The EVALUATION Project

Indicators for Reproductive Health Program Evaluation

Final Report of the Subcommittee on Women's Nutrition

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Acknowledgments

In April 1994, the United States Agency for International Development (USAID) requested that The EVALUATION Project establish a Reproductive Health Indicators Working Group (RHIWG). The purpose of the RHIWG has been to develop indicators for program evaluation in five areas of reproductive health: safe pregnancy, including post-abortion care, STD/HIV, breastfeeding, women's nutrition and adolescents. A steering committee, composed of staff from the USAID Center for Population, Health and Nutrition, and external organizations, has provided valuable guidance to the work of the RHIWG.

Following the first meeting of the RHIWG on June 8, 1994, in Rosslyn, Virginia, each of the subcommittees met several times, identified the indicators judged most useful for evaluating programs in their specific areas, and drafted descriptions of each indicator. Subsequently, the full Reproductive Health Indicators Working Group met on February 8, 1995 to review progress to date and draft a "short list of indicators" for each topic area. Further revisions were made, and each report was then externally reviewed by one or more experts in the topic area. Comments from the reviewers have been incorporated into the current reports.

The Women's Nutrition Subcommittee of the RHIWG consisted of some 12 professionals from various agencies who gave their time to participating in meetings, preparing descriptions of indicators, and reviewing various drafts of this report. The members and their organizations (who supported their participation in this subcommittee) are listed in the back of this report. We owe a debt of gratitude to all who contributed their time, energy, and ideas to this collaborative effort.

Several individuals served as external reviewers of this report: Reynaldo Martorell, Leslie Elder, Emorn Wasantwisut, and Mary Ann Anderson. While they are not to be held responsible for its content, their suggestions were extremely valuable in finalizing this document.

Thanks are also extended to USAID reviewers: Frances Davidson, Cate Johnson, Bonnie Pedersen, Elizabeth Ralston, Mary Ellen Stanton, and Krista Stewart.

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TABLE OF CONTENTS

SUMMARY LIST OF INDICATORS

SHORT LIST OF INDICATORS

Each of the Reproductive Health Indicators Working Group (RHIWG) subcommittees was asked to draw up a short list of "primary indicators" that potentially would be the most important and useful in monitoring interventions in their area. It was recommended that the list contain 7-8 policy or output (program-based) indicators and 2-3 outcome (population-level) indicators. The women's nutrition list includes the following indicators:

- Existence of women's nutrition as a policy priority
- Percentage of service delivery points (SDP) with adequate supplies of mineral/vitamin supplements
- Percentage of women who consume vitamin A-rich foods
- Percentage of pregnant clients receiving treatment for hookworm
- Percentage of program participants who practice key nutrition behaviors promoted by the program
- Percentage of malnourished women based on body mass index (BMI)
- Percentage of households using iodized salt
- Percentage of women with anemia
- Percentage of women with low breastmilk vitamin A level
- Percentage of women of low weight

LIST OF ACRONYMS

ACC/SCN	Administrative Committee on Coordination/Sub-Committee on Nutrition
AVSC	Access to Voluntary and Safe Contraception
BMI	Body Mass Index
BW	Birth Weight
CDC	Centers for Disease Control and Prevention
CED	Chronic Energy Deficiency
CPD	Cephalopelvic Disproportion
DHS	Demographic and Health Survey
EDTA	Ethylene Diamine Tetraacetic Acid
FNB	Food and Nutrition Board
HPLC	High Performance Liquid Chromatography
ICCIDD	International Council for the Control of Iodine Deficiency Disorders
ICPD	International Conference on Population and Development
IDD	Iodine Deficiency Disease
IEC	Information-Education-Communication
INCAP	Institute of Nutrition of Central America and Panama
IOM	Institute of Medicine
IPPF	International Planned Parenthood Federation
IPAS	International Projects Assistance Services
IUGR	Intrauterine Growth Retardation
LBW	Low Birth Weight
MUAC	Mid-upper Arm Circumference
NAS	National Academy of Sciences
NCHS	National Center for Health Statistics
NRC	National Research Council
PHC	Primary Health Care
SDP	Service Delivery Point
TSH	Thyroid Stimulating Hormone
UHT	Ultra-High Treatment
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

Chapter I

Introduction

- Magnitude of Women's Undernutrition
- Women's Nutrition as an Integral Part of Reproductive Health
- Causes of Undernutrition Among Women and Intervention Strategies
- Process of Selecting Indicators
- Organization of Indicators

Chapter I

INTRODUCTION

This report presents a series of indicators for use in monitoring interventions to improve the nutritional status of women. It primarily addresses women's undernutrition, which is a major threat to reproductive health in developing countries. The four most prevalent types of undernutrition are addressed in this chapter: protein-energy undernutrition (often called "general" undernutrition, or stunting and underweight for past and current nutritional status), deficiencies of iron, vitamin A, and iodine. This introduction outlines the high prevalence of women's undernutrition, explains why it is an important reproductive health concern, describes the framework that the Women's Nutrition subcommittee used to select indicators for assessing various aspects of women's nutritional status, and outlines the organization of indicators in this chapter.

Magnitude of Women's Undernutrition

As a group, women suffer from undernutrition in large numbers, with a prevalence second only to that of preschool children. Conservative estimates suggest that among the 1.1 billion women of 15 years and older living in developing countries as of the mid-1980's, 500 million women were anemic, almost 500 million were stunted, about 250 million suffered a range of consequences of severe iodine deficiency, and about two million were blind due to vitamin A deficiency (Leslie, 1991). The highest levels of undernutrition among women are found in South Asia where 60 percent of women of reproductive age are underweight, over 60 percent are anemic, and 15 percent are stunted (ACC/SCN 1992). Conservative estimates also suggest that more than 500 million of the world's people are chronically hungry, and women are disproportionately represented among them (Bread for the World, 1990).

Women's Nutrition as an Integral Part of Reproductive Health

Women's nutrition is an integral part of women's reproductive health (USAID on reproductive health, Tinker et al., 1994). The four types of women's undernutrition are each reproductive health problems in and of themselves, both because they cause women ill health and because they cause poor reproductive outcomes in the mother and child. As an example of poor reproductive outcomes in the mother, women's undernutrition contributes to three of the four major causes of maternal mortality; hemorrhage, infection, and obstructed labor. (The nutritional determinants of the fourth cause of maternal mortality, eclampsia, have not been well investigated). An anemic woman is more likely to die of postpartum hemorrhage than a non-anemic woman; a woman deficient in vitamin A and possibly iron is more likely to get an infection; and a stunted woman is more likely to suffer obstructed labor due to cephalo-pelvic disproportion than a taller woman.

The impact of women's poor nutritional status on reproductive outcomes in the child is even more striking. In fact, child outcomes have been the focus of most of the research involving women's nutritional status. Low

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Prepared by Penelope Nestel, OMNI/Johns Hopkins University and Kathleen Kurz, International Center for Research on Women.

birthweight among newborn children is closely linked to a mothers pre-pregnancy weight and her weight gain during pregnancy (Kramer, 1987). Prematurity is more common among anemic women (Scholl and Hediger, 1994); breastmilk consumption by newborn children may be compromised among those with severely undernourished mothers (Gonzalez-Cossio et al., 1991); and children are much more likely to be born with HIV infection if their mothers are vitamin A deficient (Sembu, R., et al., 1994). While the audience for this report is probably health-oriented, it is important to point out that other sectors should ultimately be involved in improving women's nutrition, most notably agriculture and education.

As with other elements of women's reproductive health, poor nutritional status impairs other aspects of women's lives, especially productivity, family welfare, and poverty reduction. Numerous interventions to improve the health and nutritional status of women are considered highly cost-effective (Tinker et al., 1994).

Causes of Undernutrition Among Women and Intervention Strategies

Inadequate dietary intake and diseases, especially infectious diseases such as diarrhea, hookworm, and malaria, are immediate causes of undernutrition because they affect the supplies and utilization of energy, iron and other nutrients for growth, development, maintenance and activity. Iodine deficiency, on the other hand, is caused by inadequate dietary intake alone (in areas where food is grown in soils without iodine), and vitamin A deficiency is caused by inadequate intake and exacerbated by disease.

Household food security, adequate care for children and women, access to health and other services including family planning, and a healthy environment are all necessary conditions for adequate dietary intake and control of diseases. These conditions are themselves determined by underlying causes, which include technological, social, economic, political or ideological factors, with poverty chief among them. These underlying causes operate at all levels of society and determine the availability and control of human, economic, and organizational resources.

The use of women's nutritional status as a measure of reproductive health is unique in that it reflects the cumulative effects of food intake and morbidity over the life cycle, which are associated with past as well as present social and economic status. In addition, the cumulative effects of poor nutritional status throughout a mother's life can then be passed to her offspring. An undernourished mother is more likely to give birth to an undernourished infant, who then becomes an undernourished child in the absence of improved circumstances. The poor nutritional status may be compounded by gender disparities, early marriage and frequent closely-spaced pregnancies, establishing a vicious cycle in which undernutrition is perpetuated from one generation to the next.

For all indicators, it is important to recognize that there are extraneous factors that may have a direct or indirect effect on program results that are beyond the control of the implementing agency. Two obvious examples are (a) an overall improvement in the national economy whereby food prices fall and both the quality and quantity of the diet improves, and (b) improved infrastructure allowing for better health care services, including antenatal care, thereby reducing morbidity.

Nutrition intervention programs are designed to bring about one or more changes in nutritional status. Possible interventions include dietary modification, ingestion of vitamin or mineral supplements, direct or indirect distribution of food, (e.g., food stamps and food for works programs) or consumption of fortified food. With the exception of food fortification programs, which are generally implemented at the national level, programs enroll beneficiaries through clinic-based and community-based activities that are often supported by IEC campaigns promoting the specific behavior(s).

These activities include individual counseling, demonstrations, group educational sessions, printed materials, and so forth. Because nutrition-related behaviors tend to be deeply rooted in the culture, change often comes slowly. This time lag makes the evaluation of nutrition programs complex. Moreover, it is often difficult to attribute the effects of behavior changes to specific IEC activities.

Process of Selecting Indicators

The indicators presented here have been selected to correspond with primary interventions to improve women's health. These include iron supplementation, vitamin A supplementation, iodine supplementation, and adequacy of energy intake. In developing the list of indicators to be included in this report, a Subcommittee on Women's Nutrition was convened. The framework included defining the age group of concern and nutrition interventions which are appropriate for women of reproductive age. The criteria used to select the indicators presented included their technical performance, acceptability, technical feasibility, cost, and the availability of reference data.

The *acceptability* of an indicator is crucial to deciding what indicator to use. In some settings, for example, collecting stool or urine samples, may be unacceptable to respondents or field staff. Because of the risks and concerns about HIV infection and the costs associated with doing whole blood or serum assays, drawing of blood has been kept to a minimum.

Technical feasibility refers to the ease of data or sample collection, including the need for any special expertise, sample storage and transport conditions, and the ability of equipment to stand up to field conditions. The normal life cycle for many projects is five years, but it is quite possible that some measures, such as of dietary intake, will not change within this time frame. Even where there are changes in factors that affect dietary patterns at the household level, it cannot be assumed that women will necessarily benefit because intra-household food allocation may discriminate against women, or political will may abort efforts on a larger scale. In other words, any increase in income or food availability does not often translate to all household members getting an appropriate share. The collection of dietary intake data is also fraught with difficulties, which often precludes getting a representative sample of the population.

The *costs* associated with the use of any indicator will include capital costs for facilities and equipment, recurrent costs for supplies, maintenance costs, training costs, and personnel and administrative costs. For indicators based on laboratory analyses, the cost per test determines the feasibility of the analysis.

The *performance* of any indicator in identifying nutrition status is measured by its sensitivity, specificity, and reliability. In general, the indicators that perform better are those that cost more to collect.

Finally, the *interpretation and availability of reference data* are important for establishing cut-off values and prevalence levels that identify whether the deficiency is at a level defined as being a public health problem.

Another consideration is the importance of distinguishing between indicators that are only useful for screening (e.g., women at high risk of pregnancy complications based on their height) and those that can be used for monitoring (e.g., tracking knowledge, appropriate behaviors, and changes in nutritional status using weight-based indicators in a given population) or evaluation. Program evaluation involves an assessment of the different components of a program, including input, process, output, and outcome, which are defined in Section I, Overview of the RHIWG.

In an evaluation of a program or intervention, the selection of indicators will depend on specific objectives of the project or program. For example, health interventions for malaria and helminth control can have a positive effect on reducing the prevalence of anaemia

in addition to improving the health status of women. Clearly, indicators related to food fortification programs are only applicable in situations where such programs are implemented.

Organization of Indicators

The indicators are organized in terms of outputs (program-based measures) including functional outputs, service outputs (adequacy), and service utilization; and outcomes (population-based measures). In some cases the definition of an indicator as output versus outcome depends on the level of measurement. For example, a given program provides nutrition-related services to women in a defined catchment population. The behavioral and nutritional status of the women who participated in the program could be monitored (which would constitute a "program-based measure" or output). Alternatively, the changes to women in the catchment area attributable to the program could be determined through a survey among a random sample of women in the catchment area (a "population-based measure" or outcome).

The key indicators for long-term outcome are anthropometric indicators that measure maternal nutritional status, either separately or in combination with one another. Certain indicators are better predictors of certain maternal or infant outcomes (i.e. weight gain during pregnancy for low birth weight, height for cephalopelvic disproportion, and arm circumference for maternal adaptation to the nutritional stresses of pregnancy). Different indicators describe different aspects of women's nutritional status (i.e. BMI for thinness, and height for nutritional stress in early childhood). In these ways, they are similar to child nutrition indicators such as weight-for-height (which describes wasting or acute undernutrition) and height-for-age (which documents stunting or chronic undernutrition). Low birth weight is not a direct measure of maternal nutritional status and thus should not be considered as a substitute for these other more direct measures of maternal anthropometry. Low birth weight, however, is useful for other reasons. For example, it provides a good link between maternal and infant nutrition and health programs.

In terms of micronutrient indicators, the most valid indicators are biologically based (e.g., percent of women with low breastmilk vitamin A level, percent of newborns who are iodine deficient; blood TSH concentration; mean urinary iodine concentration). We have included these indicators in recognition of their importance in measuring the desired outcomes of micronutrient interventions. However due to difficulty and expense of using these indicators in a developing country setting, they are generally not possible to use in measuring program outcomes.

Programs or countries need to decide which aspect(s) of undernutrition they are attempting to change with program inter-ventions in order to determine which indicator or combination of indicators is most appropriate for their programs. Under each individual indicator is a short summary of these issues under the Purpose and Issues section.

It should be noted that, unlike demographic variables, nutrition indicators are not routinely collected in the context of large-scale surveys of the target population. Much of the available data for evaluating nutrition inter-ventions are limited to participants in the programs and thus constitute measures of output.

No indicators of quality of services were included in this report. Although quality may be a major determinant of service utilization, indicators measuring the quality of nutritional services have not been developed. Program managers are urged to consider quality of services, and researchers or evaluators are encouraged to develop such indicators in the future. Finally, the use of nutritional indicators to evaluate programs that should benefit women has received little attention. Therefore, there is less consensus on the best measures, cut-points and data collection tools to be used. Nevertheless, many of the

indicators presented here have been used at the household (e.g., those for food fortification) and child (e.g., TSH in infants) level, but their application as a direct measure of nutritional status of women are not known. With the increasing attention being given to women's nutrition, the opportunity now exists to test and further develop these indicators in order to reach consensus on those that best reflect the nutritional status of women.

Chapter II

Output

- Section A: Policy
- Section B: Service Outputs
- Section C: Service Utilization

Section A

POLICY

- Existence of women's nutrition as a policy priority
- Percentage of a centrally processed staple food adequately fortified with vitamin A
- Percentage of salt supply adequately fortified with iodine
- Percentage of a centrally processed staple food adequately fortified with iron

Indicator

EXISTENCE OF WOMEN'S NUTRITION AS A POLICY PRIORITY

DEFINITION

This indicator assesses political commitment to improving or ensuring the nutritional status of women of reproductive age. It can be used as a yes/no variable, or a scale could be devised to assess degree of commitment. A "yes" value is assigned if policy documents exist which do any of the following: (1) mention women's nutrition as a policy priority; (2) state a clear rationale for improving women's nutrition; (3) state a long-term goal and short-term objectives for this improvement; (4) define a strategy for attain- ing these objectives, possibly including a scheme to target the most undernourished women; (5) establish an organizational structure for the program that is consistent with the strategy; and (6) provide the funding levels needed to implement the strategy. Each of these steps indicate increasing commitment to overcoming women's under- nutrition. A scale devised to rank these steps, according to a country's particular circum- stances, may provide more information than a "yes" value, and provide a goal for which to strive.

DATA REQUIREMENTS

Policy documents emanating from national or international agencies that direct programs which influence women's nutrition. Country-specific examples include five-year national plans or ministry-level policies. International examples include United Nations Plans of Action from the International Conference on Population and Development, Social Summit, and the Fourth World Conference on Women.

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DATA SOURCE(S)

A variety of national government offices, United Nation agencies, or other international policymaking organizations. Nutrition-related policy may be found in ministries or departments of health, agriculture, human resource development, planning or other.

PURPOSE AND ISSUES

This is an indicator that describes the process of including women's nutrition in national or international policy planning activities. It identifies awareness of the benefits of improving women's nutrition, and the commitment to making these improvements. The size of a program also indicates its priority as a policy. For example, a nationwide program reflects more policy priority than a program being administered in only a few villages.

In any such policy, a distinction should be made between maternal nutrition, which focuses on women who are pregnant or lactating, and women's nutrition *per se*, which focuses on all women of reproductive age. Maternal nutrition is the subset of women's nutrition that focuses largely on the indirect improvements in the well-being of their children (although women also benefit during the intervals when they are pregnant or lactating), whereas the broader category of women's nutrition focuses on the direct improvements in the well-being of women them themselves over a longer interval. Efforts should be made to focus on women as well as children.

Women's nutrition has numerous components: anemia, vitamin A deficiency with related night blindness, iodine deficiency disorders with related goiter and cretinism in their children, protein-energy malnutrition with re- lated wasting and stunting, adequacy of food intake, and related factors. A greater degree of specificity and a greater variety of com- ponents in the policy may indicate a greater awareness of and commitment to improving or ensuring women's nutritional status.

The search for policy statements on women's nutrition should go beyond the health sector since a variety of policies/programs can result in nutritional improvement. Furthermore, a greater number of policies in which women's nutrition is mentioned may indicate a greater commitment to it. The following are three examples where the mention of women’s nutrition in policy statements should be sought.

Within nutrition policies, which focus largely on children from birth to age five, there should be specific mention of non-pregnant, non-lactating women. Within women's health policies, there should be specific mention of one or more components of nutrition (anemia is perhaps the most commonly mentioned). Within agriculture, food policy, or food consumption policies, which usually focus on the household unit, there should be specific mention of the relevance of policies to women.

In order for there to be a clear statement of the rationale for improving women's nutrition, and for the goal, objectives, and strategy to have the greatest chance of success, those drafting the policy should be well informed by program efforts. Similarly, program practitioners should inform policymakers on a regular basis of lessons learned from field experiences.

Indicator

PERCENTAGE OF A CENTRALLY PROCESSED STAPLE FOOD ADEQUATELY FORTIFIED WITH VITAMIN A

DEFINITION

A staple food is defined here as one that is consumed throughout the year, by a large proportion of the population, with relatively little day-to-day variation in intake. Only foods that are centrally processed are suitable for fortification. "Adequately" refers to the vitamin A content of the food being within the range mandated by the government. The indicator measures the proportion of the centrally processed staple food available for human consumption (both from local production and imports) that is fortified with vitamin A, at the appropriate level, at a specific point in time.

DATA REQUIREMENTS

Total quantity of the food produced/imported and quantity that is fortified with vitamin A. Level of vitamin A (or fortificant level) in the vitamin A-fortified food at the factory, retail, and household level.

DATA SOURCE(S)

Quality assurance data that includes quality control data from the production site (factory) and distribution monitoring systems.

PURPOSE AND ISSUES

Food fortification is generally regarded as being one of the most effective ways to eliminate micronutrient deficiencies, including vitamin A deficiency. Fortification with a mirconutrient such as vitamin A is socially acceptable, requires no change in food habits, does not change the characteristics of the food, can be introduced quickly, has readily visible benefits, can be legally enforced, is relatively easy to monitor, is the cheapest intervention for a government, and is sustainable (Nestel, 1993). While many foods in developed countries are fortified, the challenge in developing countries is to find a suitable food that can be fortified. The vitamin A must remain stable and biologically available after being added to the food, during storage, and during normal food preparation procedures. Pure vitamin A and provitamin A (carotenoids) are unstable in the presence of air or when exposed to ultra violet light. The addition of antioxidants and control of exposure to air, however, allows for their use in food processing procedures. Foods that are currently fortified in developing countries include sugar, margarine, and processed milk such as milk powders and ultra-high-treated (UHT) milk.

For a national level vitamin A fortification program to be of benefit to the population at large, government must regulate, but not necessarily legislate, that the vitamin A content of the fortified food be within a given range. This range will have been determined based on consumption patterns for that food and the contribution that consumption of the fortified food will make to total dietary vitamin A intake. Thus, this indicator measures (a) the proportion of food fortified with vitamin A and (b) the quantity of vitamin A-fortified food with the minimum level of fortification at each stage in the distribution

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system, (i.e. the extent and adequacy of vitamin A fortification). By having the information at three levels (factory, retail, and household level), it is possible to identify where vitamin A losses in the food distribution system are occurring so that remedial action can be taken.

Detailed data at the factory level should be available from the factory manager or manager of quality assurance and from government inspection or quality assurance systems. Actual analyses for vitamin A content will be carried out by a laboratory as part of the quality assurance and monitoring system.

Retail and household level data can be gathered through a sentinel site, cluster, or random sampling system. Monitoring at the retail and household level should be done throughout the year. There are advantages and disadvantages to both sentinel site and cluster or random sampling. Sentinel sites are logistically easier to set up and implement than cluster or random sampling; thus they are cheaper. However, cluster or random sampling will give a more representative picture of both the volume and extent of the adequacy of fortification than sentinel sites.

For simple fortified foods, such as sugar, a colorimetric test may be useful. The technique is based on the food changing color after adding a standard solution of known concentration;[1] the intensity of the color change reflects the concentration of vitamin A in the food. A reference set of colors,[2] (usually test tubes of different shades of blue) show the range for vitamin A levels within which a specific color falls. The reference colors are stable indefinitely but the chromogenic reagent can only be used for 15 days. The chromogenic reagent can be made up at the factory and by the institution responsible for quality assurance using known quantities of specified reagents.

The cost of the reference colors is negligible. The estimated cost of analyzing a sample of fortified sugar is US$1.00, which includes the cost of the chromogenic reagent and labor costs.

There are, however, a number of limitations to using the colorimetric method. First, the field kit chromogenic reagent lasts only 15 days so a system needs to be in place to replace this reagent periodically. Second, the test is based on visual interpretation and is thus only semi-quantitative. Third, the solution needs to be handled with care because it is highly corrosive. Despite these limitations, the colorimetric kit results are reliable if the kits are used properly.

[1] The color reaction is produced by the formation of anhydrovitamin A in the presence of trichloroacetic acid. The resulting blue color lasts only a few seconds.

[2] Made of cupric sulfate solutions at different concentrations.

Indicator

PERCENTAGE OF SALT SUPPLY ADEQUATELY FORTIFIED WITH IODINE

DEFINITION

The percent of the total salt available for human consumption that is fortified with iodine[3] at the appropriate level at a specific point in time. In some countries, all salt is fortified regardless of whether it is for household, animal, or industrial use.

DATA REQUIREMENTS

Total quantity of salt produced/imported and quantity fortified with iodine. Iodine level in salt at the factory, retail, and household level.

DATA SOURCE(S)

Quality assurance data that includes quality control data from the production sites (salt processing plants) and monitoring systems.

PURPOSE AND ISSUES

The WHO/UNICEF/ICCIDD recommended levels of iodine for salt, at different salt consumption levels, environmental and packaging conditions are included in the table below.

Table 1: Recommended levels of iodine for salt under different conditions

	Parts of iodine per million (ppm) of salt (ug/g, mg/kg, g/tonne)						
	Required at factory outside the country		Required at factory inside the country		Required at retail sale (shop/market)		Required at household
	Packaging						
Climate and average per capita daily salt intake (g/person/day)	Bulk sacks	Retail pack (<2 kg)	Bulk sacks	Retail pack (<2 kg)	Bulk sacks	Retail pack (<2 kg)	
Warm moist 5 g 10 g	 100 50	 80 40	 90 45	 70 35	 80 40	 60 30	 50 25
Warm dry or Cool moist 5 g 10 g	 90 45	 70 35	 80 40	 60 30	 70 35	 50 25	 45 22.5
Cool dry 5 g 10 g	 80 40	 60 30	 70 35	 50 25	 60 30	 45 22.5	 40 20

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[3]It is recommended that the level of potassium iodate or potassium iodide be expressed as a content of iodine alone. 168.6 mg of potassium oidate (KIO_3) contains 100 mg iodine.

This indicator measures (a) the proportion of salt fortified with iodine and (b) the quantity of salt with the minimum level of iodine in the distribution system, (i.e. the extent and adequacy of salt fortification). By having the information at three levels (factory, retail, and the factory manager or the manager of quality assurance, and from the government inspection or quality assurance systems. Actual analyses of iodine content will be done, using a standard tritration method, by a laboratory as part of the quality assurance and monitoring system. Retail and household level data can be gathered through sentinel site or cluster surveys as well as lot quality assurance sampling. There are advantages and disadvantages to sentinel site, cluster and lot quality assurance sampling. Sentinel sites are logistically easier to set up and implement than cluster or lot quality assurance sampling; thus they are cheaper. However, cluster or lot quality assurance sampling will give a more representative picture of both the volume and extent of the adequacy of fortification than sentinel sites.

Full details for monitoring universal salt iodization programs are available in Sullivan et al., (1995). A colorimetric test may also be used to determine the range of the iodine concentration within which the iodine in salt falls at the retail and household level. The technique is based on salt changing color after adding one drop of a stabilized starch-based solution; the intensity of the color change reflects the concentration of iodine in salt. A reference color chart, which shows various shades of blue, gives the range for iodine within which a specific color falls. The colorimetric kits have a shelf life of 18 months if unopened and 6 months after opening the ampoule. The kits contain a dilute acid and care should be taken not to spill the solution on clothing, and they should be kept out of the reach of children. Some salts are alkaline due to the presence of carbonates or agents added to salt that allow for its "free flow." In this situation, the colorimetric test may not turn blue to show that iodine is present in salt. Where there is suspicion that the salt may be alkaline or where a normal test does not show a blue color, a drop of recheck solution followed by a drop of the normal test solution can be used to verify that iodine is present. The potassium iodate, potassium iodide, and recheck colorimetric test kits are available in boxes of three ampoules; each box costs[4] US$0.40, US$0.60, and US$0.36, respectively, and each ampoule will do 80 to 100 tests. Kits are available from UNICEF through the national Ministry of Health.

[4] Free on Board (FOB) Madras, India.

Indicator

PERCENTAGE OF A CENTRALLY PROCESSED STAPLE FOOD ADEQUATELY FORTIFIED WITH IRON

DEFINITION

A staple food is defined here as one that is consumed throughout the year, by a large proportion of the population with relatively little day-to-day variation in intake. Only foods that are centrally processed are suit- able for fortification. "Adequately" refers to the iron content of the food being within a given range mandated by the government. The indicator measures the proportion of the centrally processed staple food available for human consumption (local production and imports) that is fortified with iron, at the appropriate level, at a specific point in time.

DATA REQUIREMENTS

Total quantity of processed food produced and quantity that is fortified with iron. Iron level in the iron-fortified food at the factory level.

DATA SOURCE(S)

Quality assurance data that includes quality control data from the production site.

PURPOSE AND ISSUES

Food fortification is generally regarded as being one of the most effective ways to eliminate micronutrient deficiencies, including iron deficiency. Fortification with a micro-nutrient such as iron is socially acceptable, requires no change in food habits, does not change the characteristics of the food, can be introduced quickly, has readily visible benefits, can be legally enforced, is relatively easy to monitor, is the cheapest intervention for a government, and is sustainable (Nestel, 1993). While many foods in developed countries are fortified, the challenge in developing countries is to find a suitable food that can be fortified. The bioavailability of iron, and the presence of compounds in food that enhance or inhibit iron absorption, determine which foods can be fortified and which iron compound can be used. Processing and storage conditions are also important because the solubility of the iron compound is related to storage time and influences the development of off-flavors, -odors, and -colors. Foods that can be fortified with iron include cereal flours such as wheat and maize, infant formulae, cocoa beverages, powdered skim milk, and ultra-high treatment (UHT) milk (Hurrell et al., 1989; Nestel, 1993; Cook and Reusser, 1983).

For a national level iron fortification program to be of benefit to the population at large, the government must regulate, but not necessarily legislate, that the iron content of the fortified food must be within a given range. This range will have been determined based on consumption patterns for that food and the contribution that consumption of the fortified food will make to total dietary iron intake. Thus, this indicator measures (a) the proportion of food fortified with iron and (b) the quantity of iron-fortified food with the minimum level of fortification at each stage in the distribution system, (i.e., the extent and

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Prepared by Penelope Nestel, OMNI/Johns Hopkins University.

adequacy of iron fortification). The data are only required from the production site. Detailed data at the factory level should be available from the factory manager or manager of quality assurance as well as from the government's external inspection or quality assurance system. The actual analyses for iron content will be carried out by a laboratory as part of the quality assurance and monitoring system.

Section B

SERVICE OUTPUTS

- Percentage of service delivery points (SDPs) with adequate supplies of mineral/vitamin supplements

Indicator

PERCENTAGE OF SERVICE DELIVERY POINTS (SDPS) WITH ADEQUATE SUPPLIES OF MINERAL/VITAMIN SUPPLEMENTS

DEFINITION

"Adequate supply" refers to availability and quality of mineral/vitamin supplements (iron, iodine and vitamin A) at the SDP at the time of data collection. In order to compute adequacy, the number of individual-doses (daily or otherwise) of acceptable quality supplements relative to the client population served is determined. Each type of supplement (iron, iodine and vitamin A) should be calculated separately.

The quality of the mineral/vitamin supplement supply (iron, iodine, and vitamin A) is acceptable if the supplements are labeled properly, not expired, and are being stored under the recommended climatic and lighting conditions. Each type of supplement should be assessed separately. It is important to note that, in any given SDP, the adequacy of the supply of each type of supplement might be substantially different since different initiatives are frequently providing supplies.

DATA REQUIREMENTS

- A count of the number of SDPs.
- A count of the client population(s) served at each SDP.
- A count of units of each supplement listed by form of the supplement (e.g., iron: pill and drops; iodine: tablets and injectables; vitamin A: high and low dose tablets) of acceptable quality at the SDP.
- The volume supply of each mineral/ vitamin in terms of "individual-doses."
- Number of doses of each supplement judged (a) to be sufficiently well stocked and (b) of adequate quality (see operational definitions below).

DATA SOURCE(S)

- Program records indicating the number of SDPs in the catchment area.
- Records indicating the number of clients served by each SDP.
- Inventory of each SDP (special study) and inspection of each unit of supplement to determine the number of supplements that are of acceptable quality.

PURPOSE AND ISSUES

This indicator is important at the program level to evaluate the extent SDPs have supplements that are both available and of acceptable quality to meet clients' nutritional needs. For this indicator to be useful, it is essential to define the measurement of "insufficient quantity" and "of sufficient quality." Sufficient quantity is measured by estimating the size of the catchment area and the subgroup within that area in potential need of the supplement. One then calculates the average quantity of each supplement

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Prepared by Kelley Scanlon, CDC and Judith Ricci, Maryland Department of Health and Mental Hygiene.

needed per recipient in the target population. This allows a crude calculation of the "available supply" for each supplement. Although there is no fixed standard for measuring adequate supplies, the frequency of supply, amount of supply, and type of supplement supplied to the SDP should be taken into account when defining adequacy.

Quality is measured somewhat differently for each type of supplement. Criteria for quality that apply to all three supplements:

- supplements should be properly labeled (supplement name, volume, usage, dosage, medical contraindications, and expiration date);
- supplements should not have not expired; and
- supplements should be stored in a cool, dry place.

Additional criteria for quality that apply to specific supplements are as follows:

- **Iron**: Iron pills and drops are considered acceptable if at least 90% of pills in the bottle are intact, and if any other recommendations from the manufacturer on proper storage are being followed.
- **Vitamin A:** The quality of vitamin A supplements is considered acceptable if supplements are stored between 0°C and 30°C, and liquid vitamin A is disposed if it has been open for more than two months.

This indicator requires that the supplements meet both criteria: of adequate quantity and of sufficient quality. Thus, the results of these two factors are assessed simultaneously to determine if a given SDP has an "adequate supply."

For a supplement to be "available," action is required at two levels: 1) at the managerial level to ensure that supplement supplies of acceptable quality and clinic personnel are available at a given point; and 2) at the provider level, to effectively offer all appropriate supplements to a given client. The observation of existing supplies measures the manager's ability to stock supplements for the population served by the clinic and to ensure that the supply does not contain supplements of unacceptable quality. For any given service delivery point, it would be necessary to ascertain that a service provider is available to administer or distribute supplements.

This indicator provides a quantitative measure of the supply of vitamin/mineral supplements for the population being served. The supply is expressed as 1) the number of individual doses of acceptable supplements available and 2) the number of women who can be served for a specified period of time with the available supply. From this information, the adequacy of the supply for each SDP is calculated. With information on the adequacy of the supply at each SDP, the percent of SDPs with adequate supplies is calculated. These indicators are analogous to the section on commodities and logistics for contraceptive methods in the *Handbook of Indicators for Family Planning Program Evaluation* (Bertrand et al., 1994).

The following additional indicators are useful in evaluating the adequacy of supply.

- The percent of the supplement bottles that have 90% of pills intact.
- The percent of the supplement bottles that have 6 months left until expiration.
- The percent of the supplement bottles that have 3 months left until expiration.
- The frequency of stock-outs (the percentage of SDPs that encounter a stock-out of supplements over a 12 month period).
- The frequency of being stocked according to plan (the percentage of SDPs with supplement stocks between a specified minimum and maximum level).

Section C

SERVICE UTILIZATION

- Percentage of pregnant clients receiving treatment for hookworm
- Percentage of pregnant clients complying with treatment for hookworm
- Percentage of pregnant clients receiving treatment for malaria
- Percentage of pregnant clients complying with treatment for malaria
- Percentage of clients who received vitamin A supplementation within four weeks of delivering
- Percentage of clients receiving iodine supplements in iodine-deficient areas
- Percentage of women that gain adequate weight in pregnancy
- Percentage of targeted women receiving food supplements
- Number of food packages distributed to pregnant and lactating women
- Percentage of program participants who have knowledge of key nutrition practices promoted by the program
- Percentage of program participants who practice key nutrition behaviors promoted by the program

Indicator

PERCENTAGE OF PREGNANT CLIENTS RECEIVING TREATMENT FOR HOOKWORM

DEFINITION

- In areas of high endemicity (>30% of the population are infected), percentage of pregnant clients receiving presumptive treatment for hookworm (WHO, Safe Motherhood Program, 1994).

- In areas of low endemicity, percentage of infected pregnant clients who receive treatment for hookworm.

DATA REQUIREMENTS

The total number of pregnant clients, the total number of pregnant clients receiving treatment (either presumptive or therapy for identified hookworm), the total number of infected clients.

DATA SOURCE(S)

- Program records indicating the number of pregnant clients at the SDP.

- Program records indicating the total number of pregnant women, receiving treatment (either presumptive or therapy for identified hookworm) at the SDP.

- Program records indicating the number of infected clients.

PURPOSE AND ISSUES

This indicator measures the extent to which women clients living in well known endemic areas receive treatment for hookworm, which can negatively affect nutritional status. Defining low or high endemicity is an issue when choosing the type of indicator. In areas with high endemicity, it is probably not necessary to screen all pregnant women and presumptive treatment with anthelmintic medications should be given to all pregnant women. In areas with low endemicity, screening for intensity and the treatment of infected women is needed. Recommendations have not been made here on drug options. The World Health Organization should be contacted for the most recent list of anthelmintic medications that are efficacious and safe for pregnant women.

The definition of this indicator as an "output" versus an "outcome" is due to the level of measurement. In this case, data is collected at the program level, and therefore is classified as an "output" indicator. However, one could choose to measure the percentage of women in the population receiving treatment for hookworm by collecting data at the population level by using large-scale population surveys such as the Demographic and Health Survey (DHS). In this case the indicator would be classified as "outcome."

It would be useful to have estimates of the level of hookworm in a given population, but difficult to get (except with sentinel site data). Similarly, it would be useful to monitor whether the percent infected with hookworm decreased with enhanced treatment efforts; however this is difficult to assess at the population level using DHS type surveys.

Prepared by Rae Galloway, MotherCare/John Snow, Inc.

Indicator

PERCENTAGE OF PREGNANT CLIENTS COMPLYING WITH TREATMENT FOR HOOKWORM

DEFINITION

- For areas of high endemicity (>30% of the population are infected with hook- worm): the total number of clients who say they have taken the prescribed pre- sumptive treatment divided by the total number of clients (WHO, Safe Mother- hood Program, 1994).

- In areas of low endemicity: the total number of infected clients who say they have taken the prescribed treatment divided by the total number of infected clients.

DATA REQUIREMENTS

Self reported data regarding compliance with prescribed treatment (for areas of low, moderate or high endemicity), data on infection status among pregnant women (in low endemicity areas).

DATA SOURCE(S)

Interviews with clients in hookworm control interventions.

PURPOSE AND ISSUES

This indicator measures the extent to which efforts at presumptive treatment or efforts to treat women infected with hookworm will potentially obtain the objective of lowering the worm burden among program partici- pants. Compliance with either presumptive treatment or therapy may be an obstacle to the effectiveness of a program, especially if women take pills in unsupervised situations. Since non-adherence to treatment may be related to lack of follow-up, efforts should be made by the health care system to contact infected women for treatment and give proper counseling on pill taking.

An alternative program-based indicator is the number of pills distributed per eligible client. This indicator reflects the adequacy of the program in meeting the needs of specific clients. If the number per client falls below established standards of the program, it is important for program managers to determine the reasons for this situation. This indicator relates to the supply of hookworm medication available to clients in the program, and it may reflect inadequacies in the flow of drugs to service distribution points in the system.

An alternative program-based indicator for hookworm that is appropriate for low endemicity areas is the availability of screening supplies and equipment. This indicator measures the number of health facilities with adequate and functional screening supplies and equipment at a given period in time for a given population. In areas where presumptive treatment is not deemed necessary, it is important to be able to diagnose hookworm in pregnant women as a first step in their treatment.

Supervised pill-taking is the most effective approach to monitoring presumptive treatment or therapy because the compliance factor becomes a non-issue; however this

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Prepared by Rae Galloway, MotherCare/John Snow, Inc.

may not always be practical in a program setting. Estimating the number of pills per eligible clients is not as attractive as supervised pill-taking but probably a good check on self reporting by women. Good record keeping is essential for this, and improving the monitoring under national health information systems is imperative (although not always a first priority for Ministries of Health). In areas of low endemicity for hookworm infection, screening should be conducted, although supplies for this purpose are not always available and top priority.

Indicator

PERCENTAGE OF PREGNANT CLIENTS RECEIVING TREATMENT FOR MALARIA

DEFINITION

- In areas of moderate to high endemicity (stable malaria, based upon national classifications of regions within the country), percent of primigravidae and secundigravidae clients receiving presumptive treatment for malaria.

- In areas of low endemicity (unstable malaria), percent of infected pregnant clients who receive treatment for malaria.

DATA REQUIREMENTS

The total number of primigravidae and secundigravidae clients, the total number of primigravidae and secundigravidae women receiving treatment (either presumptive treatment or therapy for identified malaria).

DATA SOURCE(S)

- Program records indicating the number of pregnant clients at the SDP.

- Program records indicating the total number of pregnant women receiving treatment (either presumptive treatment or therapy for identified malaria) at the SDP.

- Program records indicating the number of infected pregnant clients.

PURPOSE AND ISSUES

This indicator measures the extent to which women clients living in well known endemic areas receive treatment for malaria, which can negatively affect nutritional status of their infants. Because of the suppressed immunocompetence (and subsequent devas- tating morbidity and mortality effects for both mother and child) all primigravidae and secundigravidae women living in high endemic areas (e.g., African Savannah) should receive presumptive treatment for malaria. This is particularly important in areas where *p. falciparum* is endemic because this type of malaria, in the absence of other complicating factors such as maternal nutrition, is almost exclusively responsible for the acute morbidity and mortality of malaria. In areas where malaria is a sporadic or seasonal event (unstable), programs should focus on screening women who present with symptoms and treating those who are infected.

The definition of this indicator as an "output" versus an "outcome" is due to the level of measurement. In this case, data is collected at the program level, and therefore is classified as an "output" indicator. However, one could choose to measure the percentage of women in the population receiving treatment for malaria by collecting data at the population level using large-scale population surveys such as the DHS. In this case the indicator would be classified as “outcome." With regard to data collection, it is important to desegregate population-based data by area, given that the prevalence of malaria varies tremendously even within communities. Having area-specific prevalence data will help channel resources to areas where malaria continues to persist, or adjust treatment where drug resistance has developed.

Prepared by Rae Galloway, MotherCare/John Snow, Inc.

The appropriate drug therapy for malaria is an evolving issue, and current information on drugs which are both efficacious and safe for pregnant women in the areas where they are living should be obtained from the WHO.

It would be useful to have estimates of the level of malaria in a given population, but difficult to collect (except with sentinel site data). Similarly, it would be useful to monitor whether the percent infected with malaria decreased with enhanced treatment efforts; however this is difficult to assess at the population level using DHS type surveys.

Indicator

PERCENTAGE OF PREGNANT CLIENTS COMPLYING WITH TREATMENT FOR MALARIA

DEFINITION

- For areas of high endemicity (based on national classifications of regions within the country): the total number of clients who say they have taken the prescribed presumptive treatment divided by the total number of clients.

- In areas of low endemicity: the total number of infected clients who say they have taken the prescribed treatment divided by the total number of infected clients.

DATA REQUIREMENTS

Self reported data regarding compliance with prescribed treatment (for areas of low, moderate or high endemicity), data on infection status among pregnant women (in low endemicity areas).

DATA SOURCE(S)

Interviews with clients in malaria control interventions.

PURPOSE AND ISSUES

This indicator measures the extent to which efforts at presumptive treatment or efforts to treat women infected with malaria will potentially obtain the objective of lowering the malaria burden among participants. Compliance with either presumptive treatment or therapy may be an obstacle to the effectiveness of a program, especially if women take pills in unsupervised situations. Since non-adherence to treatment may be related to lack of follow-up, efforts should be made by the health care system to contact infected women for treatment and give proper counseling on pill taking.

An alternative program-based indicator is the number of pills distributed per eligible client. This indicator reflects the adequacy of the program in meeting the needs of specific clients. If the number of pills per client falls below established standards of the program, it is important for program managers to determine the reasons for this situation. This indicator relates to the supply of malaria medication available to clients in the program, and it may reflect inadequacies in the flow of drugs to service distribution points in the system.

An alternative program-based indicator for malaria appropriate for low endemicity areas is the availability of screening supplies and equipment. This indicator measures the number of health facilities with adequate and functional screening supplies and equipment at a given period in time for a given population. In areas where presumptive treatment is not deemed necessary, it is important to be able to diagnose malaria in pregnant women as a first step in their treatment.

Prepared by Rae Galloway, MotherCare/John Snow, Inc.

Indicator

PERCENTAGE OF CLIENTS WHO RECEIVED VITAMIN A SUPPLEMENTATION WITHIN FOUR WEEKS OF DELIVERING

DEFINITION

The proportion of clients that received 200,000 IU of vitamin A within four weeks of giving birth within a specified time period (e.g. preceding year). This is calculated by dividing the total number of clients receiving high-dose supplement within four weeks of delivering by the total number of clients who delivered.

DATA REQUIREMENTS

The total number of births during a given reference period and the number of clients that received a high-dose vitamin A supplement within four weeks of delivering.

DATA SOURCE(S)

Health service data (usual source) or population-based surveys (possible alternative source).

PURPOSE AND ISSUES

Vitamin A requirements during lactation increase to replace the losses in breast milk. Mega-doses of vitamin A, however, are harmful to a fetus, therefore it is important that women who could become pregnant do not receive vitamin A supplements in excess of 10,000 IU daily. Because women are infertile for at least a brief period following delivery, WHO recommends that in hyperendemic vitamin A-deficient areas mothers be given 200,000 IU vitamin A within four weeks of delivery. This level of supplementation will raise and maintain the the vitamin A content of breast milk.

Programs tend to target supplementation interventions to lactating women (rather than to all women having recently given birth), and to those who are at low risk of being pregnant, irrespective of whether they are breastfeeding or not. This document broadens the definition of service utilization for vitamin A supplements to include all women who have recently given birth while recognizing that those most at risk are lactating mothers.

Ideally, women should be given a high dose vitamin A supplement at the time of birth. Where this is not possible, vitamin A should be administered to mothers within one month of birth at the time of the first BCG/OPV contact. The limitation of the above, however, is that not all mothers take their infants for immunization, and no data will be available for mothers whose infants died before the first immunization was due.

It is important to differentiate the results by urban-rural location and by socio-economic groups, if possible, because breast feeding patterns differ between these groups.

Although this indicator is based on program data (as an output measure), it can be used in reference to the general population by use of population based surveys. In this case, the indicator would be classified as an outcome measure.

Prepared by Penelope Nestel, OMNI/Johns Hopkins University.

Indicator

PERCENTAGE OF CLIENTS RECEIVING IODINE SUPPLEMENTS IN IODINE-DEFICIENT AREAS

DEFINITION

Among all non-pregnant reproductive-age women seen at the service delivery point, the percent who receive the prescribed dosage of an iodine-containing preparation delivered either by intramuscular injection or orally.

DATA REQUIREMENTS

Number of non-pregnant reproductive-age women seen at the service delivery point during the specified time interval.

Number of non-pregnant reproductive-age women seen at the SDP point during the specified time interval who receive an iodine supplement.

DATA SOURCE(S)

Records indicating number of non-pregnant reproductive-age women seen at the SDP during the specified time interval.

Iodine supplement distribution records indicating the number of iodine supplements that are distributed during the specified time interval.

PURPOSE AND ISSUES

The indicator measures the program's effectiveness at delivering iodine supplements to the target population of non-pregnant reproductive-age women[5].

Iodized oil supplements can be administered either intramuscularly or orally. WHO/UNICEF /ICCIDD (1992) recommends oral administration of iodine if contacts can be made with the target population at least once every year. Otherwise, injections should be given every two years.

An intramuscular injection of one milliliter of iodized oil (480 milligrams of iodine) has been demonstrated to provide adequate protection from iodine deficiency for up to three years (Dunn et al., 1987; Hetzel et al., 1980).

The prescribed dose and frequency of administration of oral iodine varies according to the desired duration of effect. Current recommendations for dose and frequency of administration of iodized oil to non-pregnant reproductive-age women are as follows:

Table 2: Recommended dose and frequency of iodized oil administrated to non-pregnant women

Duration of Effect	Dose of Oral Iodine (mg)
3 months	100-200
6 months	200-480
12 months	400-960

Source: WHO/UNICEF/ICCIDD (1992)

Prepared by Judith Ricci, Maryland Department of Health and Mental Hygiene.

[5]Whether pregnant women should receive iodine supplementation is still under debate due to the potential risks to the fetus. Studies have shown both negative (Rodesch, et al., 1976) and beneficial (Thilly, et al., 1980) effects on pregnancy outcomes. However, until more scientific evidence can unquestionably demonstrate its benefits and safety, pregnant women should not be included in iodine supplementation programs.

Indicator

PERCENTAGE OF WOMEN THAT GAIN ADEQUATE WEIGHT IN PREGNANCY

DEFINITION

Percent of women gaining more than 1 kg per month in the last 2 trimesters of pregnancy (positive outcome) (USAID/WHO/PAHO/ MotherCare, 1991).

DATA REQUIREMENTS

The denominator is the number of women who have 2 serial weights in some defined period of time.

DATA SOURCE(S)

Service statistics, prenatal cards or other clinic based records. For some projects, home based records which are sampled from at a later time may be an appropriate strategy (in which case the indicator reflects outcome).

PURPOSE AND ISSUES

This indicator measures one of the most critical factors in determining infant outcomes of pregnancy. Theoretically, weight gains influence maternal nutritional outcomes of pregnancy as well, although published information is scarce. Weight gain is particularly important for women who are underweight prior to pregnancy or for women during times of acute nutritional stress, such as famines or seasons of food scarcity. Underweight women (Body Mass Index < 19.8) need to gain between 12.5 and 18 kg during preg- nancy in order to lower their risk of producing low birth weight (LBW) babies (IOM/NAS, 1990). Average weight gains for women in developing countries (5-9 kg) are much lower than these recommendations, and much lower than averages for developed country women (10.5-13.5 kg); see following table.

Table 3: Average weight gain during pregnancy: Developed and developing countries

Country Group	Number of Studies	Mean (kg)
Africa	4	6-7.3
Asia	6	4.8-8.9
Latin America	1	7
Developed Countries		10.5-13.5

Low weight gain is associated with LBW, intrauterine growth retardation (IUGR), gestational duration, fetal and neonatal mortality and maternal nutritional status postpartum. A WHO meta-analysis found that attained weight at 5, 7 or 9 months gestation were good predictors of low birth weight and intrauterine growth retardation, although weight gain during pregnancy was a better indicator for women having low prepregnancy weights. Weight gain and prepregnancy weight also were the best predictors of preterm birth. None of the weight gain indicators predicted pre-eclampsia, or post-partum hemorrhage.

Most developing countries have some form of prenatal care. Monitoring of appropriate weight gain during pregnancy is considered by most experts as an essential element of

Prepared by Katherine Krasovec, Wellstart International.

good prenatal care. However, many countries do not routinely do weight monitoring during pregnancy.

This indicator was recommended by participants of an expert group including USAID, WHO, PAHO and MotherCare (1991). It has the advantage of orienting health staff toward weight gain rather than simply recording weights. A major limitation to this indicator is the limited coverage that it provides of the target population. Indeed, a very small percentage of women in many developing countries routinely attend prenatal services. Frequent attenders tend to be either women with pregnancy complications or women of higher socio-economic status and educational status.

The following alternative indicators were discussed but considered less satisfactory.

- Percent of women with a target weight at 5, 7, or 9 months gestation (This would require only one measurement. Unfortunately, there is no guidance on the appropriate attained weight at 5, 7, or 9 months--the WHO meta-analysis gives 4 options for each.)

- Percent of women with a defined weight gain over a defined period during pregnancy (0-5 months, 0-7, or 0-9 were much better predictors of infant out- comes for underweight women in the WHO meta-analysis. Defining shorter intervals such as 5-7, 5-9, or 7-9 did not provide better information than attained weight at 5, 7 or 9 months. Again, there is no guidance on the exact amount of weight gain for any of the shorter time periods).

- Percent of women who lost weight (severely negative outcome) (denominator same as previous indicator) This could be used in combination with the previous indicator to give an idea of improvement of a good outcome as well as decline of a bad outcome.

Indicator

PERCENTAGE OF TARGETED WOMEN RECEIVING FOOD SUPPLEMENTS

DEFINITION

Percentage of women targeted to receive food supplements (food baskets, rations, etc.) who actually receive them over a speci- fied period of time from a given program.

DATA REQUIREMENTS

- Total number of beneficiaries targeted to receive food supplements (during a specified time period and location).
- Total number of beneficiaries targeted to receive food supplements (during a specified time period and location) who actually receive food supplements.

DATA SOURCE(S)

- Program records
- Sample surveys of targeted clients

PURPOSE AND ISSUES

The indicator is a straightforward measure of program efficiency. Complementary information is required in order to interpret this measure, particularly the type and amount, and periodicity with which food supplements are received.

When program records are used to compute the indicator, enrolled beneficiaries and not actual participation may be measured. Records should permit the linkage of enrollment and receipt of food transfer over time. Also, the gender, age and physiologic status (pregnant, lactating, non-pregnancy/ non-lactation status) of beneficiaries should be recorded. Increasingly, adolescent girls are being included in food supplement programs.

Sample surveys of target beneficiary populations can greatly enhance and/or replace service statistics as data sources. This data gathering strategy is particularly useful because information on the use of food supplements can be obtained. As leakage is a major problem for food supplementation programs, the ability to assess use of supplements by beneficiaries is very informative.

The indicator measures programs aimed at improving household and individual food security. Such programs are becoming increasingly common as food aid is used as a development resource, or proceeds from the sale of food aid (monetization programs) are used for income and food security ends. Title II and Title III components of the US PL480 food assistance programs are examples of programs which, by law, must have positive food security impact (in terms of access, availability and utilization).

It should be emphasized that the basic indicator says nothing about service adequacy or the actual use of the transfer and by inference, its impact.

Prepared by Bruce Cogill, IMPACT and Nancy Mock, Tulane University.

Indicator

NUMBER OF FOOD PACKAGES DISTRIBUTED TO PREGNANT AND LACTATING WOMEN

DEFINITION

The actual number of rations or food packages (specified by weight, volume and calorie per ration over a specified time period and location) distributed to pregnant and lactating women.

DATA REQUIREMENTS

Number of units distributed by category of recipient (i.e., pregnant or lactating) specified by weight and volume over a specified time period and location.

DATA SOURCE(S)

Program data at point of distribution aggregated by geographical location.

PURPOSE AND ISSUES

This is perhaps the most basic service statistic associated with food aid/food security programs that involve food as a service. The statistic captures food flows from programs to beneficiary populations. The information generally is improved by the capability to break down data by pregnancy/lactation status, age group and type and amount of food distributed per unit time. In this way, it is possible to estimate the overall adequacy of food distributed. For example, in some cases, food distribution is so erratic that the rations women receive are of insignificant value to their health and nutrition. Typically, food programs aim to increase the intake of pregnant and lactating women in the range of 200 - 900 kilocalories.

These measures are useful for monitoring trends in the magnitude of resource transfer over time. However, these absolute measures will be virtually uninterpretable unless complementary information is available on the numbers of beneficiaries, amount and type of resources transferred, and specific beneficiaries targeted. Most often this complementary information is available through service statistics or could be assessed using qualitative and semi-qualitative surveys.

The indicator is related to programs to improve household and individual food and income security. Such programs are becoming increasingly common as food aid is used as a development resource, or proceeds from the sale of food aid (monetization programs) are used for income and food security ends. Title II and Title III components of the US PL480 food assistance programs are examples of programs which, by law, must have positive food security impact (in terms of access, availability and utilization).

This indicator has serious limitations, however, due to leakage. It is well known that food distributed does not equal food consumed by the target population. There are no general guidelines for estimating leakage. Rather, it must be assessed at the local level.

This simple measure of distribution will require standardization depending on the context (i.e, was food distributed by weight or by calorie). Problems may arise if reporting is sporadic or time periods unstandardized. In addition, if programs do not specifically target

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Prepared by Bruce Cogill, IMPACT and Nancy Mock, Tulane University.

pregnant and lactating women, it will be necessary to have additional information on beneficiaries. This indicator is useful in tracking output of a given program over time, but is not useful for comparisons across programs.

In some contexts food aid and other social safety net programs provide cash, food, credit, stamps, and other transfers to households, and more importantly to women. In cases where these programs are significant, additional indicator data should monitor the extent to which these programs reach women.

Indicator

PERCENTAGE OF PROGRAM PARTICIPANTS WHO HAVE KNOWLEDGE OF KEY NUTRITION PRACTICES PROMOTED BY THE PROGRAM

DEFINITION

The percentage of women who have knowledge of key dietary practices related to better nutrition, as communicated by local nutrition IEC programs.

DATA REQUIREMENTS

Answers to survey questions constructed to assess participants' knowledge of key dietary behaviors that are targeted by local nutrition IEC interventions or campaigns.

DATA SOURCE(S)

Surveys of program participants.

PURPOSE AND ISSUES

The main purpose of this indicator is to assess the effectiveness of nutrition IEC programs. Knowledge is a necessary (though not sufficient) element to achieving behavioral change in relation to nutritional practices. Behavioral change programs targeting the dietary consumption patterns of women are a major tool for improving women's nutrition. They commonly emphasize increased energy consumption, consumption of iron or vitamin A rich foods, and related topics. (Note: indicators relating to specific practices are described separately. This indicator deals specifically with knowledge).

Nutritional knowledge is highly specific to the local context. Personnel designing the nutrition IEC program should evaluate dietary needs, deficiencies, and practices according to age, geographic region, culture, and other factors. Therefore, the specific dietary practices to be measured cannot be stipulated here. Nutrition IEC personnel should choose the most important pieces of information they want participants to know by the end of the program, design questions to determine this knowledge, and in the ideal case administer the set of questions before and after the IEC program is implemented.

The one type of knowledge question that may be universally applicable to all nutrition education programs relates to anemia. Iron-deficiency anemia is the most prevalent nutritional deficiency worldwide. Women of reproductive age have high iron requirements due to menstruation, pregnancy and lactation. With most diets containing only small amounts of red meat, it is difficult for women to meet their iron requirements without supplements. Anemia is a risk factor for low productivity and for poor pregnancy outcomes among girls and women once they become pregnant. Examples of questions on anemia are: Who can get anemia? How would they feel if they were anemic? Which foods are good for curing anemia? How often should they be eaten? Where can iron tablets be obtained? For ease of counting correct responses in a written test, a multiple choice format of answers could be provided.

Survey questions should examine nutrition knowledge at a variety of levels: awareness of nutritional problems, understanding of the level of importance of these problems, and

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Prepared by Kathleen Kurz, International Center for Research on Women.

awareness of solutions. Knowledge of solutions could include which foods to eat (or not eat) and how to prepare the foods to optimize nutritional value. It could also include where they can obtain certain dietary supplements, such as iron tablets, or which foods are centrally fortified with micronutrients such as iodine, vitamin A, or iron. Solutions being taught should be affordable by the participants and culturally appropriate. A valuable teaching approach would include helping participants think about how to solve the problems that constrain them from adopting the nutrition practices being recommended; that is, to help them generate their own options for ways to improve their nutrition practices.

The specific survey questions administered should not be altered from one survey round to the next. Care must be taken to adequately adapt questions to local nutritional concepts and to pretest carefully. If resources permit, personnel also should consider one or more repeat post-tests several months after the nutrition education sessions to test retention of knowledge gained during the sessions. Note that retention is expected to be higher if reinforcement of IEC messages is stressed than if they are not.

Goals for the extent of the increase in nutrition knowledge expected of the participants should also be established by the nutrition education personnel prior to the pretest. The increase will depend not only on the effectiveness of the nutrition education messages and approach, but also on the extent of participants' knowledge prior to the education program. For example, the increase is expected to be the greatest when the least amount is known at the onset.

Indicator

PERCENTAGE OF PROGRAM PARTICIPANTS WHO PRACTICE KEY NUTRITION BEHAVIORS PROMOTED BY THE PROGRAM

DEFINITION

The percent of program participants who report key nutritional practices consistent with an IEC program.

DATA REQUIREMENTS

Survey of program participants/target population (in which case indicator becomes intermediate outcome).

DATA SOURCE(S)

Survey of program participants/target population. If the number of participants is large, a random sample could be selected.

PURPOSE AND ISSUES

The purpose of this indicator is to assess the degree of behavioral change that has occurred as a result of IEC programs. As with the indicator "program participants with appropriate nutritional knowledge," the specific behaviors to be measured would be locally determined.

It may take some time for women to successfully make changes in their behavior, and behavior change may not persist. Therefore, it is recommended that assessments be timed so as to permit a longer view of behavior change. Here, too, the sensible assessment schedule will depend upon the specific IEC program.

True behavioral change is difficult to measure. Self-reported data on behaviors is known to be unreliable for several reasons: Respondents may want to give the answer they think the interviewer wants to hear; and respondents may not want to admit all of their behaviors. One example in nutrition practices is that respondents may be ashamed that they cannot afford foods that they have been taught are nutritious, and may consequently report eating them when they have not. Self-reported behavior is recommended here, but only when certain conditions are in place to ensure reliability of the data. To reduce unreliability in the behavior data, women should be asked several questions about each behavior of interest. Questions about the behavior should be asked in several different ways to detect any inconsistent answers. If answers are inconsistent, the interviewer should probe further to elicit true information about the behavior. An additional way to reduce unreliability is to assure confidentiality of the respondents by assigning different interviewers to administer the pre- and post-tests.

If the nutrition practices of interest are the intakes of one or more micronutrients (for example, iron and vitamin A), the recommended measurement technique is a food frequency questionnaire. The questionnaire should ask the number of times that foods rich in the micronutrient(s) were consumed in the past week. These foods are specific to region and season, and a list of them should be developed by the staff of the nutrition program.

Prepared by Kathleen Kurz, International Center for Research on Women.

If the nutrition practices of interest are the energy intakes, the 24 hour dietary recall method can be used. Alternatively, if it is not possible to conduct and analyze 24 hour recall data, a less specific set of questions can be used to assess qualitative change such as meal frequency.

It is also important to delve into reasons why participants were able to change their behaviors. It is important, for example, to identify inadequate household food security when it is a major constraint to changing nutrition practices. Alternatively, women may not find recommended foods acceptable, or they may not be adequately motivated to change their practices. Furthermore, it is important to consider potential for behavior change in stages. Using iron supplements as an example, individuals are: (1) unaware that they need to take an iron supplement (precontemplation); (2) aware and thinking about taking an iron supplement (contemplation);(3) ready to take an iron supplement (ready for action); (4) have tried taking an iron supplement (trial); (5) have maintained their regime or iron supplementation (maintenance); and (6) have relapsed from any stage to one below it (relapse). These stages are useful to planning the form of communication needed. “Knowledge and information" is most needed to encourage people into contemplation, “motivation" is most needed to encourage them to be ready for action, "supporting skills" for trial, "facilitation" for maintenance, and “reinforcement" to prevent relapse. If the target population is in the precontemplative stage, then an information intervention is the form of communication to which they will be most responsive, and this indicator is likely to indicate "success" by detecting a large increase in knowledge. If, however, the target population is already knowledgeable but needs supporting skills, then an information intervention is likely not to result in much change in knowledge, and the indicator will not indicate success. Lack of success in this case would suggest an inappropriate choice of communication, rather than a poorly executed intervention.

Chapter III

Outcomes

- Section A: Intermediate
- Section B: Long-Term

Section A

INTERMEDIATE

- Percentage of pregnant women who report taking an adequate dosage of iron pills during pregnancy
- Percentage of women who consume vitamin A rich foods
- Percentage of households that consume foods fortified with vitamin A
- Percentage of households using iodized salt
- Percentage of women receiving iodine supplementation in iodine deficient areas
- Percentage of women who consume less than two meals per day

Indicator

PERCENTAGE OF PREGNANT WOMEN WHO REPORT TAKING AN ADEQUATE DOSAGE OF IRON PILLS DURING PREGNANCY

DEFINITION

The consumption of an adequate dosage of iron pills during pregnancy is defined as the ingestion of the government or WHO recommended dosage of iron pills over the last month of pregnancy.

DATA REQUIREMENTS

- Number of pregnant women.
- Number of pregnant women who took the recommended dosage of iron pills over the last month.
- Week or month of pregnancy when iron supplementation started, age, and (if desired) other socio-economic variables.

DATA SOURCE(S):

Cross-sectional population-based surveys, surveillance.

PURPOSE AND ISSUES

The purpose of this question is to determine the proportion of pregnant women who take an adequate dosage of iron-containing supplements in the form of a pill. This information is important in baseline surveys of supplement use and to evaluate iron interventions. Because surveys that collect prospective data on supplement use throughout pregnancy are difficult to administer, a cross-sectional survey that asks women to recall supplement use over the last month is used. A supplement frequency questionnaire is administered to each woman. The interviewer asks if the women used a supplement over the last month, how often she took the pills (i.e. > 2/day, 2/day, 1/day, 5-6 per wk, 2-4 times/week, etc.), and the average dose.

Although the indictor is based on survey data among the general population, it can be used in reference to clients in a specific program (as a measure of output). In either case, illustrative general interview questions include the following.

Interview questions on supplementation:

Q1. Over the last month, did you take a vitamin or mineral pill?

If no, skip to Q7 and Q8.
If yes, go to Q2 and proceed to Q7.

Q2. How often did you take this vitamin or mineral pill?

a. >2/day
b. 2/day
c. 1/day
d. 5-6 times per week
e. 2-5 times per week
f. 1/week
g. 2/month
h. 1/month

Q3. Do you have the bottle(s) with you so that I can read the label?

If no, ask Q4, Q5, Q6, and Q7
If yes, record Q4 and Q5, and ask Q6 and Q7

Prepared by Kelley Scanlon, CDC.

Q4. Did the pill(s) contain iron (record any pills that contained iron)?

Q5. If yes, how much iron did the pill contain (record for each different type of iron pill)?

Q6. During what month of pregnancy did you start taking the pill?

Q7. Was an iron-containing pill prescribed to you by a health care pr

Q8. Is there any specific reason why you are not taking a vitamin or mineral pill? (e.g., not recommended, not given, did not like it, made me feel ill, etc.)

The data collected from the supplement frequency questionnaire and the demographic survey questions are used to calculate the percent of pregnant women who report taking an adequate dosage of iron pills based on government or WHO recommendations. For example, according to the WHO recommended schedules for supplementation, pregnant women should consume one 60 mg iron pill per day from early pregnancy to term.

Indicator

PERCENTAGE OF WOMEN WHO CONSUME VITAMIN A-RICH FOODS

DEFINITION

The percentage of women consuming foods rich in vitamin A at least three times a week. A low risk of dietary vitamin A deficiency exists when vitamin A rich foods are eaten by more than 75 percent of women at least three times a week.

DATA REQUIREMENTS

Frequency consuming vitamin A-rich foods.

DATA SOURCE(S)

Dietary and food frequency surveys.

PURPOSE AND ISSUES

Among adults, pregnant and lactating women are the most vulnerable to vitamin A deficiency because of the vitamin A requirements of the fetus and the suckling infant. Indeed, it is for these reasons that the definition of dietary risk of vitamin A deficiency is invariably confined to pregnant and lactating women. Such a definition assumes that non-pregnant and non lactating women are not at dietary risk of an inadequate intake of vitamin A, which is not true. In view of the latter, the definition of dietary risk of vitamin A deficiency includes all women, while recognizing that those most at risk are pregnant and lactating women.

Rapid procedures can be used to obtain a history of the usual frequency that foods are consumed by households or individuals within a defined period of time. The primary purpose is to determine whether sufficient amounts of vitamin A-rich foods are eaten by households or individuals regularly to meet their dietary needs. The usual foods eaten by the community at different times of the year will have to be listed and those rich in vitamin A identified. The list can usually be developed by consulting local nutrition institutes or through key informant approaches.

Although food frequency recall methods give quick and useful information, they are limited. This is because they reflect consumption patterns over a short period of time, they may be atypical due to illness, and they do not reflect seasonal patterns in food intake; they are not quantitative; consumption patterns may be influenced by the frequency of market days; and they do not reflect any food taboos or restrictions.

Random sampling is essential and data collection requires good training and monitoring. Typically, questionnaires list all locally available vitamin A-rich foods. They may or may not be listed in groups reflecting relative vitamin A content of the foods (i.e., staple food, non-dairy animal products, dairy products, dark green leafy vegetables, yellow vegetables and fruits, other vegetables and fruits, and oils/fats). Examples of vitamin A rich foods include mango, papaya, pumpkin and red palm oil (Rosen et al., 1993). Women are asked how many days in the last week (or month) they ate each of the itemized foods. Data should be presented by food groups and can be tabulated manually.

Prepared by Penelope Nestel, OMNI/Johns Hopkins University.

Indicator

PERCENTAGE OF HOUSEHOLDS THAT CONSUME FOODS FORTIFIED WITH VITAMIN A

DEFINITION

The proportion of households that consume vitamin A-fortified food during a specific reference period.

DATA REQUIREMENTS

Data on food consumption (including vitamin A-fortified food) in a specific reference period to be defined locally.

DATA SOURCE(S)

Household surveys on food expenditures and consumption.

PURPOSE AND ISSUES

This indicator measures the proportion of households that purchase and use vitamin A-fortified food. It is an important indicator where both fortified and nonfortified products coexist in the market place. Examples of food fortified with vitamin A include some infant formulas, fortified powdered whole milk, and vitamin supplements (Rosen et al., 1993).

Care is needed when collecting data to verify the usual use of the vitamin A-fortified food in question (i.e., does the household always buy, sometimes buy, or never buy the vitamin A-fortified food). Obviously, the availability of the vitamin A-fortified food in the market on a regular basis and its price will influence whether households use this food over an alternative. Complementary information on intra-household food allocation and maternal access to food should also be collected. It is important to verify that fortified food available at the household is consumed by women.

This indicator should be used in conjunction with the previous indicator regarding the consumption of foods naturally rich in vitamin A.

Prepared by Penelope Nestel, OMNI/Johns Hopkins University.

Indicator

PERCENTAGE OF HOUSEHOLDS USING IODIZED SALT

DEFINITION

Percent of households that regularly process or prepare food with iodized salt or add iodized salt to their food at the time of consumption.

DATA REQUIREMENTS

Responses to survey questions on household salt procurement and use.

Measure of iodine concentration in household salt.

DATA SOURCE(S)

Household survey, rapid-test kit analysis of iodine concentration in salt.[6]

PURPOSE AND ISSUES

This indicator measures the extent to which households in the target population have integrated iodized salt into their diet. It is used to evaluate the short-term population-based outcome of programs that employ salt as a vehicle for iodine supplementation.

The regular consumption of iodized salt will vary among populations and should be defined according to the typical consumption pattern of the intervention population.

The term, "iodized salt," infers that the household salt supply contains at least the minimum concentration of iodine established as adequate for salt at the household level. The iodine concentration of salt can be reduced after procurement primarily due to improper storage, particularly under conditions of excessive humidity and heat. Therefore, in order to ensure that households who report procuring iodized salt are effectively using iodized salt, the iodine content of the household salt supply should be verified at the time of the survey.

WHO/UNICEF/ICCIDD (1994) set guidelines for monitoring the iodine content of fortified salt at the household level according to two factors: climatic conditions and the population's habitual daily salt consumption (per person). Recommended iodine concentrations were determined under these varying conditions in order to supply individuals with 150 micrograms of iodine per day.[7]

The form of iodine used to fortify salt in the region affects the type of assay required to measure its iodine concentration. Salt is iodized usually with either potassium iodate or potassium iodide. Although potassium iodate

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Prepared by Judith Ricci, Maryland Department of Health and Mental Hygiene.

[6] Detailed information on the rapid-test kits currently manufactured is available from WHO, UNICEF, or the International Council for the Control of Iodine Deficiency Disorders (ICCIDD).

[7] The daily iodine requirement for the prevention of goiter in adults is 50 to 75 micrograms (FNB 1970). An allowance of 150 micrograms per day adds an additional margin (beyond that required to prevent goiter) to maintain normal thyroid function in adults and adolescents particularly during pregnancy (FNB 1980).

is the preferred and most widely used form of iodine due to its stability, particularly in warm, damp or tropical climates (WHO/UNICEF/ICCIDD 1993), salt fortified with potassium iodide has also been used. There are rapid-test kits currently available that can detect the presence of either form. Programs need only to identify the type of kit needed.

Table 4: Recommended concentration of iodine in salt required at the household level according to climate and daily salt consumption

Climate	Daily Salt Consumption per Person	
	5 grams	10 grams
Warm/moist	50 mg/g	
Cool/dry	40 mg/g	20 mg/g

Source: WHO/UNICEF/ICCIDD. (1994).

Indicator

PERCENTAGE OF WOMEN RECEIVING IODINE SUPPLEMENTATION IN IODINE DEFICIENT AREAS

DEFINITION

Iodine supplementation is defined as the receipt of an iodine-containing preparation, administered either intramuscularly or orally, according to a prescribed dosage.

DATA REQUIREMENTS

Responses to survey questions on iodine supplementation.

DATA SOURCE(S)

Survey of reproductive-age women in iodine-deficient areas.

PURPOSE AND ISSUES

The purpose of this indicator is to determine and evaluate the adequacy of the population-based coverage of an iodine supplementation program in iodine-deficient areas.

Iodine supplementation with iodized oil is the major alternative to the iodine fortification of salt for the correction of iodine deficiency and is highly effective (Dunn 1987). It is used as a short-term intervention in population groups with moderate to severe iodine deficiency while waiting for the effective implementation of a salt fortification program.

Iodized oil may be administered either intramuscularly or orally. An intramuscular injection of one milliliter of iodized oil (480 milligrams of iodine) has been demonstrated to provide adequate protection from iodine deficiency for up to three years (Dunn et al., 1987; Hetzel et al., 1980).

The prescribed dose and frequency of administration of oral iodine varies according to the desired duration of effect. Current recommendations for dose and frequency of administration of iodized oil to non-pregnant reproductive-age women are as follows:

Table 5: Recommended dose and frequency of iodized oil administrated to non-pregnant women

Duration of Effect	Dose of Oral Iodine (mg)
3 months	100-200
6 months	200-480
12 months	400-960

Source: WHO/UNICEF/ICCIDD (1992)

Debate continues as to whether pregnant women should receive iodine supplementation, due to the potential risks to the fetus. Studies have shown both negative (Rodesch et al., 1976) and beneficial (Thilly et al., 1980) effects on pregnancy outcomes. However, until more scientific evidence can unquestionably demonstrate its benefits and safety, pregnant women should not be included in iodine supplementation programs.

Prepared by Judith Ricci, Maryland Department of Health and Mental Hygiene.

Indicator

PERCENTAGE OF WOMEN WHO CONSUME LESS THAN TWO MEALS PER DAY

DEFINITION

The percent of women in a given population that consume less than two meals per day**.**

DATA REQUIREMENTS

Information on the number of meals eaten.

Cultural definition of what comprises "meal" and "snack."

DATA SOURCE(S)

Survey of households and individuals.

PURPOSE AND ISSUES

The number of meals that a woman eats during the day is an indirect measure of her consumption of calories, protein, fat, and micronutrients. An intake of less than two meals per day is increasingly being identified with undernutrition. Various cultures define "meal" differently. In many groups, a "meal" is defined as one in which the staple food is eaten. Even if a significant portion of daily caloric intake is ingested during times when the staple food is not consumed, the individual may not consider that she has eaten a "meal." However, such intake of foods should be included as a meal for the purposes of this indicator. "Snacks" are also difficult to define: many cultures have no vernacular word for "snack." Survey questions trying to assess snacks should be tested ahead of time to make sure they are understood (Gershoff, 1994).

The use of dietary data as an indicator of women's nutritional status is complex. Intake of calories and protein generally is not feasible due to the need for extensive interviewer training and lengthy data collection instruments. Weighed or volumetric recall methods are costly and cumbersome to perform in the field. Household food security indicators have not been sufficiently tested; recommendations based on preliminary findings would be premature. In addition, such indicators do not address women's nutritional status *per se* and thereby fail to account for such problems as intrahousehold food distribution. Thus, number of meals is proposed as a reasonable indicator of dietary status, given time and funding constraints and lack of specificity in other indicators.

Prepared by Cate Johnson, USAID.

Section B

LONG-TERM

- Percentage of women with anemia
- Percentage of women with low breastmilk vitamin A level
- Percentage of newborns who are iodine deficient: blood TSH concentration
- Median urinary iodine concentration
- Percentage of babies born with low birthweight
- Percentage of women judged to be of inadequate nutritional status based on arm circumference
- Percentage of women of low height
- Percentage of women of low weight
- Percentage of malnourished women, based on body mass index (BMI)

Indicator

PERCENTAGE OF WOMEN WITH ANEMIA

DEFINITION

Anemia is defined as a hemoglobin concentration that is below normal, usually defined as two standard deviations below the median hemoglobin value observed for a reference population of healthy individuals of the same gender, age, and physiologic status.

Hemoglobin concentration (g/dL) cutoff values for anemia (WHO, 1994):

	Anemia	Severe anemia	Very severe anemia
Non-pregnant	< 12.0	< 7.0	< 4.0
Pregnant	< 11.0	< 7.0	< 4.0

DATA REQUIREMENTS

Hemoglobin concentration measures on a sample of women of reproductive age (or of women included in a surveillance system).

Illustrative Computation

$$\text{Anemia prevalence} = \frac{\text{\# of women with Hb measure below the cutoff criteria for anemia}}{\text{\# of women of reproductive age surveyed}} \times 100$$

Hb = hemoglobin (concentration of hemoglobin in the whole blood)

Hemoglobin distribution = plot of the distribution of observed hemoglobin measures in the population surveyed against a plot of the reference distribution of these measures.

x-axis: g/dL of hemoglobin (0.1 precision)
y-axis: percent of the population

Prepared by Kelley Scanlon, CDC.

DATA SOURCE(S)

Population-based surveys or surveillance.

PURPOSE AND ISSUES

Over 40% of non-pregnant and 50% of pregnant women in lesser developed countries are anemic (UN, 1991). Anemia also affects women in industrialized countries, especially those of lower socioeconomic status. In countries where the prevalence of anemia is greater than 20%, the majority of cases are associated with a primary iron deficiency or iron deficiency in combination with other conditions. Anemia is also caused by, or associated with deficiencies of other nutrients, including folate, vitamin B-12, A, and protein-energy. Anemia can also be caused by non-nutritional factors, including chronic infection and inflammation (e.g. malaria and intestinal parasitic infections) and genetically determined hemoglobinopathies such as thalassemia (UN, 1992). It is well known that iron deficiency does not progress to anemia until the deficiency is severe. Therefore the prevalence of iron deficiency in the population is far greater than the prevalence of iron deficiency anemia.

Additional laboratory tests are necessary to determine the etiology of the anemia. Because multiple laboratory tests are not feasible in many settings, the prevalence and distribution of anemia are used widely to estimate the extent, trends, and severity of iron deficiency anemia in the population. An anemia survey followed by a therapeutic trial with iron supplementation is an alternative method for determining if the anemia observed is due to iron deficiency.

Indicator

PERCENTAGE OF WOMEN WITH LOW BREASTMILK VITAMIN A LEVEL

DEFINITION

The proportion of lactating women whose breast milk vitamin A level is less than 1.05 umol/l or 8.0 ug/g milk fat (WHO, 1994).

The severity of vitamin A deficiency, as a public health problem, is defined as follows:

Mild: <10 percent of the population has breast milk vitamin A levels ≤1.05 umol/l

Moderate: 10.0-24.9 percent of the population has breast milk vitamin A levels ≤1.05 umol/l

Severe:. ≥25 percent of the population has breast milk vitamin A levels ≤1.05 umol/l

DATA REQUIREMENTS

Levels of vitamin A in breast milk.

DATA SOURCE(S)

Population based surveys.

PURPOSE AND ISSUES

Breast milk vitamin A concentration provides information on the vitamin A status of the mother and the breastfed infant. Secretion of vitamin A into breast milk is directly related to maternal vitamin A status, especially when maternal status is poor. When diets are adequate in vitamin A, few mothers have breast milk values <10.05 umol/l (Newman, 1992).

The concentration of vitamin A in breast milk is a reflection of a woman's diet. Breast milk and serum vitamin A concentrations are similar and significant correlations between them have been found in populations with relatively low vitamin A status. The relationship between breast milk vitamin A concentration to liver stores is stronger when liver stores are low. For this reason, breast milk vitamin A can be a useful indicator of subclinical deficiency among populations with low vitamin A status. The use of breast milk vitamin A levels as a program impact indicator is preferred over that of serum because (a) breast milk samples are easier to collect than blood samples, (b) the impact of vitamin A interventions can be measured using smaller sample sizes than for other indicators (Stoltzfus et al., 1993a), and (c) it is a useful proxy measure of the vitamin A status of non lactating women and infants.

The use of breast milk vitamin A as an indicator of vitamin A status will be most useful in communities where breastfeeding *is common and is the major source of infant food for longer than six months*. Vitamin A in colostrum (4-6 days postpartum) and transitional milk (7-21 days postpartum) is high, but it stabilizes in mature milk. Breast milk samples collected from mothers 1-8 months postpartum, when breast milk proximate composition is relatively stable (WHO, 1985), are most useful for assessing vitamin A status. Among other things, the concentration of vitamin A in breast milk varies according to time of day, month of

Prepared by Penelope Nestel, OMNI/Johns Hopkins University.

lactation, and interval since last feeding. These variations are unrelated to mother's vitamin A status and, for the purpose of assessing vitamin A status in a population, breast milk samples should be collected at different times of the day and at varied times following the last feed (WHO, 1994).

Collection of breast milk samples by women is generally acceptable even in traditional cultures. Milk samples can be collected manually or by using a simple breast pump. A 5 ml sample from one breast is sufficient.

Vitamin A is very unstable; thus samples must be kept cold and protected from light and air after collection. WHO recommends that as soon as possible after the sample is collected, aliquots of milk in the precise volume required for analysis should be placed in separate vials for longer-term storage. Pre-measured vials of milk can be stored at -20^{0}C until analyzed (Stoltzfus et al., 1993b).

Analysis for breast milk can be done by high performance liquid chromatography (HPLC) or by a spectrophotometric method. The former entails significant capital costs and technical expertise, while the later requires a visible-range spectrophotometer that is available in most laboratories.

Change in breast milk vitamin A concentration is a sensitive measure of change in vitamin A status following a related intervention, and has been used to evaluate high-dose supplementation of postpartum women (Stoltzfus et al., 1993b) as well as fortification interventions (Arroyave, 1986; Muhilal et al., 1988). WHO (1994) advocates its use for monitoring changes in vitamin A status of communities.

As noted in the introduction, this indicator is an important measure of micronutrient deficiency but often, due to difficulty and expense, will not be practical in large scale population-based surveys in developing countries. On the other hand, this indicator is among the most sensitive and reliable indicators of vitamin A status among the array of biochemical measures. Therefore, it should be considered in household survey programs or sentinel site surveillance when feasible.

Indicator

PERCENTAGE OF NEWBORNS WHO ARE IODINE DEFICIENT: BLOOD TSH CONCENTRATION

DEFINITION

The percent of newborns with a whole blood thyroid stimulating hormone (TSH) concentration above 5 milliunits per liter (mU/l).

DATA REQUIREMENTS

Measure of TSH concentration in drops of neonatal whole blood obtained from the umbilical cord (within three days of birth) or a heel prick (more than three days after birth).

DATA SOURCE(S)

An epidemiologic survey of neonatal hypothyroidism prevalence based on laboratory analysis of dried blood on filter paper using commercially-available assay kit such as enzyme-linked immunosorbant assay (ELISA).[8]

PURPOSE AND ISSUES

This indicator measures women's iodine status during pregnancy. The decreasing incidence of neonatal hypothyroidism is an excellent index of the adequacy of a successful prophylactic program (Medieros-Neto, 1987). The indicator is also particularly useful because it assesses children's iodine nutriture at a critical time of brain and neurological development. As noted in the introduction, while this indicator is an important measure of micronutrient deficiency, it generally will not be practical for doing large scale population-based surveys in developing countries due to the difficulty and expense in data collection. Its use requires that programs have the necessary technical and financial resources to collect, transport, store, and analyze blood samples.

Additionally, lab tests for measuring TSH have the disadvantage of being expensive, often unavailable in some developing coun- tries, and require the collection of blood samples which tend to be unpopular in many settings (Dunn and Van Der Haar, 1990). These resources may be available for research purposes, but are not likely to be available for periodic evaluation, except in sentinel sites.

TSH concentration in blood can be useful for assessing thyroid function, and therefore, iodine nutrition because it directly measures the availability and adequacy of thyroid hormones. Very briefly, when the circulating concentration of free thyroid hormones drops, the pituitary gland secretes more TSH. TSH stimulates the thyroid to withdraw iodide from circulation, oxidize it to iodine, and synthesize and secrete the active thyroid hormones, thyroxine (T4) and triiodothyronine (T3). Under normal conditions, the subse- quent rise in

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Prepared by Judith Ricci, Maryland Department of Health and Mental Hygiene.

[8]Additional data collection is not required in those countries that routinely collect this information as part of an ongoing nutrition surveillance system.

circulating free T4 and T3 con- centrations reduces the pituitary's secretion of TSH, and the blood TSH concentration subsides. Consequently, the relationship between iodine status and blood TSH con- centration is inverse, i.e. TSH concentration increases during iodine deficiency.

The blood spot procedure is widely accepted and the collection and transport of samples is simple (WHO/UNICEF/ICCIDD, 1993). Blood can be collected by trained traditional birth attendants in the home, local health posts, or hospitals and, only a few drops of blood are required to perform the assay. However, care must be exercised to use sterile lancets (heel pricks) for collecting samples and to follow standard procedures for handling blood products and objects contaminated with blood. Blood spots on filter paper should be thoroughly dry before transport. TSH concentrations remain stable for up to six weeks even under conditions of extreme temperature and humidity.

The methodology for assessing blood TSH concentration is well-established. The WHO/ UNICEF/ICCIDD (1993) recommend using the enzyme-linked immunosorbant assay (ELISA) because of lower equipment costs,[9] longer shelf life of reagents (6 months) and higher sensitivity (ability to detect concentrations of TSH in the full physiologic range of values) compared to other available tests. The ELISA assay can detect TSH concentrations as low as 2 mU/l. The epidemiologic sensitivity[10] and specificity[11] of the test have not yet been determined.

The population distribution of values for whole blood TSH levels has been described for newborns. Using the ELISA TSH assay, the cut-off value, 5 mU/l, defines iodine deficiency, (i.e. infants with blood TSH levels greater than 5 mU/l are iodine deficient). TSH values are reported in whole blood units (WHO/UNICEF/ICCIDD, 1993).

[9] Cost estimates for laboratory equipment and reagents (September 1993): I) TSH ELISA laboratory with state-of-the-art computer based system and software capable of processing 90,000 tests per year per technologist ($15,000); ii) TSH ELISA laboratory hardware and software capable of processing up to 5,000 tests per year per technologist ($5,000); and iii) TSH assay kits ($0.50 to $1 per test) (WHO/UNICEF/ICCIDD, 1993).

[10] Ability of the test to correctly identify individuals with IDD.

[11] Ability of the test to correctly identify individuals who are iodine replete.

Indicator

MEDIAN URINARY IODINE CONCENTRATION

DEFINITION

The median urinary iodine concentration (micrograms per deciliter) of a population of reproductive-age women. A median urinary iodine concentration less than 10 µg/dl indicates that the population is iodine deficient (WHO/UNICEF/ICCIDD, 1993).[12]

DATA REQUIREMENTS

Measure of iodine concentration in women's spot urine samples.

DATA SOURCE(S)

An epidemiologic survey of the severity of Iodine Deficiency Disorders (IDD) in women of reproductive age based on laboratory analysis.

PURPOSE AND ISSUES

This indicator is the most direct method to measure the effectiveness of an iodine supplementation program on the iodine nutriture of reproductive-age women. However, as noted in the introduction, while this indicator is an important measure of micronurtient deficiency, it generally will not be practical for doing large scale population-based surveys in developing countries due to the difficulty and expense in data collection.

Its use requires that programs have the necessary technical and financial resources to collect, transport, store, and analyze urine samples.

Urinary iodine is a good marker for dietary iodine (WHO/UNICEF/ICCIDD, 1993). A 24-hour measure of urinary iodine excretion closely reflects an individual's daily dietary iodine intake. However, the collection of 24-hour urine samples is not practicable in most field situations or large-scale surveys.

Spot urine sampling provides an alternative to 24-hour urine collection, with a caveat. Spot urine sampling can be used only to assess the iodine status of a population. The method is not valid for assessing individual iodine nutriture because of the high variability in an individual's urinary iodine concentration from day to day. When using the spot method, 40-75 samples from a group must be collected to allow for the biological variation among individuals, particularly with respect to degree of hydration (WHO/UNICEF/ICCIDD, 1993).

The spot urinary iodine procedure is widely accepted and the collection and transport of samples to a laboratory is relatively easy (WHO/UNICEF/ICCIDD 1993). Only small amounts of urine (0.5-1.0 milliliter) are required to perform the simplest assay, which yields adequate data for epidemiologic surveys. The samples do not require refrigeration and their iodine concentrations remain stable for months under usual conditions.

Prepared by Judith Ricci, Maryland Department of Health and Mental Hygiene.

[13]Note that median values are preferred to means and standard errors to describe the central tendency of the sample because the distribution of urinary iodine concentrations is often not normal, (e.g., skewed to high or low values) (WHO/ UNICEF/ICCIDD, 1993).

A number of techniques are available for assessing urinary iodine concentration. Many

of them express urinary iodine excretion relative to creatinine. However, WHO/UNICEF /ICCIDD (1993) does not recommend making this comparison because the additional step complicates the assessment, produces more unreliable estimates, and adds expense. Urinary iodine concentrations can be assessed simply and directly by digesting samples in chloric acid and observing the color change as ceric ammonium sulfate (yellow) is reduced to cerous ammonium sulfate (colorless), a reaction catalyzed by iodine. Iodine concentrations are then expressed as micrograms of iodine per deciliter (µg/dl) of urine. The test can detect urinary iodine concentrations below 2.0 µg/dl. The ICCIDD has prepared a manual describing this procedure and others in greater detail.

An overview of available urinary iodine methods has been prepared by Dunn (1993).

Table 6: Proposed epidemiologic criteria for assessing the severity of IDD in a population based on median urinary iodine concentration

Severity of IDD	Median Urinary Iodine Concentration (µg/dl)
No deficiency	≥10.0
Mild	5.0-9.9
Moderate	2.0-4.9
Severe	<2.0

Source: WHO/UNICEF/ICCIDD 1993, p. 19.

The table above presents the epidemiologic criteria proposed by WHO/UNICEF/ICCIDD (1993) for assessing the severity of IDD in a population based on median urinary iodine concentration.

Indicator

PERCENTAGE OF BABIES BORN WITH LOW BIRTHWEIGHT

DEFINITION

The percentage of babies born with birthweight < 2500 grams (WHO, 1994).

DATA REQUIREMENTS

The weights of babies born alive, measured within 48 hours of birth.

DATA SOURCE(S)

Birthweight data from community monitoring is optimal. Birthweight records from hospitals, clinics or PHC programs can be used if at least 90% of deliveries are attended.

PURPOSE AND ISSUES

Low birthweight is an indirect indicator of poor nutritional status in pregnant mothers. Birthweight is determined in large part by maternal nutritional status (especially weight) before pregnancy and weight gain during pregnancy. Birthweight is an indirect indicator, however, in part because there are biological mechanisms that occur to protect a fetus, and this protection may occur at the expense of the mother's own nutritional status. Thus, birthweight probably underestimates poor maternal nutritional status, though the degree of underestimation, and the sensitivity and specificity of the indicator, are unclear.

With this probable underestimation in mind, birthweight is suggested as an indicator of women's nutritional status (at least among pregnant women) because birthweight and women's nutritional status are expected to be correlated, and data on birthweight is more readily available than data on women's nutritional status.

Birthweight is a useful indicator only when a high percentage of births are attended by health care professionals, who are the ones who collect these data. That is, it is useful when the birthweight statistic is representative of the community in which the data are being collected.

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Indicator

PERCENTAGE OF WOMEN JUDGED TO BE OF INADEQUATE NUTRITIONAL STATUS BASED ON ARM CIRCUMFERENCE

DEFINITION

Percent of women aged 15-49 with a mid-upper arm circumference (MUAC) of < 22.0 cm. (James et al., 1994).The ACC/SCN suggests a higher cut-off of 22.5 cm (see chart below). Arm circumference reflects both fat and lean tissue stores.

Illustrative Computation

$$\frac{\text{Number of women with MUAC} < 22.5 \text{ cm}}{\text{Total number of women sampled}} \times 100$$

DATA REQUIREMENTS

Mid-upper arm circumference measurements of women aged 15-49 using circumference bands.

DATA SOURCE(S)

Population based surveys or country surveillance systems.

Clinics also could provide MUAC data measured at 4-6 weeks postpartum to assess nutritional outcomes of pregnancy for women in their programs.

PURPOSE AND ISSUES

This measure reflects the nutritional status of women of reproductive age based on a single anthropometric measure. In settings with limited infrastructure and resources, this may be the only feasible anthropometric indicator to use. Equipment needed is clearly the least expensive and most easily transportable. Arm circumference tapes used to measure children can be used for women for screening purposes (above or below 22.5 cm) but many are not long enough for more refined data needs (most are not longer than 25 cm). The indicator can also be used for rapid assessment of the nutritional status of women, particularly in emergency situations such as refugee or displaced populations, droughts or famine.

In most developing country settings, prepregnancy weights are not available. Mean upper arm circumference (MUAC) can be used as a proxy for prepregnant weight to guide weight gain recommendations for individual women or to target interventions to those most in need. Arm circumference taken during pregnancy can give an idea of maternal nutritional adaptation to pregnancy, as opposed to weight gain or Body Mass Index (BMI) which cannot separate out nutritional reserves of the mother from those of the infant. Like BMI, arm circumference 4-6 weeks post- partum can be used to assess maternal stores resulting from weight gain during pregnancy.

MUAC correlates highly with both weight and weight for height. MUAC is related to low birth weight (LBW) and late fetal and infant mortality.

Another advantage of the indicator is that the

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same cut-off value is appropriate for both pregnant and non-pregnant women, since values vary only slightly during pregnancy.

The cut-off value of 22.5 cm has not been well tested and may be inappropriate for some populations and programs (i.e., it may identify too many or too few beneficiaries for a program). Studies have shown a range of cut-offs between 21.0 and 23.5 cm, as seen in the following chart.

Data should be desegregated by age and reproductive status.

Table 7: International comparisons: Mean upper arm circumference (cm), and percentage of women below cut-off point

Country Group	Number of Studies	Mean (cm)	% ≤ 22.5 cm
Sub-Saharan Africa	12	25.9	13.3
Near East/N. Africa	2	23.7	39.0
South Asia	17	22.4	54.3
South East Asia	6	22.9	35.5
Middle America	2	25.4	12.2
South America	2	26.1	10.1
US (NHANES)	Na	29.4	Na

Indicator

PERCENTAGE OF WOMEN OF LOW HEIGHT

DEFINITION

Percent of women aged 15-49 with heights of less than 145 cm (low stature, height deficit, stunting).

Illustrative Computation

$$\frac{\text{Number of women with heights} < 145\text{ cm}}{\text{Total number of women sampled}} \times 100$$

DATA REQUIREMENTS

Heights of women aged 15-49.

DATA SOURCE(S)

Population based surveys or surveillance. (This information may also be collected at the clinic level, but it is not used for the purpose of monitoring programs).

Note: A single height measurement taken any time after age 18 (once linear growth has ceased) can be used as a lifetime indicator of reproductive risk. This value could be recorded any time the woman comes into a clinic on a home based or clinic based record and sampled from at a later date.

PURPOSE AND ISSUES

Low height is a risk factor for obstetrical complications, particularly cephalopelvic disproportion (CPD), prolonged labor or delivery by operative means such as C section, symphysiotomy or embryotomy. A recent WHO Meta-Analysis found that height was best anthropometric predictor for assisted delivery.

Height has been used in many countries to screen for risk of poor pregnancy outcomes such as LBW, perinatal, neonatal and infant mortality and lactation duration. Height is independently related to infant outcomes of pregnancy in most developing country studies. US data suggests that height does not have an independent effect on infant among well-nourished populations.

The ACC/SCN chose the cutoff point of 145 cm since this value is most widely used to indicate obstetric risk and is most reported in the literature.

Data can be compared to other countries in the same region and across regions. In developing countries, Asian women are the most stunted and African women the least. In comparison with other anthropometric indicators, the overall proportions of stunted women is lower than underweight or thin women.

Height is a good indicator of long term changes in nutritional status and is less useful for showing short term effects of interventions. Adolescents may be the exception. Research in Nigeria suggests that height may be increased during pregnancy in adolescents through food supplementation and anti-malarials. More data on the impact of nutritional intervention on adolescent growth is needed to confirm this finding.

Low height cutoffs are appropriate to both pregnant and non-pregnant women, because

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in general, values do not change during pregnancy. As more research accumulates, cut-points for adolescents might need to be adjusted. "Although growth begins slowing for girls by the age of approximately 14, linear growth particularly of the long bones is not complete until the age of 18 and peak bone mass is not achieved until the age of 25" (FNB/NAS/NRC, 1989 in ACC/SCN, 1992). This is important for pregnancy risk because the birth canal does not reach mature size until about 2-3 years after completion of height growth (Harrison, 1985).

Table 8: International comparisons: Percentage of women of reproductive age below the cut-off point for height (cm)

Country Group	Number of Studies	Mean (cm)	% <145 cm
Sub-Saharan Africa	33	157.9	2.3
Near East/N. Africa	4	157.0	4.7
South Asia	32	151.0	15.7
South East Asia	13	149.8	17.1
Middle America	14	153.6	15.3
South America	8	152.4	11.1
China	8	157.6	1.5
European		161	<1
US (NCHS)	Na	163.7	Na

Indicator

PERCENTAGE OF WOMEN OF LOW WEIGHT

DEFINITION

Percent of non-pregnant, non-lactating women aged 15-49 weighing less than 45 kg (ACC/SCN cutoff, 1993).

Illustrative Computation

$$\frac{\text{Number of non-pregnant, non-lactating women with weights < 45 kg}}{\text{Total number of women sampled}} \times 100$$

DATA REQUIREMENTS

Weights of non-pregnant, non-lactating women aged 15-49.

DATA SOURCE(S)

In general, population based surveys or community surveillance.

It is also convenient to weigh women when they accompany a child for growth monitoring, immunizations, curative care, supplementary feeding, or when she receives family plan planning information or services. These strategies will be less useful for nulliparous women. This weight (and the date it is taken and reproductive health status of the woman) could be recorded on home-based or clinic based maternal records and sampled from at a later date.

PURPOSE AND ISSUES

Prepregnancy weight is related to birth weight and infant mortality. Although pre- pregnancy weight and weight gain in pregnancy are related, prepregnancy weight has an independent effect on infant birth weight and other factors. A WHO meta-analysis showed that prepregnancy weight was one of the best indicators for predicting low birth weight (LBW), intrauterine growth retardation (IUGR), full term IUGR, and prematurity compared to attained weight at gestational months 5, 7 and 9, height, mean upper arm circumference, body mass index at the same times or weight gain for various stages of pregnancy. The relationship of prepregnancy weight to maternal outcomes of pregnancy such as assisted delivery, preeclampsia and post-partum hemorrhage, was relatively weak in the WHO meta-analysis. Its relation to other maternal outcomes of pregnancy and beyond has not be adequately assessed. Women with very low nonpregnant weights need large gestational weight gains (12.5-18 kg) to significantly lower their risk of poor pregnancy outcomes. Such gains may be unrealistic for women in developing countries given the short time period available (9 months, or the 4-5 months of acknowledged pregnancy in many cases). Numerous food supplementation studies show that the positive effect of energy supplementation on infant birth weight is restricted to, or is greater in women, who have low non-pregnant weights or weight for height. Thus, increasing women's nonpregnant weights may be an appropriate strategy to improve infant outcomes of pregnancy, while at the same time improving women's own nutritional status.

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The cut-off point established by ACC/SCN (1993) is <45 kg. Weight may fluctuate over time due to season, age, parity, lactational status (whether the woman is lactating and the length of lactation), length of time postpartum, etc.

The usefulness of weight for assessing the nutritional status of women is normally improved if height is taken into account, except in populations where there is little variation in height, or where women of very low or very high weight for height are not represented in sufficient numbers.

A lower cut-off point of 40 kg is the most commonly cited figure in the developing country literature (India, Bangladesh, Indonesia, Colombia) for populations with an average height of < 150 cm. Only 1% of US women weigh less than 40 kg.

Data from the population studied can be compared to regional means or to other regions:

Table 9: International comparisons of mean weight (kg) among non-pregnant, non-lactating women of childbearing age, and percentage below established cut-off point

Country Group	Number of Studies	Mean (kg)	% <45 kg
Sub-Saharan Africa	12	51.4	20.6
Near East/N. Africa	4	59.2	6.2
South Asia	19	42.9	61.8
South East Asia	8	46.2	44.0
Middle America	8	53.0	20.1
South America	2	57.5	10.3
China	6	51.2	18.5
US (NCHS)	Na	56.6	Na

Indicator

PERCENTAGE OF MALNOURISHED WOMEN, BASED ON BODY MASS INDEX (BMI)

DEFINITION

Low Body Mass Index (BMI) is the ratio of weight to height; it measures "thinness." The standard cut-point for non-pregnant, non-lactating women aged 15-49 is a BMI 18.5. This cut-off value has been determined by the International Dietary Energy Consultative Group as suggestive of chronic energy deficiency (CED). Further refinements in levels of CED are: Grade I for BMIs of 17-18.4, Grade II for values of 16-16.9 and Grade III for values < 16 (James, et al., 1988).

Illustrative Computation

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}$$

$$\text{Percent of women with low BMI} = \frac{\text{\# of women with BMI} < 18.5}{\text{Total \# of women sampled}} \times 100$$

DATA REQUIREMENTS

Weights and heights of non-pregnant, non-lactating women.

Women can also have weight and height measured at 4-6 weeks postpartum and a BMI calculated to determine maternal stores resulting from weight gain in pregnancy. This indicator can be used to assess nutritional outcomes of pregnancy for women. Arm circumference can serve the same purpose (see arm circumference indicator, p. 65).

DATA SOURCE(S)

Population-based surveys or surveillance systems.

PURPOSE AND ISSUES

BMI is a well accepted measure of energy deficiency among women. The advantage of BMI over weight for height as a measure of thinness is that it requires no reference tables for interpretation. However, it may not be a practical tool for field workers in service delivery programs because of the mathematical calculations required. BMI cut-points for non-pregnant, non-lactating women are presented below.

BMI also is commonly used to identify women who need to gain more weight during pregnancy in order to improve infant outcomes of pregnancy (low birth weight, intrauterine growth retardation, and perinatal mortality). It is also used to monitor women during pregnancy. A WHO meta-analysis found that prepregnancy BMI was a good predictor of preterm delivery, but not as good as weight alone or weight gain from gestational months 5-7. BMI was less useful in predicting low birth weight than prepregnancy weight or attained weight at 5, 7 or 9 months gestation. It was not related to the maternal outcomes studied (assisted delivery and pre-eclampsia). Several researchers have shown that low maternal BMI during pregnancy is associated with negative postpartum outcomes such as lower breastmilk output (quantity) and underweight children.

Appropriate BMI cut-off values for pregnant and lactating women need to be established.

Prepared by Katherine Krasovec, Wellstart International.

The lactation norms should take into account length of time postpartum, since most women lose weight over time postpartum.

Table: 10: International comparisons of mean body mass index for non-pregnant, non-lactating women, and percentage below standard cut-off point

Country Group	Number of Studies	Mean	% BMI < 18.5
Sub-Saharan Africa	8	20.5	22.4
Near East/N. Africa	2	27.0	3.7
South Asia	11	19.2	41.1
South East Asia	4	19.8	40.5
Middle America	8	22.4	14.6
South America	2	24.7	7.2
China	1	21.0	18.7
US (NCHS)	Na	21.1	Na

The functional consequences of BMI at different heights remain unknown and this is an important area for further research.

References and Appendices

- References
- Appendix A: Members of the Subcommittee on Women's Nutrition
- Appendix B: Steering Committee of the RHIWG

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Appendix A

MEMBERS OF THE SUBCOMMITTEE ON WOMEN'S NUTRITION

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Appendix B

STEERING COMMITTEE OF THE RHIWG

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