mexico	<b>EASTERN EUROPE</b>
Central African Republic	Nicaragua	Bulgaria
Chad	Panama	Czechoslovakia
Congo		Hungary
Equatorial Guinea		Poland
Gabon		Romania
Zaire		
<b>NORTHERN AFRICA</b>		<b>NORTHERN EUROPE</b>
Algeria	Argentina	Denmark
Egypt	Bolivia	Finland
Libyan Arab Jamahiriya	Brazil	Iceland
Morocco	Chile	Ireland
Sudan	Colombia	Norway
Tunisia	Ecuador	Sweden
<b>SOUTHERN AFRICA</b>	Guyana	United Kingdom
Botswana	Paraguay	
Lesotho	Peru	<b>SOUTHERN EUROPE</b>
Namibia	Suriname	Albania
South Africa	Uruguay	Greece
Swaziland	Venezuela	Italy
<b>WESTERN AFRICA</b>		Malta
Benin		Portugal
Burkina Faso		Spain
Cape Verde		Yugoslavia *
Cote d'Ivoire		
Gambia	<b>NORTHERN AMERICA</b>	<b>WESTERN EUROPE</b>
Ghana	Canada	Austria
Guinea	United States of America	Belgium
Guinea-Bissau		France
Liberia		Germany
Mali		Luxembourg
Mauritania		Netherlands
Niger		Switzerland
Nigeria		
Senegal	<b>ASIA</b>	<b>OCEANIA</b>
Sierra Leone		Australia
Togo	<b>EASTERN ASIA</b>	Fiji
<b>LATIN AMERICA</b>	China	Kiribati
<b>CARIBBEAN</b>	Dem. Peo. Rep. of Korea	New Zealand
Antigua and Barbuda	Hong Kong	Papua New Guinea
Bahamas	Japan	Samoa
British Virgin Islands	Mongolia	Solomon Islands
Cayman Islands	Republic of Korea	Vanuatu
Cuba		
Dominica	<b>SOUTH-EASTERN ASIA</b>	<b>USSR *</b>
	Cambodia	
	East Timor	
	Indonesia	
	Lao People's Dem. Rep.	
	Malaysia	
	Myanmar	
	Philippines	
	Singapore	
	Thailand	
	Viet Nam	
	<b>SOUTHERN ASIA</b>	
	Afghanistan	
	Bangladesh	
	Bhutan	
	India	
	Iran (Islamic Republic of)	
	Nepal	

\* Data collected prior to recent political changes

## 7.2 ALPHABETICAL LIST OF COUNTRIES

	Hb	Serum		Hb	Serum		Hb	Serum
	page	page		page	page		page	page
Afghanistan	32	60	Guadeloupe	41	66	Republic of Korea	31	59
Albania	37	63	Guatemala	40	65	Reunion	19	52
Algeria	20	53	Guinea	22	54	Romania	37	63
Angola	24	55	Guinea-Bissau	22	54	Rwanda	19	52
Antigua and Barbuda	40	65	Guyana	45	68	Saint Lucia	42	66
Argentina	43	67	Haiti	41	66	Saint Kitts and Nevis	42	66
Australia	48	71	Honduras	40	65	Samoa	49	71
Austria	37	63	Hong Kong	30	59	Saudi Arabia	32	60
Bahamas	41	65	Hungary	37	62	Senegal	24	55
Bahrain	31	60	Iceland	36	62	Sierra Leone	24	55
Bangladesh	32	61	India	33	61	Singapore	28	58
Barbados	41	65	Indonesia	27	58	Solomon Islands	49	71
Belgium	38	63	Iran (Islamic Republic of)	34	61	Somalia	19	52
Belize	40	65	Iraq	31	60	South Africa	25	56
Benin	22	53	Ireland	36	62	Spain	37	63
Bhutan	33	61	Israel	31	60	Sri Lanka	35	61
Bolivia	43	67	Italy	37	63	St. Vincent & the Grenadines	42	66
Botswana	25	56	Jamaica	41	66	Sudan	21	53
Brazil	43	67	Japan	30	59	Suriname	45	68
British Virgin Islands	42		Jordan	31	60	Swaziland	26	57
Bulgaria	36	62	Kenya	19	52	Sweden	36	62
Burkina Faso	22	54	Kiribati	48	71	Switzerland	39	64
Burundi	19	52	Kuwait	31	60	Syrian Arab Republic	32	60
Cambodia	27	58	Lao People's Dem. Rep.	27	58	Thailand	28	58
Cameroon	24	55	Lebanon	32	60	Togo	24	55
Canada	46	70	Lesotho	25	56	Tonga	49	
Cape Verde	22	54	Liberia	22	54	Trinidad & Tobago	42	66
Cayman Islands	42		Libyan Arab Jamahiriya	21	53	Tunisia	21	53
Central African Republic	24	55	Luxembourg	39	64	Turkey	32	60
Chad	24	55	Madagascar	19	52	Turks and Caicos Islands	43	
Chile	44	67	Malawi	19	52	Uganda	20	52
China	29	59	Malaysia	27	58	United Rep. of Tanzania	20	52
Colombia	44	68	Mali	23	54	United Kingdom	36	62
Comoros	19	52	Malta	37	63	United Arab Emirates	32	60
Congo	25	55	Martinique	42	66	United States of America	46	70
Costa Rica	40	65	Mauritania	23	54	Uruguay	45	69
Cote d'Ivoire	22	54	Mauritius	19	52	USSR *	50	72
Cuba	41	66	Mexico	40	65	Vanuatu	49	71
Cyprus	31	60	Mongolia	30	59	Venezuela	45	69
Czechoslovakia	37	62	Montserrat	42		Vict Nam	29	59
Dem. Peo. Rep. of Korea	30	59	Morocco	21	53	Yemen	32	60
Denmark	36	62	Mozambique	19	52	Yugoslavia *	37	63
Djibouti	19	52	Myanmar	28	58	Zaire	25	56
Dominica	41	66	Namibia	25	56	Zambia	20	52
Dominican Republic	41	66	Nepal	35	61	Zimbabwe	20	52
East Timor	27	58	Netherlands	39	64	* Data collected prior to recent political changes		
Ecuador	44	68	New Zealand	48	71			
Egypt	21	53	Nicaragua	40	65			
El Salvador	40	65	Niger	23	54			
Equatorial Guinea	25	56	Nigeria	23	55			
Ethiopia	19	52	Norway	36	62			
Fiji	48	71	Oman	32	60			
Finland	36	62	Pakistan	35	61			
France	38	63	Panama	40	65			
Gabon	25	56	Papua New Guinea	48	71			
Gambia	22	54	Paraguay	45	68			
Germany	38	64	Peru	45	68			
Ghana	22	54	Philippines	28	58			
Greece	37	63	Poland	37	62			
Grenada	41	66	Portugal	37	63			
			Puerto Rico	42	66			
			Qatar	32	60			

### 7.3 Abbreviations

>	more than, above
<	less than, below
*	see note section
21-25	age range in years
adol.	adolescent/s
all w.	all women
E	estimate
EP	erythrocyte porphyrin
ethn.	ethnic
f	note refers to serum folate
FEP	free erythrocyte porphyrin
G	geometric mean
g, g/L	grams, grams per litre
gest.	gestation
h	note refers to haemoglobin
Hb	haemoglobin concentration
hct	haematocrit
i	note refers to serum iron
ind.	indicator/s
irondef.	iron deficient
lact.w.	lactating women
M	median
m	metres
MCV	mean corpuscular volume
mg, mg/L	milligrams, milligrams per litre
mo	month/s
ng, ng/ml	nanograms, nanograms per millilitre
non-p.w.	non-pregnant women
n.k.	not known
P	year of publication
pg, pg/ml	picogram, picogram per millilitre
part.	parturient, at delivery
PCV	packed cell volume
post-p.	post partum
pregn.	pregnancy, pregnant
p.w.	pregnant women
RCP	red cell protoporphyrin
RS	random sample
SF	serum ferritin
SI	serum iron
SocEc	socio-economic status
SUP	supplement/ed
TIBC	total iron binding capacity
trim.	trimester
TS	transferrin saturation
ug, ug/L	( $\mu$ g) micrograms, micrograms per litre
underest.	underestimate
v	note refers to vitamin B <sub>12</sub>
var.	various
veg.	vegetarian
W	women
wks	weeks
yrs	years

**7.4**

**ANAEMIA IN WOMEN**

**TABULATIONS OF AVAILABLE INFORMATION**

**HAEMOGLOBIN CONCENTRATION**

Region, Country or Area		Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
					Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
<b>EASTERN AFRICA</b>														
BURUNDI	Intbo Region Unknown	1983 1985	*	78	96	80 68			111	69 E				0251 0353
COMOROS														
DJIBOUTI														
ETHIOPIA	Addis Ababa Addis Ababa Unknown	1972 1972 1976	2400 2400 2400	497 100 236	139 5 137	6 E			152 139	3				0560 0560 0523
KENYA	Nairobi North-East province Saradidi Western province, Nangina	1981 1973 1983-84 1981	1500-2000 144 127 291	769 84 100 116	115 E 57 E 85 E 33				97	76 E	Somali Antimalaria prophylaxis		0025 0054 0421 0132	
MADAGASCAR														
MALAWI	Unknown	1970		391	110 E	49					107			0509
MAURITIUS														
MOZAMBIQUE	National Maputo Unknown	1986 P 1986 P 1988-89		748 207 1701		58 70 E 37								0256 0256 0353
REUNION														
RWANDA														
SOMALIA	Biyoley Refugee camp	1986-87			99	75 E	110	71 E	112	71 E				0166

E = Estimate, H = Median, \* = See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN AFRICA**

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Ref. No.
				Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)	
SOMALIA cont.												
Lugh Refugee camp	1986-87		51									0166
Lugh Refugee camp	1986-87		100	102	62 E	109	60 E					0166
Lugh Refugee camp	1986-87		58	88	86 E	100						0166
Garioley Refugee camp, NW	1987											0311
Refugee Camps, NW region	1986		216									0592
Refugee Camps, NW region	1986-87		287	98	74 E	127	39 E	116	58 E	120	50 E	0166
Tog Wagate Refugee camp	1986-87		101	68	68 E							0166
<b>U. REP. TANZANIA</b>												
Bagamoyo district	1971		500E									0574
Dar es Salaam	1976-77		377		22 *							0109
Dar es Salaam	1976-77		259		31 *							0109
Dar es Salaam	1971	Sea level	1317	93	86							0546
Dar es Salaam	1971	Sea level	127	102	70 E							0548
Dar es Salaam	1972	Sea level	163	92	82 E							0580
Ilala	1983-85		152	43 *								0557
Zanzibar	1974		387	80 *								
<b>UGANDA</b>												
<b>ZAMBIA</b>												
Chingola	1984 P	1300	306E	121 *	10* *							0226
Luapula province	1973	1000	424	116	39 E							0032
Lusaka	1972 P	1200	239	110	50 E							0518
Ridola	1985-86		1911		34							0585
Unknown	1970-71	1200	1063	108	60 E							0536
Unknown	1970-71	1200						119	60 E			0536
<b>ZIMBABWE</b>												
<b>NORTHERN AFRICA</b>												
<b>ALGERIA</b>	1974		56	107	60							0516
Unknown	1988 P		254									0208

E = Estimate, N = Median, \* = See note section

Ethiopian  
Ethiopian

p.H. <25; \*<87 g/L  
p.H. <15; \*<87g/L

24 wks gest.  
Part,  
\*<15g/L  
Wallqvist method

103 90 E  
72 \*

103 90 E

Below the norm (%)  
Mean Hb (g/L)

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN AFRICA**

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
ALGERIA cont.	1985		102	111	42			127	28			Urban Rural Semirural Rural	0111 0113 0111 0111
	Zibans province, Biskra	1988 P	222	103	40			130	19				
	Zibans province, Sidi-Dkba	1985	100					123	32				
	Zibans province, Tolga	1985											
EGYPT	Ashub, Assiut	1981 P	1504	631	105	79				130		Rural	0043 0332 0441 0306 0306 0441 0441 0441 0441 0441 0441 0441 0441 0441 0441 0441 0441
	Alexandria	1983 P											
	Alexandria	1988 P											
	Souf el-Dakrour	1980 PE	250	117	21 E								
	Boulaq el-Dakrour, Quita	1980 PE	900	113	E								
	Cairo-Giza	1988 P											
	Large Village	1988 P											
	Lower Egypt	1988 P											
	Rural Family Planning Centres	1982											
	Small cities	1988 P											
	Small towns	1988 P											
	Unknown	1988 P	253	118	22								
	Unknown	1988 P											
	Unknown	1988 P											
	Upper Egypt	1988 P											
	Urban Family Planning Centres	1982											
	Wadiyea	1981 P	1848										
LIBYAN A. J.	1983 P											Urban 16-19 100 E	0043 0554 0134
	1971		355										
	Unknown												
MOROCCO	Tripolo											0516	0596
	Unknown												
SUDAN	Nad Hedani	1990 P										0586	0586
	National	1978											

E = Estimate, M = Median, \* = See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN AFRICA**

Region, Country or Area	Year	Altitude (m)	Sample size	Pregnant Women	Lactating women		Non pregnant women		All women		Notes	Ref. No.
					Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
TUNISIA cont. Kairouan	1990 P		110	111	41						3rd tria.	0586
WESTERN AFRICA												
BENIN												
National	1984-85		517				122 N	41				
Avrankou, Oueme province	1986 P		99				119	43				
Cotonou	1987 P		126	105	55							
Cotonou	1987 P		95				121	39				
Tori Bossito, Atlantic province	1986 P		102				121	46				
BURKINA FASO												
Rural area	1979		114									
Zoundeogo province	1985		30	120	24		127	0				
CAPE VERDE												
COTE D'IVOIRE												
Abidjan	1978		198	109	34							
GAMBIA												
Bakau	1984		73	121	16 E							
Banjul area	1961-75		532	109	52 E							
Banjul area	1985 P		2258									
Jai village	1985 P		81	104	61							
Keneba	1978-82		89	113								
Keneba village	1983 P		78									
Rural	1987 P		63									
GHANA												
Accra	1970		1098									
Rural Southern Villages	1973		62									
GUINEA												
GUINEA-BISSAU												
LIBERIA												
Monrovia	1982		547	112	78							
												0353

E = Estimate, N = Median, \* = See note section

Natalia endemic  
Rural

3rd tria.

Mean Hb (g/l)  
Below the norm (%)

Mean Hb (g/l)  
Below the norm (%)

Mean Hb (g/l)

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Mean Hb (g/l)

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Mean Hb (g/l)

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**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN AFRICA**

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women Mean Hb (g/l)	Lactating women Mean Hb (g/l)	Non pregnant women Mean Hb (g/l)	All women Mean Hb (g/l)	Notes		Ref. No.
								Below the norm (%)	Below the norm (%)	
LIBERIA cont.										
Norrovie	1982 P		546	100	78					0003
Norrovie	1987 P		605	99	78					0223
MALI	Bala-Diarraougou village	1973	23	102	65 E					0561
	Bala-Diarraougou village	1973	25	102	65 E					0561
	Bala-Sanambé-Diarraougou	1974	334							0562
	Unknown	1977-78	258							0544
MAURITANIA	Novatchott	1975	419	121	24					0547
NIGER	Diffa	1978	70	108	57 E					0545
	Diffa	1978	49	108	56					0545
	Dosso	1981-82	162	108	56					0553
	Dosso province	1981-82	360	111	47					0192
	Niamey	1981-82	40							0192
	Niamey	1989	94	41 *						0422
	Niamey	1989	91							0422
NIGERIA	Benin City	1980-84	792	9 *						0240
	Calabar	1981-83	728	102	72 E					0165
	Calabar	1981-83	50	115	E					0165
	Enugu	1979 P	570	115	E					00412
	Enugu	1984 P	193	193						0279
	Ibadan	1979 P	270	1850	22 *					0050
	Ibadan	1983-84	232							0422
	Ibadan	1985 P	100							0426
	Ibadan	1985 P	100							0426
	Ilesha	1977-78	200	94	88 E					0052
	Ilesha	1977-78	200							0052
	Jos	1926	500	15 *						0100
	Lorit	1986	496	60 *						0100
	Lorit	1990 P	150	131	12 E					0642
	Kaduna	1983-84	871	115	E					0246

E = Estimate, M = Median, \* = See note section

All p.m.; Rural  
\*100g/L  
\*100g/L  
E: PCV

Low SocEc  
Low SocEc  
All p.m.; Rural  
\*cut-off n.k.; W24-30  
\*cut-off n.k.; W15-19  
E: PCV

All women  
Mean Hb (g/l)  
Below the norm (%)  
Mean Hb (g/l)  
Below the norm (%)  
Mean Hb (g/l)  
Below the norm (%)

36  
123  
117  
58 E  
128  
26  
20

35  
124  
41 \*  
10 \*

131  
134  
134  
107  
63 E  
110  
113

18 E  
82 E  
57 E  
128  
23 E

113  
115 E

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN AFRICA

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)								
NIGERIA cont.													
Kano City, North Nigeria	1978	470	297	70	32 *							Mother's of LBW; * <100g/L	0582
Nalumashi, Kaduna state	1979	470	4251	122 E	29 *							part.; *cut-off n.k.	0284
Sokoto (North)	1985		433	7 *								Low SocEc	0459
Southwest+Northeast areas	1990 P		6729	28 *								*cut-off n.k.	0494
Zaria	1976-79		228	113	43							Malaria hyperendemic; Hausa	0672
Zaria	1977-78		66	95	51 E							High SocEc	0173
Zaria	1981		109	43	47							Primigravidae <26 wks gest.	0221
Zaria	1981		228	95								0595	
Zaria	1990 P		95									0595	
SENEGAL													
Bamby-Djourbel+N'Diacke	1980 P		59	98	55 E							Sahel area; 117-30	0075
Dakar area	1980 P		76	113								0074	
West Coast	1972		172									0527	
SIERRA LEONE												Low SocEc	0045
Unknown	1977			45 *								*cut-off n.k.	0577
TOGO													
Unknown	1977		1141	47									0572
MIDDLE AFRICA													
ANGOLA													
Luanda	1983 P			29 *								* <80g/L	0439
CAMEROON													
Benue (North)	1983		90	129	8								0146
Rural area, North Cameroon	1990 P		93	93								*August-September	0591
Rural area, North Cameroon	1990 P		93									*December-January	0591
CENTRAL AFRICAN REP.													
Bangui	1981-82		101	105 E	67 E							0276	
CHAD													
N'Djamena	1986 P		112	122 E	25 E							Part.; E: Hct	0292

E = Estimate, N = Median, \* = See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN AFRICA

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
CHAD cont. N'Djamena Unknown	1986 P 1988		114 112					131 E	24 E	E: hct	0292 0353
CONGO										Malaria endemic Part.; SUP	0665 0449 0228 0228
EQUATORIAL GUINEA GABON											
ZAIRE Kinshasa Kinshasa Lubumbashi Lubumbashi	1988-89 1969 1983 1983-84 1983-84		2950 476 263 1105 246	100 110 M 117 50 33 42	76 50 33 42						
SOUTHERN AFRICA											
BOTSWANA Unknown Unknown	1971 1971		386 111	140 E 50 E	3 E 50 E	145 E 10 E	10 E 135 E	135 E 20 E	20 E		0508 0514
LESOTHO											
NAMIBIA Chunukwe Chunukwe Chunukwe	1984 1984 1984		44 14 32	129 0	0	134	6	133	16	Bushmen (settled) Bushmen (settled) Bushmen (settled)	0168 0168 0168
SOUTH AFRICA											
Cape Town Cape Town Cape Town Chatsworth Chatsworth Durban Durban	1983 P 1983 P 1983 P 1981 P 1988 P 1979 P 1981 P		146 48 128 205 328 280 1046	119 116 13 *	22 E 128 124 42 E			131 124	20 E 42 E	Subsample at 36 wks gest. *<100g/L; P.W.<16 Indian; W20-25 Low Socie; Indian Black	0161 0161 0185 0071 0121 0626 0305

E = Estimate, N = Median, \* = See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN AFRICA

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
<b>SOUTH AFRICA cont.</b>													
Durban	1985 P		204	117	31 E							Low SocEc; Indian	0267
Durban	1985 P		96	112	26 E							Low SocEc; Black	0267
Gazankulu	1984		229	114	33							Low SocEc	0226
Johannesburg	1970		51	131 M	27							Bantu	0504
Johannesburg	1979		400	6 *	37							p.w. 13-23; <100g/L	0376
Johannesburg	1986		1800	224	122							Coloured; low-middle SocEc	0248
Johannesburg	1986-87		1800	100	123							Indian	0249
Natal	1972		1611	231	33 E							Indian	0542
Natal	1985 P		185	185								& 54 (24% <12yrs); rural	0258
Nkonya, Kwa Zulu	1975												0511
<b>SWAZILAND</b>													

World Health Organization. Extracted from FHE database. Mai 1992

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA

\* = Estimate,  $\bar{N}$  = Median, \* = See note section

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA

= Estimate,  $\bar{N}$  = Median, \* = See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant Women		Lactating Women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
THAILAND cont. Ayutthaya villages	1979 P 1971-72		451 39915	112 E 111	48 E 31 *					121	45	E: hot * <100g/L	0056 0558
Bangkok	1971		154	111	2 *					138	2 E		0573
Bangkok	1977-79		9237										0487
Bangkok	1979-81		144										0334
Bangkok	1980 P		80										0373
Bangkok	1981 P		144										0070
Bangkok	1983 P		568	111	52 E								0321
Doi Tao (North)	1978-80		105										0142
Nakorn Nayok villages	1970-71		207										0522
North Eastern Thailand	1972		269										0539
Northern Thailand	1973		3230										0571
Pachee & Bangpahun (Cent.)	1977-79		630										0142
Pachee & Bangpahun (Cent.)	1977-79		451										0142
Prabat Hovai Tom (North)	1978-80		134										0293
Sakaeo Holding Center	1982		162										0334
Si Sa Ket province	1979-81		48 *										0125
Si Sa Ket province	1980 P		110										0070
Si Sa Ket province	1981 P		485										0573
Ubol	1971		241	106	39								0524
Unknown	1971		879										0142
Varin Chamrab, Ubon prov.	1978-79		557	102	71								
<b>VIET NAM</b>													
<b>EASTERN ASIA</b>													
CHINA													
Beijing	1982		421										0631
Beijing	1983		68										0594
Beijing	1983		645	113	41 E								0596
Beijing	1984-85		100	114	37 E								0345
Beijing	1984-85		68										0345
Beijing	1984 P		645	128	13								0346
Beijing	1984-85		225										0364
Beijing	1984 P		82	113	28 *								0369
Beijing	1990 P		15 *										0594
													3rd trim.; *cut-off n.k.

E = Estimate, M = Median, \* = See note section

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA									
Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women	Lactating women	Non pregnant women	All women	Notes	Ref. No.
				Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)		
CHINA cont.									
Huijin County, Henan province	1990 P		294	26 *				3rd trim.; *cut-off n.k.	0594
Linxian	1994		101						0580
Shanghai	1983		288						0600
Shanghai	1982		1587						0139
Shanghai County	1984 P		917	20 *					0478
Tianjin	1980		190	119	16 *				0594
Tianjin	1990 P				20 E				0594
DEM. P. REP. KOREA									
HONG KONG									
JAPAN									
National, rural	1978-79		1636					W40-49	0326
National, rural	1968-70		1698						0347
National, rural	1977-81		1402						0347
Fukushima prefecture	1978-86		1985						0336
Fukushima prefecture	1984-86		604						0336
Gunma, Kasagake-mura	1986		1218						0326
Kumamoto	1971		1926						0179
Kumamoto prefecture	1989-81		9065						0337
Kumamoto subdistrict	1980-81		54						0337
Nara-shi	1988		2498						0326
Niigata, Nishikubo-chiku	1985		1677						0326
Sendai, Tokyo	1980-81		46						0347
Tokyo	1981		40						0357
Tokyo, Shibuya-ku	1981		142						0326
Unknown	1981-83		1164						0326
Yamada-Kohgen, Nara pref.	1986		211						0326
Yamato City Refugee Center	1981-82		65						0356
MONGOLIA									
National	1988								0457
Balan Olgi	1990 P								0457
Ulan Bator	1990 P								0457
								*cut-off n.k.	
								*cut-off n.k.	
								*cut-off n.k.	

$\hat{M}$  = Estimate,  $M$  = Median, \* = See note section

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA

$\hat{E}$  = Estimate,  $M$  = Median,  $\sigma$  = See note section

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA

$\bar{x}$  = Estimate,  $M$  = Median, \* = See note section

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA									
Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women	Lactating women	Non pregnant women	All women	Notes	
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)
BANGLADESH cont.	1975-76		174	108 *	43 E	111	74	*p.w.+lact.w. (82% <120g/L); r 0159	
	1981-82		442	109 *	53 E			Rural	
	1981-82		279	109 *	53 E			*p.w.+lact.w. (77% <120g/L); r 0159	
	1973		157	102	66			3 days post-p.	
	1976		100	106 E	58			0528	
	1977 P		130	109	46			0048	
	1977 P		42					0007	
	1983 P		151					0007	
	1976		1476					0359	
	1985 P		178	106 E	62			E: hct	
Malab	1985 P		611	108 *	50 *			Part.; rural	
	1975-76		300	42 *				*p.w.+lact.w.	
Rural	1973							*cut-off n.k.	
	Unknown								
BHUTAN	1985-86		3829	91	88			Part.	
	1984 P		150	107	53 E			0435	
	1973		216	73				0371	
	1989 P		199	107	50			0563	
	1989 P		383	81				0293	
	1987 P		559	93	81			0190	
	1981 P		764					0102	
	1981-85		90000					0220	
	1981-85		90000					Rural; hookworm inf.	
	1982 P		200					* <100g/L; urban slum	
INDIA	1982 P		72	100				Rural areas; * <100g/L	
	1982 P		512	90	96 E			W15-60; rural	
	1988 P		316	106				Low SocEc	
	1978 P		270					0019	
	1980 P		480	107				0499	
	1977-75		283					0066	
	1982 P		114	74 *				0056	
	1979 P		636					0550	
	Calcutta-Belhi+Madras							0469	
	Chandigarh+Hyderabad+Varanasi							* <100 g/L	
CHITTRARAJAN, KASHMIR	1982 P		200					3rd trim.; *cut-off n.k.	
	1982 P		72	100				0069	
	1982 P		512	90	96 E			<100 g/L	
	1988 P		316	106				0069	
	1978 P		270					0066	
	1980 P		480	107				0056	
	1977-75		283					0550	
	1982 P		114	74 *				0469	
	1979 P		636					* <100 g/L	
	Gangtok district, Haryana								
HYDERABAD	1982 P		110	E	74				
	1982 P		42 *						
	1980 P		283						
	1977 P		114	74 *					
	1982 P		125						
	1979 P		30						
	1982 P		74						
	1980 P		125						
	1977 P		30						
	1982 P		74 *						

$\hat{M}$  = Estimate,  $\hat{M}_m$  = Median, \* = See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA**

Region, Country or Area	Year	Altitude (m)	Sample size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)		
INDIA cont.													
Hyderabad	1981 P		3333	1667	49	122	43 E	120	46 E			Low SocEc	9034
Hyderabad	1981 P		3461	108	56 E			118	55 E			Low SocEc	9034
Hyderabad	1981 P		9599	107	2406			112	58 E			Part.; urban; Low SocEc	9035
Hyderabad	1981 P		1083	69	42 E							Urban; Low SocEc	9038
Hyderabad	1986 P		1083	115								Part.; Low SocEc	0339
Hyderabad	1989 P		864	110	78							Low SocEc; urban	0295
Hyderabad	1989 P		2116	101								Low SocEc; urban	0295
Hyderabad	1989 P		327	105	61 E							Low SocEc; urban	0295
Hyderabad area	1981 P		204					108	77 E			Rural; Low SocEc	0296
Hyderabad area	1981 P		1022	95	83 E							Rural; Low SocEc	0038
Hyderabad region	1981 P		747									Rural; Low SocEc	0038
Jaipur	1983 P		171	96	91							Rural	0220
Jhansi, Uttar Pradesh	1980		246	102	68			123	25				0191
Jhansi, Uttar Pradesh	1980		246										
Madras	1981 P		648										
Manipur	1980 P		99	113	42 E								
Manipur	1989 P		165	111	49 E								
New Delhi	1986 P		175	116	38 E								
New Delhi	1988 P		53	111	43								
New Delhi & Vellore	1979 P		151	103									
New Delhi(+)Vellore(S)	1979		247	106									
Northern India	1975		647	96	87								
Panchmahals, Gujarat	1977		2795		62								
Rohilkhand, Haryana	1986 P		211	85 E	96								
Unknown	1989 P		1660										
Uttar Pradesh	1987 P		308	115 E	43 E								
Varanasi	1976-77		666	92	87								
Varanasi	1977-78		232		75 *								
Varanasi	1983 P		680		26 *								
Varanasi	1986 P		365	112 E	42 E								
IRAN, ISLAMIC REP.	1976		1590	565									
Istahran area	1980-81		1650	169	127	8							
Shiraz													

E = Estimate, M = Median, \* = See note section

0278

0450

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN ASIA										
Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women	Lactating women	Non pregnant women	All women	Notes		
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Ref. No.
IRAN, ISLAMIC REP. cont. Shiraz, Fars province Teheran Teheran Teheran Teheran Teheran	1980-81	1650	116	12 *						0495
	1971	1100	2125	115	40 E					0550
	1978 P	1100-1500	55	111	56					0067
	1978	1100	108	111						0520
	1978	1100	86	138	4					0520
	1986 P		43	120	28 E					0358
NEPAL Kathmandu	1972	1450	151	117	33					0500
									*not altitude adjusted	
PAKISTAN National Faisalabad Karachi Karachi Karachi Karachi Karachi Karachi Karachi Karachi Karachi Karachi Karachi Karachi Peshawar Unknown	1982 PE	>250		57 *						0234
	1980 P	80	121	19						0010
	1970	509	99	73						0525
	1971	889	96	64						0526
	1981 P	3262								0043
	1982-83	1571	51							0115
	1985-88	709	17 *							0116
	1985-87	400	120	24 E						0250
	1987 P	200								0195
	1987	213	30 *							0250
SRI LANKA Colombo Kandy area Kandy district Unknown Unknown	1988 P	206	99	65						0103
	1984 P	250	106 E	57						0314
	1976	105	54							0540
SRI LANKA Colombo Kandy area Kandy district Unknown Unknown	1990 P	93						50		0448
	1974	830	213							0564
	1979 P		199							0040
	1983 P	172	128	1 E						0214
	1983 P	184								0214
	1969-72	983	106	62						0567
	1974	368								0568
	1974	200								0568

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN EUROPE

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women	Lactating women	Non pregnant women	All women	Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
<b>NORTHERN EUROPE</b>									
<b>DENMARK</b>									
Copenhagen County	1981	163							0194
Fyn	1987 P	54.8							0697
Glostrup	1978	99.7							0194
Vejle	1981	54.8							0194
	1985 P	13.6							0197
<b>FINLAND</b>									
Tampere	1985	2694	120 E						0473
<b>ICELAND</b>									
<b>IRELAND</b>									
Dublin	1985 P	106							0354
Sligo	1989 P	148							0110
<b>NORWAY</b>									
Unknown	1990 P								0447
<b>SWEDEN</b>									
Goteborg	1980-81	122							0374
<b>UNITED KINGDOM</b>									
National	1990 P	328							0253
Bradford	1974-78	64.43	119 E	30 E					0261
Bradford	1974-78	189.24	122 E	18 E					0261
Cardiff	1970-82	44.316	123 E	9 E					0272
Glasgow	1975-77	117.9		9 *					0281
London	1983 P	78.2							0390
London	1984 P	49	118	19					0143
Oxford	1987-89	86.84	39 *						0445
Portsmouth	1986 P	69	113	45 E					0252
Ulster, N. Ireland	1990 P	192							0324
<b>EASTERN EUROPE</b>									
<b>BULGARIA</b>									

E = Estimate. M = Median, \* = See note section

8 \*  
8 \*  
13†  
17 E

p.M. <24; \*cut-off n. k.  
\*<112/L; ethn. mixed  
p.M. 22-25  
lowest Hb during pregn.  
Part.

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN EUROPE

E = Estimate, N = Median, \* = See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN EUROPE

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant Women		Lactating Women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
AUSTRIA cont.													
Wien	1984 P		65							135 M			0257
BELGIUM	1983 P		83	126	0								0378
Rotterdam, Antwerp	1983 P		61	124	6 E								0378
Rotterdam, Antwerp													
FRANCE	1976		203			24							
Chambart	1986		171	104	69 E								0452
Le Havre	1986		171	119	18 E								0145
Lyon+Nancy+Nevers+Paris	1979-82		173										0145
Paris	1981-82		676										0620
Paris	1981-83		658	120	23 E								0339
Paris	1983 P		203	115	24								0418
Paris	1983 P		30										0365
Paris	1984 P		124	122	20 E								0365
Paris	1985 P		476										0204
Paris	1985 P		107										0180
Paris	1985 P		802	120	22 E								0203
Paris	1985 P		233	120	15								0205
Paris	1985 P		233										0211
Paris	1986 P		303										0154
Paris	1987 P		332	121	18								0206
Paris	1989 P		191	125	5 E								0153
Poissy	1989 P		94	30	30								0153
Poissy	1989 P		203	115	28 E								0603
Unknown	1980 P		100	130	2								0375
Unknown	1982 P												
GERMANY	1977-78		100			33							
Bad Pyrmont	1980 P		5000			17							0253
Fulda	1986 P		156	121	22								0419
Goettingen	1984 P		192		7								0344
Hannover	1984 P		192		20								0127
Hannover	1978-79		740										0127
Kerdelberg	1989 P		500	129 E	12 E								0232
Leipzig	1983 P		139										0171
Rhein-Hain area	1983 P		470	126	5 E								0241
Rhein-Hain area													0241

E = Estimate. M = Median, \* = See note section

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN EUROPE											
Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
LUXEMBOURG											
NETHERLANDS	1985-86		796	117 E	26						0240
	1985		494	118 E	18 E						0417
	1985		494		28						0476
SWITZERLAND										30-32 wks gest.	

World Health Organization. Extracted from FHE database. Mai 1992

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN LATIN AMERICA

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
<b>CENTRAL AMERICA</b>													
BELIZE	1984												
National	1989	1160	100	127	28 *								
COSTA RICA	1977 P												
National	1983 P	< 750	33	104	33 *								
EL SALVADOR	1978	841	122 E	14	133 E	16	137 E	11	130	13			0017
National	1983 P	1500	32										
GUATEMALA	1983 P	751-1500	32										
Coastal area	1983 P												
Guatemala City	1983 P												
Highland area	1983 P												
HONDURAS													
MEXICO	1977-78												
Durango	1983 P	500	305	505	68								
Merida	1985 P												
Merida, Ticul, Tiximil	1978	2250	2240	216	127								
Mexico City	1979 P												
Mexico City	1988 P												
Mexico City	1988 P												
Tlaxcala	1988 P	2550	162	68									
NICARAGUA													
PANAMA													
CARIBBEAN													
ANTIGUA & BARBUDA	1979												
Antigua	1979												
Antigua	1979	195	105	195	58								

E = Estimate, M = Median, \* = See note section

0046  
04540044  
0454\*cut-off n.k.  
SUP: 3rd trim; low SocEc;

Multipara

Rural; \*cut-off n.k.

\*cut-off n.k.,  
Rural; \*cut-off n.k.

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HABMOGLOBIN LEVELS IN LATIN AMERICA**

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women	Lactating women	Non pregnant women	All women	Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
ANTIGUA & BARBUDA cont.									
BAHAMAS	1983			12 *				*<100g/L	0461
BARBADOS	1981		193	29 *				*<115g/L	0461
National	1981								0483
National	1984 P								0120
CUBA	1979-81		225	117	10				
Camaguey municipality	1979		205	72	36 E				0122
Habana	1983		72	115					0125
Habana	1986 P		177	52					0182
Sancti Spiritus	1986 P								0297
Unknown	1986 P								0269
DOMINICA	1985								
National	1982		28						0461
DOMINICAN REPUBLIC									0317
GRENADA	1984 P		110 E	51					
National	1985		64						
National	1985		271						0120
National	1985		62	106	63				0175
National	1985		397						0175
National	1985		271						0288
National	1986								0288
GUADELOUPE									0436
HAITI	1970		102						0461
Unknown									
JAMAICA	1978		229	104	62				0505
National									0014

E = Estimate, H = Median, \* = See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN LATIN AMERICA

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
JAMAICA cont.											
National	1978		423								0014
National	1982										0461
National	1984 P		106	62							0120
Kingston	1984		697	124	4						0318
MARTINIQUE											
PUERTO RICO											
ST LUCIA	1976		118	22							0461
National	1984 P		118	E	22						0120
ST VINCENT	1983		152	110	E						0461
National	1989 P		152	110	E	43					0289
St Vincent & Grenadines											
ST. KITTS AND NEVIS	1977		3432	34							0013
National	1977-80		3170	43							0438
National	1981-84			42							0438
National	1982			42							0661
National	1984 P		2044	57							0120
National	1985-88										0438
TRINIDAD AND TOBAGO	1976										
National	1984 P		109								0461
Trinidad, Port-of-Spain	1976										0120
OTHER CARIBBEAN	1979										0559
British Virgin Islands	1984 P		116	E	10						0461
British Virgin Islands	1979					16					0120
Cayman Islands	1984 P		118	E	15						0461
Cayman Islands	1975-76		106		100						0120
Honitserat	1980		184	101	E	82					0333

E = Estimate, M = Median, \* = See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN LATIN AMERICA**

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below norm (%)	Mean Hb (g/l)	Below norm (%)	Mean Hb (g/l)	Below norm (%)	Mean Hb (g/l)	Below norm (%)		
OTHER CARIBBEAN cont.													
Montserrat	1980		138	100	85								0318
Turks and Caicos Islands	1981-86		1042	106	67								0316
Turks and Caicos Islands	1984 P		103	E	74								0120
Turks and Caicos Islands	1984				65								0461
SOUTH AMERICA													
ARGENTINA													
Buenos Aires	1991 P		184										0491
BOLIVIA													
La Paz	1984 P	3700	152										0271
La Paz	1987	3700											0484
San Simon	1982												0484
Santa Cruz	1976-77		2036	113	E								0427
Santa Cruz	1985 P		200	126									0141
BRAZIL													
Amazon Basin	1989 P	3256	118	E									0250
Amazon Basin	1989 P	188E											0250
Amazon Basin	1990 P	400											0597
Amazon Basin	1990 P	200											0597
Caceres, Mato Grosso	1985	378											0307
Fortaleza, Ceara	1983 P	119											0124
Para State	1982-83	762											0126
Paraiba State	1982-83	1447											0126
Paralba State, l. Bre.	1982-83	217											0061
Paralba, Litoral	1982-83	81											0126
Paralba, Z. Mata	1982-83	82											0126
Pernambuco State	1975 P	144											0061
Pernambuco State	1990 P	1214											0126
Pernambuco, Litoral	1982-83	472											0126
Porto Alegre	1984 P	317											0183
Rio de Janeiro	1989 P	51											0383
Rio de Janeiro	1990 P	83											0492
Santa Casa de Sao Paulo	1983 P	72											0329
		79	123	6 E									

E = Estimate, N = Median, \* = See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN LATIN AMERICA**

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women	Lactating women	Non pregnant women	All women	Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
BRAZIL cont.									
Sao Paulo	1982-83		1616	32					0126
Sao Paulo	1982 P		77	118	26				0055
Sao Paulo	1986		349						0106
Sao Paulo	1990 P		835	130	12 *				0451
Sao Paulo, state of	1977-81								0270
Sao Paulo, state of	1977-81								0327
Unknown	1991 P		4537	116	35				0456
CHILE									
National	1974-75		1006						0323
National	1974-75		417						0323
Santiago	1976		446	118	20				0519
Santiago	1976 P		106						0519
Santiago	1978 P		106						0396
Santiago	1981 P		102						0123
Santiago	1981 P		100						0286
Santiago	1982-83		47	117	21 *				0123
Santiago	1982-83		192						0397
Santiago	1982-83		60		10 *				0397
Santiago	1983		57						0187
Santiago	1984 P		124	115	35 E				0258
Santiago	1987 P		50						0258
Santiago	1989 P		153	119	13 E				0137
Santiago, La Granja	1970		189						0259
Santiago, La Granja	1970		136						0576
Talca	1984		121						0576
Talca	1984								0286
COLOMBIA									
National	1977-80		*						
National	1977-80		*						
Hecelain	1981 P		1538	2196					
ECUADOR									
Portoviejo	1984-85		40	100					0349
Quito	1984-85		2800	412	133				0177
Quito	1984-85		2800	100					0349

E = Estimate, M = Median, \* = See note section

\*cut-off n.k.; M post-p.

\*116g/l

Healthy M

W12-17

W15-23

Part., subsample  
p.w.<16g; \*cut-off n.k.; low SocEc

\*cut-off n.k.

Blood donors

Part.; low SocEc

Blood donors

1st trim

Post-p.

Blood donors

\*large RS; \* E<113g/l

\*large RS; \* E<123g/l

Adol. 14+; E: hct

Low SocEc

Adol. 14+; E: hct

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN LATIN AMERICA**

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)	Mean Hb (g/L)	Below the norm (%)		
ECUADOR cont.													
Quito	1987 P	2800	86	124	46			148	2 E				0359
Quito	1987 P	2800	32					116	55	113	63		0359
GUYANA													
National	1971		642	101									0551
National	1982 P		32209										0395
National	1985-85												0470
National	1986 P												0120
National	1985		3185										0470
National	1986		498										0470
Georgetown	1985-87		18962										0471
PARAGUAY	(Taipu+Taipyte+Itakyry)							56 *					0437
	1980		63	63 *									
PERU													
Lima	1987 P	sealevel	25	109									0303
Lima	1987 P	sealevel	36										0303
Lima	1988 P		27										0169
Lima	1988 P		75										0169
North Peru Jungle Area	1987		92										0225
Oroaya & Puno	1987 P	3700	51	141	21 E			156	6 E	108	71 E		0303
SURINAME													
URUGUAY													
VENEZUELA													
Carabobo State	1987 P		38										0174
Curimagua, Falcon State	1985 P		120	115	5 *								0108
Maracaibo	1972		31										0517
Maracaibo	1972		132	123 M									0543
Maracaibo	1976		176	122									0155
Maracaibo	1983 P		52	111	14								0155
Maracaibo	1983 P		58	44									0155

E = Estimate, M = Median, \* = See note section

HAEMOGLOBIN LEVELS IN NORTH AMERICA

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN NORTH AMERICA									
Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women	Lactating women	Non pregnant women	All women	Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)
<b>NORTHERN AMERICA</b>									
<b>CANADA</b>									
Hudson Bay Region Quebec	1986-88		230	47		133	5 E	Inuit *10-48	0589 0313
	1978-80		263						
<b>USA</b>									
National	1971-74		5070	32 *		137	5	*<120g/L White	0340 0360
National	1971-74		196			138	4	Black	0498 0498
National	1971-74		3076			130	20 *	*<117 g/L	0498 0150
National	1971-74		742			135 M	6 *		0178
National	1976-80		1682						0360
National	1976-80		3470			135 M			0468
National	1976-80		1999	17 * *					
National	1978-88		*						
National	1980		791		38			11 *	0199 0338
Thirteen states + DC	1987		*		19				
Thirteen states + DC	1987		*						
Alabama	1975-80		1749	115	27 E				0217
Baltimore	1977 P		202	118 E	16 E				0172
Bogalusa, LA	1981 P		103						0343
Bogalusa, LA	1976-77		600						0149
Bogalusa, LA	1982-83		515						0254
Boston, MA	1980		8163	124 E	11 E				0310
Baltimore	1977 P		32	114	33 E				0310
Camden, NJ	1980		22	119	16 E				0320
Chicago	1982-87		1253	9 *					0117
Chicago	1982-87		5119	4 *					0118
Florida	1982 P		79						0119
Florida	1982 P		77						0465
Florida, Putnam county	1983 P		58	117 E	34 E				0273
Fresno County, CA	1980-85		1001	1001	13 *				
Gainesville, FL	1980 P		269	40 *					
Gulf Ford County, NC	1983		91						0416

E = Estimate, M = Median, \* = See note section

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN NORTH AMERICA

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
USA cont.													
Jefferson City, Mo	1983 P	2183	185										
Laramie, WY	1989 P	1576	199										
Los Angeles	1985-88												
Lowell, MA	1981-87	110	16										
Lowell, MA	1981-87	452	30										
Madison, WI	1987 P	40	123 E	23 E									
Madison, WI	1987 P	40											
Milwaukee, WI	1982-85	582	2										
Minneapolis, MN	1980-82	350	120 E	27 E									
Minneapolis, MN	1980-82	573	125 E	15 E									
New York City	1986 P	137	50 *										
Shreveport, LA	1981 P	62											
Southern States	1983 P	1026											
Springfield, MA	1982-84	272	126	4 E									
Washington DC area	1977-80	1893											
Washington State	1988-71	125											
Washington State	1988-71	370											
Washington State	1990-83	32030	1 *										

World Health Organization. Extracted from FME database. Mai 1992

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN OCEANIA

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women	Lactating women	Non pregnant women	All women	Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
<b>OCEANIA</b>									
<b>AUSTRALIA</b>									
Adelaide	1977-80		76	20 *					
Carlton, Victoria	1986 P		459			119 E	54 E		0426
Kimberley region	1977		122	8 *					0379
South Australia	1981-82		550 *	3 *					0396
South Australia	1981-82								0198
South Australia	1981-83		5675	4 *					*
South Australia	1981-83		2694	2 *					0198
Sydney	1989 P		228	122					
Yirrkala, Arnhem Land	1983		200 E						
<b>FIJI</b>									
Labasa	1970		139						
Lautoka, Suva	1979		245	116	29	120	107	Indian; Rural;	
Lautoka, Suva	1979		240	116	33	123	120	Indian; Hindu; semirural	00005
Suva	1971-76		1871	40 *		38 *	32	Indian; Moslem; semirural	00005
Suva	1982 P							HP	00533
Suva area	1975		616					cut-off R.K.	04533
Suva area	1975		589					cut-off R.K.	0037
Unknown	1972		1089	103	68	102	129 E	Indian; E: PCV	0037
							135 E	Fijian; E: PCV	0037
							8 E		0037
<b>KIRIBATI</b>									
Gilbert & Ellice Islands	1971		233	105		111	77		
<b>NEW ZEALAND</b>									
Middlemore, Auckland	1981-82		110	22 *					
<b>OTHER OCEANIA</b>									
Trust Territories	1972				70				
<b>PAPUA NEW GUINEA</b>									
Kaul Village, Kar Kar Island	1974		150	47		99	100	Malaria endemic area; rural	0513
Madang	1985-87		296	87		103	77 E	Malaria endemic area; rural	0131
			335						0131

E = Estimate, H = Median, \* = See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN OCEANIA

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
PAPUA NEW GUINEA cont.	1980-81		539	98	75 E	100	83 E						0681
	Madang Province	1980-81	362	97 E	81								0681
	Port Moresby	1985	600	99	75								0315
	Port Moresby	1985	100	99									0332
	Tabubil, Western province	1975	44										0579
	Tabubil, Western province	1984	34										0579
	Upper Matut Motley Yagum	1973	1600-1600	3201	97	75 E							0512
SAMOA	1979		408	108	56								0624
	Apia	1978	973	115	37 E								0620
WESTERN SAMOA													
SOLOMON ISLANDS	1978		235	119 E	26								0022
	Gizo, Western Province	1979	220	125 E	10								0022
TONGA	Unknown	1979	540	40									0023
		1982-84	1135	41									0664
VANUATU	Port Vila												

World Health Organization. Extracted from FME database. Mai 1992

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: HAEMOGLOBIN LEVELS IN THE USSR**

Region, Country or Area	Year	Altitude (m)	Sample Size	Pregnant women		Lactating women		Non pregnant women		All women		Notes	Ref. No.
				Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)	Mean Hb (g/l)	Below the norm (%)		
<b>USSR</b>													
<b>USSR</b>	1987	*	969										
Osh region, Kirghizian	1983 P		1497										
Unknown													

123  
128  
\* mountainous area  
\* <120g/L + Si <0.57mg/L

World Health Organization. Extracted from FINE database. Mai 1992

0368  
0275

**7.5**

**ANAEMIA IN WOMEN**

**TABULATIONS OF AVAILABLE INFORMATION**

**SERUM IRON, SERUM FOLATE AND SERUM VITAMIN B<sub>12</sub>**

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN AFRICA							
Region, Country or Area	Year	Sample Size	Serum iron	Serum folate	Serum B12	Notes	Ref. No.
			Mean (mg/L)	Below the norm (%)	Mean (pg/ml)		
<b>EASTERN AFRICA</b>							
BURUNDI							
COMOROS							
DJIBOUTI							
ETHIOPIA							
KENYA Western province, Nairobi	1981	291					0132
MADAGASCAR							
MALAWI							
MAURITIUS							
MOZAMBIQUE National	1986 P	748	48 i			p.w.; i: SF<120g/L	0256
REUNION							
SOMALIA							
U. REP. TANZANIA							
UGANDA							
ZAMBIA							
Lusaka	1972 P	239	0.85	24 E		p.w.	0518
Unknown	1970-71		1.02	10		p.w.	0536
Unknown	1970-71		0.95	10		lact.+	0535
ZIMBABWE							

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, N = Median,  
v = note refers to serum vitamin B12, \* See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN AFRICA

Region, Country or Area	Year	Sample Size	Serum iron	Serum folate		Serum Vitamin B12	Notes	Ref. No.
			Mean (mg/l)	Below the norm (%)	Mean (ng/ml)	Below the norm (%)		
<b>NORTHERN AFRICA</b>								
ALGERIA								
Urban	1980 P	101	20 i	5.4	23 E			
Zibans province	1988 P	254	34 i	5.2	29			0210
Zibans province, Biskra	1985	102	29 i	5.2				0208
Zibans province, Biskra	1988 P	222	0.91	28 E	11.4			0111
Zibans province, Sidi-Okba	1985	100	27 i	5.2	28			0113
Zibans province, Tolga	1985	100	22 i	5.7	21			0111
EGYPT								
Boulaq-el-Dakrour	1980 PE	250	0.99	2 E				
LIBYAN A. J.								
MOROCCO								
SUDAN								
Wad Medani	1990 P	121	73 i					
TUNISIA								
Kairouan	1990 P	110	56 i					
Tunis	1990 P	46	47 i					
Unknown	1978	284	0.90	11				0586
Unknown	1978	118	0.87	14				0587
Unknown	1978	277	0.95	7				0532
WESTERN AFRICA								
BENIN								
National	1984-85	517	0.72 H	21 i				
Avrankou, Queme province	1986 P	99	0.86	20 E				0209
Cotonou	1987 P	126	39 i	3.3	65			0393
								0207

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum Vitamin B12, M = Median,  
 v = note refers to serum Vitamin B12. \* See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN AFRICA**

Region, Country or Area	Year	Sample Size	Serum iron Mean (mg/dl)	Serum folate Mean (ng/ml)	Serum folate Below the norm (%)	Serum B12 Mean (pg/ml)	Serum B12 Below the norm (%)	Notes	Ref. No.
BENIN cont. Coronou	1987 P	95	14 i						0207
Tori Bossito, Atlantic province	1986 P	102	31 i	4.8	34			non-p.M.; i: SF<12ug/dL + TS<16% and/or EP >Sug/1b non p.M.; i: 2+ indicators(S, EP, SF, MCV) abnormal	0212
<b>BURKINA FASO</b>									
<b>CAPE VERDE</b>									
<b>CÔTE D'IVOIRE</b> Abidjan	1978	198	0.69	35				post-p.	0556
<b>GAMBIA</b> Bakau Jali village Rural	1984 1985 P 1987 P	73 81 63	0.56 0.53	4.2 4.4	5.0 2.0			P.W.; urban P.W. & Lact. N. Lact.W.	0299 0274 0291
<b>GHANA</b>									
<b>GUINEA</b>									
<b>GUINEA-BISSAU</b>									
<b>LIBERIA</b>									
<b>MALI</b> Balafiorabougou village Balafiorabougou village	1973 1973	23 25	0.86 0.93	15 E 7 E	4.7 5.4	21 E		non-p.W. P.N.	0561 0561
<b>Mauritania</b> Novachott	1975	419	0.89	3	3.4	51		P.N.	0547
<b>NIGER</b> Diffa Diffa Giesey & Dosso counties Unknown	1978 1978 1987 1978	70 49 95 70	0.89 1.01	22 i				P.W. Lact. subsample P.W.; i: SF<12ug/dL non p.W., 6 mo.s post-p.	0545 0545 0136 0577

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, M = Median,  
N = note refers to serum vitamin B12, \* See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN AFRICA**

Region, Country or Area	Year	Sample Size	Serum iron	Serum folate	Serum B12	Notes	Ref. No.
			Mean (mg/L)	Mean Below the norm (%)	Mean (pg/mL)		
NIGER cont.							
Unknown	1978	70	0.89			P.W.	0577
<b>NIGERIA</b>							
Ibadan	1985 P	232	0.73	13 E		Lact. W.; Low SocEc	0496
Ibadan	1985 P	100	0.89	2 E		non-P.W.; low SocEc	0696
Ibadan	1986 P	120				W12-17	0282
Ibarapa district	1974-76	40	1.34			P.W.	0549
Zaria	1977-78	228				P.W.; Hausa	0173
Zaria	1981	66	0.97	4 E		non-P.W.; high SocEc	0221
Zaria	1981	95	1.04	9 E		P.W.	0221
Zaria	1980 P	228		18 i		i = cut-off n.k.; 25% malaria	0595
<b>SENEGAL</b>							
West Coast	1980 P	172	1.02	6		non-P.W.; low SocEc	0045
<b>SIERRA LEONE</b>							
<b>TOGO</b>							
<b>MIDDLE AFRICA</b>							
<b>ANGOLA</b>							
CAMEROON	Bene (North), Bere & villages, North	1983 1985 P	90 80	10 5.3	3 5.4	P.W. P.W.	0146 0366
<b>CENTRAL AFRICAN REP.</b>							
Bangui	1981-82	101		50+ i		P.W.; i < 0.6	0276
<b>CHAD</b>							
N'Djamena	1986 P	112	67 i			TS<16% and/or EP>3ug/gHb	0292
N'Djamena	1986 P	114	31 i			non-P.W.; i: TS<12ug/gHb and/or EP>3ug/gHb	0292
<b>CONGO</b>							

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, M = Median,

v = note refers to serum vitamin B12, \* See note section

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN AFRICA

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN AFRICA							
Region, Country or Area	Year	Sample Size	Serum iron Mean (mg/l)	Serum folate Mean (ng/ml)	Vitamin B12 Mean (pg/ml)	Serum B12 Mean Below the norm (%)	Notes
<b>EQUATORIAL GUINEA</b>							
<b>GABON</b>							
<b>ZAIRE</b> Kinshasa Lubumbashi	1983 1983-84	203 1105	1.10 21	55 1			P.W.; Part.; SUP P.W.; i: <0.6 mg/L + Hb<110g/L
<b>SOUTHERN AFRICA</b>							0449 0228
<b>BOTSWANA</b>							
<b>LESOTHO</b>							
<b>NAMIBIA</b> Chunke Chunke Chunke	1986 1984 1984	44 14 32	0.70 0.91 0.88	0 E 0 E 0 E	4.3 3.9 2.8	1038 714 989	0 0 0
<b>SOUTH AFRICA</b>							
Cape Town	1983 P	146	1.04	17 E			D.H.
Cape Town	1983 P	48	0.80	27 I			p.M. 36eks gest., subsample
Chatsworth	1988 P	328					non-p.W.; Low SocEc; Indian;
							i: low Hb + SF<20 ug/L
Durban	1985 P	206	0.83	14 E	4.5	465	P.M.; Indian; low SocEc
Durban	1985 P	96	1.11	5 E	7.2	480	p.W.; Black; low SocEc
Gazankulu	1984	229	0.91	12 E	3.5	48	p.W.; low SocEc
Johannesburg	1970	51	0.68	H			0226
Johannesburg	1982 P	170					0504
Johannesburg	1982 P	40					0385
Johannesburg	1982 P	243					0386
Johannesburg	1982 P	82					0387
Johannesburg	1985 P	82					0248
Johannesburg	1986	224	0.81	21 E	2.0	357 G	p.W.; coloured; low-middle SocEc
Johannesburg	1986-87	100	0.70	26 E	2.6	337 G	p.W.; Indian
Natal	1972	1611					0249
Natal	1985 P	231	0.61	37 E			0542
Ngutu, Kwa Zulu	1975	144					0268
							0511

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, M = Median,  
 N = note refers to serum vitamin B12. \* See note section

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN AFRICA							
Region, Country or Area	Year	Sample Size	Serum iron	Serum folate	Serum Vitamin B12	Notes	Ref. No.
			Mean (mg/l)	Below the norm (%)	Mean (pg/ml)	Mean (pg/ml)	
SOUTH AFRICA cont.							
EQUATORIAL GUINEA	1975	185			32	f	972
SWAZILAND							non-p.W.; rural; f: red cell folate

World Health Organization. Extracted from FHE database. Mai 1992

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN ASIA

Region, Country or Area	Year	Sample Size	Serum Iron Mean (mg/dl)	Below the norm (%)	Serum folate Mean (ng/ml)	Below the norm (%)	Serum Vitamin B12 Mean (pg/ml)	Below the norm (%)	Notes	Ref. No.
<b>SOUTH-EASTERN ASIA</b>										
<b>CAMBODIA</b>										
<b>EAST TIMOR</b>										
<b>INDONESIA</b> Unknown	1970	90	0.64	23					P.M.	0533
<b>LAO, P.D.R.</b>										
<b>MALAYSIA</b> Kuala Lumpur Kuala Lumpur	1982 P 1986 P	104 229		27 i					P.M. part. non-p.M.; i: SF<12ug/l	0050 0184
<b>MYANMAR</b> Rangoon Rangoon Rangoon Villages	1972 P 1976 P 1982 P 1972 P	447 310 135 1491	0.99 0.70 E 0.88 E 0.84	33 13 18	5.1 E 13				P.M. P.M. P.M. all W.	0502 0112 0018 0512
<b>PHILIPPINES</b> National National National National National Manila Manila Manila Unknown	1981 P 1981 P 1981 P 1987 1978 P 1982 P 1983 P 1978	484 332 350 158 110 566 300 252	0.65 0.75 0.78 1.09 1.09 4 i 0.74 0.84	36 E 24 E 25 E 16 i 5 4 i 24 E 24	6.6 4.1 6.1 9.0 9.0 0	17 E 24 E 32 E			non-p.M.; low SocEc p.M.; low SocEc lact.W.; low Soc.Ec. P.M.; i: EP>28ug/dl+SF<12ug/ml non-p.M.; 13-19; i: SF<12ug/L P.M.; P.M.	0266 0266 0266 0244 0242 0059 0263 0533
<b>SINGAPORE</b>										
<b>THAILAND</b> Bangkok Bangkok Bangkok Bangkok	1971 1979-81 1981 P 1983 P	154 144 144 568		21 i 0 E 0 E 22 i					P.M.; i: *4b<110g/l all W 427-30 p.M.; i: SF<12ug/l	0573 0354 0070 0321

E = Estimate, f = note refers to Serum folate, G = Geometric mean, i = note refers to serum iron, N = Median,  
 v = note refers to serum vitamin B12, \* See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN ASIA**

Region, Country or Area	Year	Sample Size	Serum iron	Serum folate	Serum Vitamin B12	Notes	Ref. No.
			Mean (mg/l)	Below the norm (%)	Mean (pg/ml)		
THAILAND cont.							
North Eastern Thailand	1972	269	43	7		all W.	0539
Si Sa Ket province	1979-81	101	1.06	18 E		all W.; low SocEc	0334
Si Sa Ket province	1980 P	110	1.06	18 E		all W.; i: SF<13ug/ml	0425
Si Sa Ket province	1981 P	485	46 i			p.w.; i: +Hb<11g/L	0070
Si Sa Ket province	1971	261	35 i			p.w.; i: +Hb<11g/L	0573
VIET NAM							
EASTERN ASIA							
CHINA							
Beijing	1982	421	41 i			non-p.w.; i: SF<16ug/L	0431
Beijing	1983	645	0.83	27 E		p.w.	0594
Beijing	1984-85	100	1.13	21 E		p.w.	0345
Beijing	1984-85	225				p.w.	0366
Beijing	1984-85	74	0.87			non-p.w.	0364
Beijing	1984 P	82	0.87	17 E	4.0	p.w.	0369
Beijing	1985 P	74			11 E	non-p.w.; f <2.5 ng/ml	0363
Beijing	1985 P	163			25 f	p.w.; f <2.5 ng/ml	0363
Shanghai	1982	288				non-p.w. 13-15%; i: FEP>50ug/dl	0139
Shanghai	1984 P	158?				all W.; i: SF <14ug/L	0370
DEM. P. REP. KOREA							
HONG KONG							
JAPAN							
Fukushima prefecture	1978-86	1985	19 i			all W.; rural + urban; i: SF <12ug/L + TS<16%	0336
Fukushima prefecture	1986-86	604	19 i			i: SF <12ug/L + TS<16%	0336
Kumamoto	1971	1926	0.96	12 E		all W.	0179
Kumamoto subdistrict	1980-81	54	0.87	16 E		farmworkers	0337
Tokyo	1981	40	1.04	7 E		all W.	0357
MONGOLIA							
REPUBLIC OF KOREA							

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron. M = Median,  
w = note refers to serum vitamin B12. \* See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN ASIA

Region, Country or Area	Year	Sample Size	Serum iron Mean (mg/l)	Serum folate Mean (ng/ml)	Serum B12 Mean (pg/ml)	Serum B12 Below the norm (%)	Notes	Ref. No.
<b>WESTERN ASIA</b>								
BAHRAIN								
CYPRUS								
IRAQ Mosul	1989 P	162	0.74 H	21				0351
ISRAEL Jerusalem	1982	152	1.02	17 E				0392
JORDAN Amman Dead Sea	1983 P 1983 P	40E 40E	0.97 0.56	0 E 23 E			non-P.W. non-P.W.	0235 0235
KUWAIT								
LEBANON								
OMAN								
QATAR								
SAUDI ARABIA								
SYRIAN A. REP.								
TURKEY								
UNITED ARAB EMIRATES Abu Dhabi	1985 P	784			3.6	31 E	276	2 E P.W.; var. ethn. origins 0352
YEMEN								
<b>SOUTHERN ASIA</b>								
AFGHANISTAN								

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, M = Median,  
 v = note refers to serum vitamin B12, \* See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN ASIA**

Region, Country or Area	Year	Sample Size	Serum iron	Serum folate	Serum Vitamin B12	Notes	Ref.-No.
			Mean (mg/l)	Below the norm (%)	Mean (ng/ml)		
<b>BANGLADESH</b> Dacca	1977 P 1977 P	130 42	0.65 0.87	35 5		p.w.; non-p.w.	0007 0007
<b>BHUTAN</b>							
<b>INDIA</b> Allgarh Baltiaghari Chittaranjan, Kashmir Coimbatore Coimbatore city Hyderabad Hyderabad Manipur Vellore	1984 P 1989 P 1982 P 1982 P 1980 P 1989 P 1989 P 1980 P 1979	150 199 200 112 480 283 327 99 89	0.81 0.56 0.57 0.57 0.63 0.95 0.97 0.84 0.49	16 E 56 i 45 i 94 E 62 E 6 E 6 E 11 E 13		p.w.; rural; i: SF<12ug/L W15-60; i: Hb<100g/L+multiple criteria p.w.; low SocEc p.w. p.w.; p.w.; p.w.; p.w.; p.w.; p.w.; p.w.; p.w.	0372 0298 0434 0342 0019 0066 0295 0296 0064
<b>IRAN, ISLAMIC REP.</b> Shiraz, Fars province Tehran Tehran Tehran	1980-81 1978 1978 1986 P	116 108 86 43	0.94 1.16 1.32	13 i 14 E 7 E 5 E		p.w.; i: TS<15% p.w.; part. public hospital p.w.; part. private hospital p.w.	0495 0520 0520 0358
<b>NEPAL</b>							
<b>PAKISTAN</b> Faisalabad Karachi Karachi Karachi	1980 P 1971 1987 P 1988 P	80 889 2040 206	1.23 0.86 0.45 38 i			p.w. p.w. all w. p.w.; part; i: SF <16ug/L	0010 0536 0195 0103
<b>SRI LANKA</b> Kandy district Kandy district Unknown	1983 P 1983 P 1969-72	172 184 350		4.2 4.7 57	9 E 9 57	p.w.; rural non-p.w. p.w.; i <0.7mg/l	0214 0214 0566

World Health Organization. Extracted from FHE database. May 1992

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN EUROPE**

Region, Country or Area	Year	Sample Size	Serum iron (mg/l)	Mean	Below the norm (%)	Serum folate (ng/ml)	Mean	Below the norm (%)	Serum vitamin B12 (pg/ml)	Mean	Below the norm (%)	Notes	Ref. No.
<b>NORTHERN EUROPE</b>													
<b>DENMARK</b>													
<b>FINLAND</b>													
<b>ICELAND</b>													
<b>IRELAND</b>													
Dublin	1985 P	106											
Sligo	1989 P	148											
<b>NORWAY</b>													
Oslo	1983 P	75											
Oslo	1983 P	50											
Unknown	1990 P												
<b>SWEDEN</b>													
<b>UNITED KINGDOM</b>													
National	1990 P	328											
London	1984 P	49	1.09										
Ulster, N. Ireland	1990 P	192	0.80										
<b>EASTERN EUROPE</b>													
<b>BULGARIA</b>													
CZECHOSLOVAKIA													
HUNGARY													
Budapest	1986 P	218	0.93										
<b>POLAND</b>													
Lodz area	1976	243	1.01										
Warsaw	1979	114											
Warsaw	1985 P	91	0.87										
Warsaw	1985 P	100	0.96										

E = Estimate, f = note refers to serum folate, g = geometric mean, i = note refers to serum iron, M = Median,

v = note refers to serum vitamin B12. \* See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN EUROPE

Region, Country or Area	Year	Sample Size	Serum iron	Serum folate	Serum B12	Notes	Ref. No.				
			Mean (mg/l)	Mean (ng/ml)	Mean (pg/ml)						
<b>ROMANIA</b>											
SOUTHERN EUROPE											
ALBANIA											
GREECE	Florina	1989 P	365	1.19	5 i	P.W.; i: 0.6mg/L	0474				
ITALY	National, urban	1987-88	458	0.95	6 E	P.W. 12-16 wks gest.	0335				
	National, urban	1987-88	118	0.75	19 E	P.W. 38-42 wks gest., subsample	0335				
	Assisi	1986 P	31	2.6	61	P.W. part.; middle class	0105				
	Assisi	1986 P	60	2.6	61	P.W. part.	0388				
	Umbria	1990 P	65	4.4	40	P.W.	0593				
MALTA											
PORTUGAL											
SPAIN	Madrid	1985 P	100	0.88	14 E	P.W.	0362				
YUGOSLAVIA											
WESTERN EUROPE											
AUSTRIA	Wien	1984 P 1984 P	71 65	0.86 H 0.73 H		125 140	0257 0257				
BELGIUM	Rotterdam, Antwerp	1983 P 1983 P	83 41	1.30 0.84	2 E 20 E	P.W. 16 wks gest. P.W. part., subsample	0378 0378				
FRANCE	Four cities Grenoble	1986 P 1983 P	173 36	1.13	2 E	all W. non p.W. 20-60, blood donors	0201 0167				

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, H = Median,  
 v = note refers to serum vitamin B12. \* See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN EUROPE

Region, Country or Area	Year	Sample Size	Serum iron Mean (mg/dl)	Below the norm (%)	Serum folate Mean (ng/ml)	Below the norm (%)	Serum vitamin B12 Mean (pg/ml)	Below the norm (%)	Notes	Ref. No.
FRANCE cont.										
Grenoble	1983 P	28	0.83	27 E						0167
Lyon+Nancy+Never+Paris	1979-82	173	1.06	7 E						0020
Paris	1981-82	476	0.92	16 E						0369
Paris	1981-83	658	0.92	15 E						0418
Paris	1983 P	203	0.84	10 E	4.8	24 E				0345
Paris	1983 P	30	1.06	6 E	6.8	1 E				0365
Paris	1984 P	126	0.87	18 E						0214
Paris	1985 P	476	0.76	16 E						0180
Paris	1985 P	107	1.03	12 E						0203
Paris	1985 P	802	0.91	21 E						0205
Paris	1985 P	233	1.03	12 E						0211
Paris	1986 P	203	0.90	21 E						0154
Paris	1987 P	332	0.90	15 E	5.7	16				0206
Poissy	1989 P	191	1.07	7 E						0153
Unknown	1980 P	203	0.84	10 E						0603
Unknown	1982 P	100	0.78	27 E	3.8					0375
GERMANY										
Bad Pyrmont	1977-78	100	4.1							0253
Goettingen	1986 P	156	0.97	9 E						0344
Heidelberg	1978-79	740	1.19	6	7					0232
Rhein-Hain area	1983 P	139	25	i						0241
LUXEMBOURG										
NETHERLANDS										
Utrecht	1983	70			1.7	95 E	4.64	4 E	p.w.part.	0341
Utrecht	1985 P	70			1.9	84 E			6 mo. post-p.	0135
Utrecht	1985 P	70			2.9	55 E			p.w. <14wk gest.	0135
Utrecht	1985 P	70			1.7	95 E			p.w.part.	0135
Utrecht	1985 P	80			4.0	26 E			non-p.w.	0135
SWITZERLAND										

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## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN LATIN AMERICA

Region, Country or Area	Year	Sample Size	Serum iron	Serum folate	Serum Vitamin B12	Notes	Ref. No.
			Mean (mg/l)	Below the norm (%)	Mean (ng/ml)		
<b>CENTRAL AMERICA</b>							
BELIZE							
COSTA RICA Unknown	1977 P	100	1.12	2 i	7.3	18	
EL SALVADOR							
GUATEMALA Coastal area Guatemala City Highland area	1983 P 1983 P 1983 P	33 104 32	61 i 16 i 38 i	0 f 0 f 0 f			
HONDURAS							
MEXICO Acapulco	1985 P	77	51 i				
Merida Merida, Ticul, Tizimin Mexico City Mexico City	1983 P 1985 P 1979 P 1985 P	305 505 216 195	0.84 0.82 1.01	17 E 20 24 i	6.3	284	
Tenixco, Morelia Tlaxcala	1985 P 1988 P	83 68		28 i 43 i			
NICARAGUA							
PANAMA							
CARIBBEAN							
ANTIGUA & BARBUDA							
BAHAMAS							
BARBADOS							

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, N = Median,  
v = note refers to serum vitamin B12. \* See note section

## PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN LATIN AMERICA

Region, Country or Area	Year	Sample Size	Serum iron Mean (mg/l.)	Below the norm (%)	Serum folate Mean (ng/ml.)	Below the norm (%)	Serum B12 Mean (pg/ml.)	Below the norm (%)	Notes	Ref. No.
<b>CUBA</b> Camaguey municipality Habana Habana	1979-81	225	1.11	7						0122
	1979	205	0.99	7						0325
	1983 P	72	1.07	E					P.W.; <12 wks gest. non-P.W. P.W.	0182
<b>DOMINICAN REPUBLIC</b>										
<b>GRENADE</b>										
National	1985	54	54							0107
National	1985	62	62							0107
National	1985	64	62							0175
National	1985	271	48							0175
National	1985	62	54							0288
National	1985	397	50							0288
National	1985	271	48							0436
<b>GUADELOUPE</b>										
<b>HAITI</b> Artibonite Valley	1990	221			89	f				0584
<b>JAMAICA</b>										
<b>MARTINIQUE</b>										
<b>PUERTO RICO</b>										
<b>ST LUCIA</b>										
<b>ST VINCENT</b> St Vincent & Grenadines	1989 P	152			49	i				0289
<b>ST. KITTS AND NEVIS</b>										
<b>TRINIDAD AND TOBAGO</b> Trinidad, Port of Spain	1976	109			6.1		190		P.W.	0559

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, H = Median,

v = note refers to serum vitamin B12, \* See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN LATIN AMERICA**

Region, Country or Area	Year	Sample Size	Serum iron		Serum folate		Serum Vitamin B12		Notes	Ref. No.
			Mean (mg/l)	Below the norm (%)	Mean (ng/ml)	Below the norm (%)	Mean (pg/ml)	Below the norm (%)		
<b>OTHER CARIBBEAN</b>										
SOUTH AMERICA										
<b>ARGENTINA</b>										
Buenos Aires	1991 P	184								0491
La Paz	1984 P	152	1.05 E	11 i						
Santa Cruz	1976-77	2036		33 i						
<b>BOLIVIA</b>										
Amazon Basin	1989 P	325E			91 E					0250
Amazon Basin	1989 P	185E			98 E					0250
Amazon Basin	1990 P	400			91 f					0250
Amazon Basin	1990 P	200			97 f					0250
Porto Alegre	1984 P	51			4.5	24				0597
Porto Alegre	1984 P	30			4.9	14				0163
Rio de Janeiro	1989 P	83	0.92	20 E	7.1	22	E	4.82	2 E	0183
Rio de Janeiro	1990 P	72	0.92	23				4.15	9 E	0383
Sao Paulo	1977-78	145		50 i						0265
Sao Paulo	1982 P	77	0.78	19 E	5.5	15 E		324	5 E	0055
Sobradinho (Brasilia)	1972	80			6.3	8 E		408	0 E	0660
Sobradinho (Brasilia)	1972	30			3.9	23 E		230	7 E	0660
Sobradinho (Brasilia)	1972	35								0460
Unknown	1991 P	369	0.72	17						0456
<b>CHILE</b>										
National	1974-75	1006		33 i						0423
National	1974-75	417		29 i						0423
Sant Iago	1978 P	106	0.95	11 E						0196
Sant Iago	1981 P	102	1.26							0123
Sant Iago	1981 P	100	1.05							0123
Sant Iago	1981 P	47	0.80							0186
Sant Iago	1983	57	1.00							0123
Sant Iago	1984 P	124	1.07							0187
					8.7	6				0258

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, M = Median,  
v = note refers to serum Vitamin B12. \* See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN LATIN AMERICA**

Region, Country or Area	Year	Sample Size	Serum iron Mean (ng/ml)	Serum folate Mean (ng/ml)	Serum folate Below the norm (%)	Vitamin B12 Mean (pg/ml)	Vitamin B12 Below the norm (%)	Notes	Ref. No.
CHILE cont.									
Santiago	1987 P	50	1.09	4 E	7.1	203	10	p.w. part. non-p.w.; blood donors	0137
Santiago	1987 P	153	1.31	4 E	5.4	265	0	p.w.; 1st trim.	0137
Santiago	1989 P	189	0.74	25	7.1			p.w.; post-P.	0259
Santiago, La Granja	1970	136	0.82	18	8			lact.w.	0576
Santiago, La Granja	1970	121	1.11	6 E				all w.; blood donors	0576
Talca	1984	*	*	*	*				0286
COLOMBIA									
National	1977-80	*	*	*	*				
National	1977-80	*	*	*	*				
ECUADOR									
Quito	1987 P	84	0.78	26 E				p.w. part. non-p.w.	0359
Quito	1987 P	32	1.07	3 E					0359
GUYANA									
National	1982 P	142	1.06	17 i	1.8	238	24	all w.; i:<0.5mg/L +/or TS<15%	0395
National	1982 P	19	0.88	36 i	1.0	222	18	p.w.; i:<0.5mg/L +/or TS<15%; v:<80 pg/ml	0395
National	1982 P	40	1.01	18 i	1.6	235	19	lact.w.; i:<0.5mg/L +/or TS<15% v:<80 pg/ml	0395
National	1982 P	84	1.12	12 i	2.0	241	26	non-p.w.; i:<0.5mg/L +/or TS<15%	0395
PARAGUAY									
PERU									
Lima	1984		0.49					p.w.	0302
Lima	1984		0.92					non-p.w.	0302
Lima	1987 P	25	0.49	52 E				p.w.; low SocEc	0303
Lima	1987 P	36	0.97	6 E				non-p.w.	0303
Lima	1988 P	27		11 i		3 f		i: TS<15%;	0169
Lima	1988 P	75		65 i		31 f		f: cut-off n.k.	0169
Oroya	1987 P	20	0.92	12 E				p.w.; i: TS<15%; f: cut-off n.k.	0303
Oroya & Puno	1987 P	51	0.88	16 E				non-p.w.	0303
SURINAME								p.w.; low SocEc	0303

E = Estimate, f = note refers to serum folate, G = Geometric mean, i = note refers to serum iron, M = Median,  
v = note refers to serum vitamin B12, \* See note section

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN LATIN AMERICA**

Region, Country or Area	Year	Sample Size	Serum iron	Serum folate	Vitamin B12	Notes	Ref. No.
			Mean (mg/l)	Below the norm (%)	Mean (pg/ml)		
<b>URUGUAY</b>							
VENEZUELA							
Carabobo State	1987 P	38	21.1	14	0	P.W.; low SocEc; I: Ts<16% + SF <12ug/L	0174
Haracalibo	1972	31	0.94 M	16	5.9 M	P.W.	0517
Haracalibo	1972	132	0.80 M	28	5.0 M	P.W.	0517
Haracalibo	1974	176	0.99	9	5.8	P.W.; low middle SocEc	0543
Haracalibo	1983 P	52	0.64	33 E	23	P.W. part.; low SocEc	0155
Haracalibo	1983 P	58	0.91	10 E	9.5 E	low SocEc	0155
Haracalibo	1988 P	30				P.W. part.; low SocEc	0156

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PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN NORTH AMERICA

$i$  = Estimate,  $f$  = note refers to serum folate,  $G$  = Geometric mean,  
 $\gamma$  = note refers to serum vitamin B12. \* See note section  
 $H$  = note refers to serum iron,  $M$  = Median.

PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN OCEANIA								
Region, Country or Area	Year	Sample Size	Serum Iron	Serum folate	Serum Vitamin B12	Notes		
			Mean (mg/l)	Below the norm (%)	Mean (ng/ml)	Below the norm (%)	Mean (pg/ml)	Below the norm (%)
OCEANIA								
AUSTRALIA								
National	1985	230	0.94	7 E				
Kimberley region	1977	122	0.59	36 E				
Yirrkala, Arnhem Land	1983	200	E					
FIJI								
Lautoka, Suva	1979	24.5		34 i	235 E	9	all w.; Indian, Hindu;	0285
Lautoka, Suva	1979	24.0		28 i	232 E	10	i: 3/4 indicators	0334
KIRIBATI								
NEW ZEALAND								
OTHER OCEANIA								
PAPUA NEW GUINEA								
Kaul Village, Kar Kar Island	1974	4.7	0.51	69 i	6.0	13 f	non-p.w.; i <0.45mg/L;	0513
Port Moresby	1985	100		8 i		2 f	f <3.5ng/ml; p.w.; i:Si<14ug/L; f:2ng/ml	0432
SAMOA								
SOLOMON ISLANDS								
TONGA								
VANUATU								

**PREVALENCE OF NUTRITIONAL ANAEMIA IN WOMEN: SERUM LEVELS IN THE USSR**

Region, Country or Area	Year	Sample Size	Serum iron	Serum folate	Serum Vitamin B12	Notes	Ref.-No.
			Mean (mg/r.)	Mean (ng/ml)	Mean (pg/ml)		
<b>USSR</b>							
<b>USSR</b>							
Dushanbe, Tadzhik SSR	1984 P	50				non-p.w.	0150
Dushanbe, Tadzhik SSR	1984 P	141				p.w.	0160
Dushanbe, Tadzhik SSR	1984 P	63				p-part.	0160
Osh region, Kirghizian	1987	969	1.00	9 i	5 E	all w.	0358
Unknown	1983 P	1497			7.6	all w.; i:<0.57mg/L + Hb<120g/L	0275

World Health Organization. Extracted from FHE database. Mai 1992

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**ANAEMIA IN WOMEN**  
**LIST OF DATA SOURCES**

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