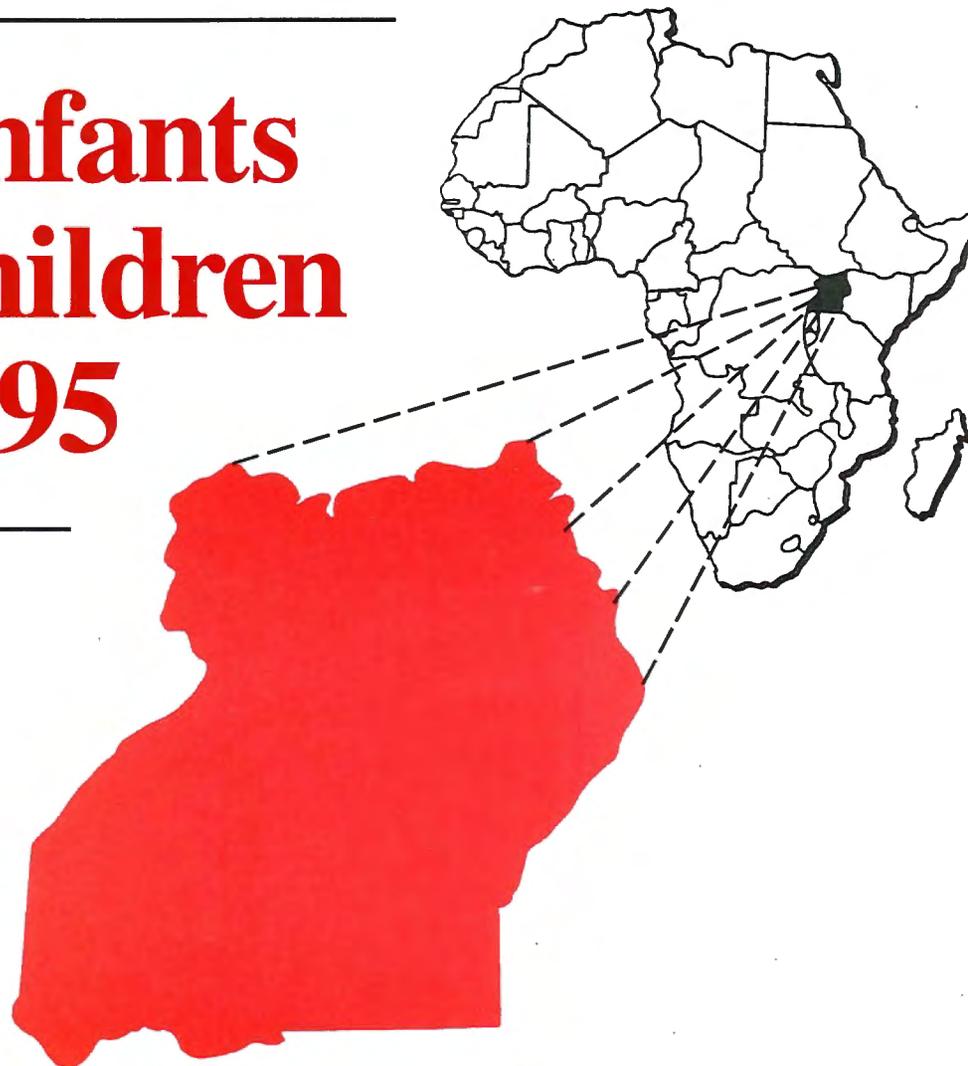

Nutrition of Infants And Young Children In Uganda, 1995

AFRICA NUTRITION CHARTBOOKS



U.S. Agency for International Development
AFR/SD/HRD and G/PHN/HN



Macro International Inc.



Food Security and Nutrition Monitoring Project

AFRICA NUTRITION CHARTBOOKS

NUTRITION OF INFANTS AND YOUNG CHILDREN IN UGANDA

Findings from the 1995 Uganda DHS Survey

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July 1996

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Introduction

Undernutrition¹ is one of the most important health and welfare problems among infants and young children in Uganda. It is a result of both inadequate food intake and disease. Inadequate food intake is a consequence of insufficient food available at the household level and improper feeding practices. Infectious diseases, particularly diarrhoea, acute respiratory illness, malaria and measles, result from inadequate health care, poor environmental sanitation and insufficient water supplies. Both inadequate food intake and disease reflect underlying social and economic conditions.

Among the significant health and economic consequences of undernutrition, the most serious is an increased risk of death. Other adverse consequences include an increased risk of illness, lower cognitive development and poor pregnancy outcomes.

The Uganda data analyzed here are from the 1995 Uganda Demographic and Health Survey (UDHS), a nationally representative survey of 7,550 households conducted by the Statistical Department of the Ministry of Finance and Economic Planning, with technical assistance from Macro International and funding from the U.S. Agency for International Development. Fieldwork was conducted between March and August 1995. Of the 5,756 living children age 0-47 months that were part of the UDHS, 3,816 children 0-35 months are included in these analyses. Nutritional data collected on these children include height, weight, age, breastfeeding history, and feeding patterns. Information was also collected on diarrhoea, fever and cough in the two weeks prior to the survey and on relevant socio-demographic characteristics. For comparison purposes, data are presented from Demographic and Health Surveys conducted in other sub-Saharan countries.

An earlier nutrition chartbook was published in 1993 based on data from the 1989 UDHS. Where applicable, findings from the 1995 UDHS have been compared with those from the 1989 UDHS. A minor difference between the first and second chartbooks is that the second chartbook presents anthropometric data for children 0 to 35 months, whereas the first presented anthropometric data for children 3 to 35 months. Comparisons in the text between 1989 and 1995 thus apply to the 3 to 35 month age-range. The comparison of diarrhoea rates is between children 1 to 24 months (1989) and 0 to 24 months (1995). The one-month difference in age range has no effect on the comparison of prevalence rates. Other slight differences in presentation between the two chartbooks result from modifications in the UDHS survey design between 1989 and 1995.

¹ The technical definitions of *undernutrition* as defined by the National Center for Health Statistics (NCHS), the Centers for Disease Control (CDC), and the World Health Organization (WHO) are presented in Appendix 2.

Figure 1: Undernutrition among Children under 3 Years, Uganda

In Uganda:

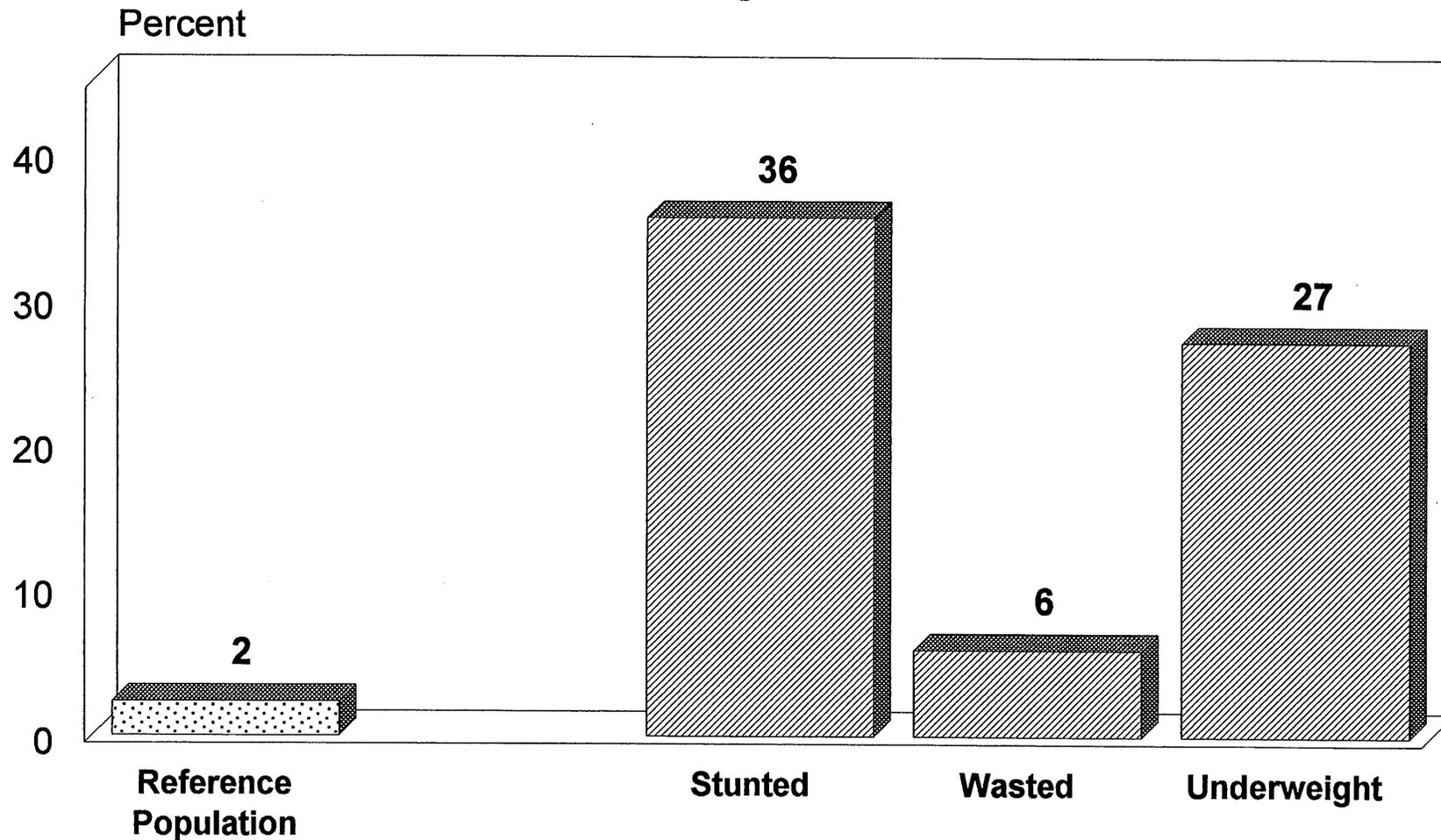
- **Over one-third of children aged 0 to 35 months are chronically undernourished.** In other words, they are too short for their age or *stunted*.¹ The proportion of children who are stunted is 18 times the level expected in a healthy, well-nourished population. The proportion of children 3 to 35 months of age who are stunted has decreased by 18 percent since the 1989 UDHS.
- **Acute undernutrition**, manifested by *wasting*,² results in a child being too thin for his or her height. Wasting affects 6 percent of children, which is three times the level expected in a healthy, well-nourished population. The proportion of children 3 to 35 months of age who are wasted has tripled since the 1989 UDHS.
- **Twenty-seven percent of children are *underweight***³ for their age. This is 13 times the level expected in a healthy, well-nourished population. The proportion of underweight children 3 to 35 months of age has increased by 8 percent since the 1989 UDHS.

¹ A *stunted* child has a height-for-age Z-score that is below -2 standard deviations (SD) based on the NCHS/CDC/WHO reference population. Chronic undernutrition is the result of an inadequate intake of food over a long period of time 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 undernutrition is the result of a recent failure to receive adequate nutrition and may be affected by acute illness, especially diarrhoea.

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 undernutrition, or a combination of both.

Figure 1
Undernutrition among Children under 3 Years,
Uganda



Note: *Stunted* reflects chronic undernutrition; *wasted* reflects acute undernutrition; *underweight* reflects chronic or acute undernutrition, or a combination of both.

Source: UDHS 1995

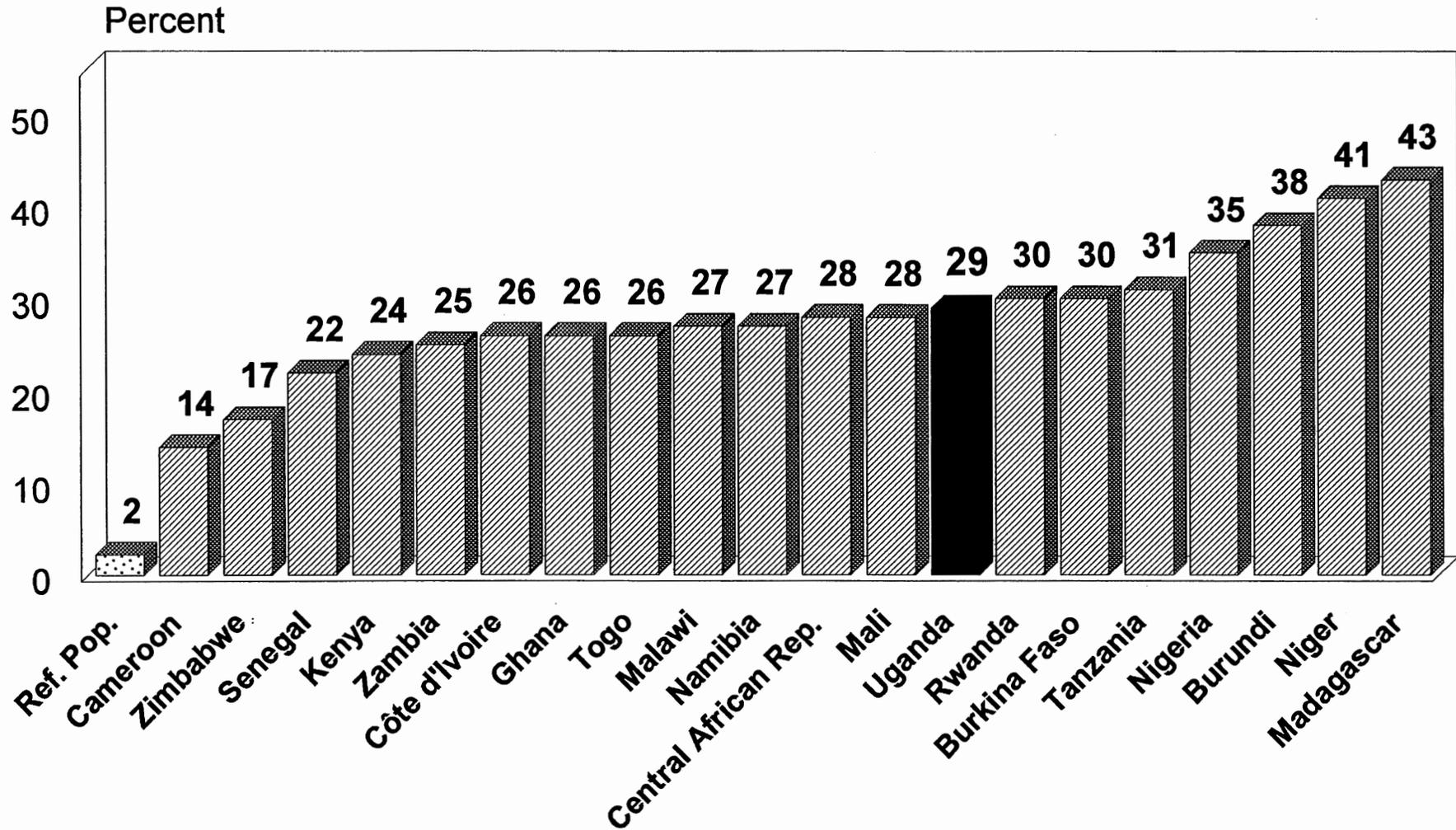
Figure 2: Underweight among Children Age 3 to 35 Months in Uganda Compared with Other Sub-Saharan Countries

Among the sub-Saharan countries surveyed:

- The percentage of children age 3 to 35 months who are underweight ranges from 14 to 43 percent. **At 29 percent, the proportion of underweight children in Uganda falls in the middle range of sub-Saharan countries surveyed.** The proportion of children underweight has increased by 8 percent since the 1989 UDHS.

Figure 2

Underweight among Children Age 3 to 35 Months in Uganda Compared with Other Sub-Saharan Countries



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

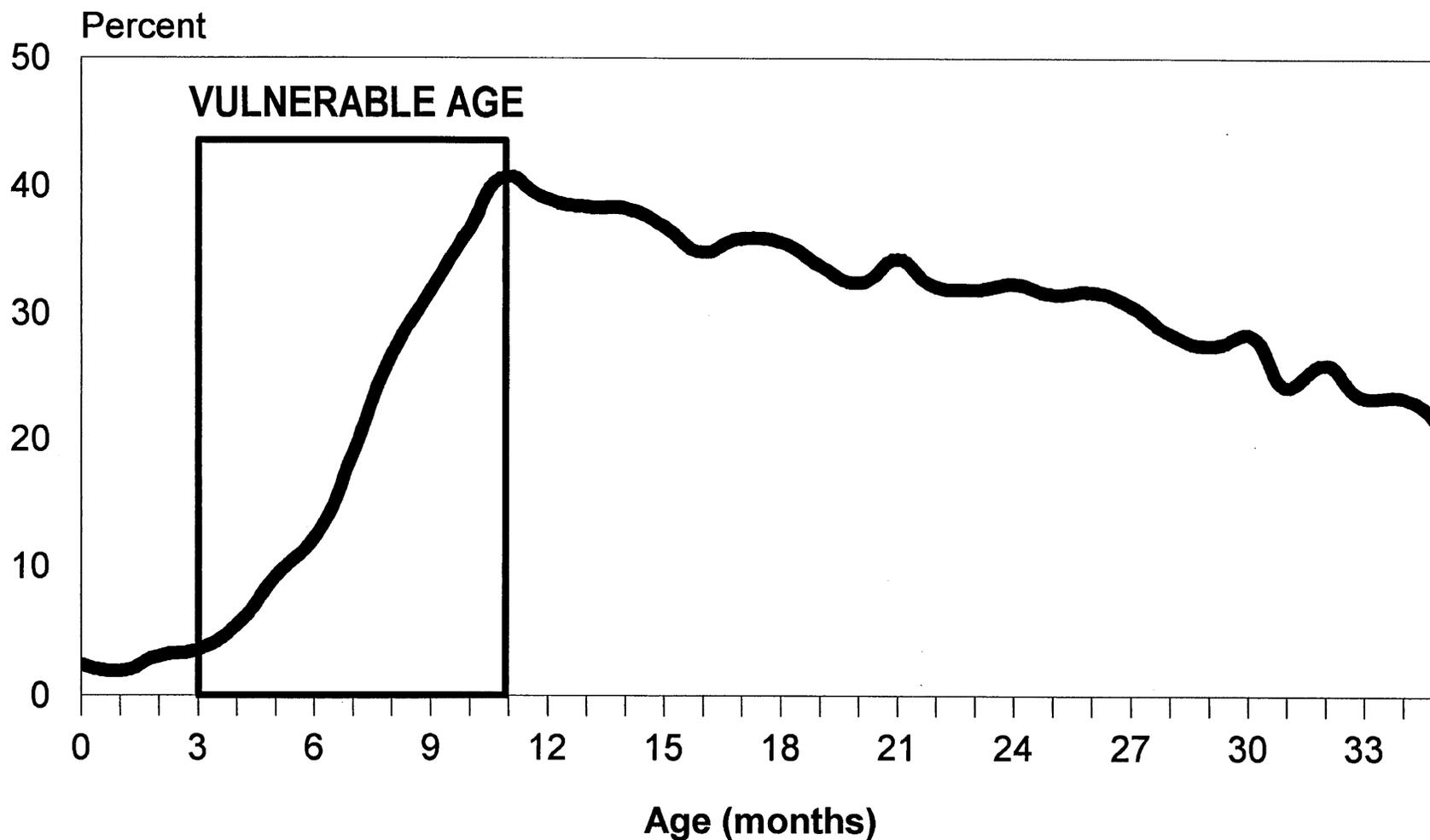
Source: DHS Surveys 1986-1995

Figure 3: Underweight by Age, Uganda

In Uganda, the time between 3 months and 11 months of age is a vulnerable period:

- **The proportion of children underweight increases very rapidly from 3 months to 11 months of age, peaking at about 40 percent.** It slowly decreases from this high level through the second and third years of life to reach about 23 percent by the end of the third year. This pattern is similar to that observed in 1989.

Figure 3
Underweight by Age, Uganda



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

Source: UDHS 1995

Figure 4: Feeding Practices for Infants under 4 Months, Uganda

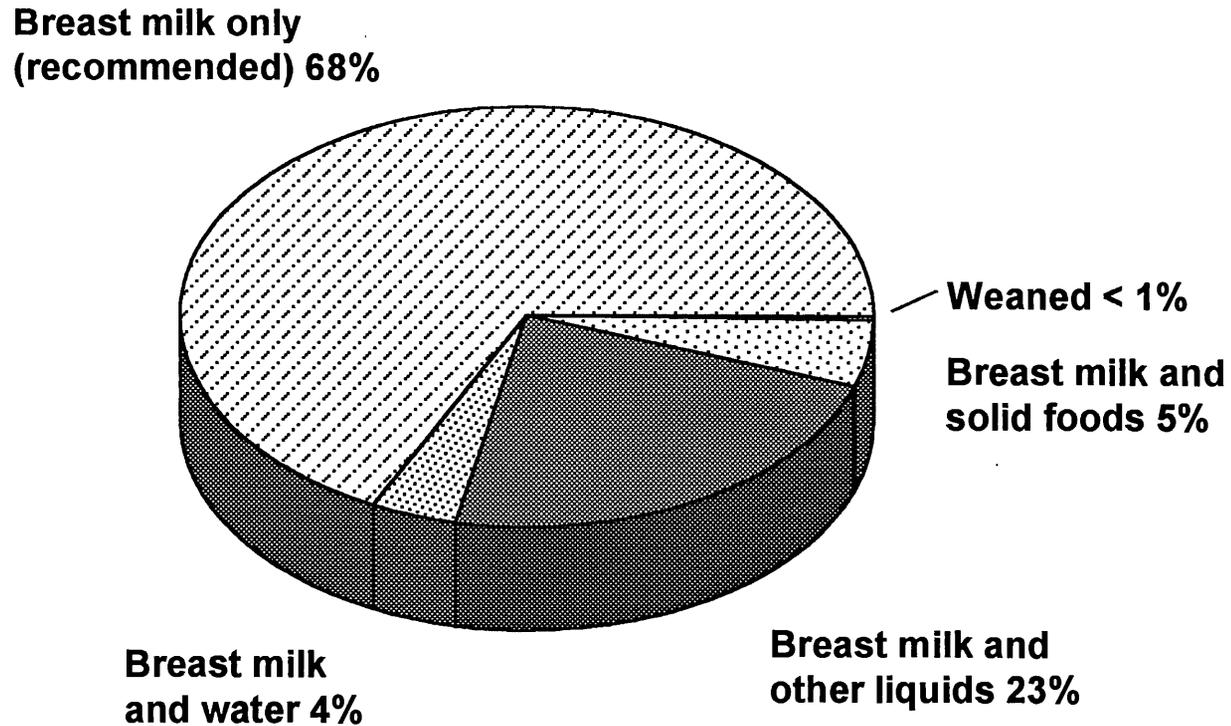
Improper feeding practices, in addition to infectious disease, are important determinants of undernutrition. The World Health Organization (WHO) recommends that *all infants be exclusively breastfed from birth until about 6 months of age.*¹ In other words, infants should be fed only breast milk during the first months of their lives.

In Uganda, the introduction of liquids, such as water, juice, formula, and solid foods, takes place far earlier than the recommended age of about 6 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 and thus puts them at greater risk of diarrhoeal disease.

- **Some 68 percent of children in Uganda under the age of 4 months are exclusively breastfed, as is recommended by WHO. This represents a slight decrease in exclusive breastfeeding since the 1989 UDHS, which reported that 70 percent of mothers followed the WHO recommendation.**
- **Almost one-third of infants under 4 months old are given some form of supplements other than water, which is not recommended.**

¹ World Health Organization, Forty-seventh World Health Assembly (WHA 47.5), May 9, 1994.

Figure 4
Feeding Practices for Infants under 4 Months, Uganda



Note: WHO recommends that all infants be breastfed exclusively until they are about 6 months old.

Source: UDHS 1995

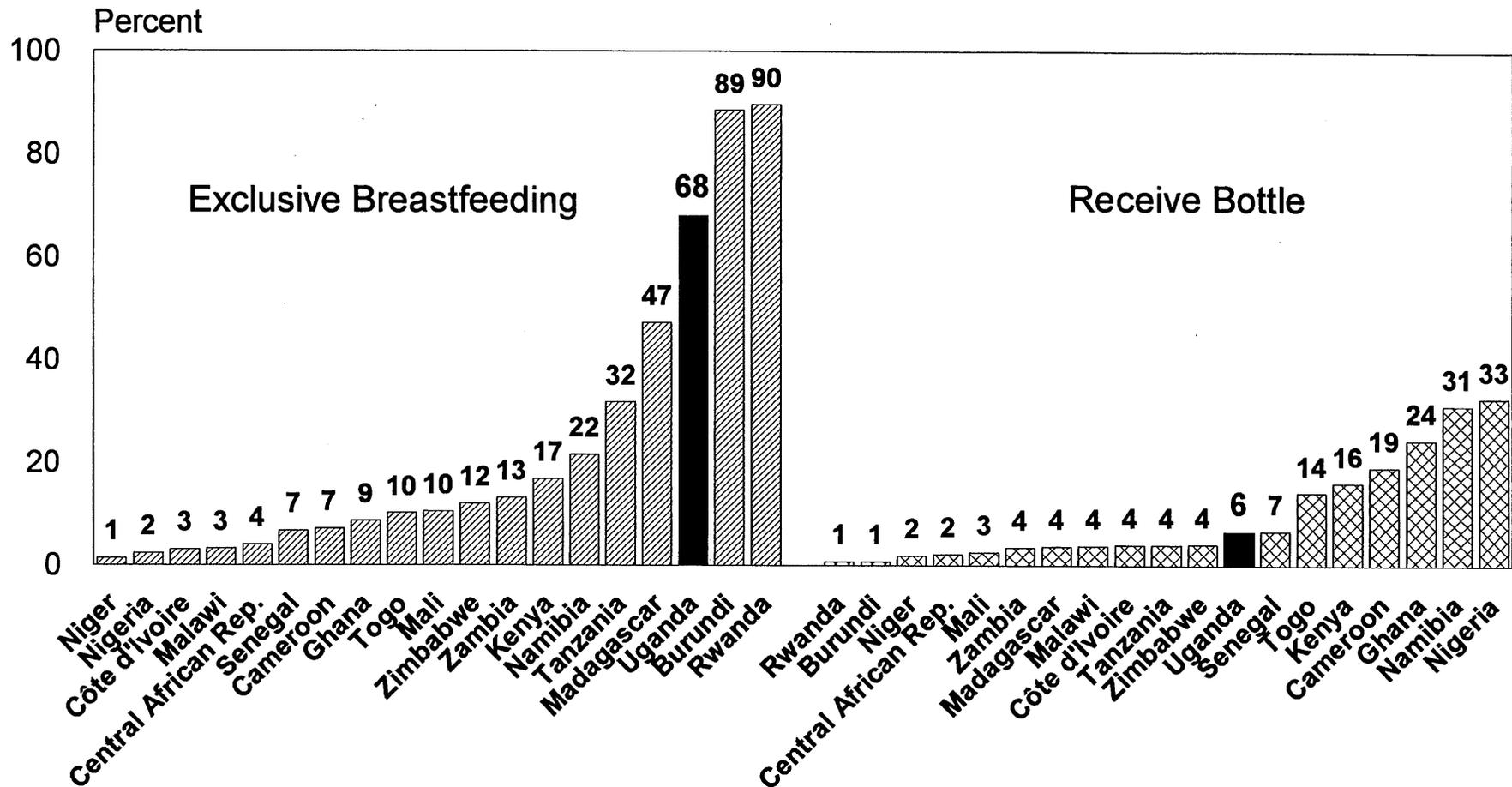
Figure 5: Infants under 4 Months Who are Exclusively Breastfed and Those Who Receive a Supplemental Bottle in Uganda Compared with Other Sub-Saharan Countries

The failure to exclusively breastfeed young infants, the introduction of liquids and solid foods at too early an age and the use of bottles, all increase the risks of diarrhoea, other infectious diseases and mortality in Africa.

- In most of the sub-Saharan countries surveyed, relatively few mothers of infants under 4 months follow the recommended practice of breastfeeding exclusively. **However, over two-thirds of mothers in Uganda breastfeed their young infants exclusively.** This places them in the upper range of sub-Saharan countries.
- **Bottle feeding, which is not recommended by WHO, is used by 6 percent of mothers of infants under 4 months in Uganda.** This represents an increase of two and a half times the level reported in the 1989 UDHS.

Figure 5

Infants under 4 Months Who Are Exclusively Breastfed and Those Who Receive a Supplemental Bottle in Uganda Compared with Other Sub-Saharan Countries



Note: Information on feeding practices is based on the 24 hours preceding the survey. WHO recommends that all infants should receive nothing but breast milk until about 6 months of age.

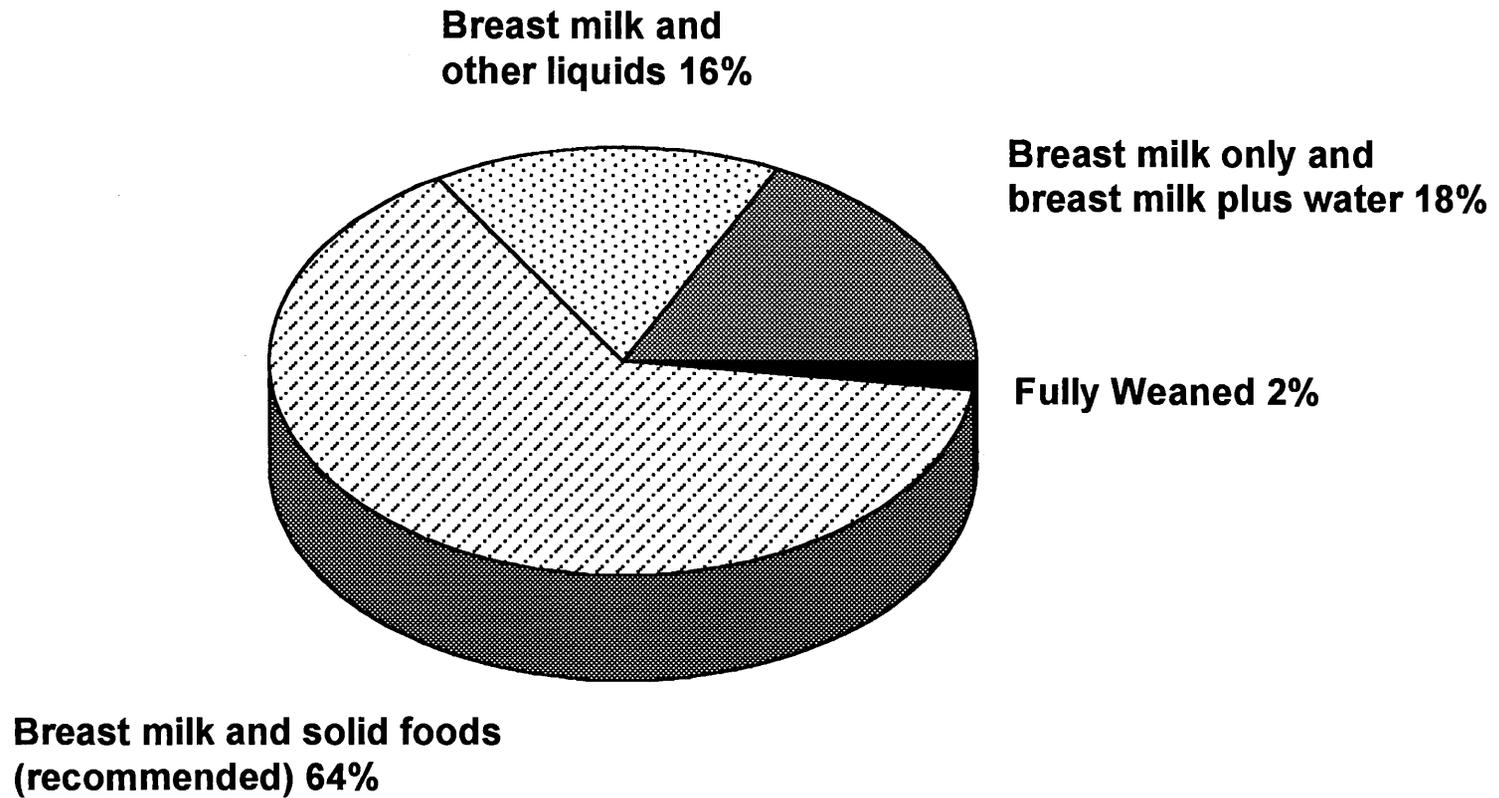
Source: DHS Surveys 1986-1995

Figure 6: Feeding Practices for Infants Age 6 to 9 Months, Uganda

The WHO recommends that solid foods be introduced to infants around the age of 6 months because breast milk alone is no longer sufficient to maintain a child's optimal growth. Thus, *all infants over 6 months of age should be receiving solid foods* along with breast milk.

- **About 64 percent of infants age 6 to 9 months are fed solid foods in addition to breast milk.** In other words, a majority of infants between the ages of 6 and 9 months are fed **according to the recommended practice**. The proportion of mothers who feed their infants solid foods in addition to breast milk has declined slightly since the 1989 UDHS, when 69 percent were fed according to the recommendations.
- **One-third of infants age 6 to 9 months are not fed solid foods in addition to breast milk; 2 percent are fully weaned from the breast.**

Figure 6
Feeding Practices for Infants Age 6 to 9 Months, Uganda



Note: WHO recommends that by the age of 6 months all infants should receive solid foods in addition to breast milk.

Source: UDHS 1995

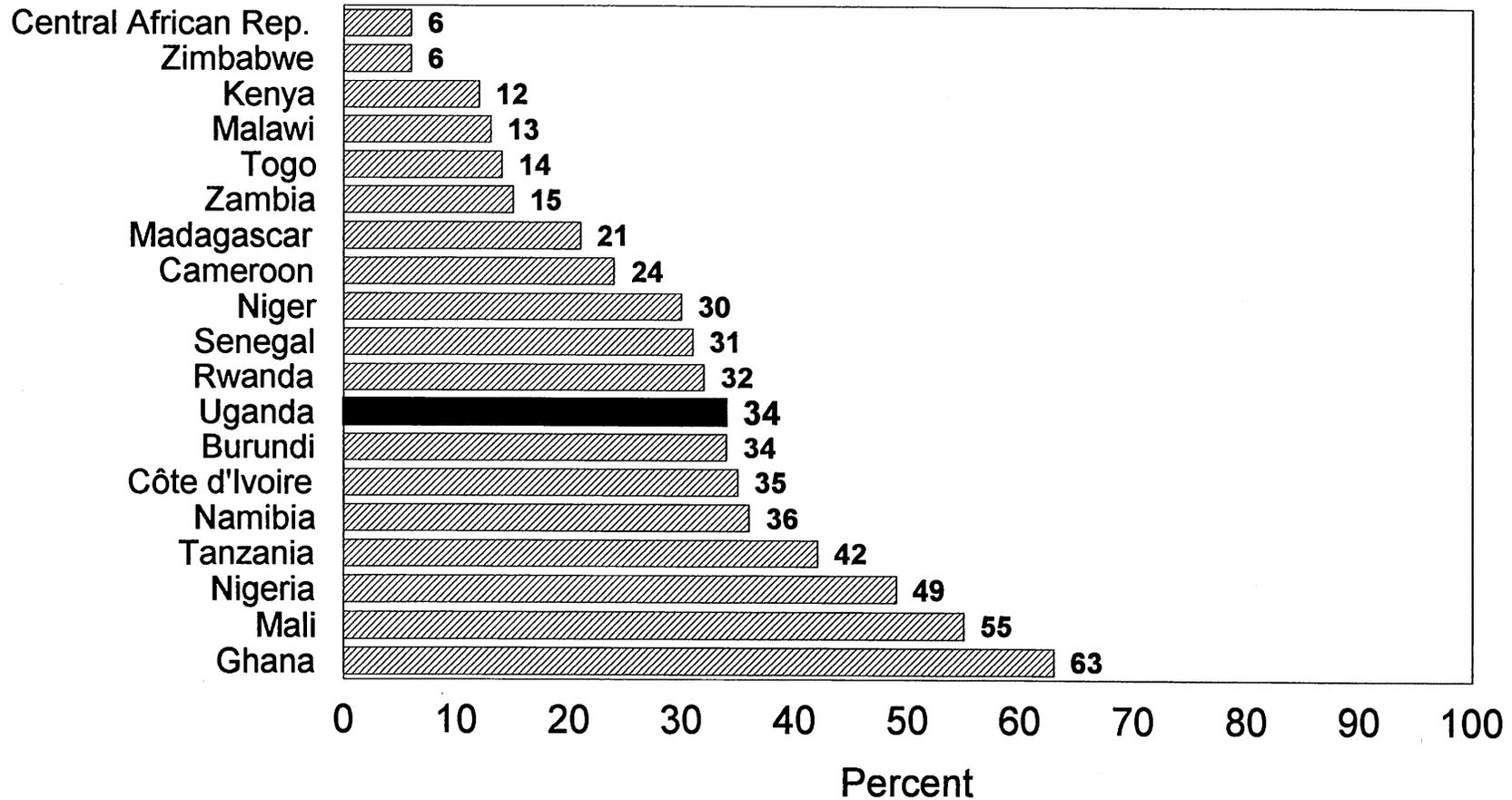
Figure 7: Infants Age 6 to 9 Months Not Receiving Food in Addition to Breast Milk in Uganda Compared with Other Sub-Saharan Countries

In Uganda:

- **Thirty-four percent of infants age 6 to 9 months do not receive solid food in addition to breast milk.** The percent of infants not receiving solid foods in addition to breast milk has increased by 57 percent since the 1989 UDHS. This suggests that compliance with the WHO recommendations has declined.

Figure 7

Infants Age 6 to 9 Months Not Receiving Food in Addition to Breast Milk in Uganda Compared with Other Sub-Saharan Countries



Note: WHO recommends that by the age of 6 months all infants should receive solid foods and liquids in addition to breast milk.

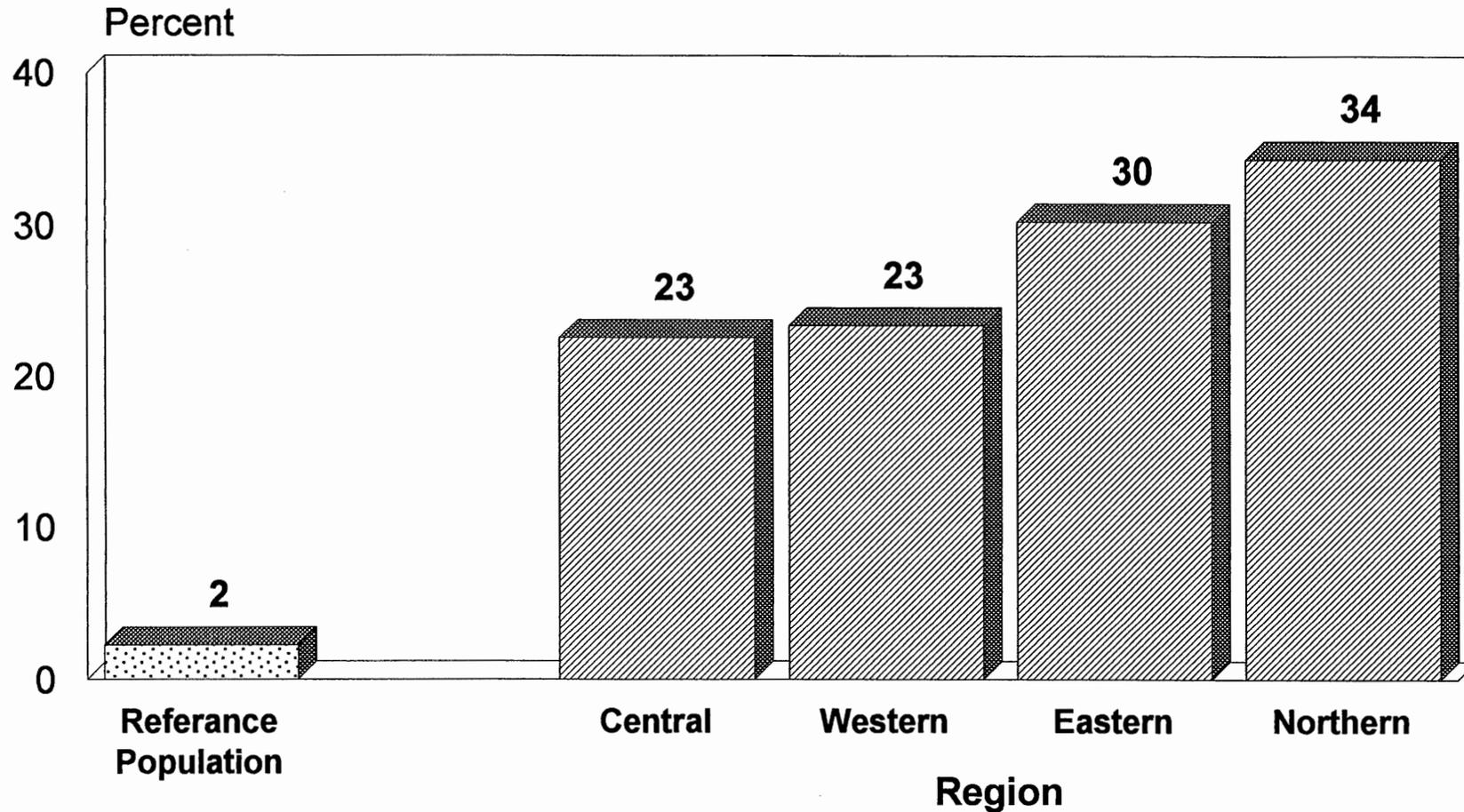
Source: DHS Surveys 1986-1995

Figure 8: Underweight among Children under 3 Years by Region, Uganda

In Uganda:

- **Underweight occurs in over one-third of children living in the Northern region and 30 percent of children in the Eastern region.**
- **Almost one-quarter of children under age 3 are **underweight** in the Central and Western regions.**

Figure 8
Underweight among Children under 3 Years
by Region, Uganda



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

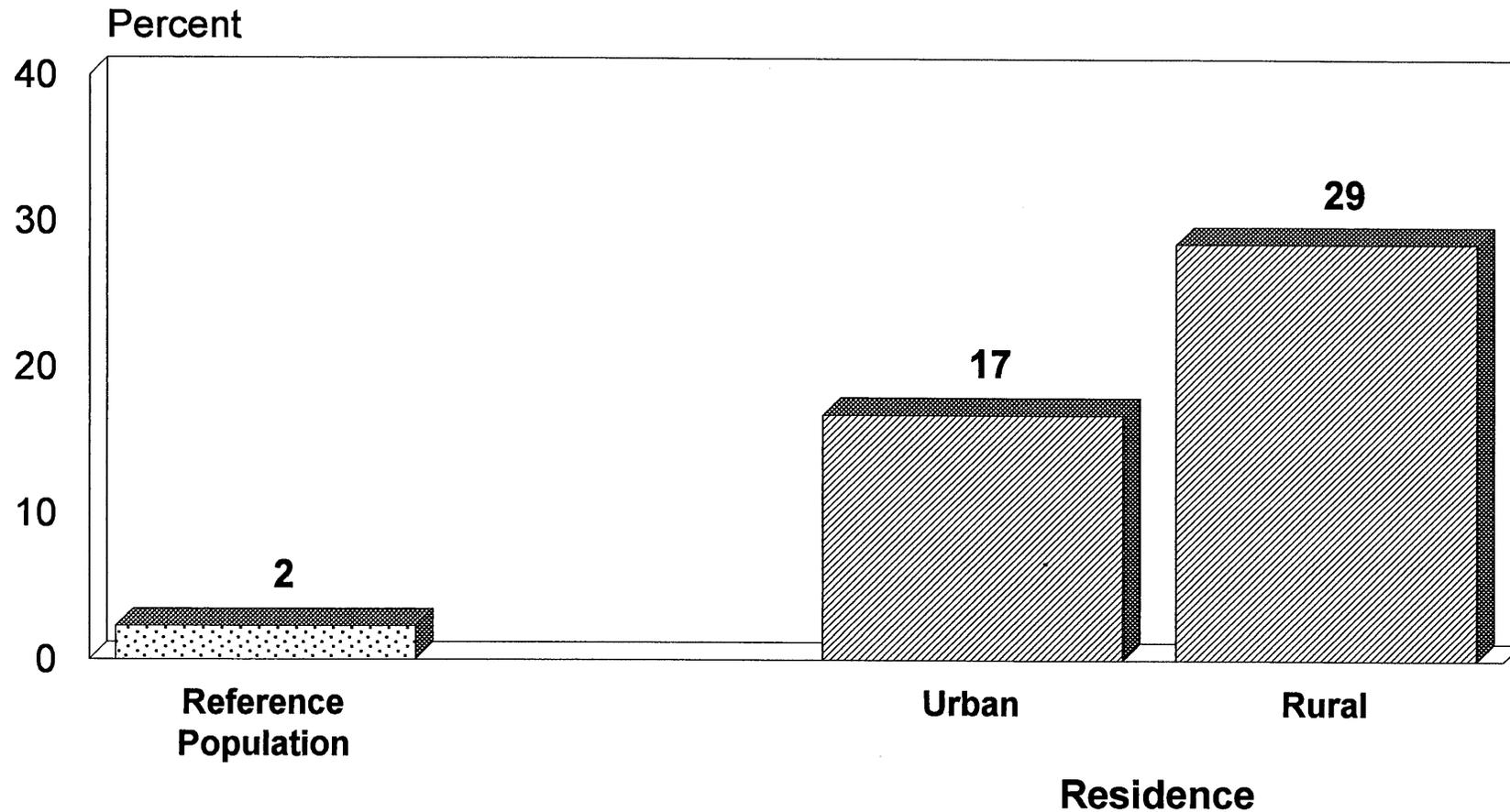
Source: UDHS 1995

Figure 9: Underweight among Children under 3 Years by Residence, Uganda

In Uganda:

- **In rural areas, where most of the population lives, 29 percent of children under 3 years are underweight.**
- **In urban areas, 17 percent of children under 3 years are underweight.** This is nearly 60 percent lower than the level in the rural areas.

Figure 9
Underweight among Children under 3 Years
by Residence, Uganda



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

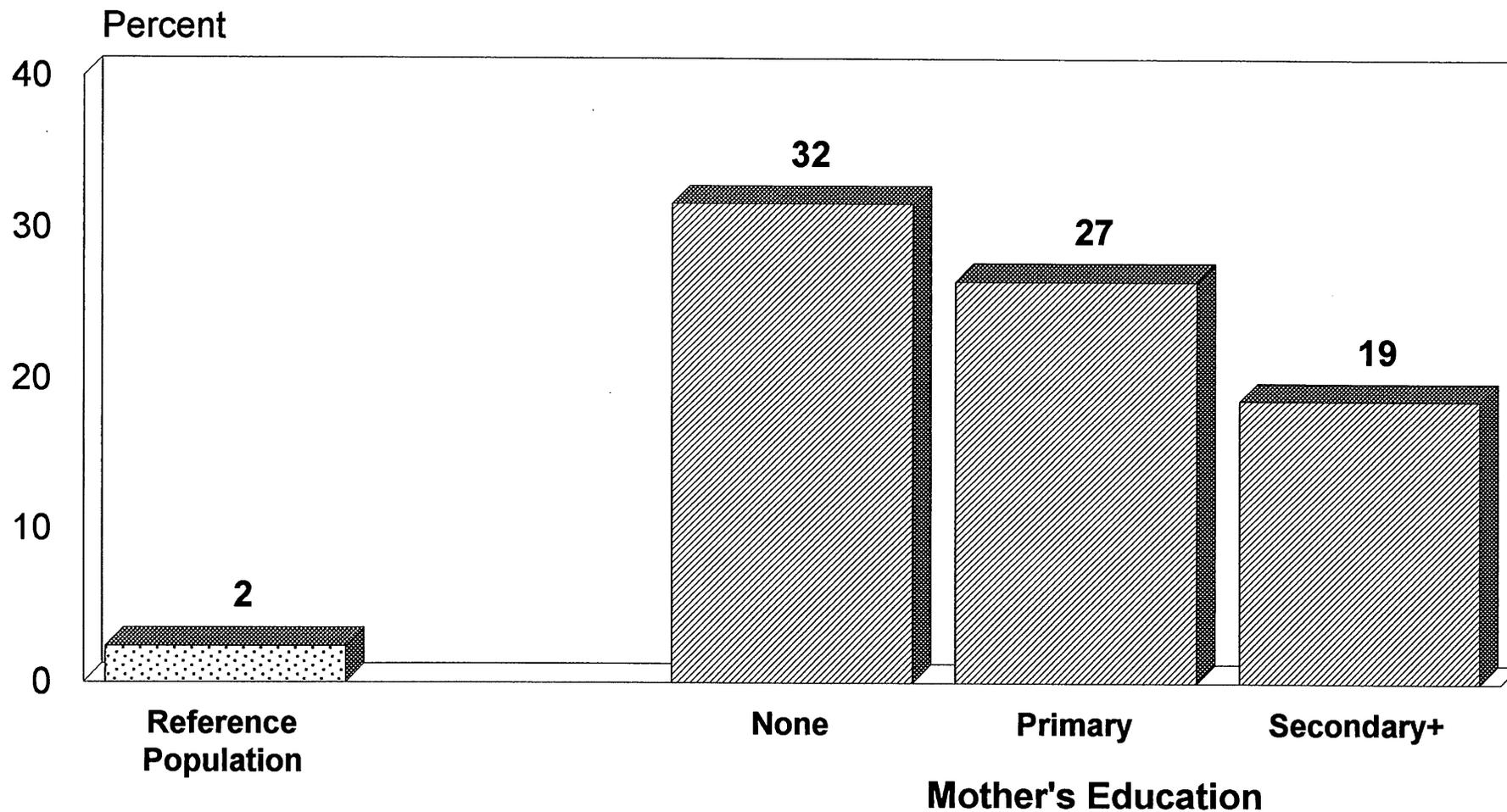
Source: UDHS 1995

Figure 10: Underweight among Children under 3 Years by Mother's Education, Uganda

Maternal education, which is related to household wealth, is a determinant of good child-care knowledge and practices. In Uganda, over 30 percent of mothers with children under 3 years of age have never attended school, while just 11 percent have secondary or higher education. Maternal education varies widely across regions, and there are large differences between urban and rural areas. In urban areas, approximately 10 percent of mothers have never been to school and about 35 percent have gone to at least secondary school. In rural areas, 33 percent of mothers have not been to school, while only 8 percent have been to at least secondary school.

- **Underweight is almost twice as high among children of mothers with no education, and almost 20 percent higher among children of mothers with only primary school education, compared to children of mothers with secondary or higher education.**
- **A surprisingly high proportion (19 percent) of children of mothers with secondary or higher education are underweight. This is over nine times the level in the reference population.**

Figure 10
**Underweight among Children under 3 Years by
Mother's Education, Uganda**



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

Source: UDHS 1995

Figure 11: Underweight among Children under 3 Years by Source of Drinking Water, Uganda

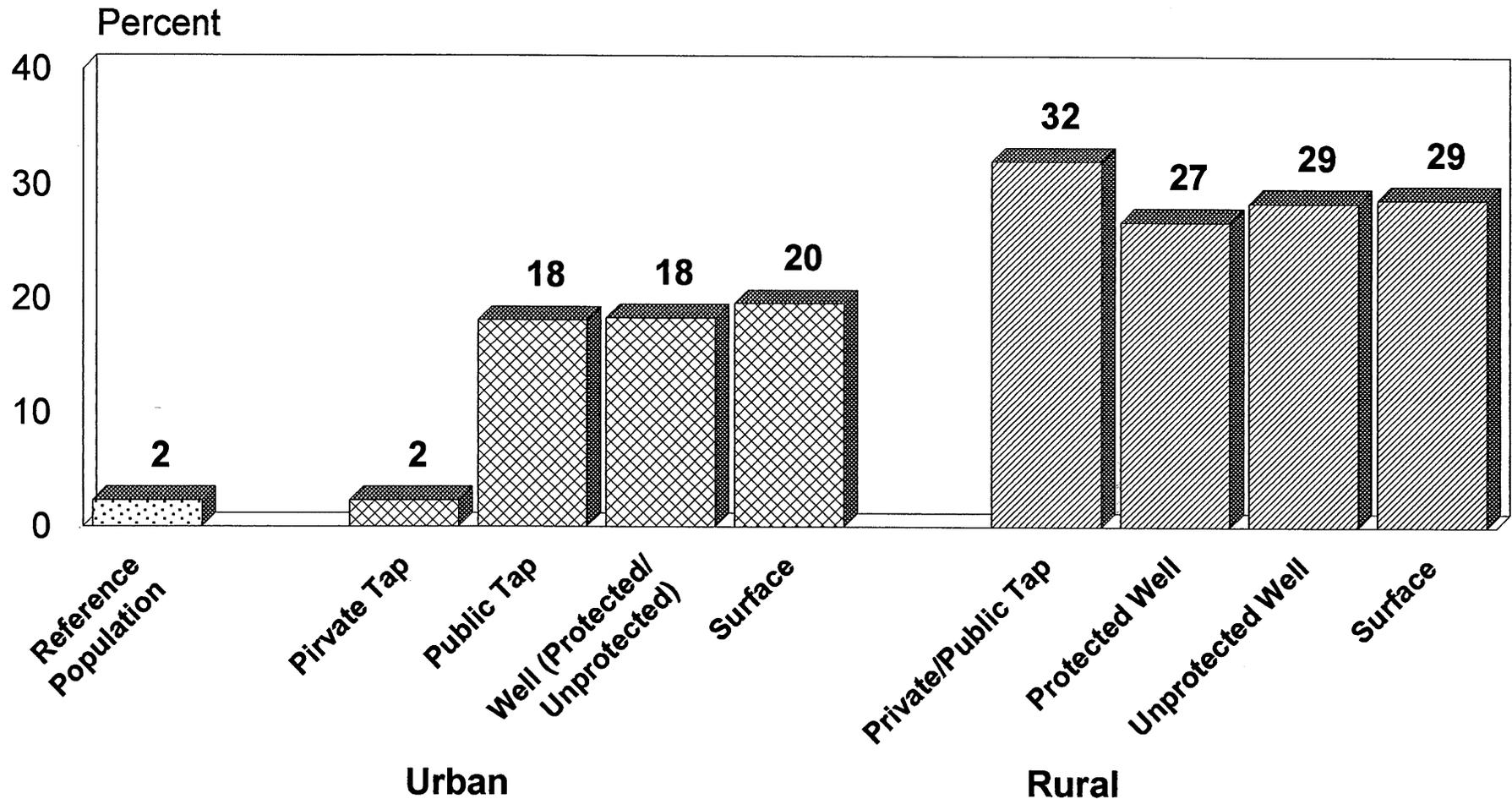
A household's source of drinking water is associated with child nutritional status directly, through its impact on hygiene and the risk of diarrhoeal disease, and indirectly, being a measure of wealth and access to water. Without an adequate supply of good quality water, a household's personal, domestic and food hygiene are compromised and the risk of pathogen contamination (and thus diarrhoeal diseases) increases. Poor households are likely to have an insufficient supply of water and to obtain drinking water from contaminated sources, such as surface water.

In Uganda, the type of drinking water available to households varies by residence. In urban areas, almost one half (45 percent) of households use either public or private taps, while the majority of those remaining use protected or unprotected wells or surface water sources. In contrast, among rural households, two-thirds obtain drinking water from protected or unprotected wells or surface sources. Only 1 percent of rural residents obtain drinking water from public or private taps. Among households with children under 3 years of age, the proportions are similar.

- **In urban areas**, underweight is at least 9 times more common in households using a water source other than a private tap. Only 2 percent of children with private taps were underweight compared to over 18 percent among households using public taps, protected or unprotected wells or surface water sources.
- **In rural areas**, underweight among children does not vary widely by source of drinking water; however, children from homes using a protected well are slightly less likely to be underweight than children from households using public or private taps, unprotected wells or surface water sources.

Figure 11

Underweight among Children under 3 Years by Source of Drinking Water, Uganda



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

Source: UDHS 1995

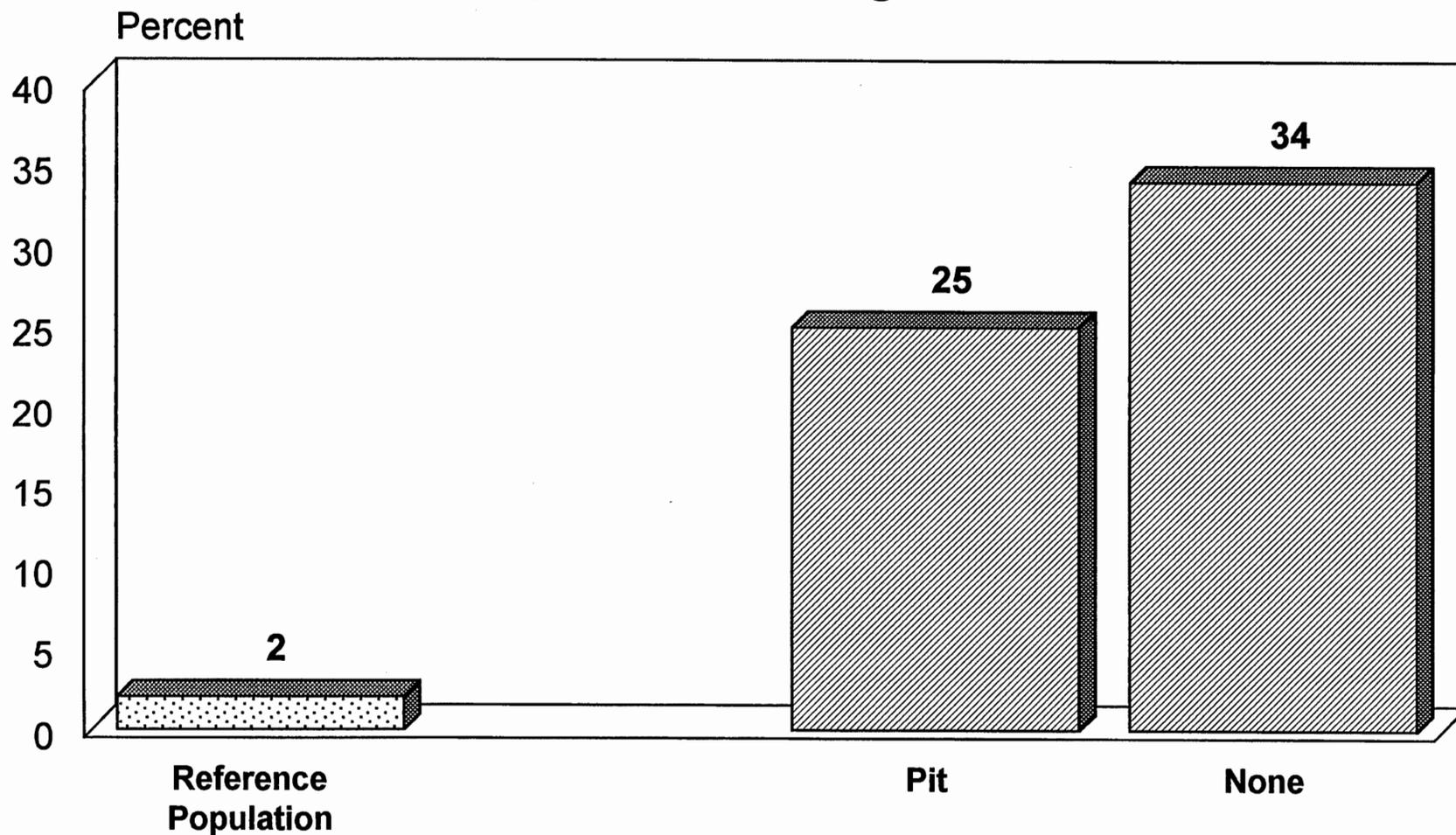
Figure 12: Underweight among Children under 3 Years by Residence and Type of Toilet, Uganda

The type of toilet used by a household is an indicator of household wealth and a determinant of environmental sanitation. Poor households are less likely to have sanitary toilet facilities. Poor sanitation results in increased risk of diarrhoeal disease, which contributes to undernutrition. In Uganda, the type of toilet used differs by area of residence. In urban areas, almost 90 percent of all households use a pit latrine, while only 6 percent have a flush toilet and 4 percent have no toilet at all. In rural areas, almost 80 percent of all households have a pit latrine, while less than 1 percent use flush toilets and 20 percent have no toilet at all.

- **Underweight varies by the type of toilet used; 25 percent of children from households using a pit latrine were underweight compared to 34 percent among households with no toilet.¹**

¹ Only 1.1 percent of all children under 3 years come from households with flush toilets, therefore, prevalence of undernutrition among these children is not shown.

Figure 12
**Underweight among Children under 3 Years by
Type of Toilet, Uganda**



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

Source: UDHS 1995

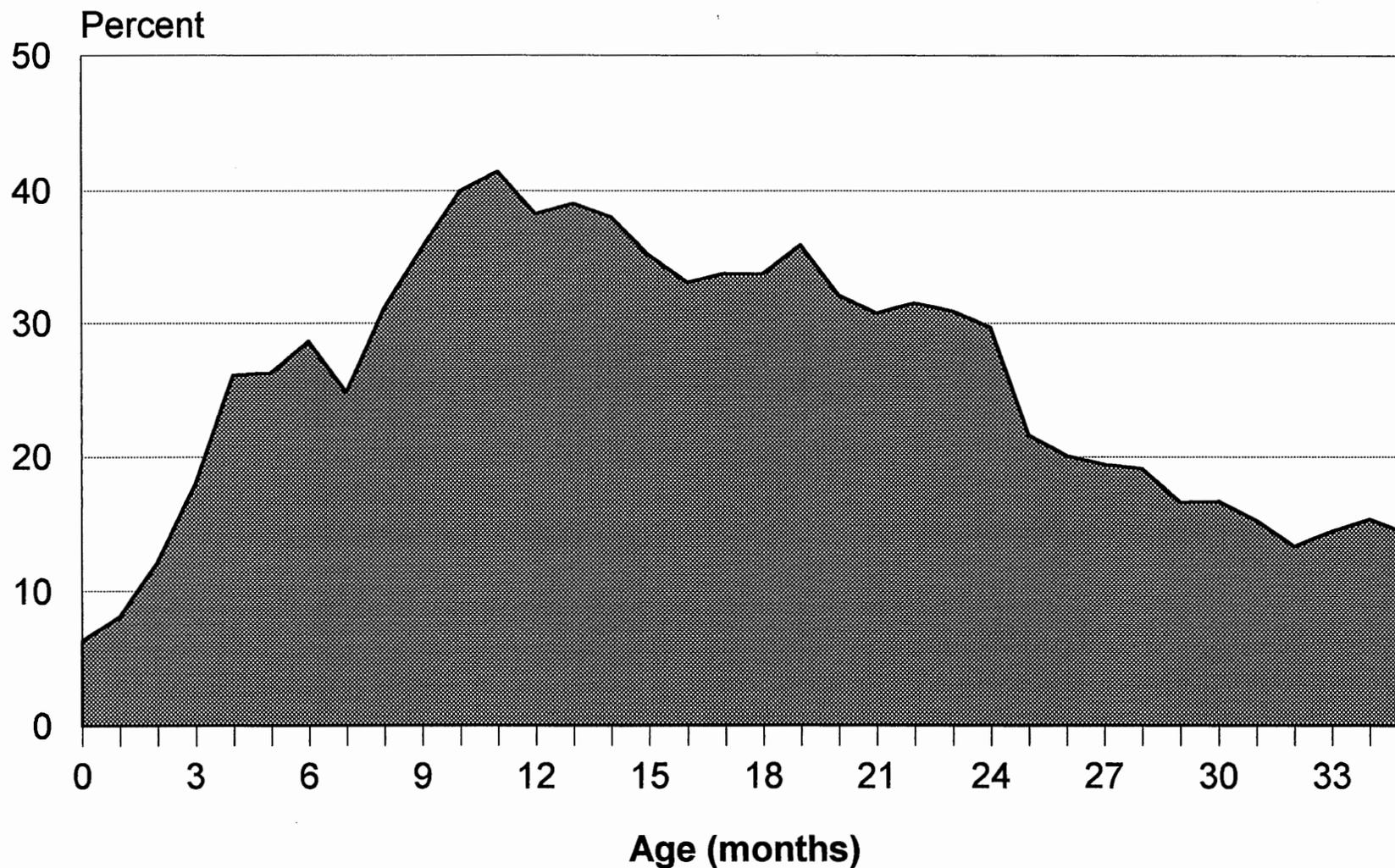
Figure 13: Age-related Pattern of Diarrhoea among Children under 3 Years, Uganda

In Uganda:

- **The prevalence of diarrhoea increases rapidly during infancy until it peaks at age 11 months, when over 40 percent of children are reported to have had diarrhoea during the preceding two weeks. The prevalence of diarrhoea remains above 30 percent until the age of two years, after which it declines gradually to about 15 percent by the age of three.**

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

Figure 13
**Age-Related Pattern of Diarrhoea among
Children under 3 Years, Uganda**



Source: UDHS 1995

Figure 14: Prevalence of Diarrhoea, Fever, and Cough among Children Age 0 to 24 Months¹ in Uganda Compared with Other Sub-Saharan Countries

Diarrhoea, fever, and cough are common infectious diseases that may diminish a young child's nutritional status by decreasing food intake or absorption. While a single disease episode may affect short-term, or acute, nutritional status, growth will catch up with adequate food intake. After repeated episodes of disease, however, a child's growth cannot catch up sufficiently and long-term, or chronic, undernutrition results.

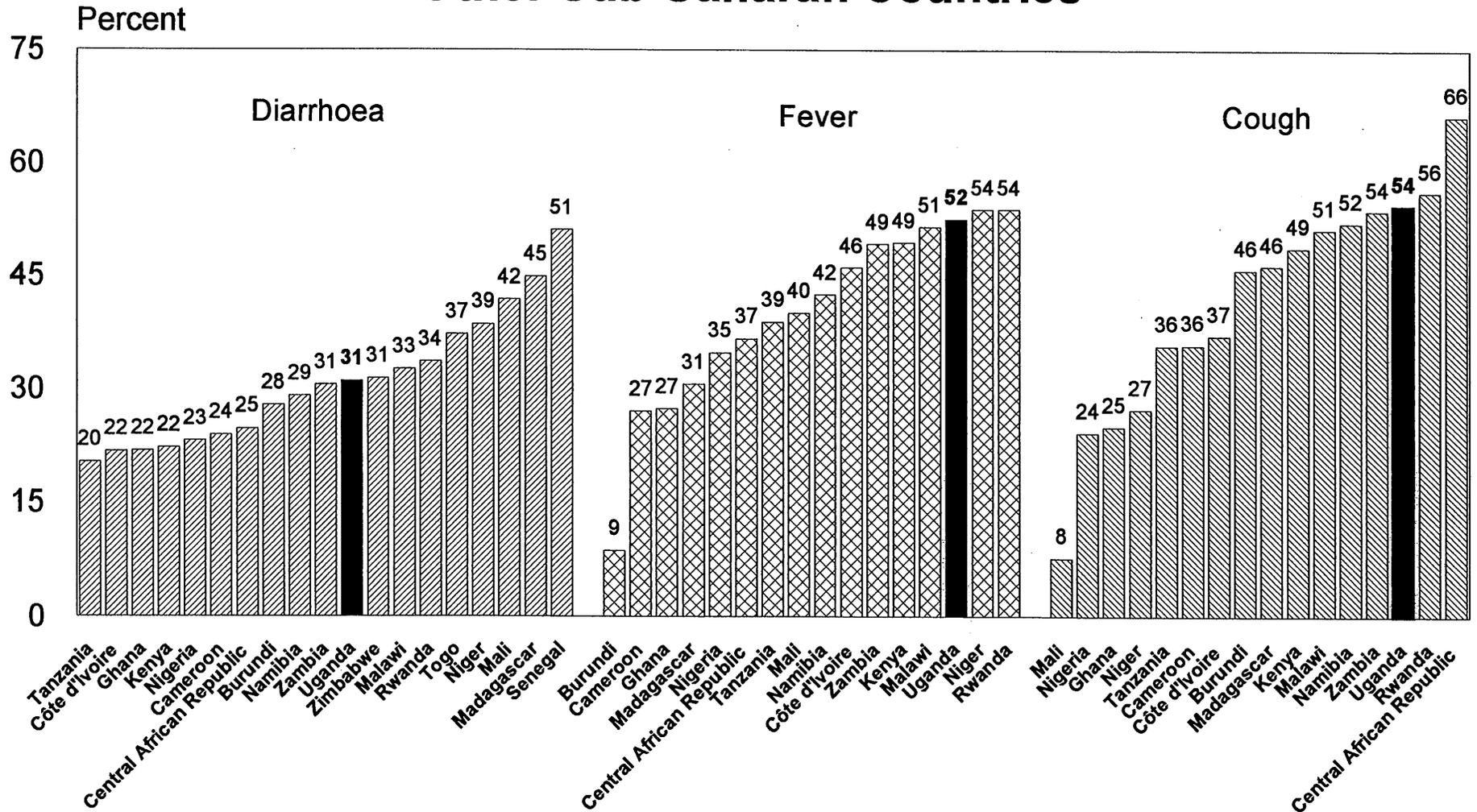
- **About 31 percent of Ugandan children under 24 months suffered from diarrhoea during the two weeks preceding the survey.** This level is in the middle range for the sub-Saharan countries surveyed.² The prevalence of children with diarrhoea has declined by 21 percent since the 1989 UDHS.
- **About 52 percent of Ugandan children reportedly had a fever during the two weeks prior to the survey.** This is the third highest of the sub-Saharan countries surveyed. The prevalence of fever has increased by 8 percent since the 1989 UDHS.
- **Mothers reported that 54 percent of children had a cough in the preceding two weeks.** This is the third highest figure recorded in the sub-Saharan countries surveyed. The prevalence of cough has more than doubled since the 1989 UDHS.

¹ Data are presented only for children under 2 years because this age group is the most vulnerable to diarrhoeal disease.

² Survey data on the prevalence of diarrhoea in different countries may not be strictly comparable because mothers' perceptions of diarrhoea may differ by country. Additionally, the prevalence of diarrhoea, fever, and respiratory illness is influenced by seasonal patterns and thus will vary depending on the season the fieldwork is conducted.

Figure 14

Prevalence of Diarrhoea, Fever, and Cough among Children Age 0 to 24 Months in Uganda Compared with Other Sub-Saharan Countries



Source: DHS Surveys 1986-1995

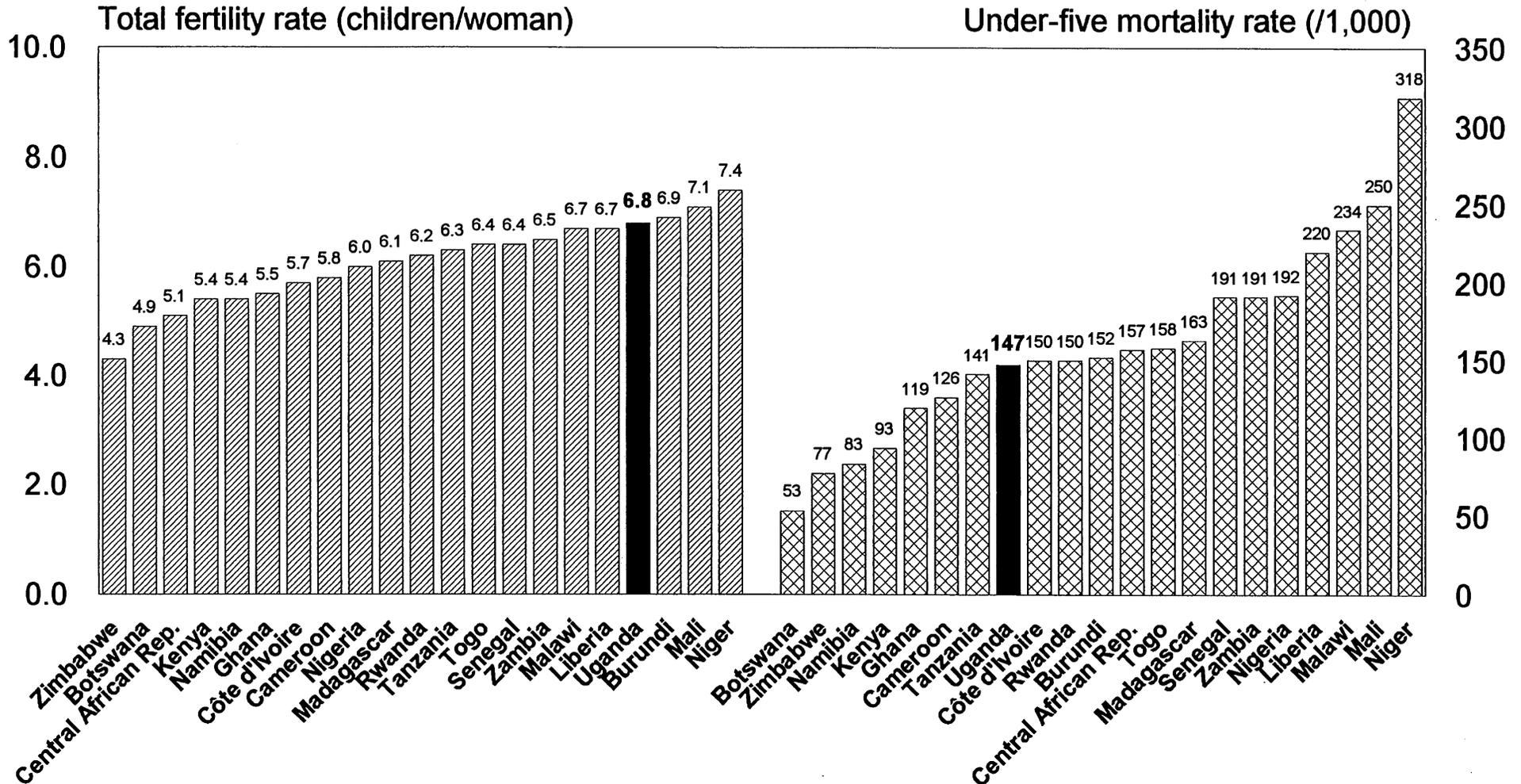
Figure 15: Fertility and Child Mortality in Uganda Compared with Other Sub-Saharan Countries

High fertility rates, especially when accompanied by short intervals between births, 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 women's health, thus increasing the chances that a mother may not be able to breastfeed or care for her children adequately. Young children, who are more vulnerable to undernutrition and disease, are more likely to die.

- **At current fertility levels, each woman in Uganda will have an average of 6.8 children by the end of her childbearing years** (this is the total fertility rate for women age 15 to 49 years). This rate is the fourth highest among the sub-Saharan countries surveyed; however, it represents an important decrease since the 1989 UDHS, when women had an average of 7.4 children.
- **Under-five mortality is in the middle range in Uganda compared with other sub-Saharan countries. At current mortality levels, less than 15 percent of children born will die before their fifth birthday.** Uganda's under-five mortality rate of 147 deaths per 1,000 births, although still high, has dropped by 18 percent since the 1989 UDHS.

Figure 15

Fertility and Child Mortality in Uganda Compared with Other Sub-Saharan Countries



Source: DHS Surveys 1986-1995

Figure 16: Survival and Nutritional Status of Children, Uganda

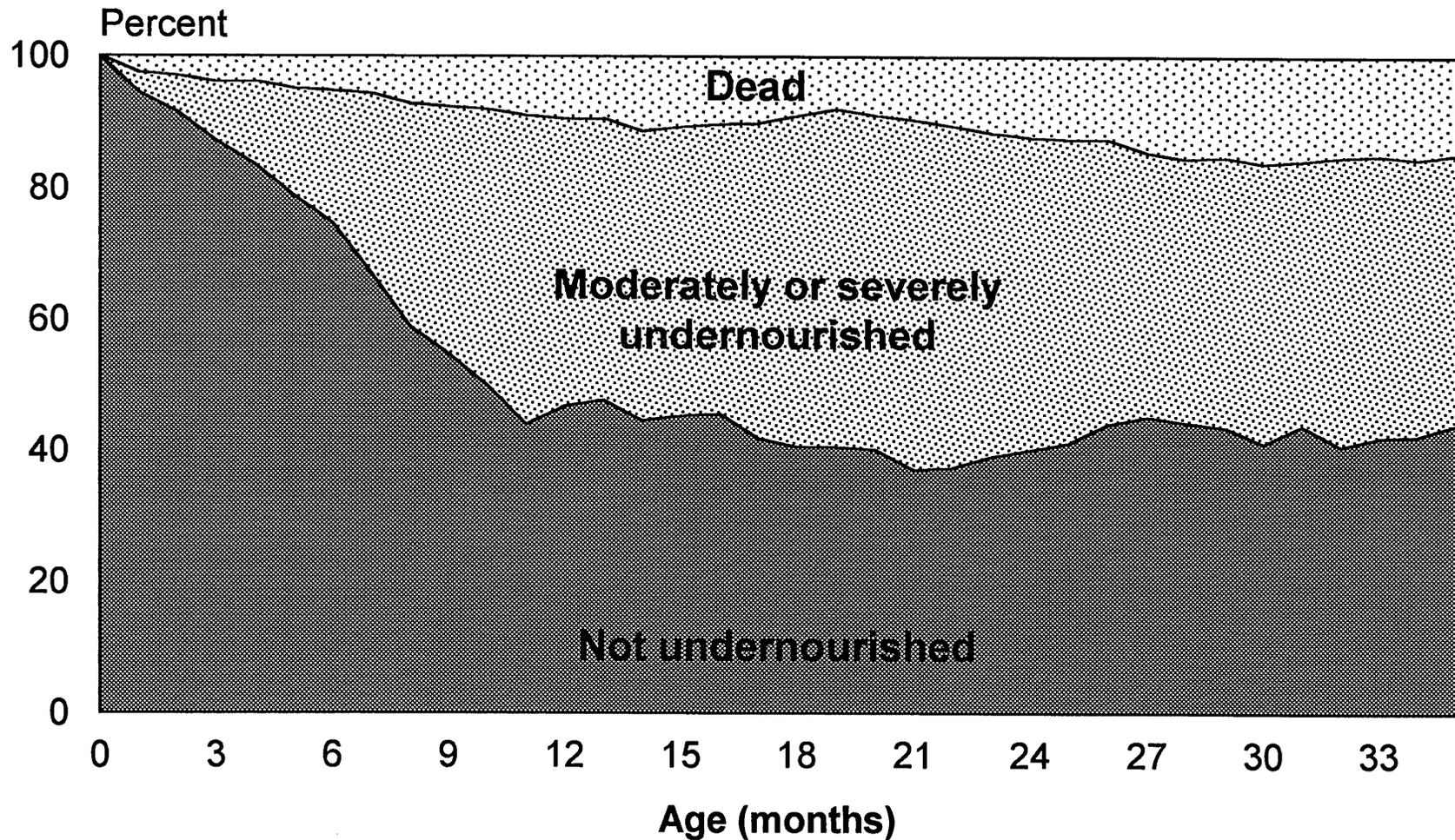
Undernutrition and mortality take a tremendous toll on young children. This figure illustrates the proportion of children who have died or are undernourished at each age.

In Uganda:

- Between 0 and 11 months of age, the percentage of children who are alive and well nourished drops rapidly.
- **At two years of age, 12 percent of children have died, 48 percent are severely or moderately undernourished,¹ and only 40 percent remain alive and well nourished.**

¹A child with a Z-score below -3 SD on the reference standard is considered severely undernourished while one with a Z-score between -3 and -2 SD is considered moderately undernourished.

Figure 16
Survival and Nutritional Status of Children, Uganda



Note: A child with a Z-score below -3 SD on the reference standard is considered severely undernourished while one with a Z-score between -3 and -2 SD is considered moderately undernourished.

Source: UDHS 1995

Figure 17: Contribution of Undernutrition to Under-five Mortality, Uganda

Undernutrition is an important factor in the death of many young children in Uganda. Formulas developed by Pelletier et al.¹ are used to quantify the contributions of severe and mild-to-moderate undernutrition to under-five mortality.

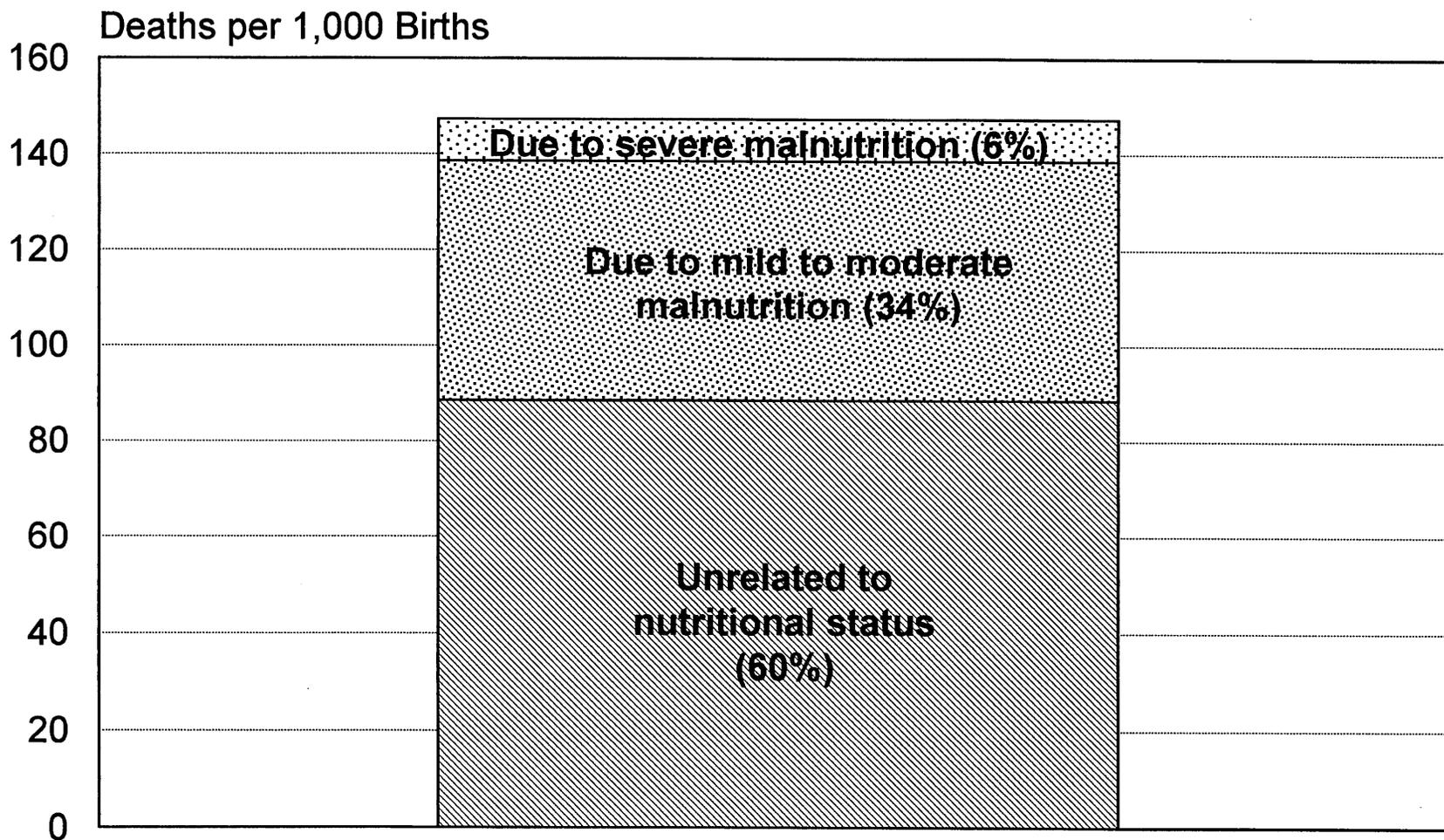
In Uganda:

- **Fifty-nine deaths per thousand births are related to undernutrition.** This is 40 percent of all deaths that occur before age five.
- Because of its extensive prevalence, **mild-to-moderate undernutrition contributes to more deaths (50 per 1,000) than does severe undernutrition (9 per 1,000).** Thus, mild-to-moderate undernutrition is implicated in 85 percent of all deaths associated with undernutrition.

¹Pelletier, 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 17

Contribution of Undernutrition to Under-five Mortality, Uganda



Note: Calculation based on Pelletier et al., 1994.

Source: UDHS 1995

Figure 18: Undernutrition among Mothers of Children under 3 Years by Region and Residence, Uganda

A mother's nutritional status affects her ability to successfully carry, deliver, and care for her children and is of great concern in its own right. While there are no generally accepted cut-off points for indicators of undernutrition among adult women, ad hoc standards can be applied.

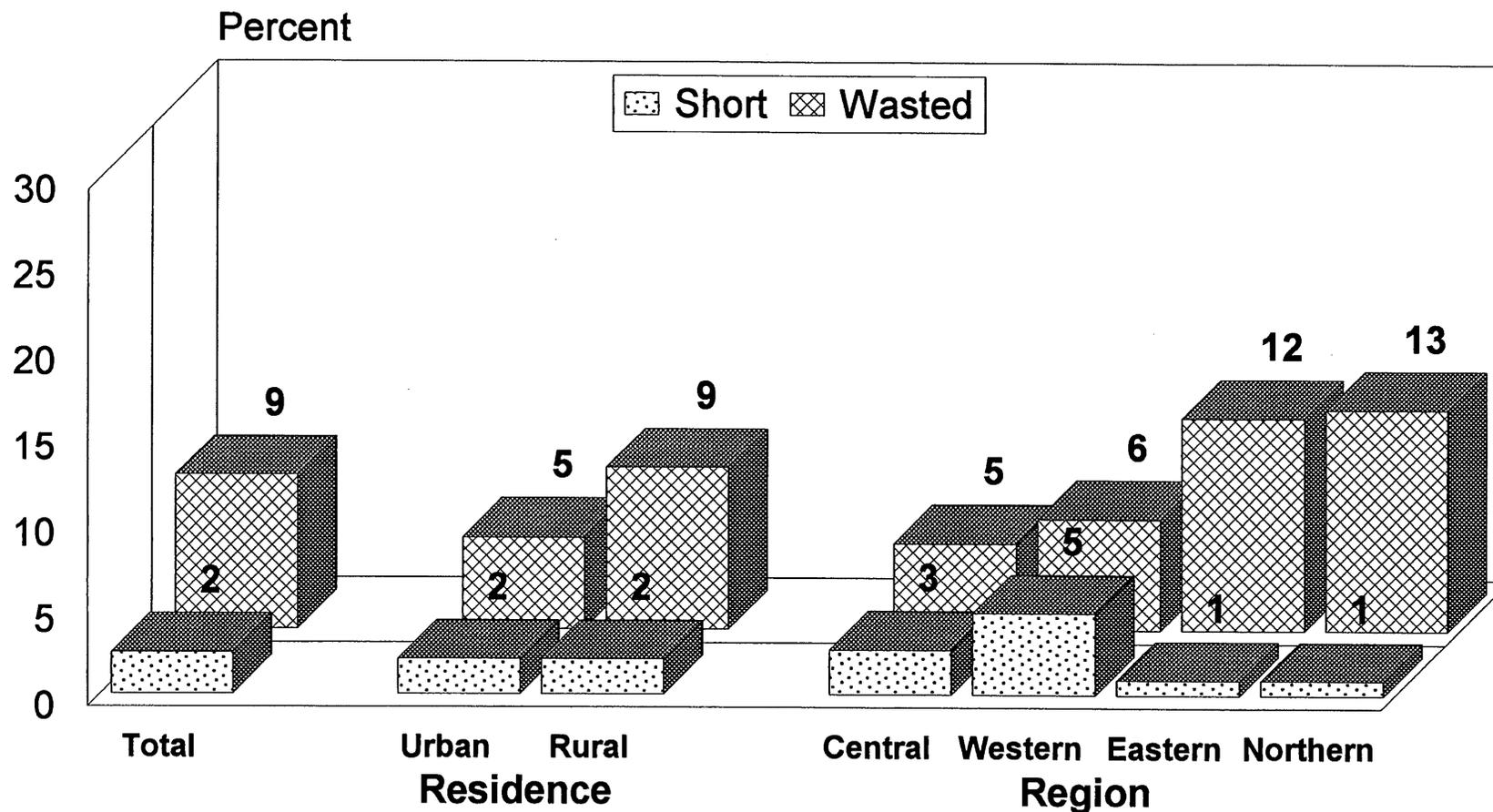
Women who are too short—largely due to stunting during childhood and adolescence—may have difficulty during childbirth because of the small size of their pelvis. Evidence also suggests there is an association between maternal height and low birth weight. Women less than 145 centimeters in height are considered too short.

Wasting, or acute undernutrition 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, $BMI = \text{kg}/\text{m}^2$. When the BMI of non-pregnant women falls below the suggested cut-off point of $18.5 \text{ kg}/\text{m}^2$, acute undernutrition is indicated.

- **Nine percent of mothers of children under age three in Uganda are wasted (acutely undernourished), while 2 percent are too short.**
- **Approximately 2 percent of women in both urban and rural areas are too short.**
- **Wasting is almost twice as prevalent among mothers living in rural areas as among those in urban areas.**
- **By region, the highest prevalence of mothers who are short is in the Western region, where 5 percent of women are short. The highest prevalence of maternal wasting occurs in the Eastern and Northern regions, where 12 and 13 percent, respectively, of mothers are acutely undernourished.**

Figure 18

Undernutrition among Mothers of Children Under 3 Years by Residence and Region, Uganda



Note: *Short* is the percentage of mothers under 1.45 m;
wasted is the percentage of mothers whose BMI is less than 18.5 kg/m².

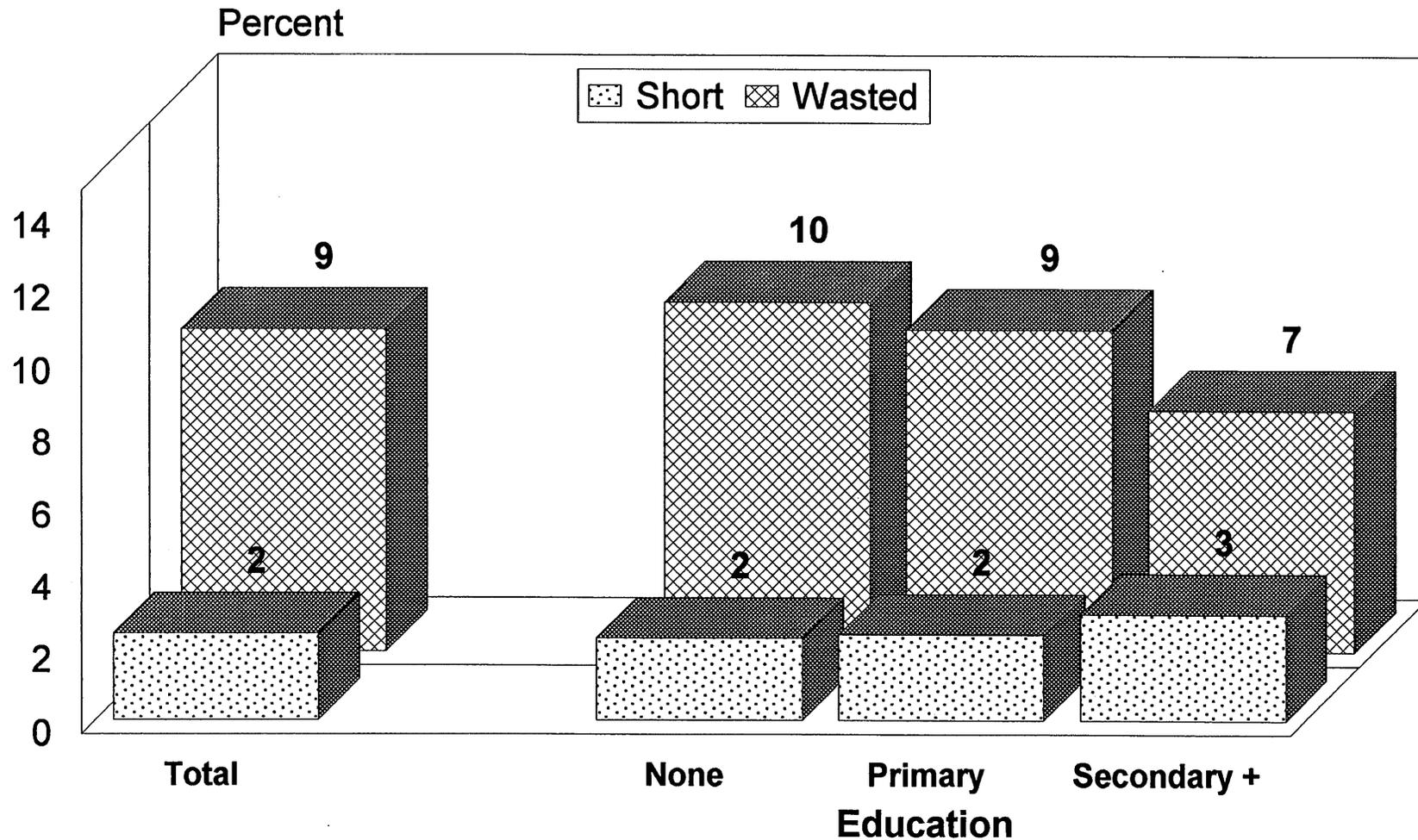
Source: UDHS 1995

Figure 19: Undernutrition among Mothers of Children under 3 Years by Education, Uganda

In Uganda:

- **Education has little affect on whether a mother is likely to be short.** Among mothers with children under 3 years, 2 percent of mothers with no education were short, compared with 3 percent of mothers with secondary education.
- **Wasting, or acute undernutrition, declines with increasing level of education.** The prevalence of wasting falls from 10 percent among mothers with no education to 9 percent among mothers with a primary education to 7 percent among mothers with at least a secondary education.

Figure 19
**Undernutrition among Mothers of Children under 3 Years
 by Education, Uganda**



Note: *Short* is the percentage of mothers under 1.45 m;
wasted is the percentage of mothers whose BMI is less than 18.5 kg/m².

Source: UDHS 1995

Appendix 1
Stunting, Wasting and Underweight Rates by Background Characteristics
Uganda 1995

| Background Characteristic | Stunted | Wasted | Under-weight | Background Characteristic | Stunted | Wasted | Under-Weight |
|----------------------------------|----------------|---------------|---------------------|----------------------------------|----------------|---------------|---------------------|
| Child's Age in Months | | | | Region of Residence | | | |
| 0-5 | 6.8 | 2.0 | 3.9 | Central | 33.0 | 3.8 | 22.6 |
| 6-11 | 27.0 | 7.3 | 29.1 | Eastern | 32.1 | 7.9 | 30.3 |
| 12-17 | 39.8 | 10.0 | 38.6 | Northern | 39.1 | 9.0 | 34.4 |
| 18-23 | 51.8 | 8.3 | 32.8 | Western | 39.2 | 3.9 | 24.4 |
| 24-29 | 42.8 | 3.3 | 30.0 | n=3816 | p<0.0004 | p<0.0001 | p<0.0001 |
| 30-35 | 47.8 | 2.1 | 24.8 | | | | |
| n=3816 | p<0.0001 | p<0.0001 | p<0.0001 | | | | |
| Child's Sex | | | | Location of Residence | | | |
| Female | 34.0 | 5.2 | 25.0 | Rural | 37.4 | 6.0 | 28.5 |
| Male | 37.6 | 6.7 | 29.5 | Urban | 22.5 | 5.6 | 16.8 |
| n=3816 | p<0.05 | p<0.05 | p<0.002 | n=3816 | p<0.0001 | NS | p<0.0001 |
| Overall | 35.7 | 5.9 | 27.2 | | | | |

Note: Level of significance is determined using the chi-square test.

NS = Not significant

Appendix 2

WHO/CDC/NCHS International Reference Population

The assessment of nutritional status is based on the concept that in a well-nourished population the distributions 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 1 standard deviation of the mean for children of that age or height, and a height within 1 standard deviation of the mean for children of that age. About 14 percent of children will be between 1 and 2 standard deviations above the mean; these children are considered relatively tall or overweight for their age, or relatively fat for their height. Another 14 percent will be between 1 and 2 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 very overweight for their age, or very overweight for their height, that is, they are more than 2 standard deviations above the mean. Another 2 percent will fall more than 2 standard deviations below the mean and be considered undernourished. These children are very short (stunted) or very underweight for their age or very thin (wasted) for their height.

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 World Health Organization and the Centers for Disease Control.

Appendix 2
**WHO/CDC/NCHS Nutrition Reference Standard
Normal Distribution**

