Madagascar 2003

Nutrition of Young Children and Mothers

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NUTRITION OF YOUNG CHILDREN AND MOTHERS IN MADAGASCAR

Findings from the 2003-2004 Madagascar Demographic and Health Survey

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Introduction

Malnutrition[1] is one of the most important health and welfare problems among infants and young children in Madagascar. It is a result of both inadequate food intake and illness. Inadequate food intake is a consequence of insufficient food being available at the household level, improper feeding practices, or both. Improper feeding practices include both the quality and quantity of foods offered to young children as well as the timing of their introduction. Poor sanitation puts young children at increased risk of illness (in particular, diarrheal disease), which adversely affects their nutritional status. Both inadequate food intake and poor environmental sanitation reflect underlying social and economic conditions.

Malnutrition has significant health and economic consequences, the most serious of which is an increased risk of death. Other outcomes include an increased risk of illness and a lower level of cognitive development, which results in lower educational attainment. In adulthood, the accumulated effects of long-term malnutrition can be a reduction in workers' productivity and increased absenteeism in the workplace; these may reduce a person's lifetime earning potential and ability to contribute to the national economy. Furthermore, malnutrition can result in adverse pregnancy outcomes.

The data presented here are from the 2003-2004 Madagascar Demographic and Health Survey (EDSMD-III), a nationally representative survey of 8,420 households, conducted by Institut National de la Statistique (INSTAT), Ministère de l'Économie, des Finances et du Budget, Antananarivo, Madagascar. ORC Macro furnished the technical assistance to the survey as part of the MEASURE DHS program, while funding was provided by INSTAT, ORC Macro, the World Bank, the U.S. Agency for International Development (USAID), the United Nations Population Fund (UNFPA), and the United Nations Children's Fund (UNICEF).

Of the 6,284 children age 0-59 months who were part of the study, there were 5,013 who were alive, whose mothers were interviewed, and who had complete anthropometric data. All nutritional analysis includes these children unless otherwise noted. Nutritional data collected on these children include height, weight, age, breastfeeding history, and feeding patterns. Information was also collected on the prevalence of diarrhea and acute respiratory infection (ARI) in the two weeks preceding the survey and on relevant sociodemographic characteristics. For comparison, data are presented from Demographic and Health Surveys conducted in other sub-Saharan countries.

[1] The technical method of identifying a *malnourished* population as defined by the U.S. National Center for Health Statistics (NCHS), the Centers for Disease Control and Prevention (CDC), and the World Health Organization (WHO) is presented in Appendix 2.

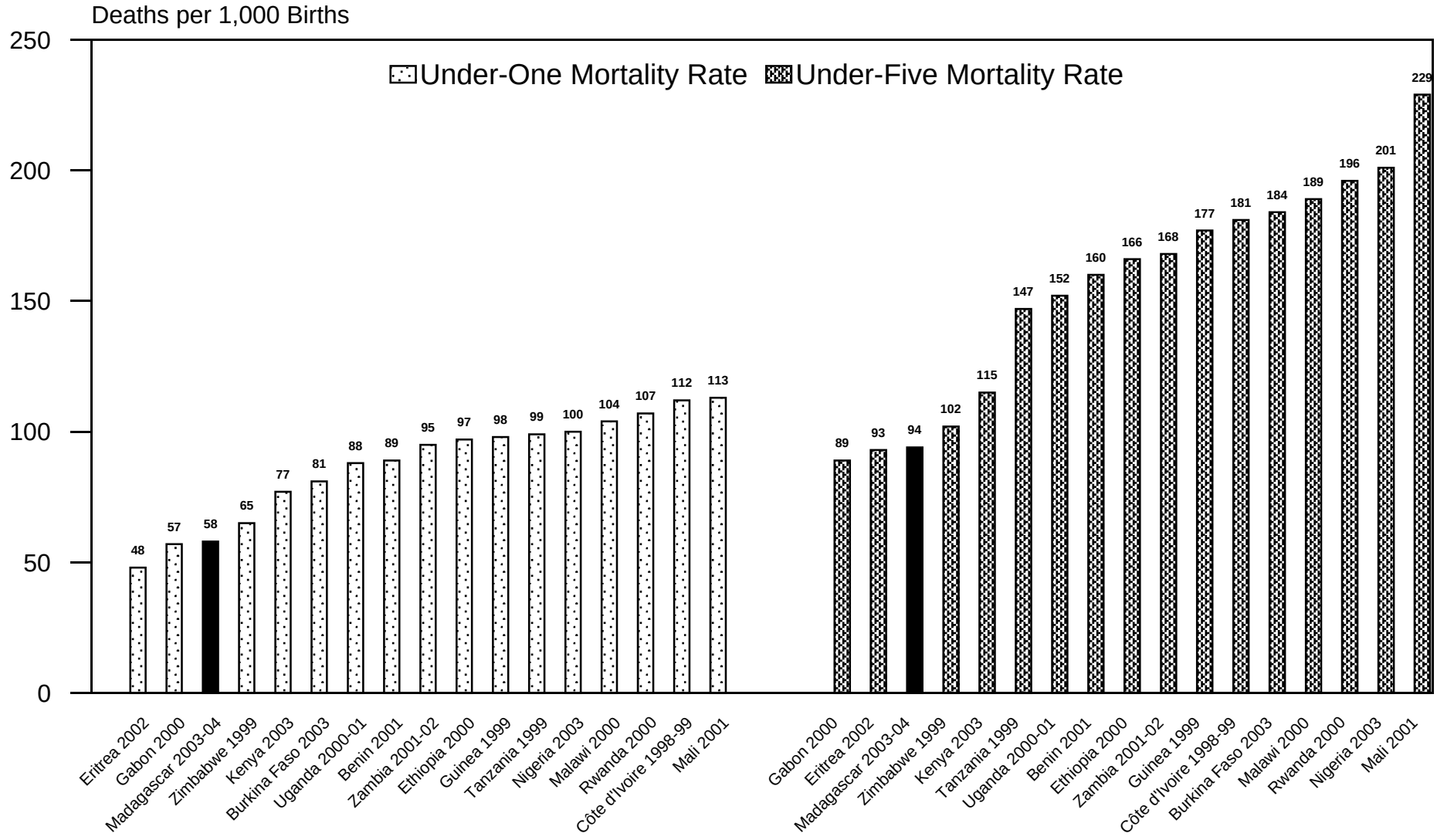
Figure 1: Infant and Child Mortality, Madagascar Compared with Other Sub-Saharan Countries

Malnutrition compromises child health, making children susceptible to illness and death. Infectious diseases, such as acute respiratory infections, diarrhea, and malaria, account for the greatest proportion of infant and under-five mortality. The infant mortality rate (under-one rate) is a commonly used measure of infant health and is a sensitive indicator of the socioeconomic conditions of a country. The under-five mortality rate is another informative indicator of infant and child survival.

- **Madagascar's under-one mortality rate (58 deaths per 1,000 births) indicates that 6 percent of children born in Madagascar will die before their first birthday.** This rate is among the lowest of the sub-Saharan countries surveyed.

- **Madagascar's under-five mortality rate (94 deaths per 1,000 births) indicates that 9 percent of children born in Madagascar will die before their fifth birthday.** This rate is near the lower end of the range of sub-Saharan countries surveyed.

Figure 1
Infant and Child Mortality, Madagascar Compared with Other Sub-Saharan Countries



Source: DHS surveys 1999-2004

Figure 2: Contribution of Undernutrition to Under-Five Mortality, Madagascar

Undernutrition is an important factor in the death of many young children. Even if a child is only mildly malnourished, the mortality risk is increased. Under-five mortality in developing countries is largely a result of infectious diseases and neonatal death. Respiratory infections, diarrhea, malaria, and measles particularly take their toll on these children.

Formulas developed by Pelletier et al.[1] are used to quantify the contributions of moderate and severe malnutrition to under-five mortality.

In Madagascar—

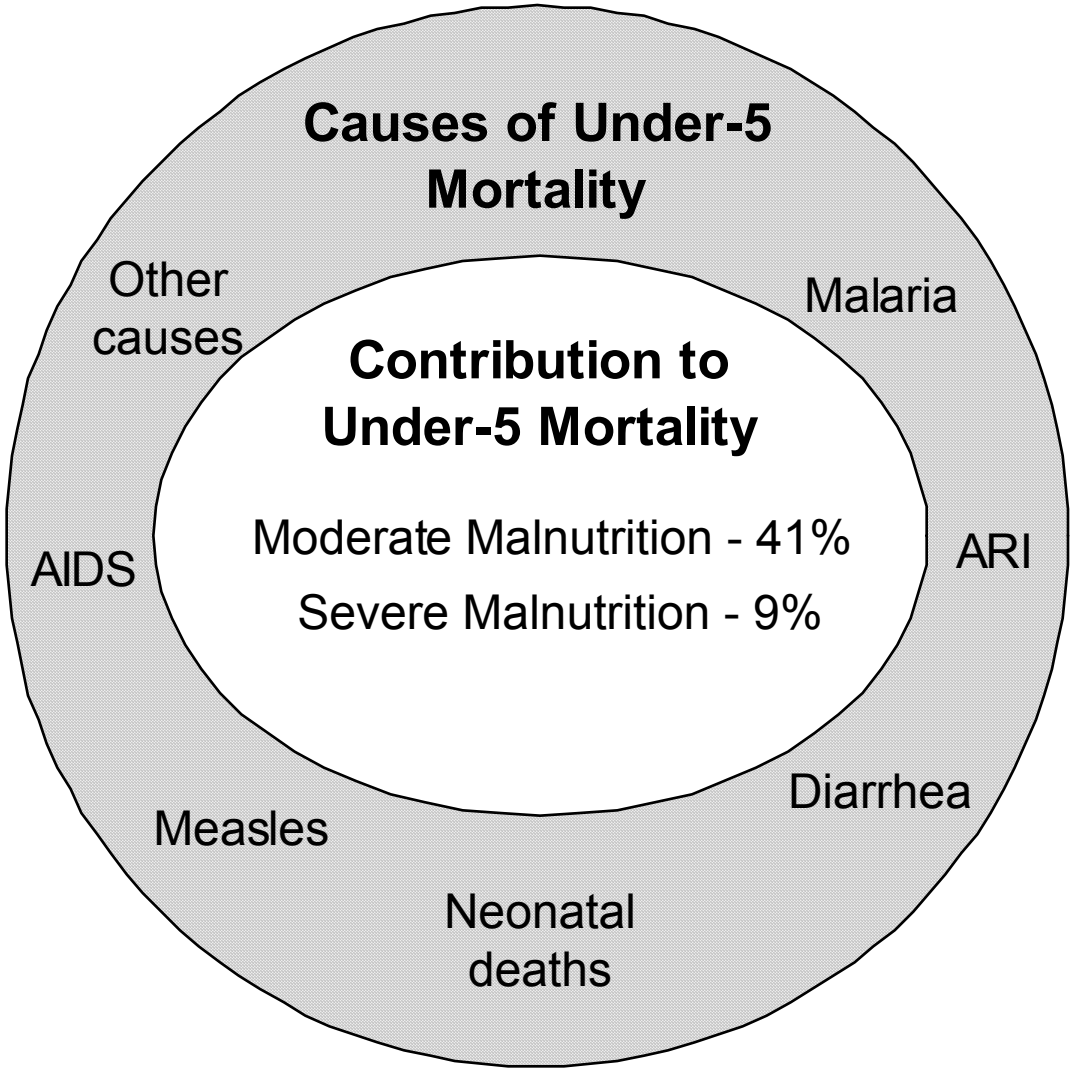
- **Fifty percent of all deaths that occur before age five are related to malnutrition (severe and moderate malnutrition).**

- Because of its extensive prevalence, **moderate malnutrition (41 percent) contributes to more deaths than severe malnutrition (9 percent).**

- **Moderate malnutrition is implicated in 82 percent of deaths associated with malnutrition.**

[1] Pelletier, D.L., E.A. Frongillo, Jr., D.G. Schroeder, and J.P. Habicht. 1994. A methodology for estimating the contribution of malnutrition to child mortality in developing countries. *Journal of Nutrition* 124(10 Suppl.): 2106S-2122S.

Figure 2
Contribution of Undernutrition to Under-Five Mortality, Madagascar



Note: Calculation is based on formulas by Pelletier et al. (1994).

Source: EDSMD-III 2003-2004

Figure 3: Survival and Nutritional Status of Children, Madagascar

Malnutrition and mortality both take a tremendous toll on young children. This figure illustrates the proportion of children who have died or are undernourished at each month of age.

In Madagascar—

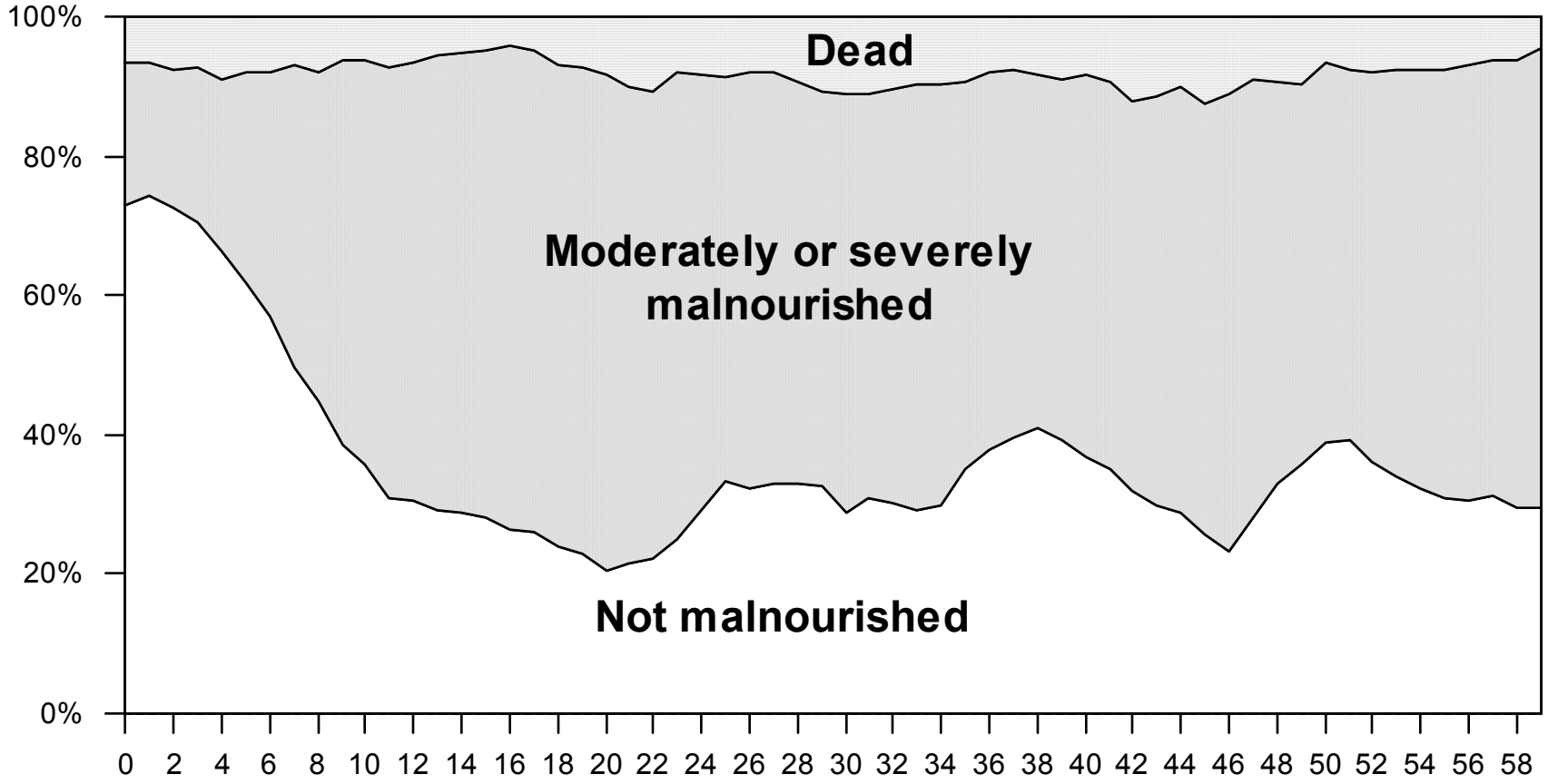
- **Between birth and 20 months of age, the percentage of children who are alive and not malnourished drops rapidly from 74 to 20 percent.** The rate rises to 41 percent at 38 months, fluctuates between 20 and 40 percent thereafter, and levels off at 30 percent by 59 months.

- **Between birth and 20 months of age, the percentage of children who are moderately or severely malnourished[1] increases from 15 to 70 percent.** This percentage then varies between 55 and 65 percent through 59 months.

- **From birth until 20 months of age, the percentage of children who have died increases from 7 to 10 percent**. The mortality rate goes up to 12 percent at 42 months and then gradually declines to 5 percent by 59 months.

[1] A child with a Z-score below minus three standard deviations (-3 SD) on the reference standard is considered severely malnourished, while one with a Z-score between -2 SD and -3 SD is considered moderately malnourished.

Figure 3
Survival and Nutritional Status of Children, Madagascar



Note: A child with a Z-score below -3 SD on the reference standard is considered severely malnourished (stunted, wasted, or underweight), while a child with a Z-score between -3 SD and -2 SD is considered moderately malnourished. Values have been smoothed using a five-month moving average.

Source: EDSMD-III 2003-2004

Malnutrition in Madagascar

Figure 4: Malnutrition among Children under Five Years, Madagascar

In Madagascar—

- **Forty-seven percent of children age 0-59 months are chronically malnourished.** In other words, they are too short for their age, or ***stunted.***[1] The proportion of children who are stunted is almost 24 times the level expected in a healthy, well-nourished population.

- **Acute malnutrition,** manifested by ***wasting,***[2] results in a child being too thin for his or her height. **It affects 13 percent of children,** which is more than 6 times the level expected in a healthy population.

- **Forty-one percent of children under five years are *underweight***[3] for their age. This is about 21 times the level expected in a healthy, well-nourished population.

- **Four percent of children under five are *overweight.***[4] This is twice what is expected in a healthy, well-nourished population.

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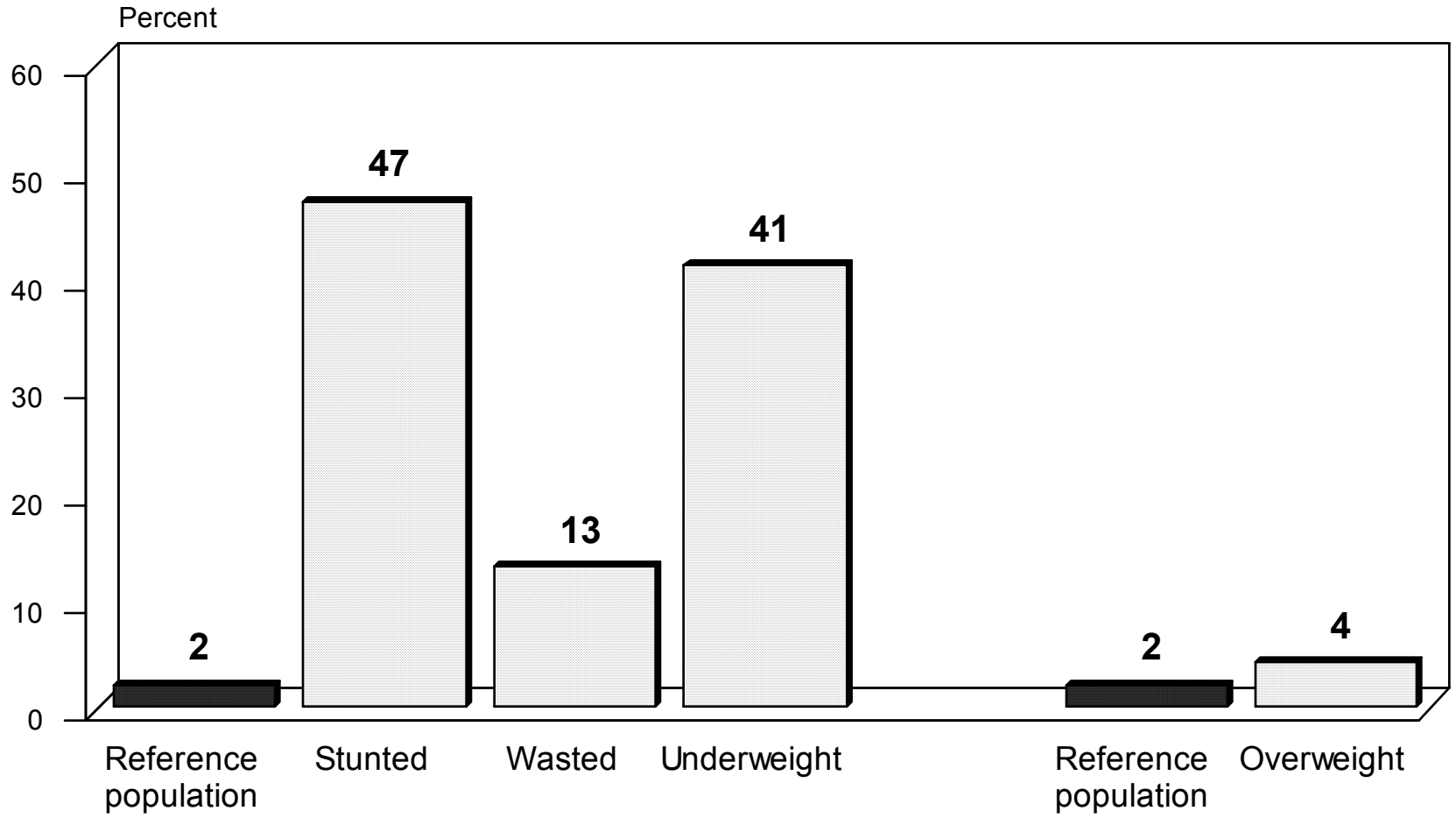
[1] A stunted child has a height-for-age Z-score that is below -2 SD based on the NCHS/CDC/WHO reference population. Chronic malnutrition is the result of an inadequate intake of food over a long period and may be exacerbated by chronic illness.

[2] A wasted child has a weight-for-height Z-score that is below -2 SD based on the NCHS/CDC/WHO reference population. Acute malnutrition is the result of a recent failure to receive adequate nutrition and may be affected by acute illness, especially diarrhea.

[3] An underweight child has a weight-for-age Z-score that is below -2 SD based on the NCHS/CDC/WHO reference population. This condition can result from either chronic or acute malnutrition or a combination of both.

[4] An overweight child has a weight-for-height Z-score that is above +2 SD based on the NCHS/CDC/WHO reference population.

Figure 4
Malnutrition among Children under Five Years, Madagascar



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition; *underweight* reflects chronic or acute malnutrition or a combination of both.

Source: EDSMD-III 2003-2004

Figure 5: Changes in Undernutrition Rates among Children under Five Years, Madagascar 1992, 1997, and 2003-2004

The findings of the EDSMD-III 2003-2004 suggest that the nutritional status of children in Madagascar has changed since the two previous surveys (ENDS 1992 and EDS 1997).[1]

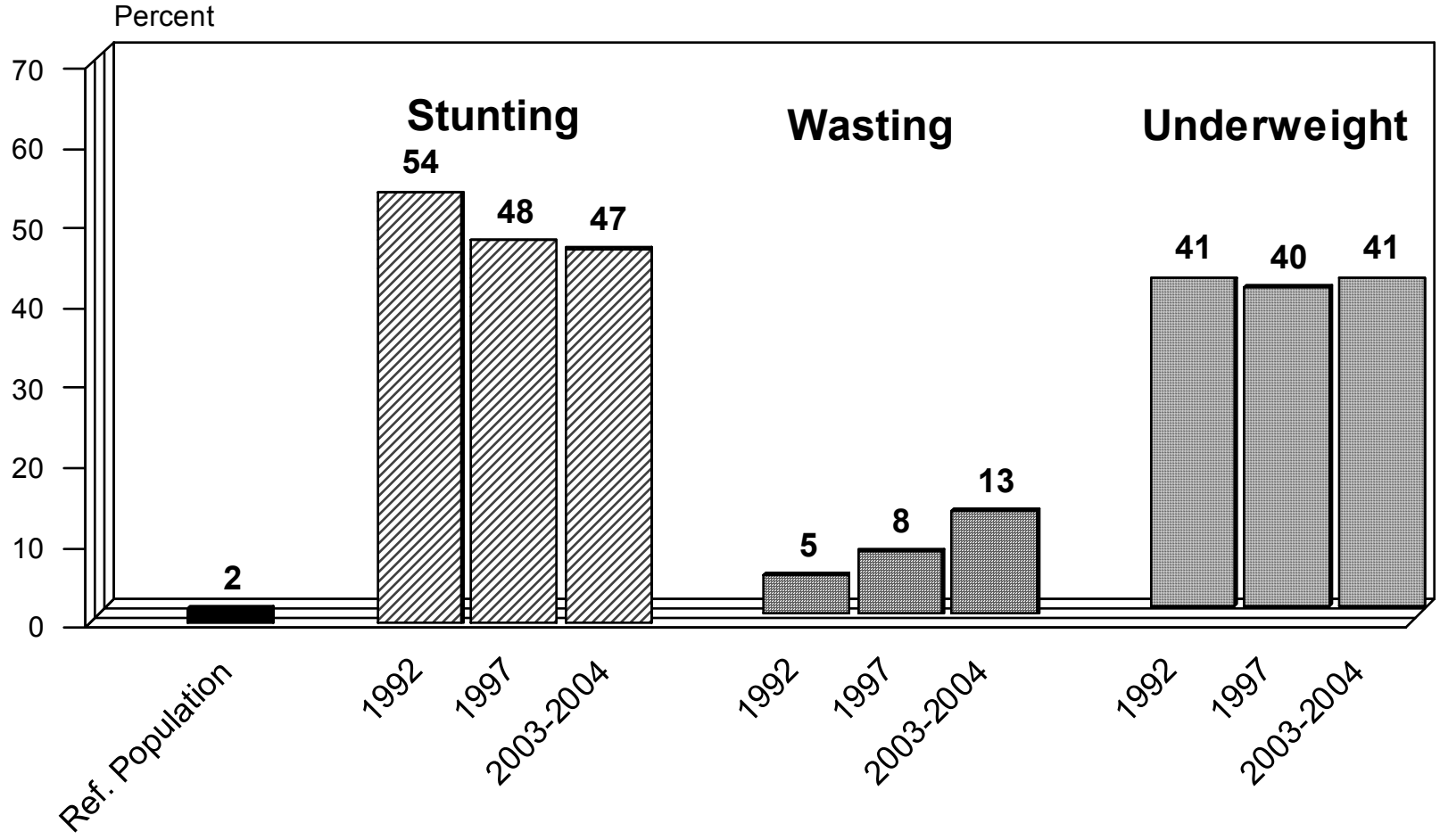
- Compared with 1992, **chronic malnutrition (stunting) in 1997 and 2003 went down by 6 and 7 percentage points, respectively.** The decrease of 1 percentage point in the rate of stunting between 1997 and 2003 is not statistically significant.

- Compared with 1992, **there was an increase in acute malnutrition (wasting) in 1997 and 2003 by 8 and 13 percentage points, respectively.** However, because of the seasonality of wasting, meaningful interpretation of these increases cannot be made.

- The rate of underweight has remained unchanged since 1992 (41 percent).

[1] *Enquête Nationale Démographique et Sanitaire 1992* and *Enquête Démographique et de Santé 1997*

Figure 5
Changes in Undernutrition Rates among Children under Five Years, Madagascar 1992, 1997, and 2003-2004



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition; *underweight* reflects chronic or acute malnutrition or a combination of both.

Source: ENDS 1992, EDS 1997, and EDSMD-III 2003-2004

Figure 6: Stunting, Wasting, and Underweight by Age, Madagascar

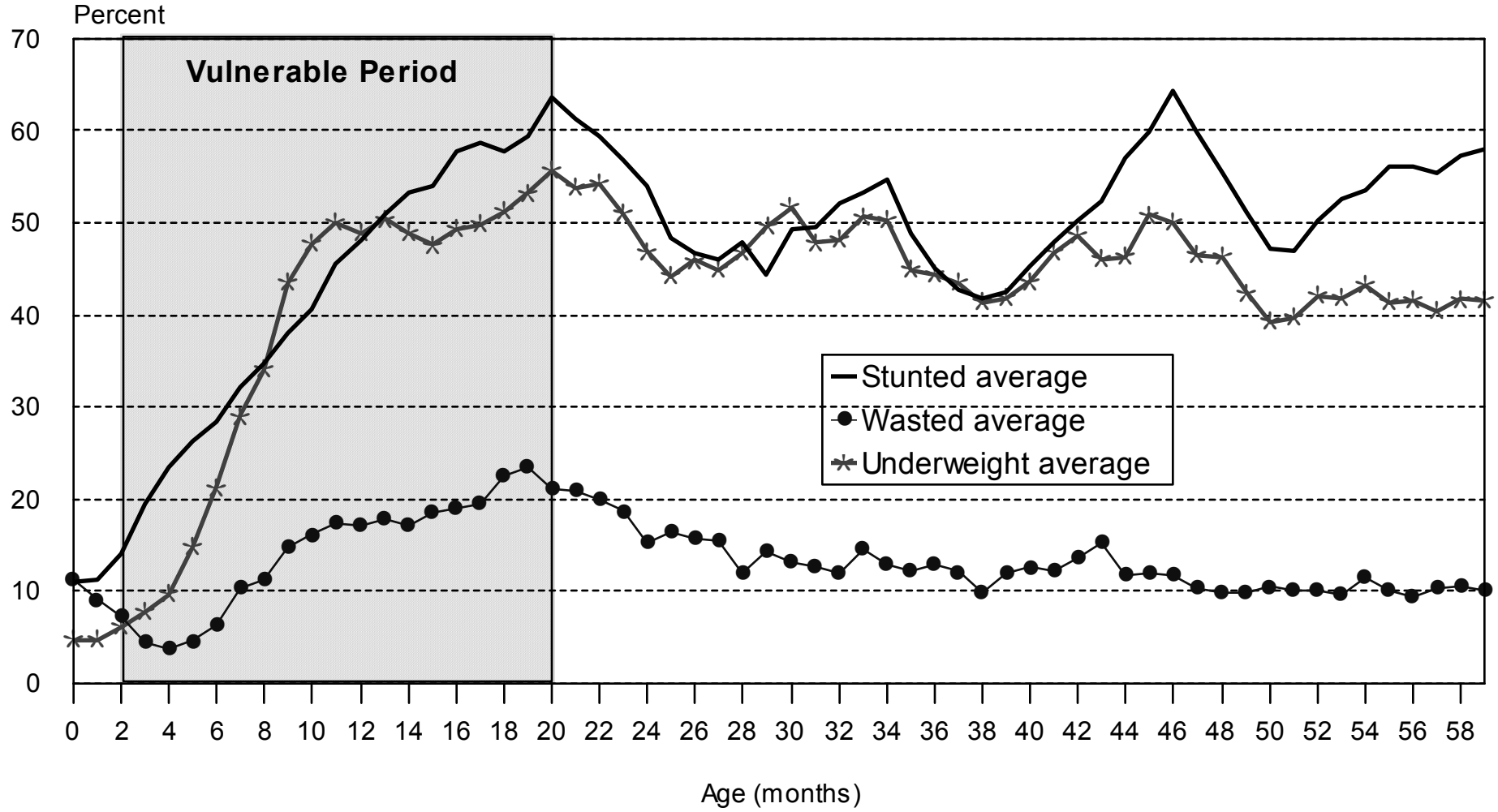
In Madagascar, the time between 2 and 20 months of age is a vulnerable period.

- **The proportion of children stunted rises sharply between 2 and 20 months of age, peaking at 64 percent.** The proportion drops to 44 percent at 29 months, goes up again to 64 percent at 46 months, and then drops and rises to 58 percent by 59 months.

- **The proportion of children wasted rises between 4 and 19 months of age, when it peaks at 23 percent.** Then it gradually declines to 10 percent at 47 months and remains about the same through 59 months.

- **The proportion of children underweight rises sharply to 55 percent at 20 months.** Thereafter, the proportion varies between 40 and 50 percent through 59 months.

Figure 6
Stunting, Wasting, and Underweight by Age, Madagascar



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition; *underweight* reflects chronic or acute malnutrition or a combination of both. Plotted values are smoothed by a five-month moving average.

Source: EDSMD-III 2003-2004

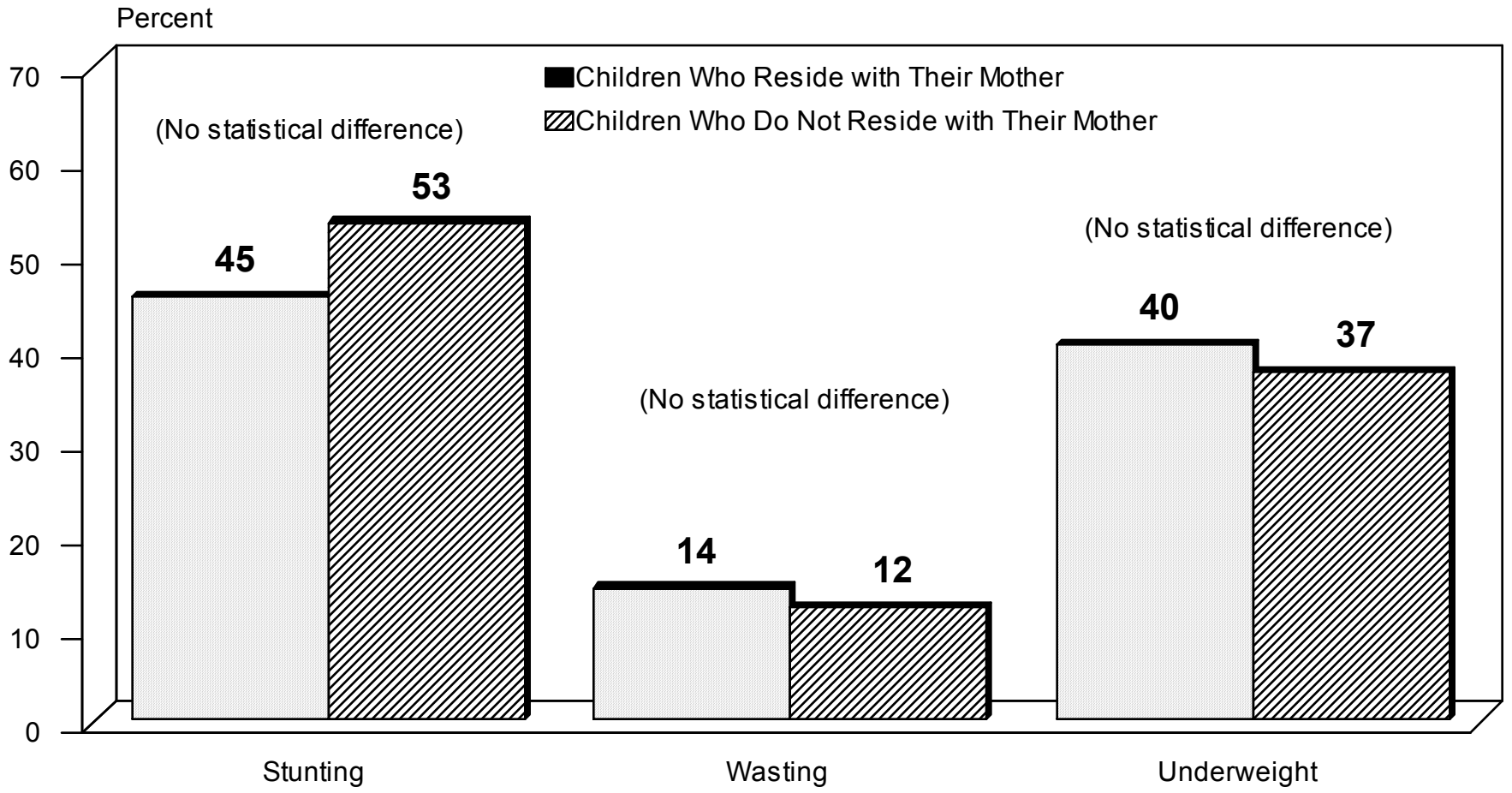
Figure 7: Undernutrition among Children under Five Years Who Do Not Reside with Their Mother, Madagascar

Previously, anthropometric data from Demographic and Health Surveys excluded children whose mother did not live in the household or was not present to be interviewed. Currently, all children in the household are measured, regardless of their mother's residence status. In the EDSMD-III 2003-2004, 120 children under five years were included in the survey even though they did not reside with their mother.

In Madagascar—

- **No statistical relationship was found between malnutrition rates and whether or not children resided with their mother.**

Figure 7
Undernutrition among Children under Five Years Who Do Not Reside with Their Mother, Madagascar



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition; *underweight* reflects chronic or acute malnutrition or a combination of both.

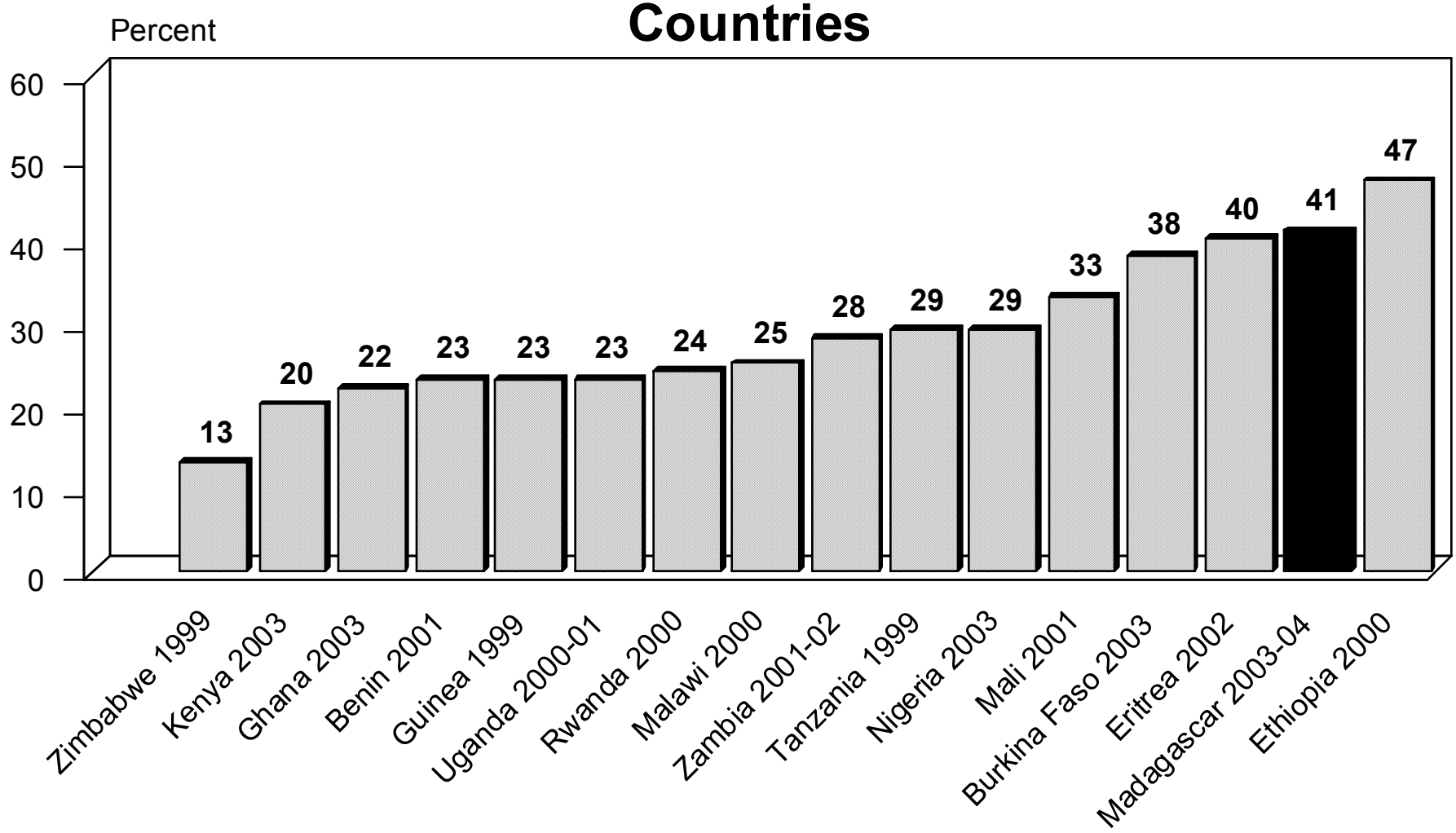
Source: EDSMD-III 2003-2004

Figure 8: Underweight among Children under Five Years, Madagascar Compared with Other Sub-Saharan Countries

Among the sub-Saharan countries surveyed—

- The percentage of children **under five years** who are *underweight* ranges from 13 to 47 percent. **With 41 percent of children under five years of age underweight, Madagascar is second highest among the sub-Saharan countries surveyed.** Underweight status is indicative of children who suffer from chronic or acute malnutrition or a combination of both, and it may be influenced by both short- and long-term determinants of malnutrition. Underweight is often used as a general indicator of a population's health status.

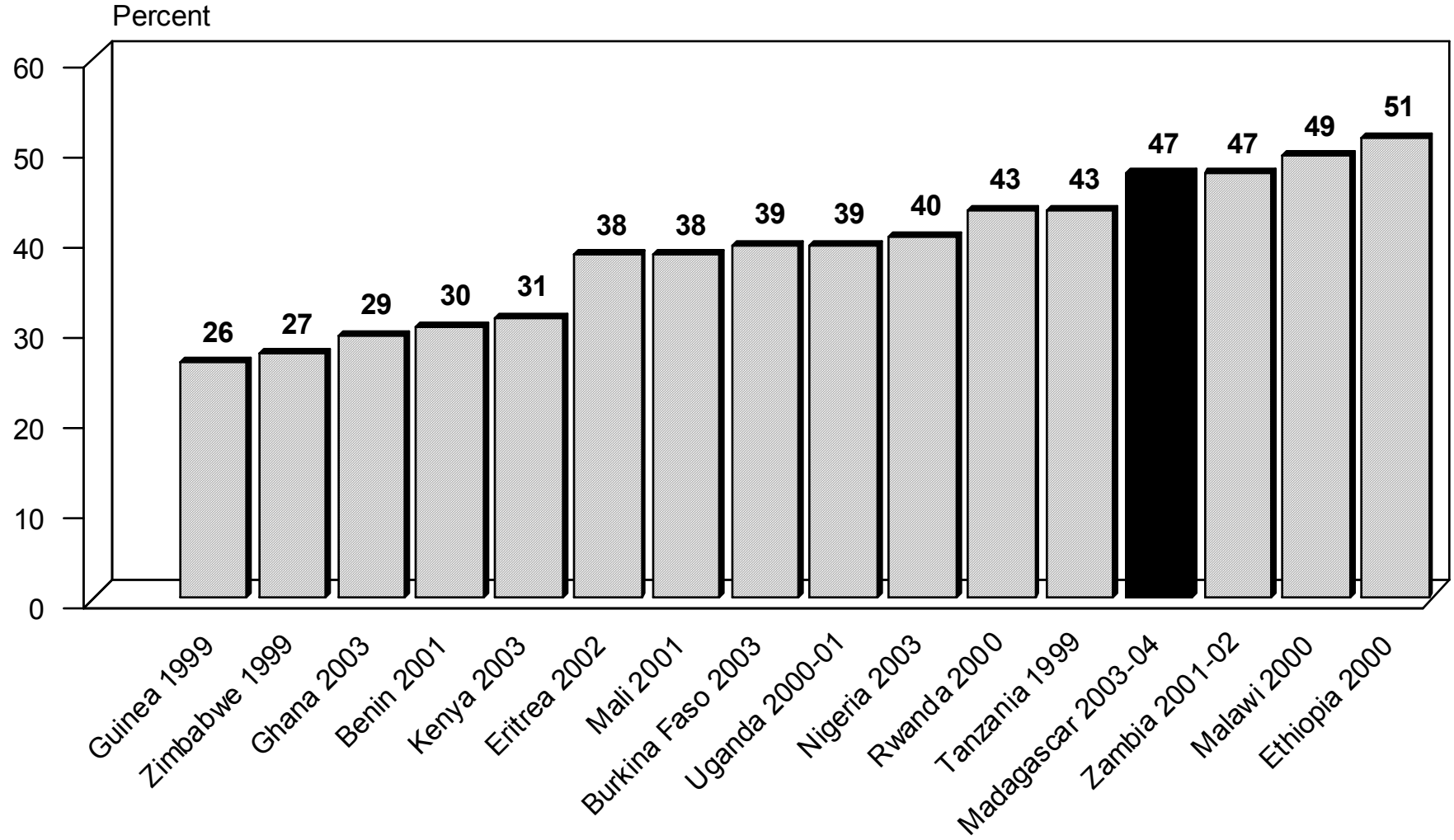
Figure 8
Underweight among Children under Five Years, Madagascar Compared with Other Sub-Saharan Countries



Note: *Underweight* reflects chronic or acute malnutrition or a combination of both.

Source: DHS surveys 1999-2004

Figure 9
Stunting among Children under Five Years, Madagascar Compared with Other Sub-Saharan Countries



Note: *Stunting* reflects chronic malnutrition.

Source: DHS surveys 1999-2004

Conceptual Framework for Nutritional Status

Nutrition is directly related to food intake and infectious diseases, such as diarrhea, acute respiratory infection, malaria, and measles. Both food intake and infectious diseases reflect underlying social and economic conditions at the household, community, and national levels, which are supported by political, economic, and ideological structures within a country.

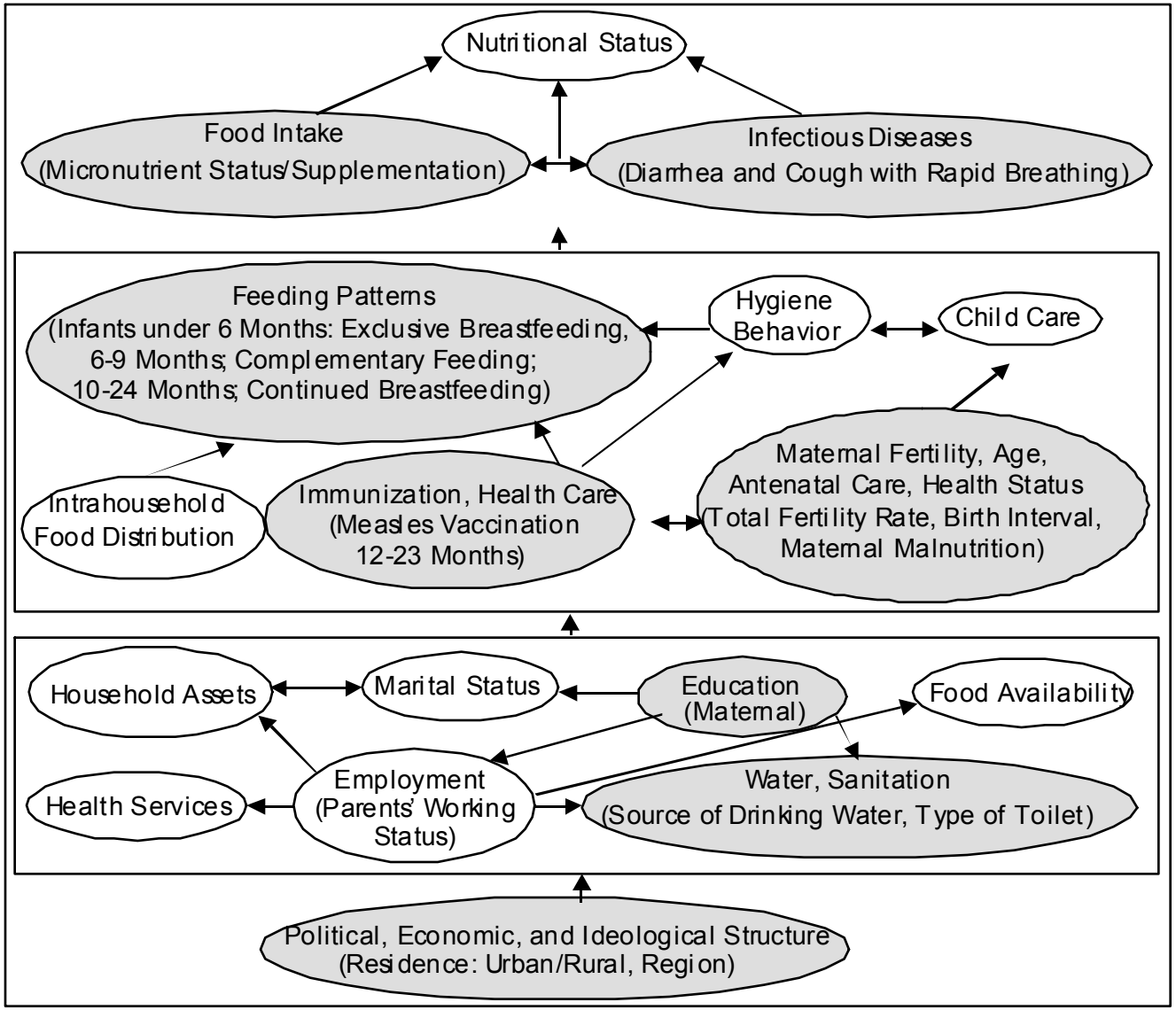
The following diagram is a conceptual framework for nutrition adapted from UNICEF.[1] It reflects relationships among factors and their influences on children's nutritional status. Although political, socioeconomic, environmental, and cultural factors (at the national and community levels) and poverty (at the household level) affect the nutritional status of women and children, the only variables included in this chartbook are those that can be collected as part of a national household survey. The highlighted areas of the framework depict selected factors.

These factors are—

- **Immediate influences,** such as food intake (micronutrient status and supplementation) and infectious diseases (diarrhea and respiratory infections)
- **Underlying biological and behavioral influences,** such as maternal fertility, measles vaccinations, and feeding patterns of children under two years
- **Underlying social and economic influences,** such as maternal education, drinking water, and sanitation
- **Basic influences,** such as area of residence.

[1] United Nations Children's Fund. 1998. *State of the World's Children, 1998*. New York: Oxford University Press.

Conceptual Framework for Nutritional Status



Adapted from: UNICEF,
State of the World's Children, 1998

Figure 9: Stunting among Children under Five Years, Madagascar Compared with Other Sub-Saharan Countries

Among the sub-Saharan countries surveyed—

- The percentage of children **under five years** who are *stunted* ranges from 26 to 51 percent. **With 47 percent of children under five years of age stunted, Madagascar is at the upper end of the range of the sub-Saharan countries surveyed.** Stunting is a good long-term indicator of the nutritional status of a population because it is not markedly affected by short-term factors such as season of data collection, epidemic illnesses, acute food shortages, and recent shifts in social or economic policies.

Immediate Influences of Malnutrition

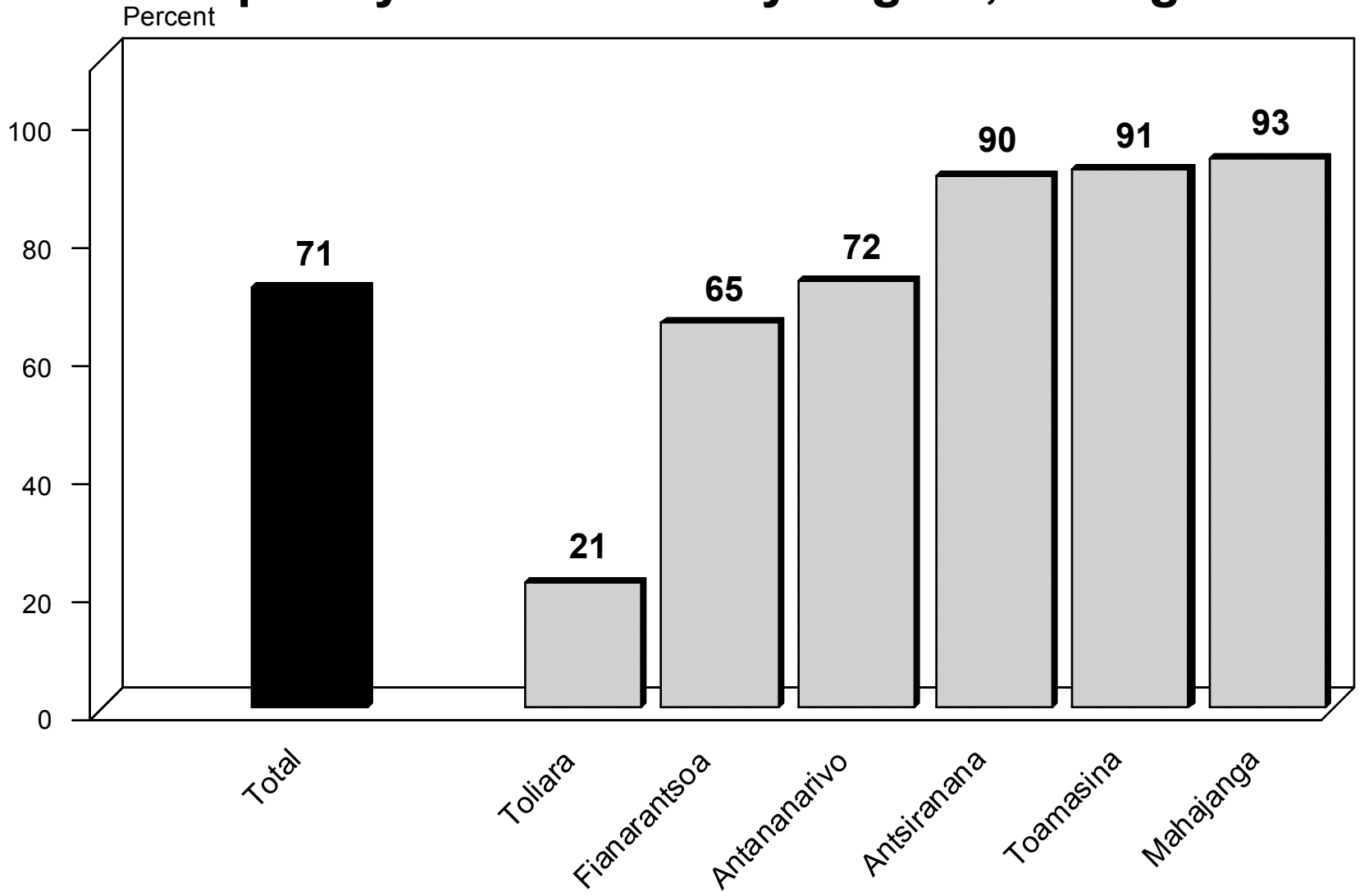
Figure 10: Children under Five Years Living in Households with Adequately Iodized Salt by Region, Madagascar

Iodine deficiency is known to cause goiter, cretinism (a severe form of neurological defect), spontaneous abortion, premature birth, infertility, stillbirth, and increased child mortality. One of the most serious consequences to child development is mental retardation caused by iodine deficiency disorder (IDD). IDD is the single most common cause of preventable mental retardation and brain damage in the world. It decreases the production of hormones vital to growth and development. Children with IDD can grow up stunted, apathetic, mentally retarded, and incapable of normal movement, speech, or hearing. IDD in pregnant women may cause miscarriage, stillbirth, and mental retardation in infants.

The remedy for IDD is relatively simple. A teaspoon of iodine is all a person requires in a lifetime. Since iodine cannot be stored for long periods by the body, tiny amounts are needed regularly. In areas of endemic iodine deficiency, where soil and therefore crops and grazing animals do not provide sufficient dietary iodine to the population, food fortification and supplementation have proven to be highly successful and sustainable interventions. The fortification of salt or oil with iodine is the most common tool used to prevent IDD. Iodized salt that is commercially packaged in plastic sacks and not stored properly can lose its concentration of iodine. Proper packaging and storage of iodized salt are essential to ensure that the population benefits from iodine fortification.

- **In Madagascar, 71 percent of children under five years live in a household that uses salt containing an adequate level of iodine (≥15 parts per million [ppm]).** Use of iodized salt is lowest in the Toliara region (21 percent) and highest in Mahajanga (93 percent).

Figure 10
Children under Five Years Living in Households with Adequately Iodized Salt by Region, Madagascar



Note: Adequately iodized salt is ≥15 ppm.

Source: EDSMD-III 2003-2004

Figure 11: Night Blindness among Mothers of Children under Five Years, Madagascar

Globally, vitamin A deficiency (VAD) is the leading cause of childhood blindness. The damage to vision (xerophthalmia) is only one of the harmful outcomes of VAD. Vitamin A is crucial for rapid growth and recovery from illness or infection. Children who are vitamin A deficient have reduced immunity and are less likely to recuperate from common childhood illnesses, such as diarrhea, ARI, and measles, and are twice as likely to die as children who are not vitamin A deficient.

A mother's vitamin A status during pregnancy can be an indicator of the vitamin A status of her child. One sign of VAD in women during pregnancy is night blindness.

- **In Madagascar, 8 percent of all women who had given birth in the past five years reported having some form of night blindness during their last pregnancy.**

- **However, 1 percent of women reported having trouble with their vision during the night but not during the day during their last pregnancy.** Although this figure corrects for women with vision problems, in general, it may slightly underestimate the rate of night blindness.

Figure 11
Night Blindness among Mothers of Children under Five Years, Madagascar

Eight percent of all women reported night blindness during their last pregnancy.

One percent of women had trouble with their vision during the night but not during the day during their last pregnancy.

Source: EDSMD-III 2003-2004

Figure 12: Vitamin A Supplementation among Mothers of Children under Five Years by Region, Madagascar

Recent studies show that pregnant women who are vitamin A deficient are at a greater risk of dying during or shortly after delivery of the child. Pregnancy and lactation strain women's nutritional status and their vitamin A stores. For women who have just given birth, vitamin A supplementation helps to bring their level of vitamin A storage back to normal, aiding recovery and helping them to avoid illness.

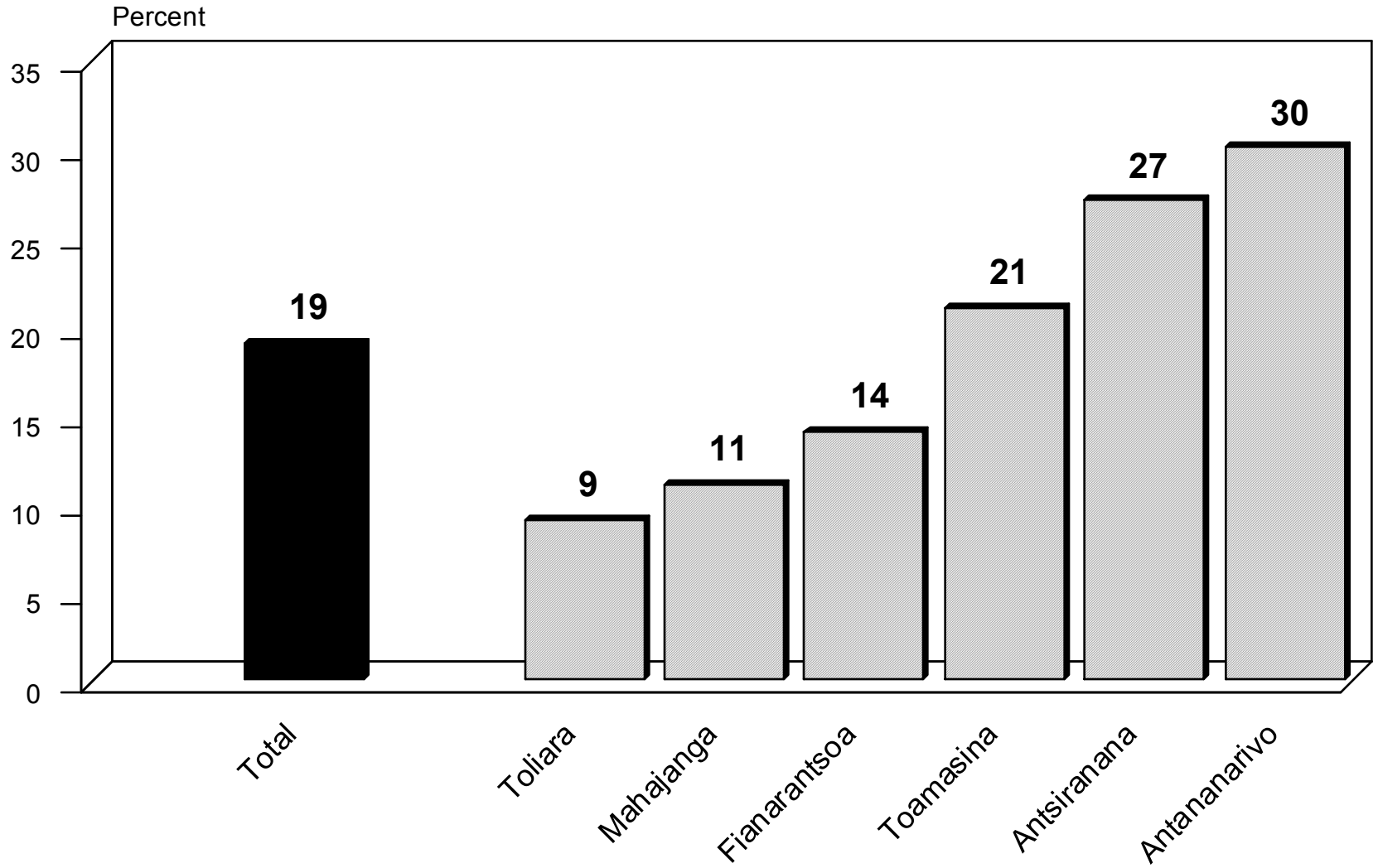
Vitamin A supplementation also benefits children who are breastfed. If mothers have vitamin A deficiency, their children can be born with low stores of vitamin A. Low birth weight babies are especially at risk. Additionally, infants often do not receive an adequate amount of vitamin A from breast milk when mothers are vitamin A deficient. Therefore, supplementation is important for postpartum women within the first eight weeks after childbirth.

In Madagascar—

- **Ninteen percent of mothers received vitamin A supplements within two months after delivery.**

- **Vitamin A supplementation of mothers varies by region.** Only 9 percent of mothers in the Toliara region received vitamin A, while 30 percent in Antananarivo did.

Figure 12
Vitamin A Supplementation among Mothers of Children under Five Years by Region, Madagascar



Source: EDSMD-III 2003-2004

Figure 13: Vitamin A Supplementation among Children Age 6-59 Months in the Past Six Months by Region, Madagascar

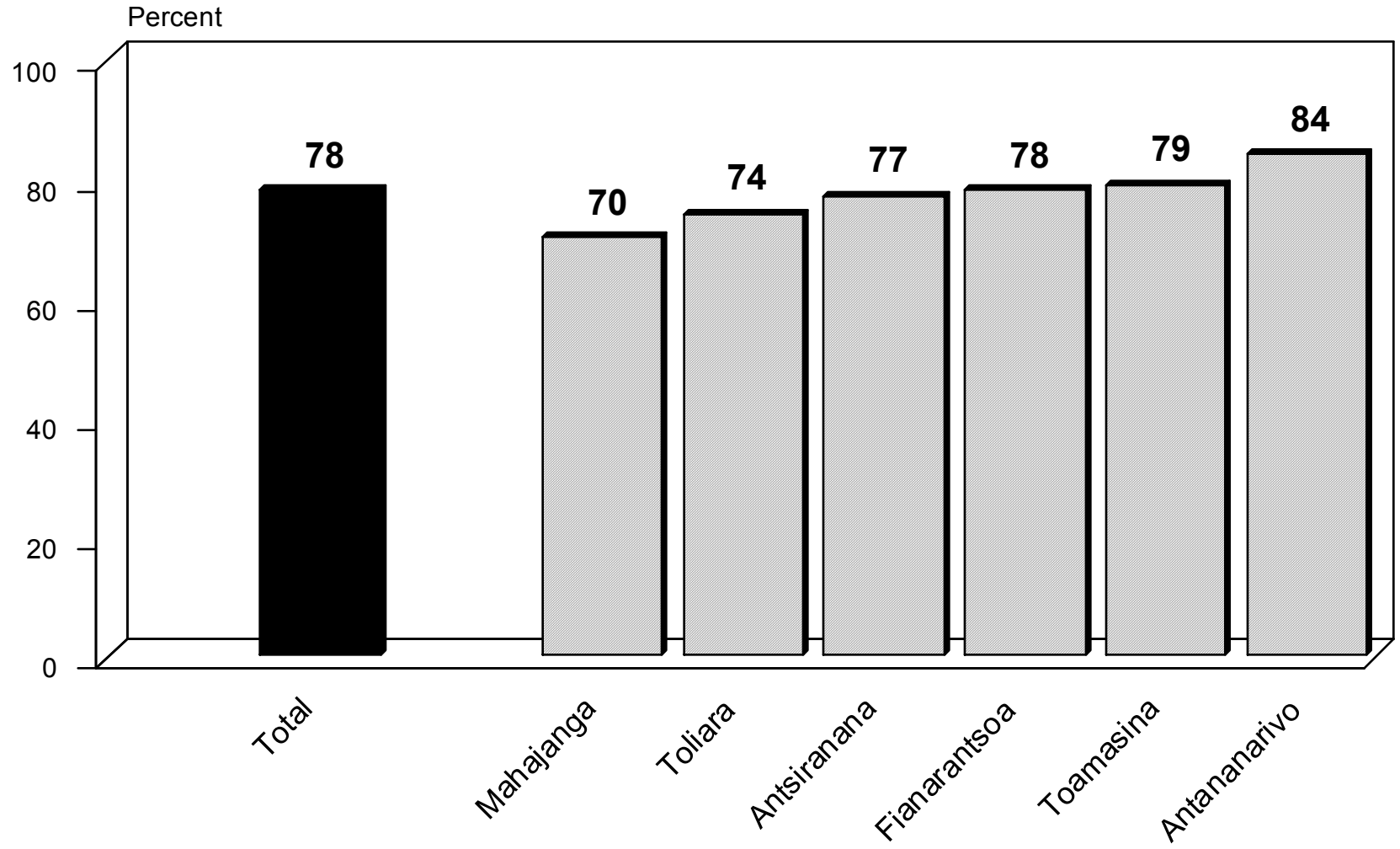
Vitamin A deficiency (VAD) is common in dry environments, where fresh fruits and vegetables are not readily available. Vitamin A is found in breast milk, other milks, liver, eggs, fish, butter, red palm oil, mangos, papayas, carrots, pumpkin, and dark leafy greens. Unlike iron or folate, vitamin A is a fat-soluble vitamin, which means that consumption of oils or fats are necessary for its absorption into the body. The liver can store an adequate amount of the vitamin for four to six months. Periodic dosing (every four to six months) with vitamin A supplements is a rapid, low-cost method of ensuring children at risk do not develop VAD. National Immunization Days for polio or measles vaccinations reach large numbers of children with vitamin A supplements as well.

In Madagascar—

- **Seventy-eight percent of children age 6-59 months received a vitamin A dose in the past six months.**

- **The rate of vitamin A supplementation among children varies by region.** Supplementation is lowest in the Mahajanga region (70 percent) and highest in Antananarivo (84 percent).

Figure 13
Vitamin A Supplementation among Children Age 6-59 Months in the Past Six Months by Region, Madagascar



Source: EDSMD-III 2003-2004

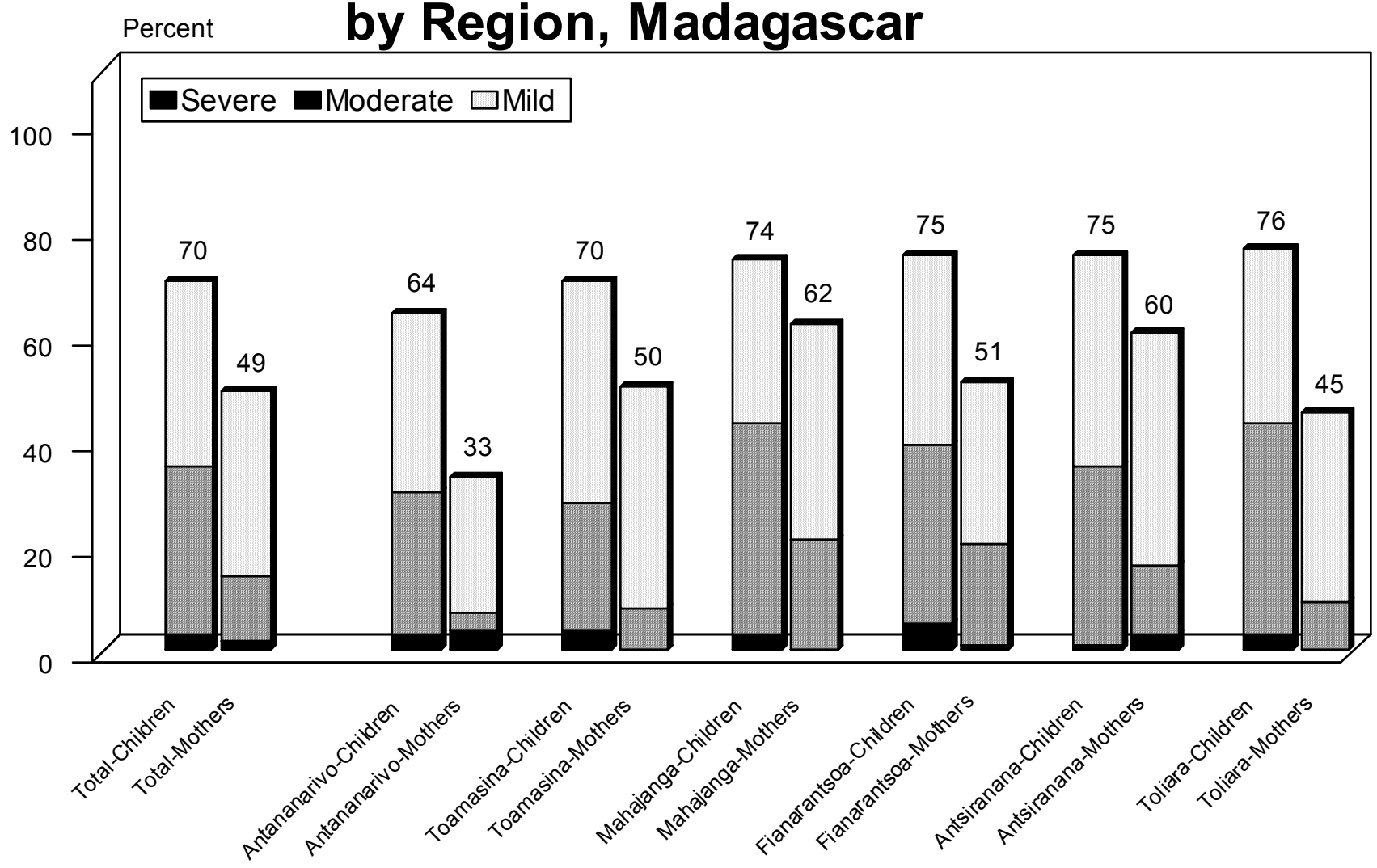
Figure 14: Anemia among Children Age 6-59 Months and Mothers by Region, Madagascar

Anemia is the lack of an adequate amount of hemoglobin in the blood. It can be caused by several different health conditions; iron and folate deficiencies are some of the most prevalent conditions related to anemia. Vitamin B_{12} deficiency, protein deficiency, sickle cell disease, malaria, and parasite infection also cause anemia.

In Madagascar—

- **Seventy percent of children age 6-59 months and 49 percent of mothers are anemic.**
- **Anemia rates for children are highest in Toliara (76 percent) and lowest in Antananarivo region (64 percent).**
- **Anemia rates for mothers are highest in the Mahajanga region (62 percent) and lowest in Antananarivo region (33 percent).**

Figure 14
Anemia among Children Age 6-59 Months and Mothers by Region, Madagascar



Source: EDSMD-III 2003-2004

Figure 15: Iron Supplementation among Mothers of Children under Five Years, Madagascar

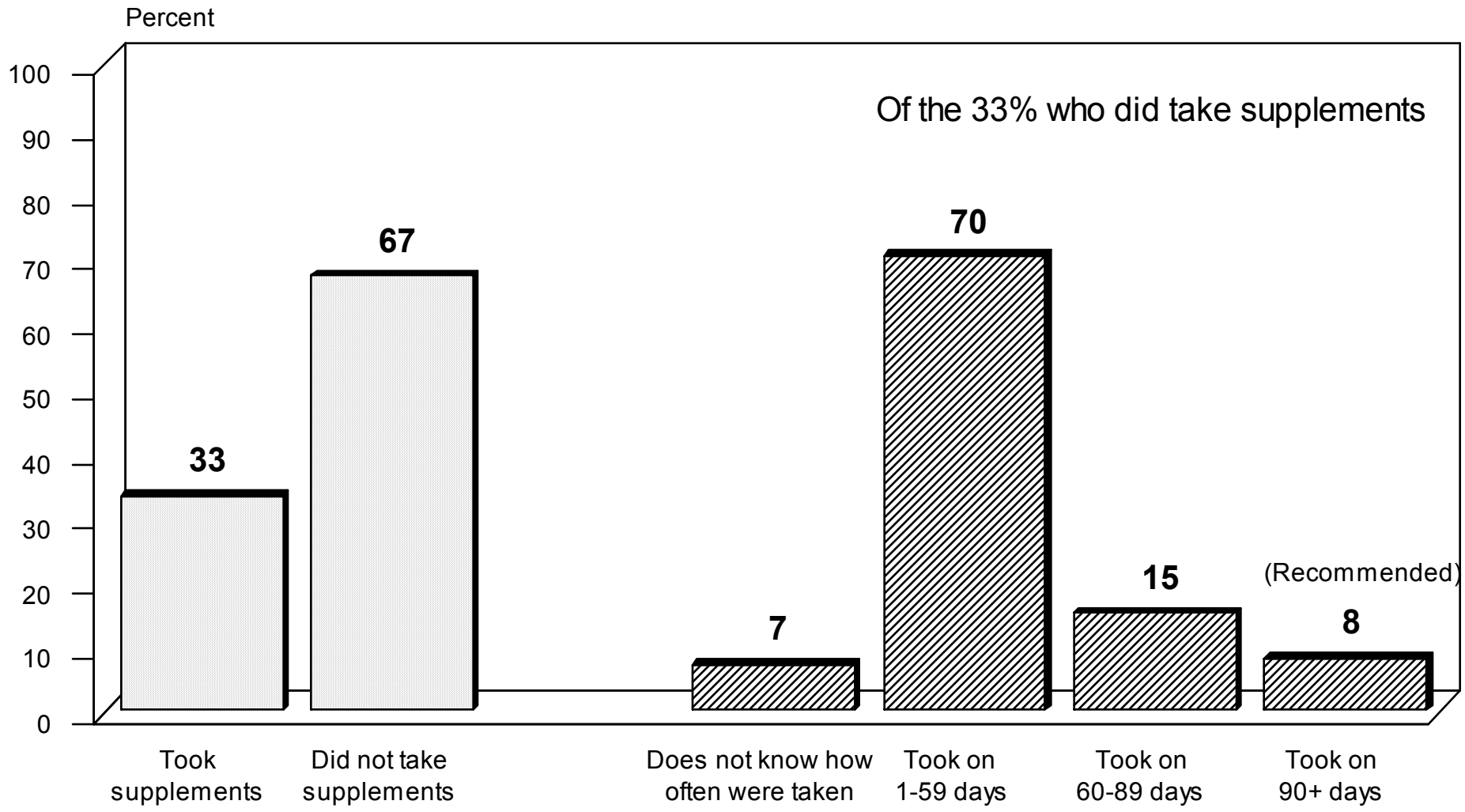
Iron-deficiency anemia is the most common form of nutritional deficiency worldwide. This type of nutritional deficiency develops slowly and does not manifest symptoms until anemia becomes severe. Diets that are heavily dependent on one grain or starch as the major staple often lack sufficient iron intake. Iron is found in meats, poultry, fish, grains, some cereals, and dark leafy greens (such as spinach). Foods rich in vitamin C increase absorption of iron into the blood. Tea, coffee, and whole-grain cereals can inhibit iron absorption. Anemia is common in children age 6-24 months who consume purely a milk diet and in women during pregnancy and lactation. Iron-deficiency anemia is related to decreased cognitive development in children, decreased work capacity in adults, and limited chances of child survival. Severe cases are associated with the low birth weight of babies, perinatal mortality, and maternal mortality. The worldwide anemia prevalence data indicate that normal dietary intakes of iron are insufficient to cover the increased requirements for a significant proportion of pregnant women. Providing iron supplements to pregnant women during this critical period is one of the most widely practiced public health measures to prevent and treat anemia.

In Madagascar—

- **Thirty-three percent of mothers took some iron supplementation during pregnancy.**

- **Of those women who received iron supplementation, only 8 percent reported taking iron the recommended minimum number of days during their pregnancy (90 or more days).**

Figure 15
Iron Supplementation among Mothers of Children under Five Years, Madagascar



Source: EDSMD-III 2003-2004

Figure 16: Diarrhea and Cough with Rapid Breathing among Children under Five Years Compared with Malnutrition Rates, Madagascar

Acute respiratory infection and dehydration due to diarrhea are major causes of morbidity and mortality in most sub-Saharan countries. To estimate the prevalence of ARI, interviewers asked mothers whether their children under five years had been ill with coughing accompanied by short, rapid breathing in the past two weeks. For diarrhea, mothers were asked whether their children under five years had symptoms of diarrhea in the past two weeks. Early diagnosis and rapid treatment can reduce the rates of illness or death caused by these conditions.

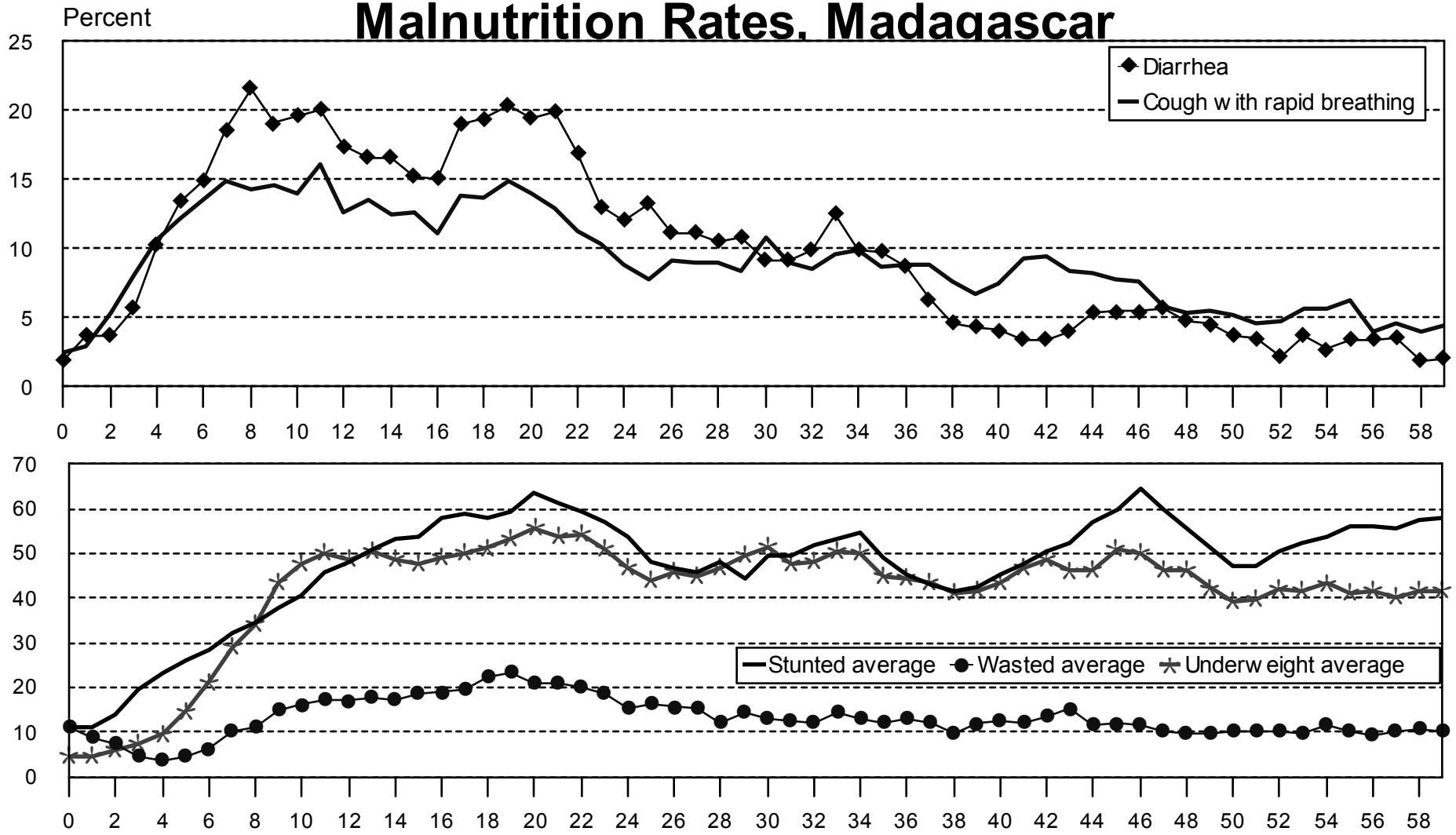
In Madagascar—

- **Nine percent of children under five years of age experienced cough with rapid breathing in the two weeks preceding the survey.** Madagascar's prevalence of cough with rapid breathing increases from 2 to 16 percent in the first 11 months and then varies between 10 and 15 percent until 21 months. Thereafter, the prevalence of cough with rapid breathing gradually decreases to 4 percent by 59 months of age.

- **Ten percent of children under five years of age had diarrhea in the two weeks preceding the survey.** The prevalence of diarrhea increases rapidly between 2 and 8 months then it varies between 15 and 20 percent through 21 months. After that, the rate gradually decreases to 2 percent by 59 months.

The rapid rise in the prevalence of diarrhea during infancy reflects the increased risk of pathogen contamination associated with the early introduction of water, other liquids, and solid foods. In addition, when infants begin to crawl and move around, they tend to put objects in their mouth, again increasing the risk of pathogen contamination.

Figure 16
Diarrhea and Cough with Rapid Breathing among Children under Five Years Compared with Malnutrition Rates, Madagascar



Note: Plotted values are smoothed by a five-month moving average.

Source: EDSMD-III 2003-2004

Underlying Biological and Behavioral Influences of Malnutrition

Figure 17: Fertility and Birth Intervals, Madagascar Compared with Other Sub-Saharan Countries

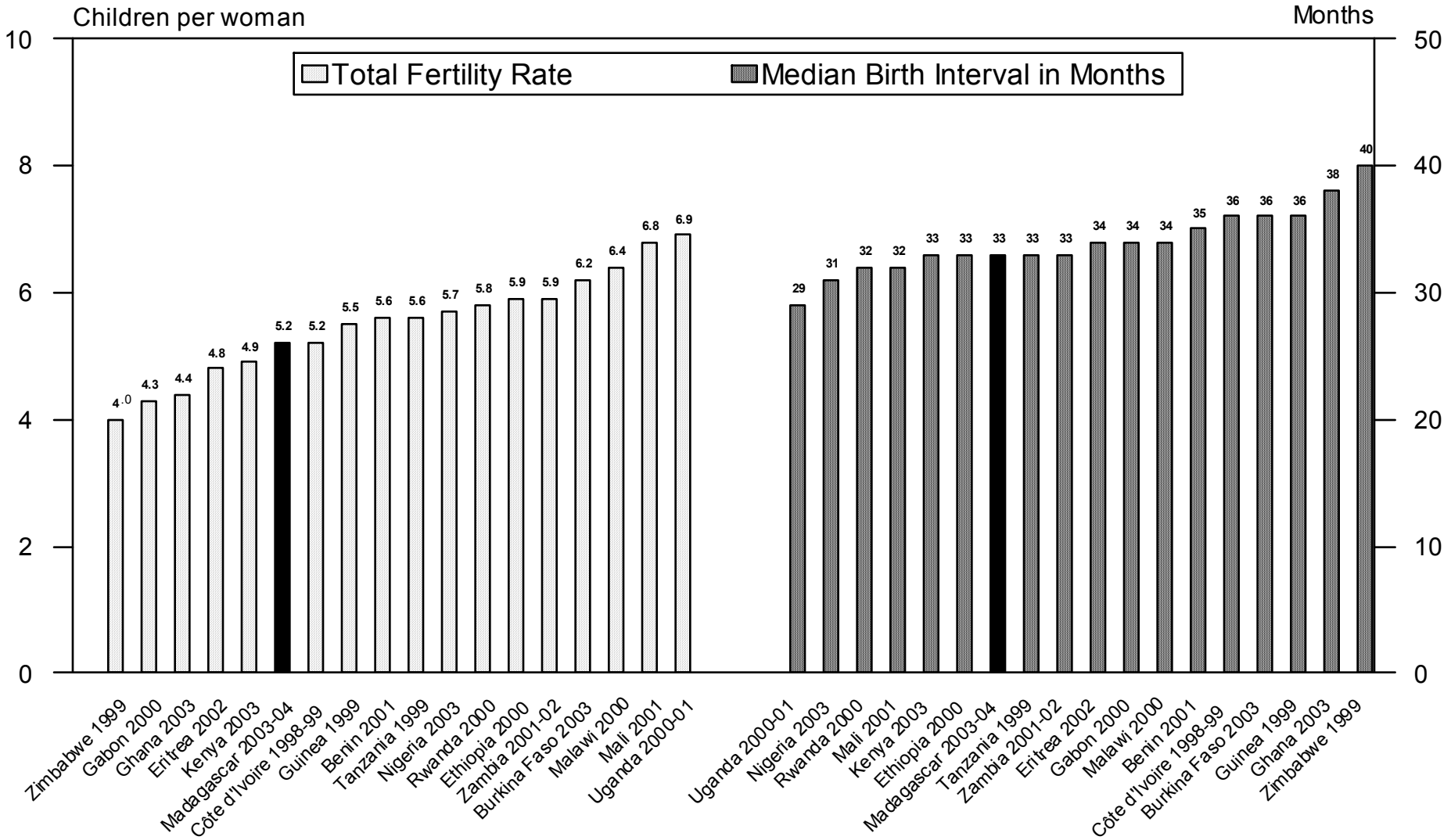
High fertility rates, especially when accompanied by short birth intervals, are detrimental to children's nutritional status. In most countries in sub-Saharan Africa, families have scarce resources to provide adequate nutrition and health care for their children. As the number of children per woman increases, fewer household resources are available for each child. High fertility also has a negative impact on maternal health, thus influencing a mother's ability to adequately care for her children. The most widely used measure of current fertility is the total fertility rate, which is defined as the number of children a woman would have by the end of her childbearing years if she were to pass through those years bearing children at the currently observed age-specific rates.

Information on the length of birth intervals provides insight into birth spacing patterns. Research has shown that children born too soon after a previous birth are at increased risk of poor nutrition and health and at increased risk of mortality, particularly when that interval is less than 24 months. The odds of stunting and underweight have been shown to be higher when birth intervals are less than 36 months. Short birth intervals are associated with small birth size and low birth weight, both of which are precursors to poor nutritional status in early childhood.

- **At current fertility rates, a woman in Madagascar will have an average of 5.2 children by the end of her childbearing years.** This rate is in the lower range of the sub-Saharan countries surveyed between 1999 and 2004.

- **Madagascar's mothers have a median birth interval of 33 months.** This interval is in the midrange of the sub-Saharan countries surveyed.

Figure 17
Fertility and Birth Intervals, Madagascar Compared with Other Sub-Saharan Countries



Source: DHS surveys 1999-2004

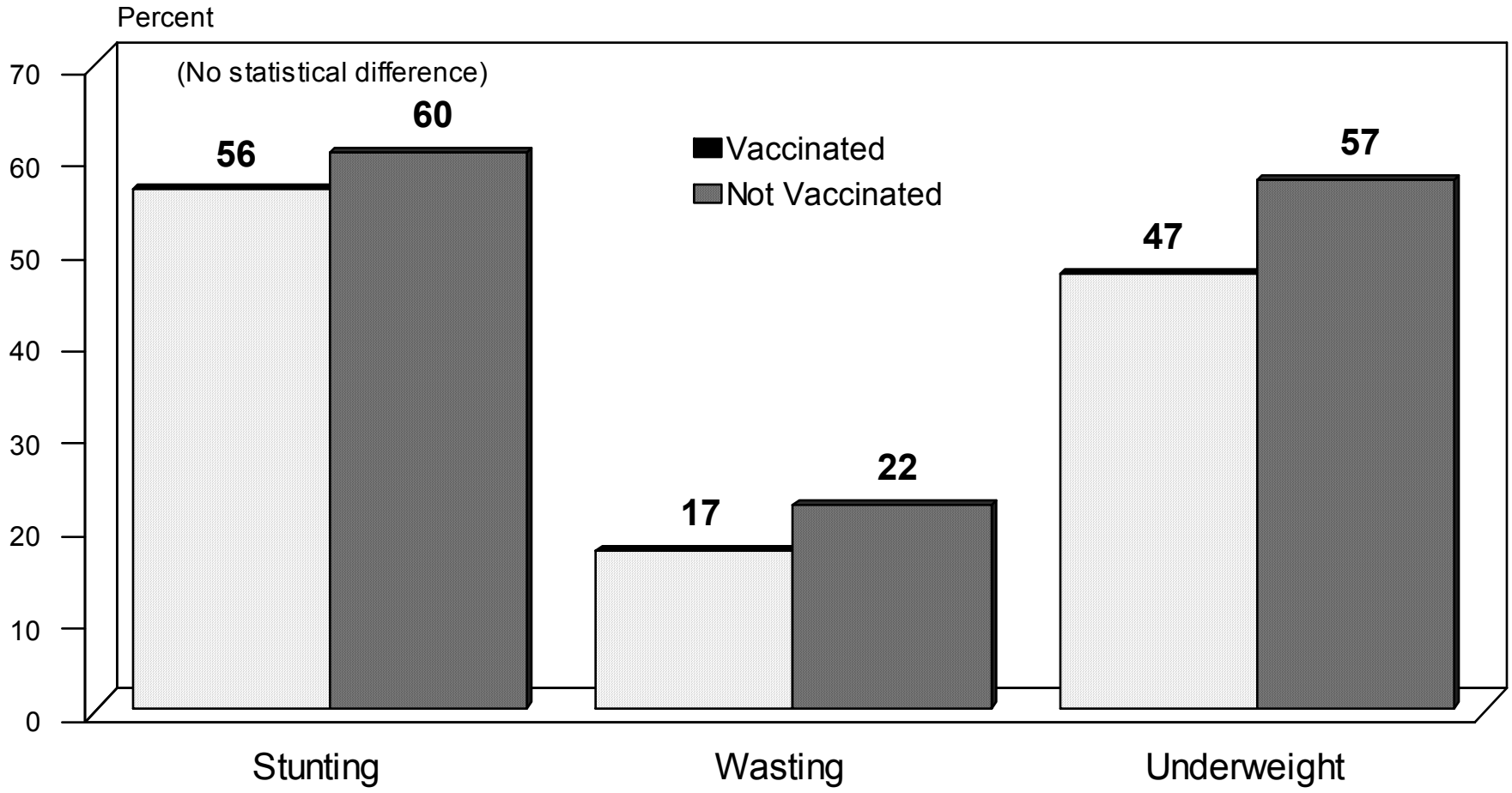
Figure 18: Undernutrition among Children Age 12-23 Months by Measles Vaccination Status, Madagascar

Measles is estimated to kill two million children per year, all in developing countries. It is one of the most common diseases during childhood in areas with low immunization coverage. Measles not only increases the risk of death, but also is a direct cause of malnutrition. The occurrence of measles in poor environments is associated with faltered growth, vitamin A deficiency, and immune suppression. Although infants are not protected from measles after birth by their mother's breast milk, they are protected while in the womb by their mother's measles antibodies. These antibodies can last up to 15 months in infants, but because of malnutrition, last only 8 or 9 months in children in developing countries. Therefore, measles vaccination is an important child health strategy.

In Madagascar—

- **Stunting is not statistically related to measles vaccination status.**
- **Wasting is higher (by 5 percentage points) among children who did not receive a measles vaccination than among children who did.**
- **Underweight is higher (by 10 percentage points) among children who did not receive a measles vaccination than among children who did.**

Figure 18
Undernutrition among Children Age 12-23 Months by Measles Vaccination Status, Madagascar



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition; *underweight* reflects chronic or acute malnutrition or a combination of both.

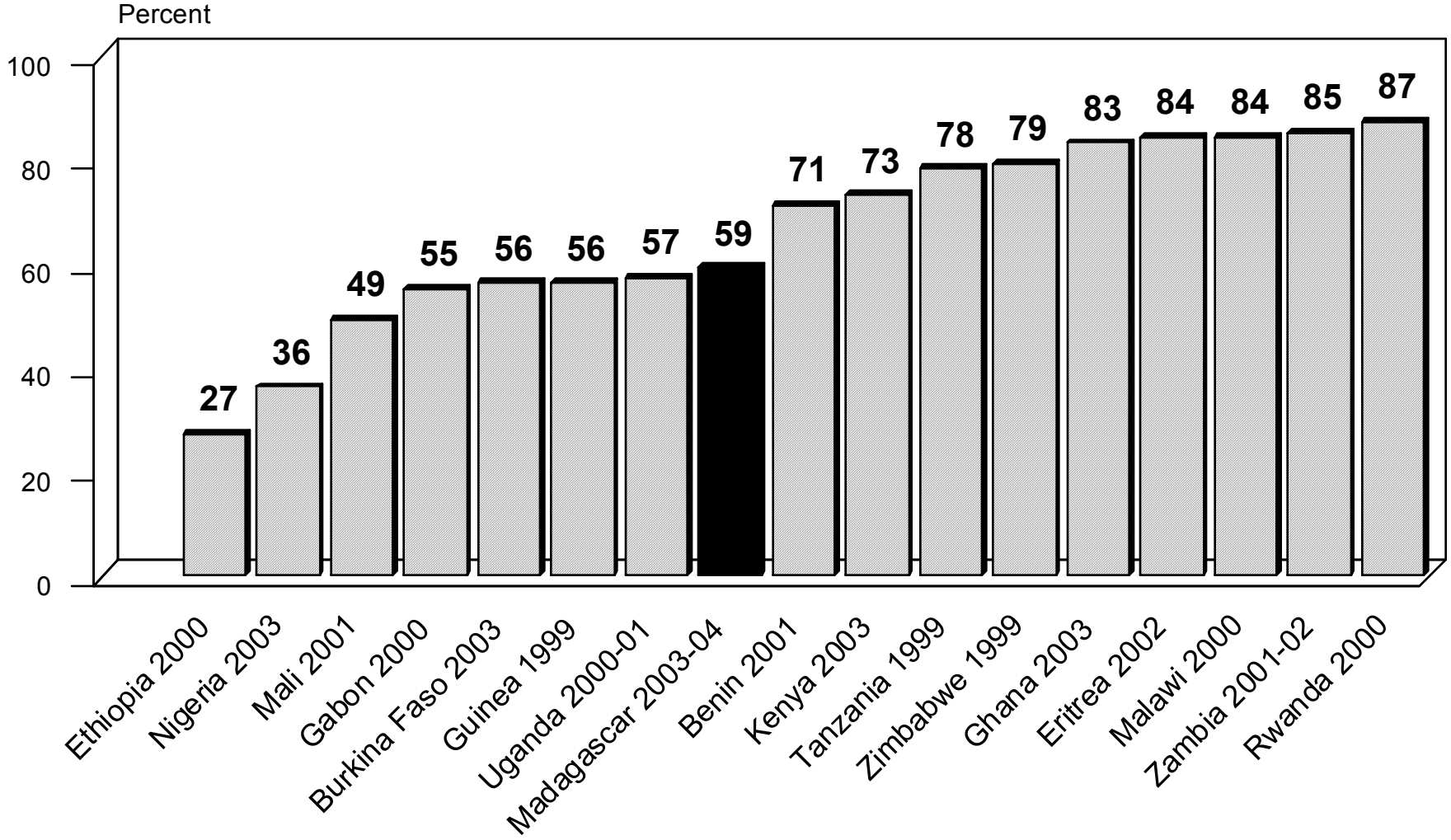
Source: EDSMD-III 2003-2004

Figure 19: Measles Vaccination Coverage among Children Age 12-23 Months, Madagascar Compared with Other Sub-Saharan Countries

Among the sub-Saharan countries surveyed—

- Measles vaccination ranges from 27 to 87 percent. **In Madagascar, 59 percent of children age 12-23 months have been vaccinated against measles.** This level of coverage is in the midrange of the sub-Saharan countries surveyed.

Figure 19
Measles Vaccination Coverage among Children Age 12-23 Months, Madagascar Compared with Other Sub-Saharan Countries



Source: DHS surveys 1999-2004

Figure 20: Feeding Practices for Infants under Six Months, Madagascar

Improper feeding practices, in addition to diarrheal disease, are important determinants of malnutrition. WHO and UNICEF recommend that *all infants be exclusively breastfed from birth until six months of age.* In other words, infants should be fed only breast milk during the first six months of life.

In Madagascar, the introduction of liquids (such as water, sugar water, and juice), formula, and solid foods takes place earlier than the recommended age of six months. This practice has a deleterious effect on nutritional status for a number of reasons. First, the liquids and solid foods offered are nutritionally inferior to breast milk. Second, the consumption of liquids and solid foods decreases the infant's intake of breast milk, which in turn reduces the mother's supply of milk. (Breast milk production is determined, in part, by the frequency and intensity of suckling.) Third, feeding young infants liquids and solid foods increases their exposure to pathogens, thus putting them at greater risk of diarrheal disease.

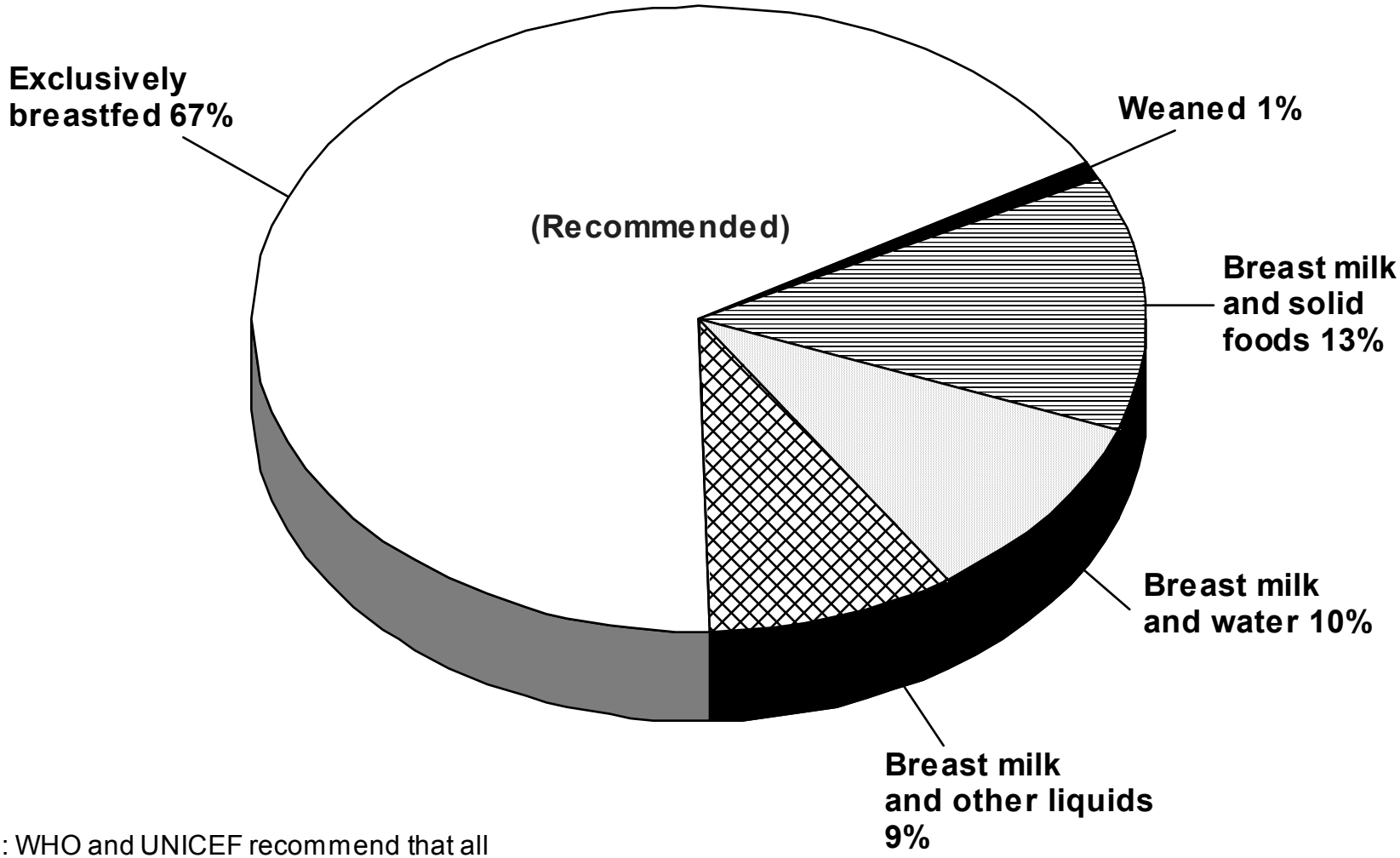
In Madagascar—

- **Sixty-seven percent of children under the age of six months are exclusively breastfed, as recommended by WHO and UNICEF.**

- **Ten percent of infants under six months of age are given a combination of breast milk and water; additionally, 9 percent of infants under six months are given liquids other than water, and 13 percent receive solid food in addition to breast milk and/or water.**

- **One percent of infants under six months of age are fully weaned.**

Figure 20
Feeding Practices for Infants under Six Months, Madagascar



Note: WHO and UNICEF recommend that all infants be breastfed exclusively up to six months of age.

Source: EDSMD-III 2003-2004

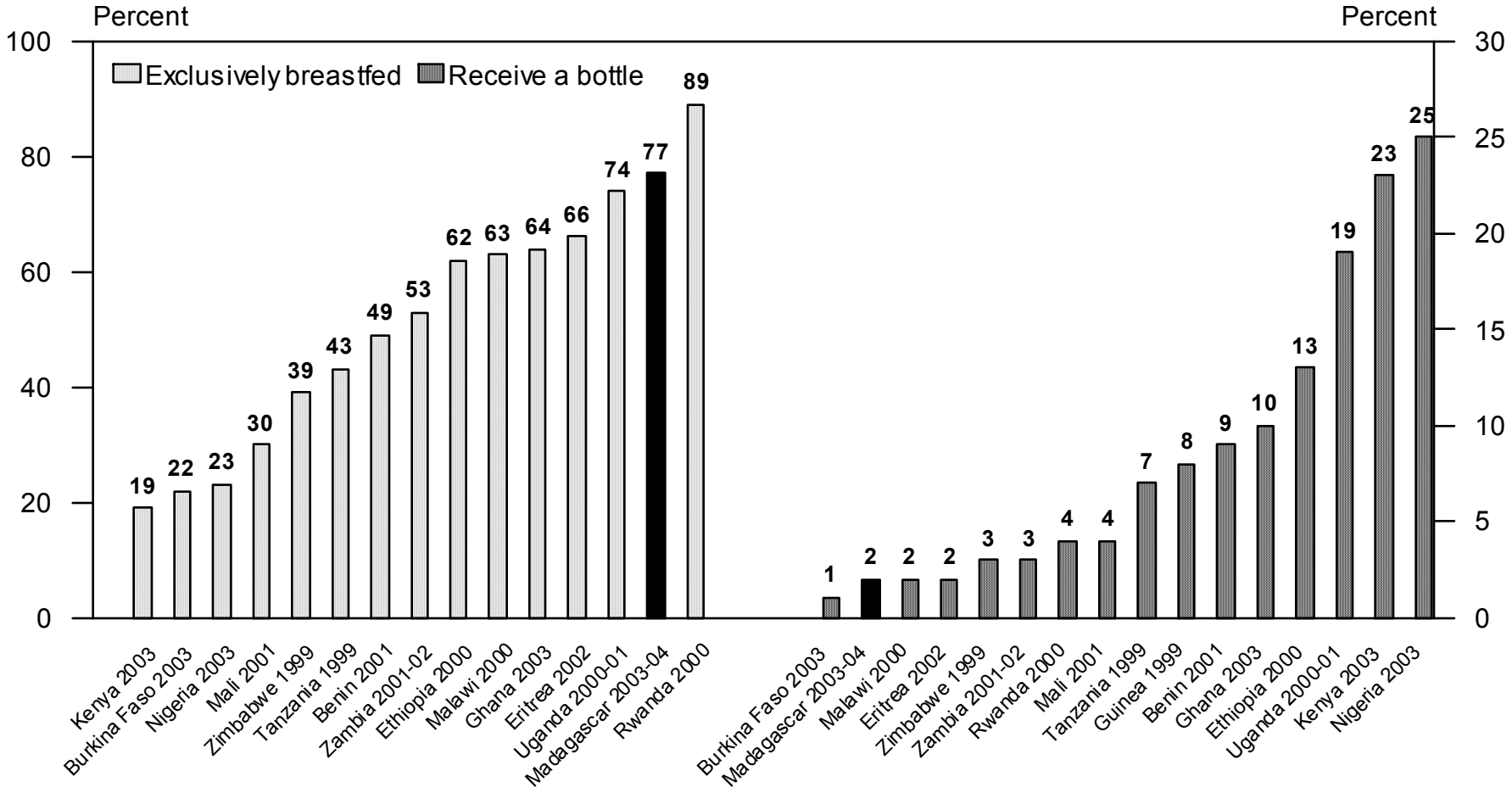
Figure 21: Infants under Four Months Who Are Exclusively Breastfed and Those Who Receive a Bottle, Madagascar Compared with Other Sub-Saharan Countries

The failure to exclusively breastfeed young infants and the introduction of liquids and solid foods at too early an age increases the risk of diarrheal disease, an important cause of mortality in Africa.

- In most of the sub-Saharan countries surveyed, relatively few mothers of infants under four months follow the recommended practice of breastfeeding exclusively. **In Madagascar, 77 percent of mothers breastfeed their young infants exclusively.** This gives Madagascar the second highest rate of exclusive breastfeeding among the sub-Saharan countries surveyed.

- **Bottle-feeding is provided to only 2 percent of infants under four months in Madagascar.** This rate is one of the lowest of the Sub-Saharan countries surveyed. **Bottle-feeding is not recommended** because improper sanitation and formula preparation with bottle-feeding can introduce pathogens to the infant, putting the child at a greater risk of illness and malnutrition.

Figure 21
Infants under Four Months Who Are Exclusively Breastfed and Those Who Receive a Bottle, Madagascar Compared with Other Sub-Saharan Countries



Note: Information on feeding practices is based on the 24 hours preceding the survey. WHO and UNICEF recommend that all infants be breastfed exclusively up to six months of age.

Source: DHS surveys 1999-2004

Figure 22: Feeding Practices for Infants Age 6-9 Months, Madagascar

UNICEF and WHO recommend that solid foods be introduced to infants around the age of six months because breast milk alone is no longer sufficient to maintain a child's optimal growth. Thus, *all infants over six months of age should receive solid foods* along with breast milk.

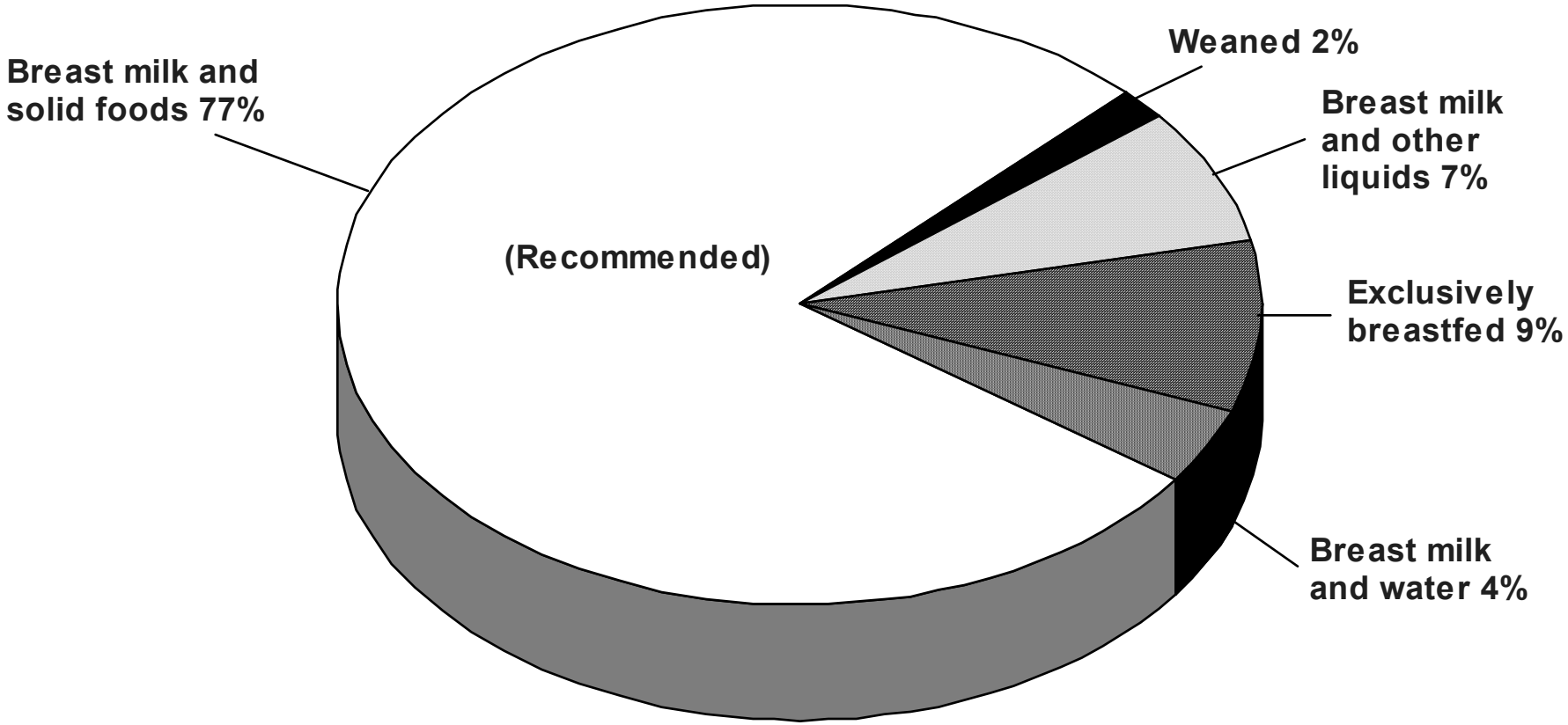
In Madagascar—

- **Seventy-seven percent of infants age 6-9 months are fed solid foods in addition to breast milk.** This indicates that more than a third of all infants age 6-9 months are fed according to the recommended practice.

- **Twenty percent of infants age 6-9 months are not fed solid foods in addition to breast milk, putting these children at risk of malnutrition.**

- **Two percent of infants are fully weaned** and are thus not receiving the additional nutritional and emotional support of breastfeeding.

Figure 22
Feeding Practices for Infants Age 6-9 Months, Madagascar



Note: WHO and UNICEF recommend that all infants age 6-9 months should receive solid foods in addition to breast milk.

Source: EDSMD-III 2003-2004

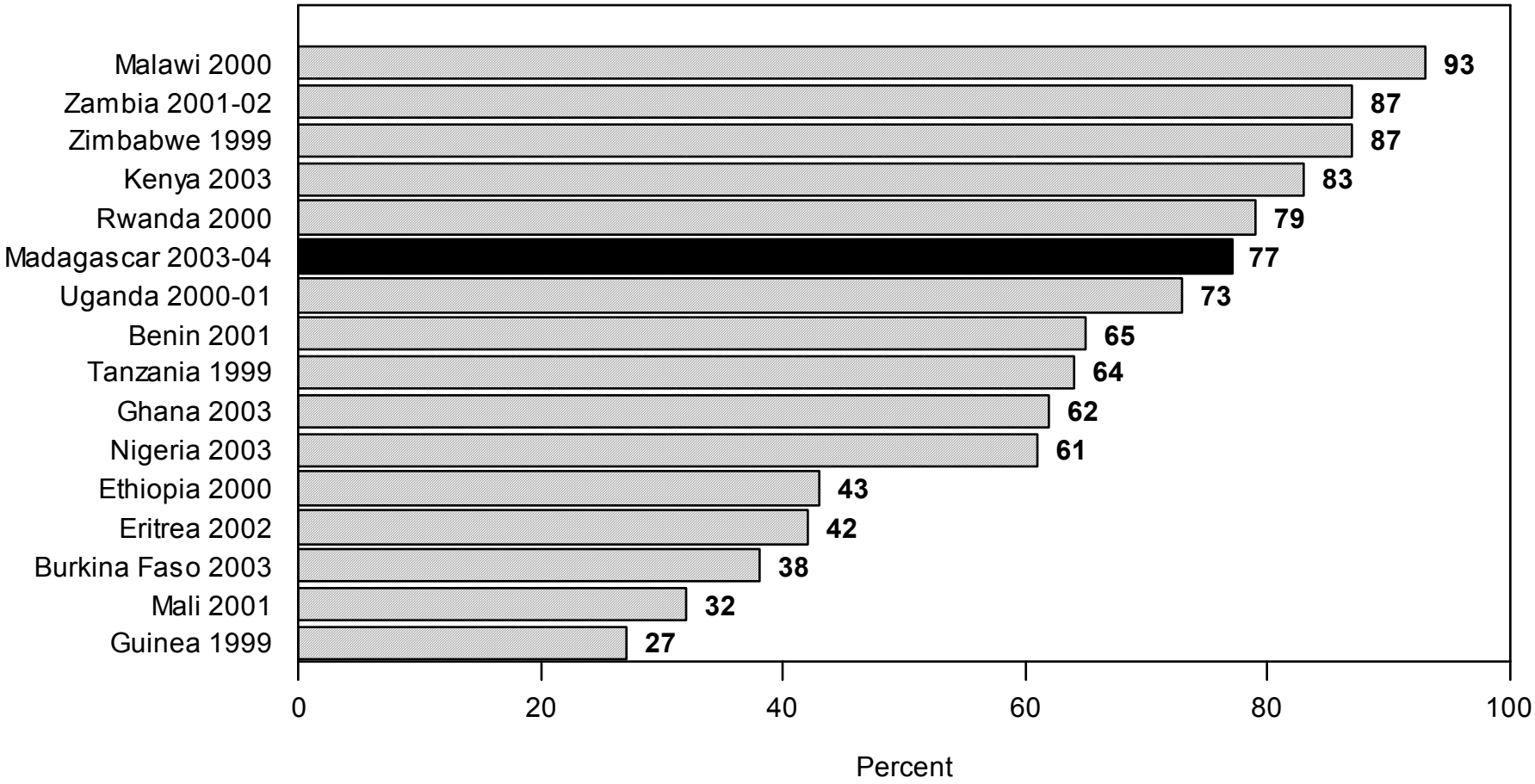
Figure 23: Infants Age 6-9 Months Receiving Solid Foods in Addition to Breast Milk, Madagascar Compared with Other Sub-Saharan Countries

Optimal infant feeding practices include the introduction of complementary foods at about six months of age. The introduction of complementary feeding is necessary because breast milk is no longer sufficient to satisfy the developing infant's energy, protein, and micronutrient needs. All infants age 6-9 months should receive complementary foods in addition to breast milk.

- The percentage of infants age 6-9 months receiving solid food in addition to breast milk ranges from 27 to 93 percent among the sub-Saharan countries surveyed.

- In Madagascar, **77 percent of infants age 6-9 months receive solid food in addition to breast milk.** This puts Madagascar in the upper range of the sub-Saharan countries surveyed.

Figure 23
Infants Age 6-9 Months Receiving Solid Foods in Addition to Breast Milk, Madagascar Compared with Other Sub-Saharan Countries



Note: WHO and UNICEF recommend that infants age 6-9 months should receive solid foods in addition to breast milk.

Source: DHS surveys 1999-2004

Figure 24: Children Age 10-23 Months Who Continue to Be Breastfed, Madagascar Compared with Other Sub-Saharan Countries

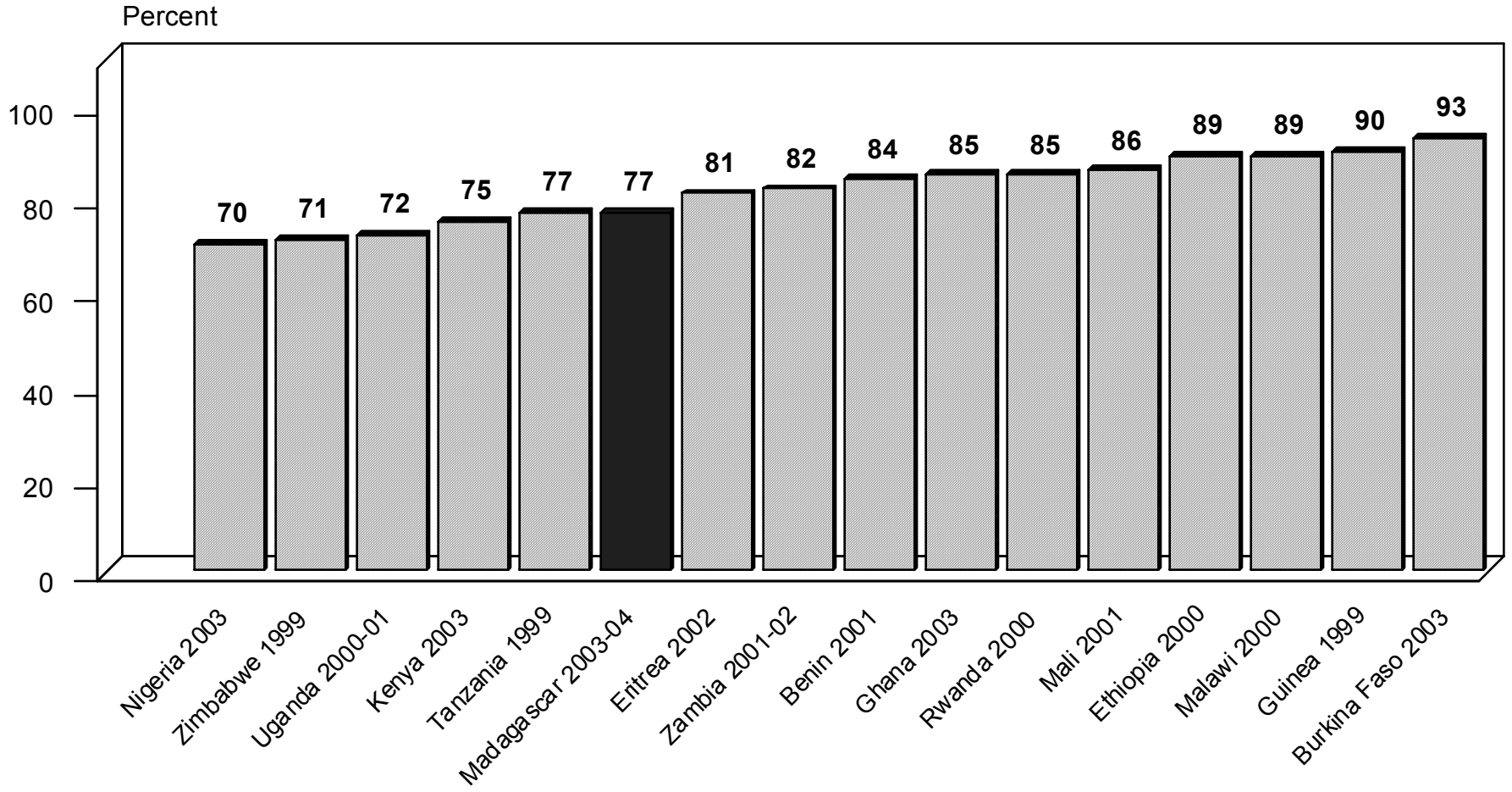
For older infants and toddlers, breast milk continues to be an important source of energy, protein, and micronutrients. Studies have shown that, in some populations, breast milk is the most important source of vitamin A and fat among children over 12 months of age. Breastfeeding older infants also reduces their risk of infection, especially diarrhea.

Additionally, breastfeeding up to 24 months can help reduce a woman's fertility, especially in areas where contraception is limited. Women who breastfeed for longer periods have lower fertility rates than women who breastfeed for shorter periods.

In Madagascar—

- **Seventy-seven percent of children age 10-23 months are still given breast milk.** This rate is in the lower range of the sub-Saharan countries surveyed.

Figure 24
Children Age 10-23 Months Who Continue to Be Breastfed, Madagascar Compared with Other Sub-Saharan Countries



Note: Information on feeding practices is based on the 24 hours preceding the survey. WHO and UNICEF recommend that all children should continue to be breastfed up to 24 months of age.

Source: DHS surveys 1999-2004

Underlying Social and Economic Influences of Malnutrition

Figure 25: Stunting and Wasting among Children under Five Years by Mother's Education, Madagascar

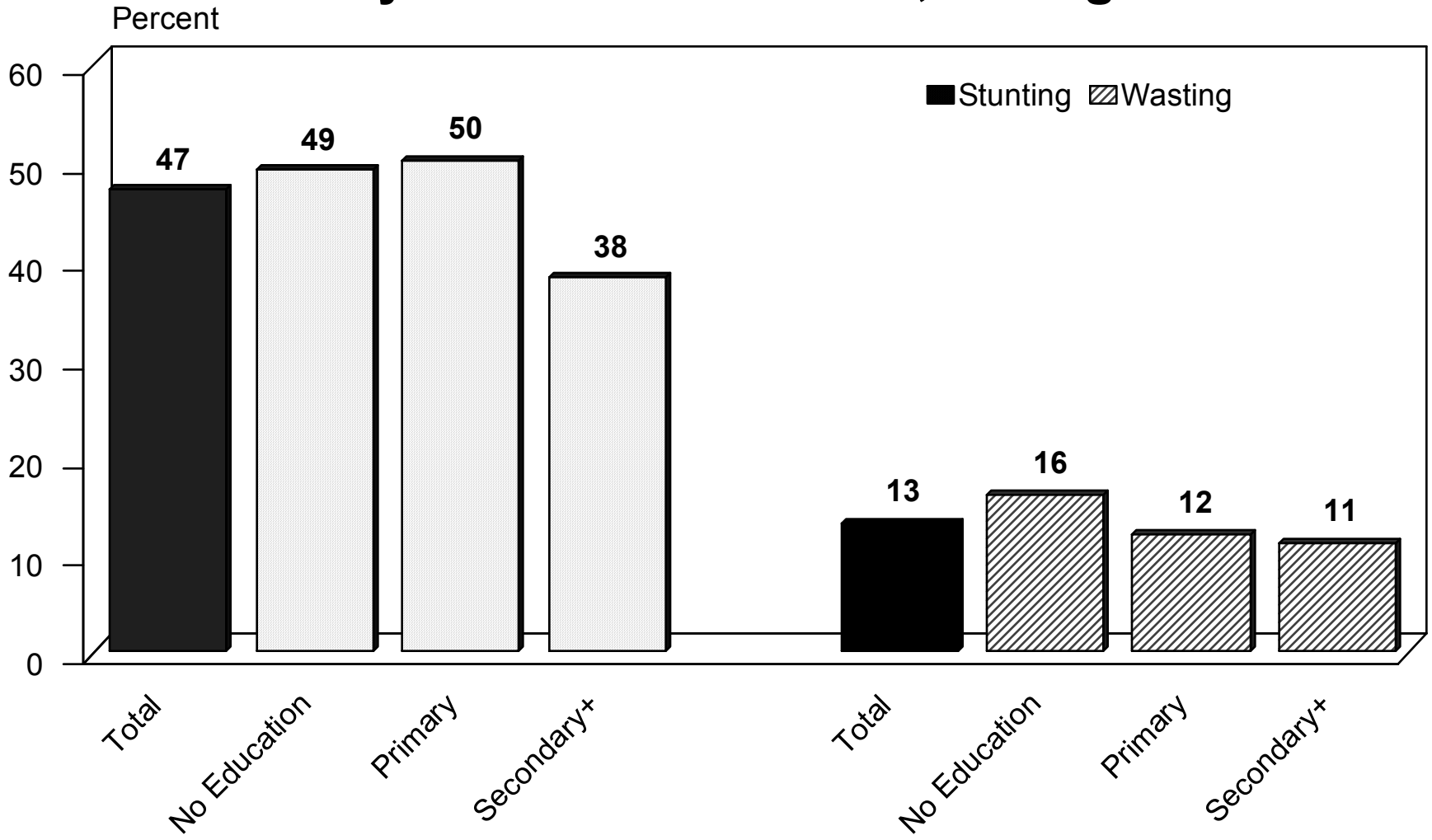
Maternal education is related to knowledge of good child care practices and to household wealth. In Madagascar, 26 percent of the mothers of children under five years of age have never attended school, 51 percent have some primary education, and 23 percent have a secondary or higher education. There are variations in school attendance, especially between urban and rural areas. In the rural areas, 30 percent of the mothers have never attended school, 53 percent have attended primary school, and only 17 percent have gone to secondary school or higher. In contrast, 3 percent of mothers in the capital and large cities and 12 percent of the mothers in small cities/towns have never attended school, while 61 percent in the capital and large cities and 48 percent in small cities/towns have gone to secondary school or higher. Thirty-six percent of mothers in Antananarivo region have received at least a secondary school education, compared with 14 to 22 percent of mothers in the rest of Madagascar.

In Madagascar—

- Maternal education has an inverse relationship with stunting at the secondary or higher level. However, there is no difference in the levels of stunting in children between mothers with no education and mothers with a primary education. There is a 12 percentage point difference in the level of stunting in children of mothers with a secondary or higher education and children of mothers with no education or a primary education.

- With increasing level of maternal education, wasting in children decreases. However, the difference in the rate of wasting in children of mothers with primary and secondary levels of education is not statistically significant.

Figure 25
Stunting and Wasting among Children under Five Years by Mother's Education, Madagascar



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition.

Source: EDSMD-III 2003-2004

Figure 26: Stunting and Wasting among Children under Five Years by Source of Drinking Water, Madagascar

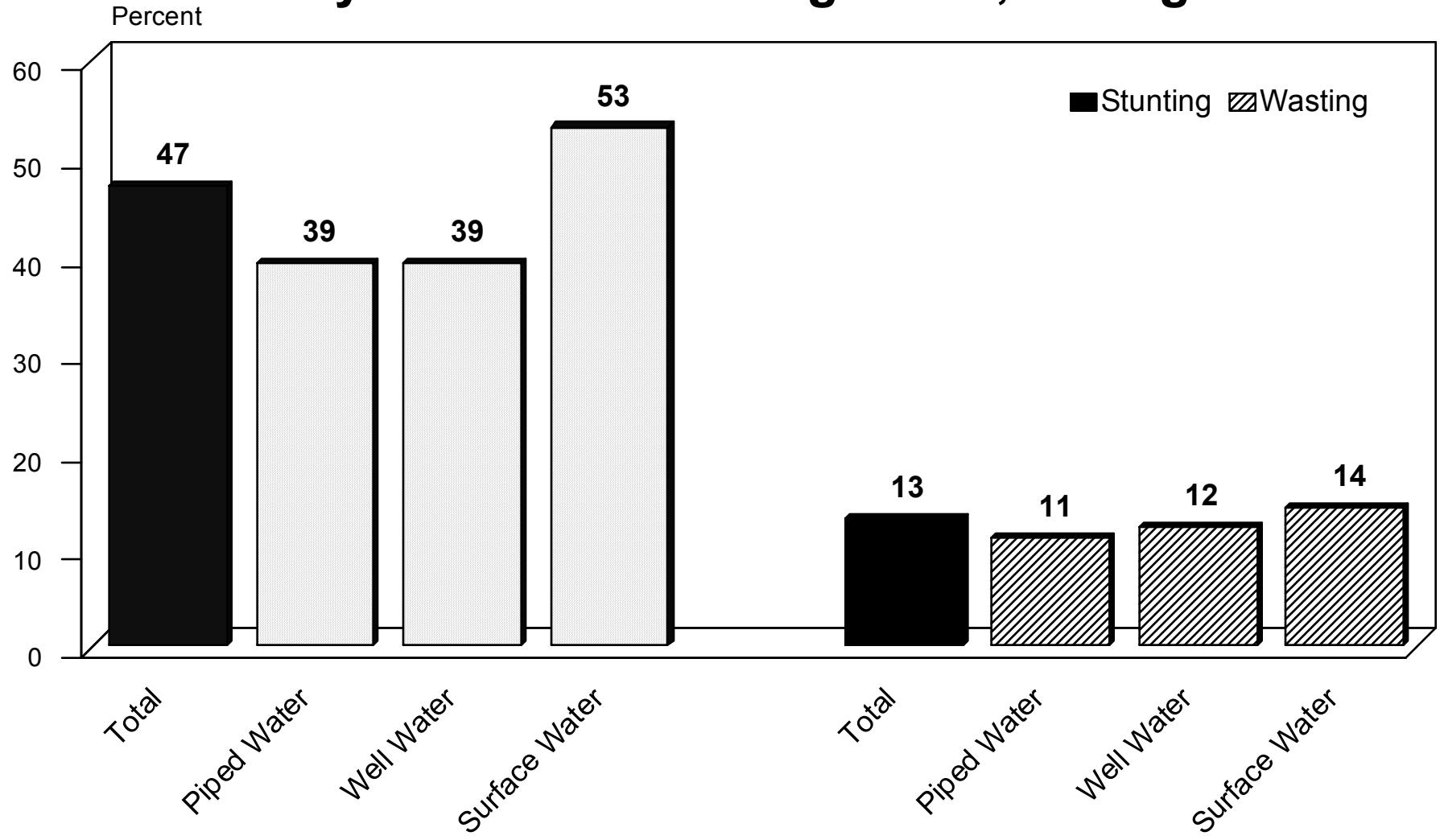
A household's source of drinking water is related to its socioeconomic status. Poor households are more likely to obtain drinking water from contaminated sources, such as surface water or open wells. Without an adequate supply of good-quality water, the risks of food contamination, diarrheal disease, and malnutrition increase. Infants and children in households that do not have a private tap are at greater risk of being malnourished than those in households with this amenity. Among the households surveyed with children under five years, 18 percent use piped water, 21 percent obtain their drinking water from a well, and 61 percent use surface water.

In Madagascar—

- Children whose drinking water is surface water are more likely to be stunted (53 percent) than children with access to piped water or well water (39 percent).

- Children whose drinking water is surface water are more likely to be wasted (14 percent) than children with access to piped water (11 percent) or well water (12 percent).

Figure 26
Stunting and Wasting among Children under Five Years by Source of Drinking Water, Madagascar



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition.

Source: EDSMD-III 2003-2004

Figure 27: Stunting and Wasting among Children under Five Years by Type of Toilet, Madagascar

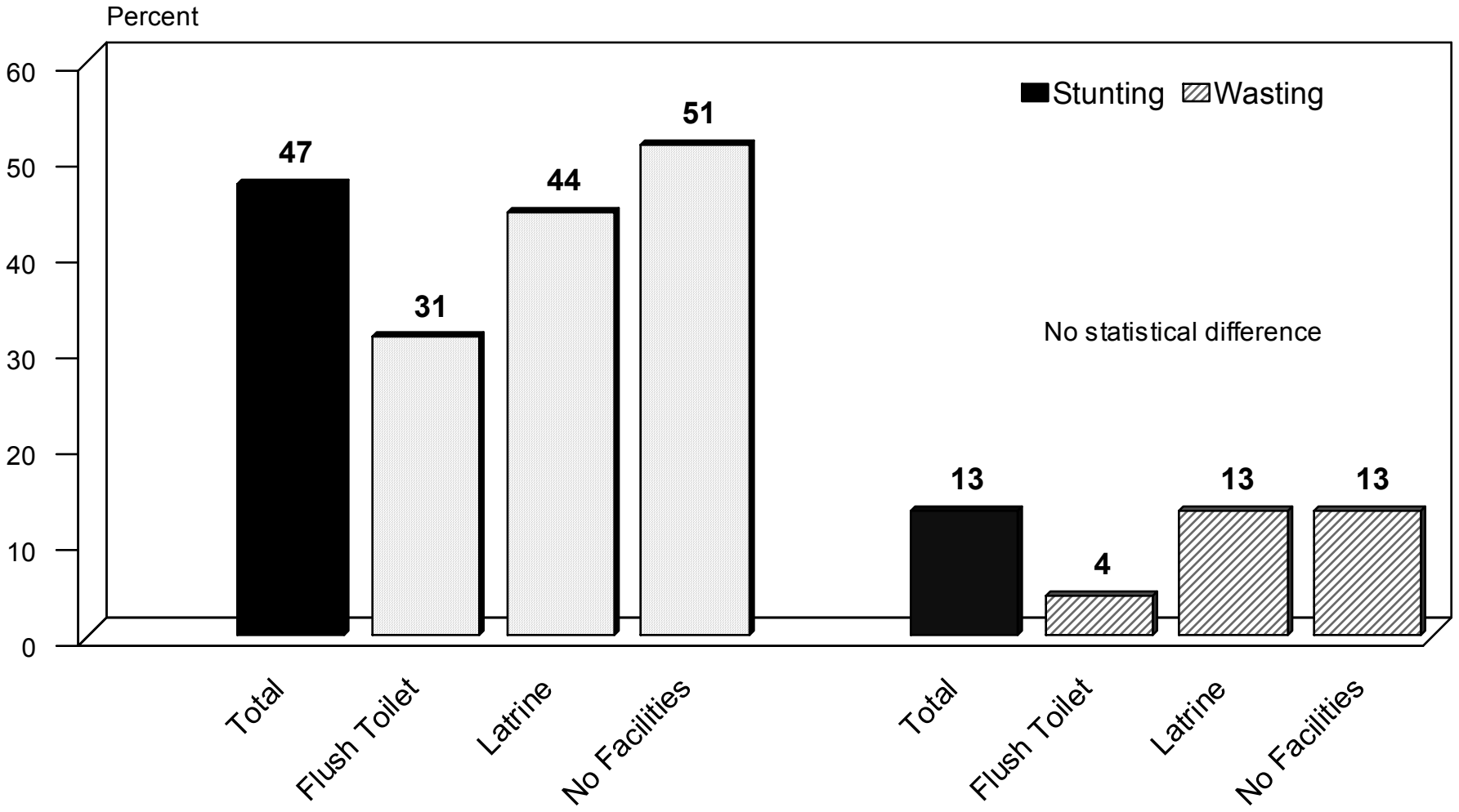
The type of toilet used by a household is related to its socioeconomic status, and poor households are less likely to have adequate toilet facilities. Inadequate sanitation facilities result in an increased risk of diarrheal disease, which contributes to malnutrition. Infants and children in households that do not have ready access to a flush toilet are at greater risk of being malnourished than children in households with this amenity. In Madagascar, 47 percent of households surveyed with at least one child under five years have access to a latrine, 53 percent have no facilities, and 1 percent of surveyed households have access to a flush toilet.

In Madagascar—

- Children who have no access to toilet facilities and those who have access to a latrine are more likely to be stunted (51 and 44 percent, respectively) than children with access to a flush toilet (31 percent).

- Children who have access to flush toilets are less likely to be wasted (4 percent), compared with children who have access to latrines (13 percent) or have no access to toilet facilities (13 percent). However, this difference is not statistically significant.

Figure 27
Stunting and Wasting among Children under Five Years by Type of Toilet, Madagascar



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition.

Source: EDSMD-III 2003-2004

Basic Influences

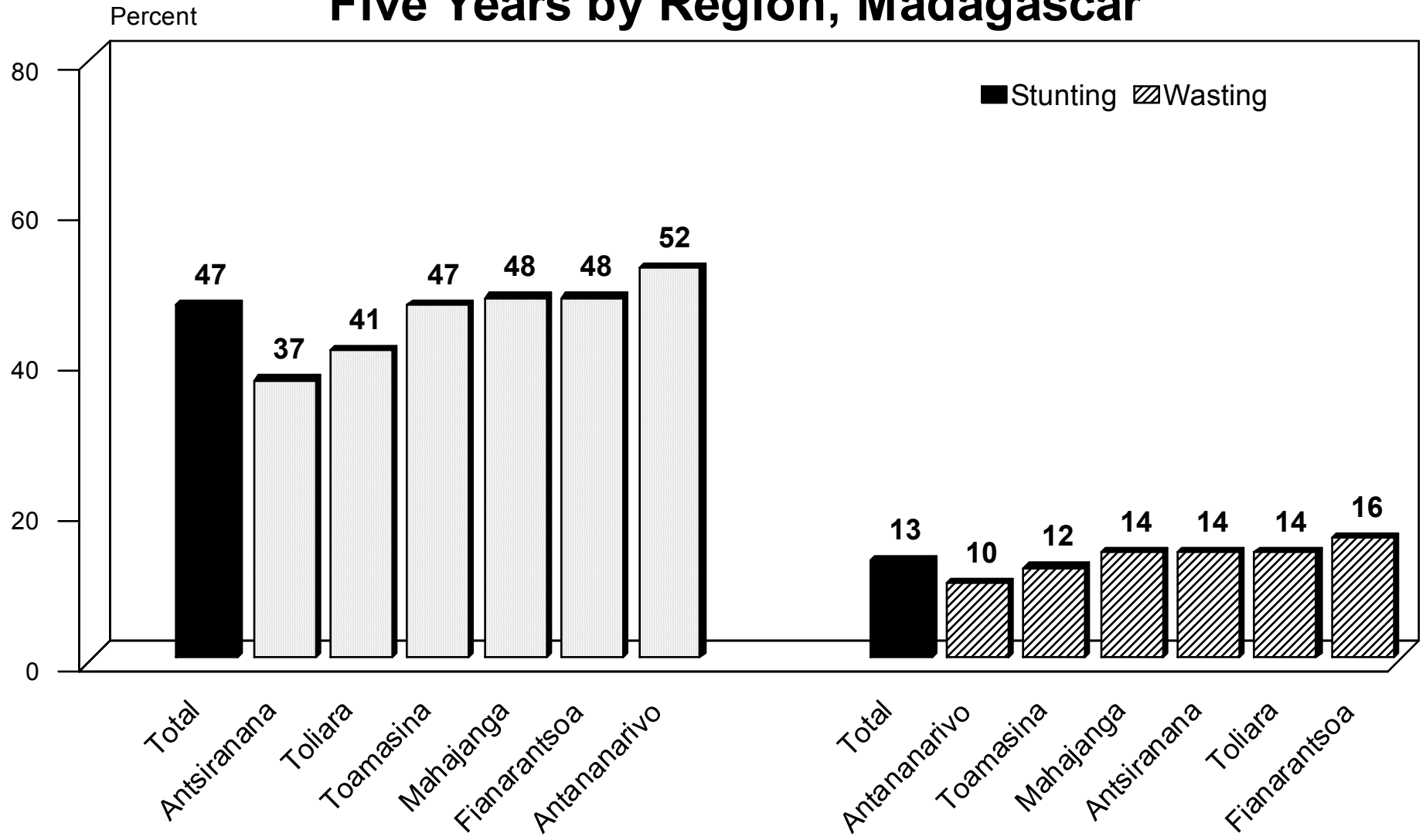
Figure 28: Stunting and Wasting among Children under Five Years by Region, Madagascar

In Madagascar—

- **Stunting ranges from 37 to 52 percent among children in the six regions.** Stunting rates are lowest in Antsiranana region (37 percent) and highest in Antananarivo region (52 percent).

- **Wasting ranges from 10 to 16 percent among children in the six regions.** Wasting rates are lowest in Antananarivo region (10 percent) and highest in Fianarantsoa region (16 percent).

Figure 28
Stunting and Wasting among Children under Five Years by Region, Madagascar



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition.

Source: EDSMD-III 2003-2004

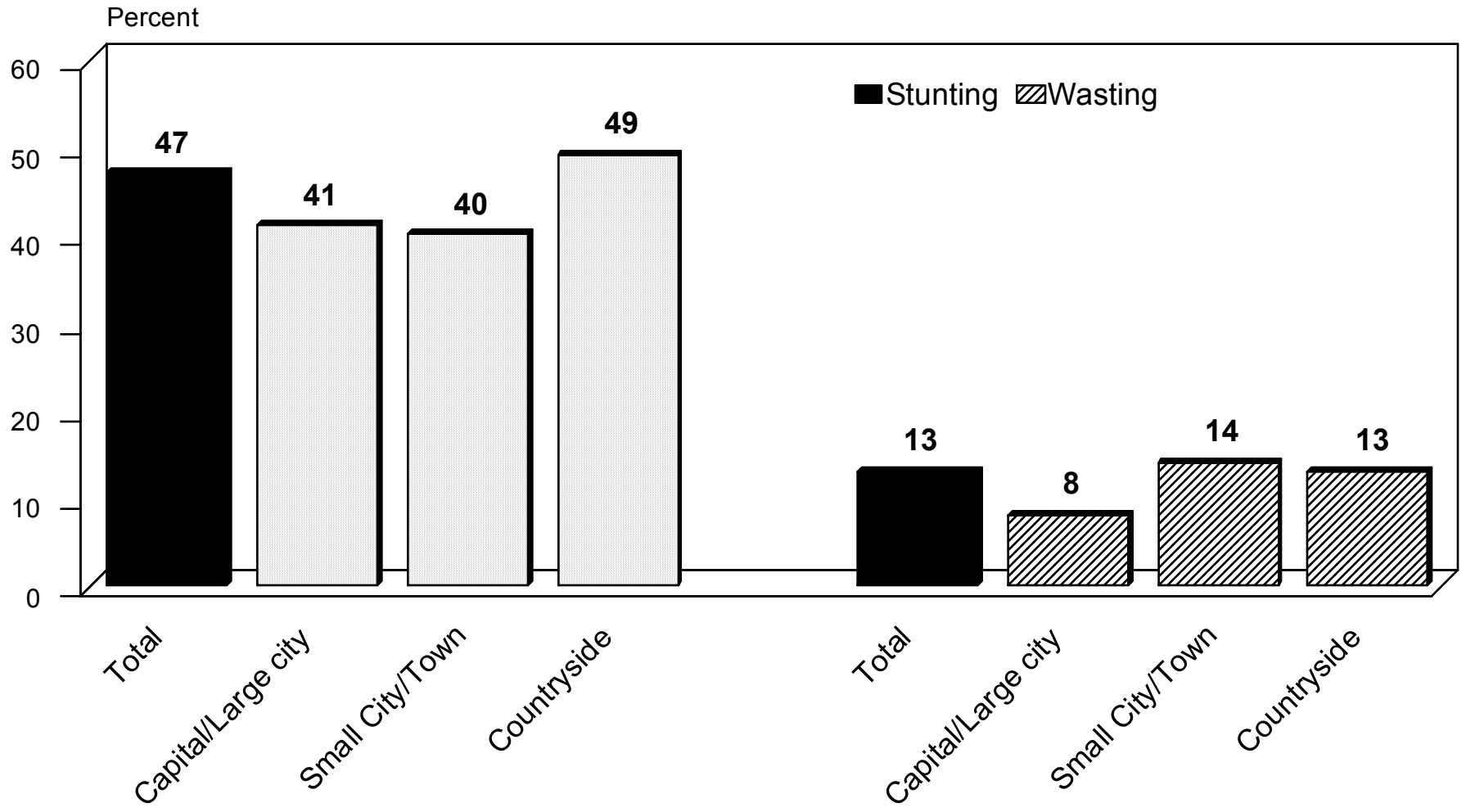
Figure 29: Stunting and Wasting among Children under Five Years by Urban-Rural Residence, Madagascar

In Madagascar—

- **The rate of stunting is highest in the countryside (49 percent),** compared with the capital/large cities (41 percent) or small cities/towns (40 percent).

- **In the capital/large cities, 8 percent of children are affected by acute malnutrition,** compared with 14 and 13 percent, respectively, in small cities/towns and the countryside.

Figure 29
Stunting and Wasting among Children under Five Years by Urban-Rural Residence, Madagascar



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition.

Source: EDSMD-III 2003-2004

Maternal Nutritional Status

Figure 30: Malnutrition among Mothers of Children under Five Years by Region, Madagascar

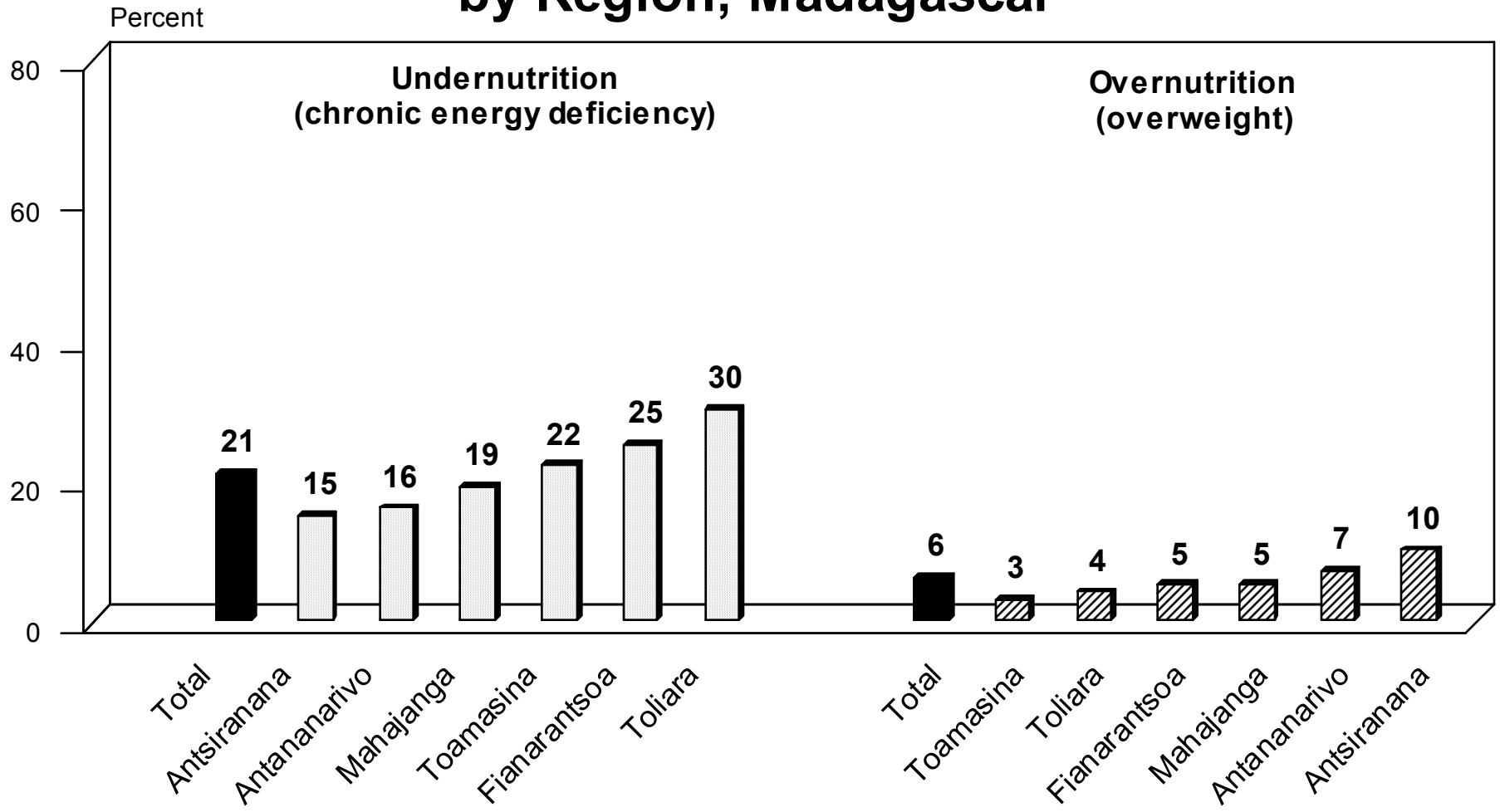
In addition to being a concern in its own right, a mother's nutritional status affects her ability to successfully carry, deliver, and care for her children. There are generally accepted standards for indicators of malnutrition among adult women that can be applied.

Malnutrition in women can be assessed using the body mass index (BMI), which is defined as a woman's weight in kilograms divided by the square of her height in meters; thus, BMI = kg/m^2. When the BMI is below the suggested cutoff point of 18.5, this indicates chronic energy deficiency or undernutrition for nonpregnant, nonlactating women. When the BMI is 25 or higher, women are considered overweight.

- **Twenty-one percent mothers of children under five years in Madagascar are undernourished.** The highest level of maternal undernutrition is in the Toliara region (30 percent). The lowest level is in Antsiranana (15 percent).

- **Six percent of mothers of children under five years are overweight.** The highest level of maternal overnutrition is in Antsiranana region (10 percent). The lowest level is in the Toamasina region (3 percent).

Figure 30
Malnutrition among Mothers of Children under Five Years by Region, Madagascar



Note: Maternal *undernutrition* is the percentage of mothers whose BMI (kg/m^2) is less than 18.5. Maternal *overnutrition* is the percentage of mothers whose BMI is 25 or higher.

Source: EDSMD-III 2003-2004

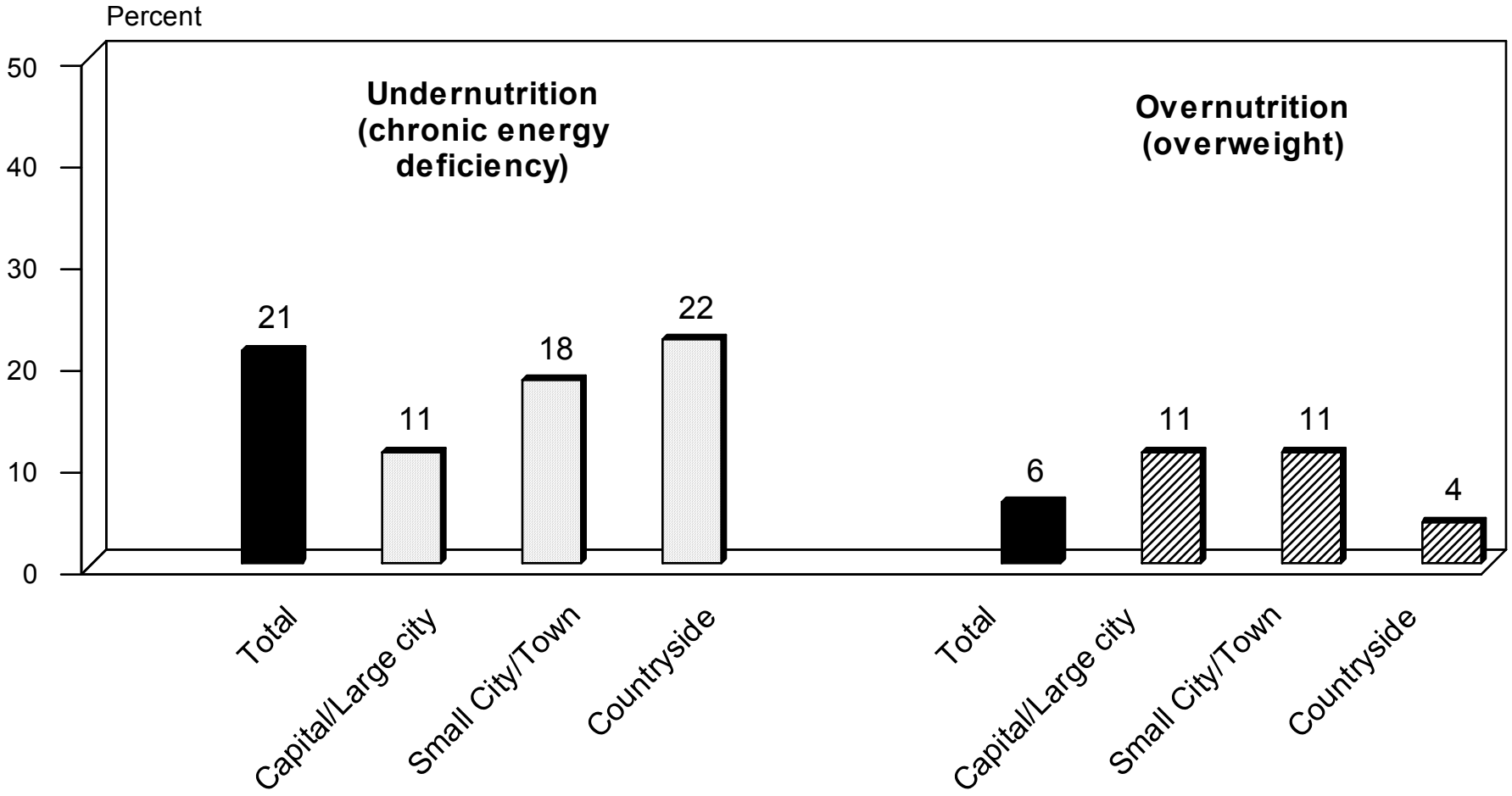
Figure 31: Malnutrition among Mothers of Children under Five Years by Residence, Madagascar

In Madagascar—

- The undernutrition rate (chronic energy deficiency) for mothers of children under five years is **11 percent in the capital/large cities, 18 percent in small cities/towns, and 22 percent in the countryside.**

- The overnutrition rate (overweight) for mothers of children under five years **is 4 percent in the countryside and 11 percent in the capital/large cities and in small cities/towns.**

Figure 31
Malnutrition among Mothers of Children under Five Years by Residence, Madagascar



Note: Maternal *undernutrition* is the percentage of mothers whose BMI (kg/m^2) is less than 18.5. Maternal *overnutrition* is the percentage of mothers whose BMI is 25 or higher.

Source: EDSMD-III 2003-2004

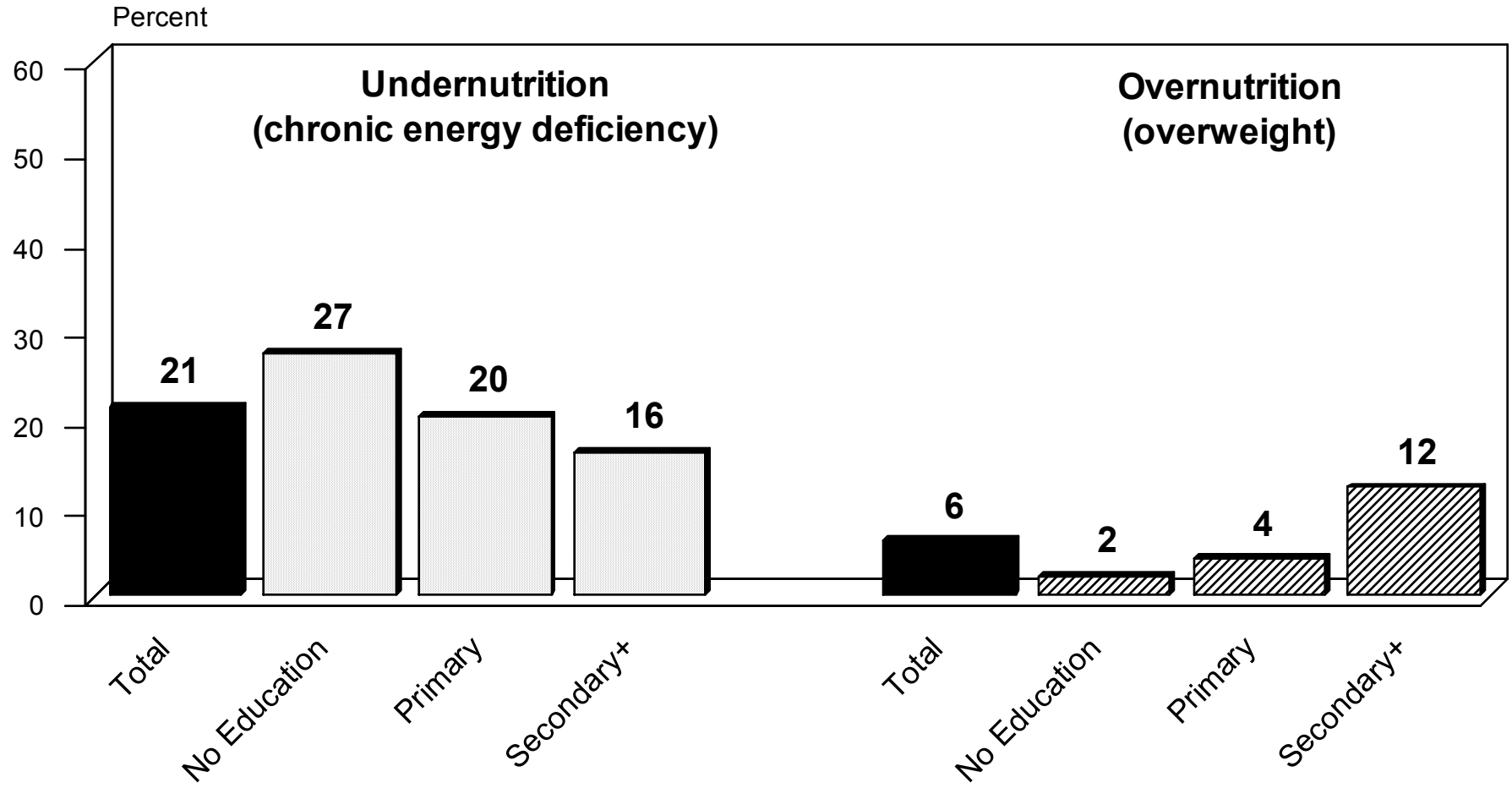
Figure 32: Malnutrition among Mothers of Children under Five Years by Education, Madagascar

In Madagascar—

- **Maternal education has an inverse relationship with maternal undernutrition.** As the level of maternal education increases, the level of undernutrition goes down.

- The rate of maternal overnutrition is **highest among women with a secondary school education (12 percent) and lowest among those with no education (2 percent).**

Figure 32
Malnutrition among Mothers of Children under Five Years by Education, Madagascar



Note: Maternal *undernutrition* is the percentage of mothers whose BMI (kg/m^2) is less than 18.5. Maternal *overnutrition* is the percentage of mothers whose BMI is 25 or higher.

Source: EDSMD-III 2003-2004

Figure 33: Malnutrition among Mothers of Children under Five Years, Madagascar Compared with Other Sub-Saharan Countries

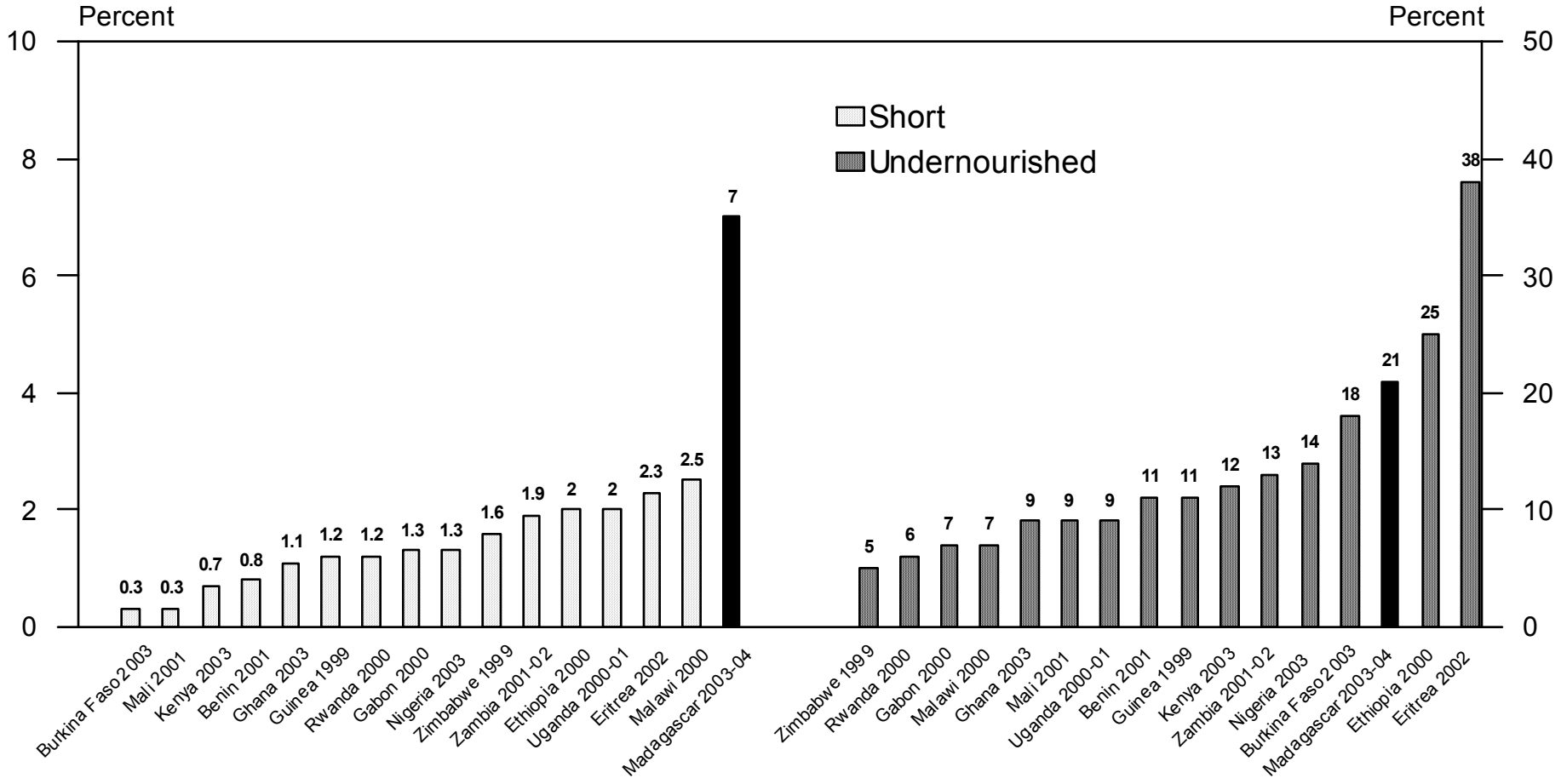
Malnutrition among mothers is likely to have a major impact on their ability to care for themselves and their children. Women less than 145 centimeters in height are considered too short. Mothers who are too short (a condition largely due to stunting during childhood and adolescence) may have difficulty during childbirth because of the small size of their pelvis. Evidence also suggests there is an association between maternal height and low birth weight. Malnutrition among mothers is also assessed using the body mass index (kg/m^2). Pregnant women and those who are less than two months postpartum are not included in the analysis of maternal malnutrition because of weight considerations.

In Madagascar—

- **Seven percent of mothers of children under five are too short (<145 cm).** This proportion is the highest among the sub-Saharan countries surveyed.

- **Twenty-one percent of mothers of children under five are undernourished (BMI <18.5).** This level is in the upper range of the sub-Saharan countries surveyed.

Figure 33
Malnutrition among Mothers of Children under Five Years, Madagascar Compared with Other Sub-Saharan Countries



Note: *Short* is the percentage of mothers under 145 cm; *undernourished* is the percentage of mothers whose BMI (kg/m^2) is less than 18.5. Pregnant women and those who are less than two months postpartum are excluded from BMI calculations

Source: DHS surveys 1999-2004

Appendices

Appendix 1:
Stunting, Wasting, Underweight, and Overweight Rates by Background Characteristics, Madagascar 2003-2004

Background characteristic	Stunted	Wasted	Underweight	Overweight	Background characteristic	Stunted	Wasted	Underweight	Overweight
Child's age in months					**Regions**				
0-5	18.0	5.6	7.3	13.2	Antananarivo	52.4	10.3	40.4	4.9
6-11	36.8	12.8	37.1	7.4	Fianarantsoa	47.8	15.7	44.4	3.9
12-17	52.7	18.4	48.4	3.6	Toamasina	47.3	12.2	43.8	2.2
18-23	63.1	20.2	54.3	3.6	Mahajanga	47.6	13.6	41.9	2.0
24-29	47.0	16.1	44.7	0.8	Toliara	40.6	14.2	39.4	2.8
30-35	52.5	12.7	50.1	0.8	Antsiranana	37.1	14.0	31.7	4.1
36-47	50.6	11.7	46.0	1.0					
48-59	52.4	10.3	40.8	1.2					
	p<0.000 n=5,014	p<0.000 n=5,013	p<0.000 n=5,012	p<0.000 n=5,014		p<0.000 n=5,015	p<0.000 n=5,014	p<0.000 n=5,012	p<0.000 n=5,013
Gender of child					**Urban-rural residence**				
Female	46.2	11.2	40.7	3.5	Capital/Large city	40.7	7.6	29.8	5.6
Male	48.5	15.0	42.1	3.5	Small city/Town	39.9	14.4	36.1	3.8
					Countryside	49.1	13.1	43.1	3.3
	NS n=5,012	p<0.000 n=5,014	NS n=5,013	NS n=5,012		p<0.000 n=5,012	p<0.000 n=5,013	p<0.000 n=5,012	NS n=5,012
Overall	**47.3**	**13.0**	**41.4**	**3.5**	**Overall**	**47.3**	**13.0**	**41.4**	**3.5**

Note: Level of significance is determined using the chi-square test. NS = Not significant at $p \leq 0.05$

Appendix 2:
NCHS/CDC/WHO International Reference Population Compared with the Distribution of Malnutrition in Madagascar

The assessment of nutritional status is based on the concept that in a well-nourished population, the distribution of children's height and weight, at a given age, will approximate a normal distribution. This means that about 68 percent of children will have a weight within one standard deviation of the mean for children of that age or height and a height within one standard deviation of the mean for children of that age. About 14 percent of children will be between one and two standard deviations above the mean; these children are considered relatively tall or overweight for their age or relatively overweight for their height. Another 14 percent will be between one and two standard deviations below the mean; these children are considered relatively short or underweight for their age or relatively thin for their height. Of the remainder, 2 percent will be very tall or obese for their age or obese for their height; that is, they are more than two standard deviations above the mean. Another 2 percent will fall more than two standard deviations below the mean and be considered moderately or severely malnourished. These children are very short (stunted), very underweight for their age, or very thin for their height (wasted). For comparative purposes, nutritional status has been determined using the International Reference Population defined by the United States National Center for Health Statistics (NCHS standard) as recommended by the Centers for Disease Control and Prevention and the World Health Organization.

Appendix 2 includes four curves: height-for-age, weight-for-height, and weight-for-age, graphed against a normal curve. The height-for-age, weight-for-height and weight-for-age curves are shifted to the left of the standard curve, indicating that there is a large number of malnourished children in Madagascar. The implications are that interventions are necessary to address widespread malnutrition. Improve child health will result in a shift of the curves closer to the reference standard.

Appendix 2
NCHS/CDC/WHO International Reference Population Compared with the Distribution of Malnutrition in Madagascar