DHS ANALYTICAL REPORTS

1

Household Structure, Socioeconomic Level, and Child Health in Sub-Saharan Africa

DHS

DEMOGRAPHIC AND HEALTH SURVEYS

The Demographic and Health Surveys (DHS) is a 13-year project to assist government and private agencies in developing countries to conduct national sample surveys on population and maternal and child health. Funded primarily by the United States Agency for International Development (USAID), DHS is administered by Macro International Inc. in Columbia, Maryland.

The main objectives of the DHS program are (1) to promote widespread dissemination and utilization of DHS data among policymakers, (2) to expand the international population and health database, (3) to advance survey methodology, and (4) to develop in participating countries the skills and resources necessary to conduct high-quality demographic and health surveys.

For information about the Demographic and Health Surveys program, write to DHS, Macro International Inc., 11785 Beltsville Drive, Suite 300, Calverton, MD 20705, U.S.A. (Telephone 301-572-0200; Telefax 301-572-0999.

Demographic and Health Surveys
Analytical Reports No. 1

Household Structure, Socioeconomic Level, and Child Health in Sub-Saharan Africa

ANASTASIA J. GAGE
A. ELISABETH SOMMERFELT
ANDREA L. PIANI

Macro International Inc.
Calverton, Maryland USA

May 1996

Recommended citation:

Gage, Anastasia J., A. Elisabeth Sommerfelt, and Andrea L. Piani. 1996. *Household structure, socioeconomic level, and child health in sub-Saharan Africa*. DHS Analytical Reports, No. 1. Calverton, Maryland: Macro International Inc.

Contents

Preface v

Acknowledgments vi

Executive Summary vii

1 Introduction 1

1.1 Literature and Hypotheses 1
1.2 Data 3
1.3 Statistical Model 4

2 Household Structure and Socioeconomic Level . . . 7

2.1 Classification of Households 7
2.2 Children's Living Arrangements 7
2.3 The Home Environment 9
2.4 Socioeconomic Level of Households 14
2.5 Summary 15

3 Immunization 18

3.1 Estimating Vaccination Coverage 18
3.2 Vaccination Coverage Rates 18
3.2.1 Differentials by Household Type . . . 19
3.2.2 Differentials by Socioeconomic Level 22
3.3 Multivariate Analysis 23
3.4 Summary 26

4 Diarrhea 28

4.1 Prevalence Levels 28
4.1.1 Differentials by Household Type . . . 28
4.1.2 Differentials by Socioeconomic Level 30
4.2 Knowledge and Ever-use of ORS 30
4.2.1 Differentials by Household Type . . . 30
4.2.2 Differentials by Socioeconomic Level 33
4.3 Treatment Patterns 33
4.3.1 Fluid Therapy 33
4.3.1.1 Overall Treatment Rates . . . 35
4.3.1.2 Differentials by Household Type 35

4.3.1.3 Differentials by Socio-economic Level 37
4.3.2 Health Facility 39
4.3.3 No Treatment 40
4.4 Multivariate Analysis 40
4.4.1 Any Treatment 41
4.4.2 Oral Rehydration Therapy 41
4.4.3 Medical Assistance 44
4.5 Summary 46

5 Conclusions and Recommendations 48

References 51

Appendix

Regression Results 54

Tables

1.1 Distribution of children, according to survival status and residence 5
2.1 Distribution of children, according to household structure and residence 8
2.2 Home environment of children, by household structure and residence 11
2.3 Educational background of children, by household structure and residence 13
2.4 Socioeconomic level of children, by household structure and residence 16
3.1 Percent of children receiving specific vaccines, by household structure and residence 20
3.2 Percent of children receiving specific vaccines, by socioeconomic level and residence 21
3.3 Regression results: Vaccination of rural children 24
3.4 Regression results: Vaccination of urban children 25
4.1 Percent of children with diarrhea in last two weeks, by household structure and residence 29
4.2 Percent of children with diarrhea in last two weeks, by socioeconomic level and residence 31
4.3 Mothers' knowledge and ever-use of oral rehydration salts, by household structure and residence 32
4.4 Mothers' knowledge and ever-use of oral rehydration salts, by socioeconomic level and residence 34
4.5 Percent of children with diarrhea who received oral rehydration therapy, by household structure 36
4.6 Percent of children with diarrhea who received oral rehydration therapy, by socioeconomic level 38
4.7 Regression results: Likelihood of receiving treatment for diarrhea, by household characteristic 42
4.8 Regression results: Likelihood of receiving oral rehydration therapy, by household characteristic 43
4.9 Regression results: Likelihood of being taken to a provider for treatment of diarrhea, by household characteristic 45

Figures

2.1 Percent distribution of rural children age 12-59 months, according to household structure and country 10
2.2 Percent distribution of urban children age 12-59 months, according to household structure and country 10
4.1 Percent of children age 12-59 months receiving treatment for diarrhea in the last two weeks, by type of treatment and country 37

Preface

One of the most significant contributions of the DHS program is the creation of an internationally comparable body of data on the demographic and health characteristics of populations in developing countries. The *DHS Analytical Reports* series and the *DHS Comparative Studies* series examine these data across countries in a comparative framework, focusing on specific topics.

The overall objectives of DHS comparative research are: to describe similarities and differences between countries and regions, to highlight subgroups with specific needs, to provide information for policy formulation at the international level, and to examine individual country results in an international context. While *Comparative Studies* are primarily descriptive, *Analytical Reports* utilize a more analytical approach.

The comparative analysis of DHS data is carried out primarily by staff at the DHS headquarters in Calverton, Maryland. The topics covered are selected by staff in conjunction with the DHS Scientific Advisory Committee and USAID.

The *Analytical Reports* series is comprised of in-depth, focused studies on a variety of substantive topics. The studies employ a range of methodologies, including multivariate statistical techniques, and are based on a variable number of data sets depending on the topic under study.

It is anticipated that the *Analytical Reports* will enhance the understanding of significant issues in the fields of international population and health for analysts and policymakers.

Martin Vaessen
Project Director

Acknowledgments

The authors wish to thank Ann Blanc, Alex Chika Ezeh and Patricia Haggerty for their helpful review of this manuscript.

Executive Summary

This report provides some insight into variations in household structure in sub-Saharan Africa and the relationship of household structure and socioeconomic status to children's health outcomes. To achieve higher levels of child health and reduce child mortality, it is clearly necessary that governments have better information on the home environments in which children are most at risk of adverse health outcomes. The analysis focuses on full immunization coverage and the management of diarrhea in 11 countries. The households studied are divided into two primary groups: elementary and extended. Elementary households are defined as consisting only of parents and their biological children; whereas extended households consist of parents, their biological children, and other family members or non-relatives. Furthermore, extended households are subdivided into two groups: 1) "laterally extended" which includes siblings, cousins and other relatives of the household head, and 2) "three-generational" which includes the parents or parents-in-law of the head. Some of the important findings are as follows:

- There is considerable variation across countries in children's living arrangements. Elementary households are the predominant living arrangement in 4 of the 11 countries examined. In four other countries, extended households are predominant and in the remaining countries, children are almost equally divided between elementary and extended households.

- There are household structure differences in relative poverty, particularly in rural areas. In 9 of 11 countries, rural children from elementary households are socioeconomically more disadvantaged than those from extended households.

- Children from elementary households tend to be worse off than those from laterally extended households in terms of mother's education and are less likely to reside with adults who have secondary or higher levels of schooling.

- The higher the socioeconomic level of the household, the more likely a child is to be fully immunized. This relationship is significant in rural areas of all countries and in urban areas of eight countries.

- In more than one-half of the countries examined, there is a negative relationship between elementary household structure and full immunization coverage. This relationship shows greater statistical significance in urban than in rural areas. However, in some countries, household structure differences in full immunization coverage are explained by differences in socioeconomic level.

- Although the lowest levels of immunization coverage tend to be found in elementary households, in rural Rwanda and urban Madagascar, children from three-generational households have significantly low levels of immunization coverage, even after controlling for other factors.

- In almost all countries, children are less likely to receive oral rehydration therapy in elementary than in laterally extended households. Children from laterally extended households tend to be the most likely taken for medical treatment of diarrhea and to receive the highest levels of fluid treatment.

- There is no consistent evidence that the relationship between household structure and diarrhea treatment practices is mediated by socioeconomic level. In Burkina Faso, Cameroon, Niger and Zambia, household structure differences in oral rehydration therapy are largely explained by socioeconomic difference. However, in Senegal household structure has a statistically significant effect on receipt of oral rehydration therapy, even after controlling for socioeconomic level and other factors.

These findings suggest that an understanding of the relationships between household structure, poverty and child health would aid community health workers in identifying situations in which children may not be receiving recommended health care or adequate treatment, and may help minimize the number of missed opportunities for vaccination coverage. However, fundamental assumptions about households, their accessibility to resources and utilization of health services may not be easily transferred from one country to another.

1 Introduction

The influence of family structure on children's well-being has emerged as an issue of considerable research and interest in developed as well as developing countries. To achieve higher levels of child health and reduce child mortality, it is clearly necessary that governments have better information on the home environments in which children are most at risk of adverse health outcomes. It is also important to identify whether countries are similar in the relative importance of family structure for child outcomes, or whether the influence of social institutions such as the family needs to be investigated at the national or subnational level.

The purpose of this report is to examine the influence of household structure on various issues pertaining to child health in sub-Saharan Africa. The analysis is based on data from the Demographic and Health Surveys (DHS) for 11 countries: Burkina Faso, Cameroon, Kenya, Madagascar, Namibia, Niger, Nigeria, Rwanda, Senegal, Tanzania and Zambia. As a group, these countries show higher levels of child mortality than countries in Asia and Latin America. Yet they provide an appreciable degree of interregional and cultural diversity in patterns of household formation, levels of vaccination coverage and other aspects of child health. Because the influence of social institutions may be culturally conditioned, such cross-country comparisons also help to establish the social context that shapes the effect of family structure on individual outcomes. This is of crucial importance in view of the fact that general models of household structure may not be applicable to all cultures (see, for example, Desai, 1992).

This report focuses on childhood immunization and the prevalence and management of diarrhea. Childhood immunization, particularly against measles, has a significant impact on morbidity and mortality. Furthermore, immunization coverage is a good indicator of the utilization of health services both at the aggregate and individual level. The management of diarrhea is also examined since this aspect of child health requires action by the family, and because diarrhea is one of the most frequently reported causes of death among infants and children in developing countries. In addition, diarrhea treatment patterns, particularly oral rehydration therapy, have been an important part of public health programs in many African countries.

The analysis is made possible by the fact that, in each country surveyed, the DHS collected comparable nationally representative data on many facets of child health, including immunization coverage and the occurrence and treatment of diarrhea. Each survey also included a household schedule with uniform information on the sex, age and relationship to head-of-household. Details on housing and household possessions were also collected, making possible the delineation of household types, as well as an examination of household structure differences in socioeconomic level. A detailed description of the data on each of these topics is given at the beginning of the respective section in the report.

The first chapter of the report discusses findings from empirical studies of the relationship between family structure and child outcomes and the reasons why one might anticipate differentials in child health between households with different structures in a single society. Next, the classification of households and the basic relationship between household structure and socioeconomic level are presented. The following two chapters examine the influence of household structure and socioeconomic level on immunization coverage rates and the prevalence and management of diarrhea. The final section of the report highlights the main findings of the analysis and their policy implications.

1.1 LITERATURE AND HYPOTHESES

Recent empirical studies have shown that family structure is an important determinant of child outcomes. Most of these studies have concentrated on the implications of growing up in a single-parent or female-headed household (Angel and Worobey, 1988). Findings from research conducted in the United States indicate that children who reside with both biological parents are advantaged in several domains of well-being, compared with children whose parents are divorced or who are born to single mothers (Amato and Keith, 1991; Astone and McLanahan 1991; Thomson et al., 1994). By comparison, few studies have examined the impact of family structure or parents' divorce and remarriage on child outcomes in sub-Saharan Africa. Increasing attention has been given to the effects of female headship on child welfare, but the empirical evidence is generally inconclusive (see, for example, Lloyd and Blanc (1995) for the association between family structure and children's schooling outcomes).

There is a paucity of information about the implications of nuclear or extended household formations for individual outcomes. Although early studies focused on the fertility implications of nuclear and joint families (Lorimer, 1954; Davis, 1955; Caldwell et al., 1982), little attention has been paid to the physical health of children in nuclear and extended households. One study conducted in rural Bengal shows that children from extended households are nutritionally advantaged, compared with those from nuclear households (Murthy et al., 1985). Unfortunately, this study did not examine the processes through which household extension operates to influence children's nutritional status.

Research conducted in the United States has identified economic resources as the predominant explanation for family structure variations in children's well-being (Acock and Kiecolt, 1989; Geronimus et al., 1994; Thomson et al., 1994). However, the potential links between family structure and economic resources in sub-Saharan Africa have not been adequately explored. Research from other developing regions suggests that household extension may be associated with higher socioeconomic status. Indeed, Dasgupta et al. (1993) found that the proportion of households that are nuclear increases as one moves from high to low caste. Tienda and Ortega (1982, cited in DeVos, 1993) found that in Latin America, educational attainment is a significant predictor of household extension, lower education being negatively associated with the presence of extended family members. In contrast, Dasgupta et al. (1993) found no significant relationship between level of educational attainment of the household head and the incidence of nuclear households. The literature on sub-Saharan Africa generally suggests that extended family arrangements, large household size and polygyny are associated with high socioeconomic status, wealth and prestige (Uchendu, 1965; Schuster, 1981).

Several studies also indicate that family structure variations in child health may reflect differences in the limits of time and energy that the household has for health care. These differences are, in turn, manifested in differential household practices in the management of illness or in the utilization of health services. Coreil (1983) observes that in rural Haiti, the opportunity cost of taking children to health facilities is greatest in single-adult households. In the United States, it has been found that children may receive less parental time and attention in single-parent families (Astone and McLanahan, 1991).

If the number of adults in the household is a critical factor in the management of child health, then it would be expected that the consequences of growing up in an extended household would be positive, compared with the consequences of growing up in a nuclear-type household. However, the size of nuclear families may be less important for children's welfare, if the nuclear family draws on the support of an extended kinship group or the larger community (Shavit and Pierce, 1991).

Family structure variations in children's health outcomes may also result from differences in how households identify and evaluate symptoms and their beliefs regarding the nature and cause of illness. These may in turn affect treatment patterns and the utilization of health services. In the United States, for example, it has been found that single mothers report poorer overall physical health for their children than mothers in intact marriages, a phenomenon that the authors attribute to the relative economic disadvantage and to somatic and emotional stresses associated with single motherhood (Angel and Worobey, 1988). One might also expect such variations in the assessment of child health if households differ considerably in the educational composition of their adult members.

The precise relationship between household structure, socioeconomic level and child health may be socially conditioned. Although the household is often conceptualized as a cohesive unit for production and consumption in theoretical models of the family proposed by the new home economics (Becker, 1981), there are important transfers of both adults and children that occur between many African households by virtue of their incorporation into the larger kinship group or lineage (Bledsoe and Isuigo-Abanihe, 1989; Desai, 1992; Isuigo-Abanihe, 1993; Schuster, 1981). Where the relocation of children and adults entails strategies for upward mobility, family members are most likely to move from poor or rural households to urban or better-off households within their kinship group. Indeed, Bledsoe (1994) observes that in rural Sierra Leone, 51 percent of all fostered children were in higher status households than their biological parents'. Only 17 percent were in lower status homes, and 32 percent were in households of socioeconomic status equal to that of their natal homes.

This pattern of interhousehold transfer implies that, contrary to conventional wisdom, households consisting of only parents and their biological children (that is, nuclear-type households) are likely to be rural and of low socioeconomic status. Higher status households are more likely to be extended than nuclear households, as they tend to attract a flow of relatives and nonrelatives who comprise a

significant component of the maintenance and mobilization of social, political and patronage contacts (Guyer, 1981; Schuster, 1981 of urban Zambia; Uchendu, 1965 of the Igbo of southeast Nigeria). This postulated interrelationship between household structure and socioeconomic status would imply elevated health risks among children living in nuclear-type households.

Of course, the relationship between household extension and socioeconomic status is not necessarily causal. Residence with extended members may be a reflection of economic constraints or of a desire to achieve economies of scale in consumption because household survival strategies may entail adding family members who can provide income or assistance with child care (Schmink, 1984; De Vos, 1987 Hackenberg et al., 1984). For example, Bledsoe and Isuigo-Abanihe (1989) note that for elderly women who head their own households or who can no longer rely on support from their spouses, fostering-in children is a vital mechanism for ensuring continued access to resources from younger members of their lineage.

Although household economic resources may mediate the relationship between household structure and child health, the economic costs of children may not fall directly on the household alone but may be shared with other households within the larger kinship group. This is most relevant for extended family compounds in which subunits of families from the same kin group reside in adjacent but separate dwellings (see, for example, Uchendu, 1965). Within such complex residential enclaves, household boundaries may be flexible, and the distinction between nuclear and extended households may be artificial. Family structure may not have a significant association with children's health outcomes because households within the same compound are likely to draw on each other's material, social and informational resources for the identification, evaluation and treatment of illness.

On the basis of these considerations, two main hypotheses are examined: (1) the availability of extended family members in a household provides a child with greater access to health care, but (2) the effects of family structure on child health are attenuated by socioeconomic status. The analysis examines these expectations at the individual level and investigates the impact of household structure and socioeconomic level on immunization coverage and the management of diarrhea.

1.2 DATA

The analysis is based on DHS data from surveys that were conducted from 1990 to 1993. The surveys consist of a household questionnaire that identifies de facto women[1] of reproductive age (15-49 years) for detailed interview and an individual questionnaire. The household questionnaire collects comparable information on household composition, including relationship to head, the age and sex of all household members and educational attainment for those age 6 years and over. The individual questionnaire includes information on the background characteristics of survey respondents, fertility, mortality, family planning and child health. Child health information is collected for all children born to women during the five-year period preceding the survey.

The analysis focuses on children aged 12-59 months. As information on child health is collected only in the detailed interviews of de facto women aged 15-49, the sample of children is not fully representative of the national sample of children aged 12-59 months. The sample excludes children whose mothers have died as well as those whose mothers are younger than 15 or older than 49 at the time of the survey. Because fertility rates are substantially lower outside the age range 15-49, the restriction of the DHS individual interviews to women of reproductive age does not appear to seriously compromise the representativeness of the sample.

Given that the information on household structure is based on the de jure household population, the focus is on children whose mothers are usual household residents. The sample of children is further restricted to those whose mothers were both de facto and de jure, because non-de facto women were not interviewed in the Nigeria DHS, and the selection criteria is preferred to be identical in all countries for comparative purposes. Children who had died and those who were living away from their mothers are excluded from the analysis because there is no information on their living arrangements at any particular point in time.

[1]De facto household members are those who actually slept in the household the night before the survey. De jure household members are the people who are the usual residents, whether or not they were actually in the household the night before the survey.

The exclusion of these children may be a potential source of bias, because fostered children may be more disadvantaged than children who live with their mothers (Bledsoe and Brandon, 1992), and children's risk of dying may be associated with the dependent variables of interest.[2]

With the exception of Senegal, which is a self-weighting sample, the tabulations are based on weighted data in order to correct for sampling probabilities. Because the analysis is based on children and is further restricted to those whose mothers are both de facto and de jure, the sample weights provided in the DHS data files are not used because these are generally calculated for de facto women. Instead, the design weights (that is, the probability of selection of the cluster) are used for all tabulations.

Table 1 shows the distribution of children born 12-59 months before the survey by survival status, residence with mother, and de jure household status for urban and rural areas separately. The overall proportion of children who had died ranges from 7 percent in Namibia to 25 percent in Niger. With the exception of Rwanda and Tanzania, mortality accounts for a larger loss of sample size in rural than in urban areas, particularly in Niger. The exclusion of children whose mothers are not usual household members and those of de jure household members who did not sleep in the household the previous night results in a negligible loss of sample size. The proportion of children who are excluded from the analysis because they do not reside with their mother is not substantial except in Cameroon (9 percent of urban children), Kenya (11 percent of urban children) and Namibia (15 and 26 percent of children in rural and urban areas, respectively). Overall, at least three-quarters of the children born in the 12-59 months are included in the sample, except for Namibia and Niger.

1.3 STATISTICAL MODEL

Logistic regression has been used to investigate the linkage between household structure, immunization coverage and diarrhea treatment practices. In each country, one child per household is randomly selected for the regression analysis in order to avoid the statistical problems created by correlated observations within households. In addition to household structure and socioeconomic level (described in Chapter 2), selected characteristics of mother and child are controlled for. The indicators of mothers' characteristics include age, education and cash-work status. These last two measure the human and financial resources that can influence the utilization of preventive and curative health services. These variables have been shown in many studies to be among the important determinants of children's health. Mother's age has been categorized into three groups, under 20 years, 20-34, and 35 years and over, to examine whether maternal age has a significant impact on children's immunization status. In addition, mother's marital status is controlled for.

The measures of child characteristics include age, sex and number of siblings aged 0-5. Child's age is a dichotomy, 1 indicating that the child is aged 12-23 months and 0 indicating an age of 24-59 months. Child's age was thus defined to provide some indication of the timeliness of vaccination. In communities without a health center, mobile clinics or immunization campaigns held at periodic intervals may provide the only opportunity for children to receive the recommended vaccines. Thus, the older the child, the more likely he or she is to be fully vaccinated. On the other hand, if the immunization program has intensified over time, one would expect higher vaccination coverage among younger children. Overall, the relationship between child's age and the probability of full vaccination would be insignificant if children were vaccinated at the recommended ages.

The number of uterine siblings aged 0-5 measures direct competition for parents' resources. The costs to the mother of immunization or treatment of diarrhea is expected to increase with each additional sibling in the age range 0-5. The sex of the child was included in the model to examine whether female children are discriminated against in access to health care. Region of residence is also controlled for in the multivariate analysis because of regional variations in family formation and household living arrangements. The number of adults in the household (excluding the child's mother) is also included among the independent variables. With the exception of the socioeconomic index that ranges from 0 to 6, the number of siblings aged 0-5 and the number of other adults in the household, all other variables in the regression are dichotomous, 1 representing that the child exhibits the specified characteristic, and 0 otherwise.

[2] The relative disadvantage of fostered children may depend on the socioeconomic status of the families into which they are fostered, compared with that of their natal families. Although children who are sent to higher status families may be worse off than the biological children of their guardians, they may indeed be better off than their siblings who remain with their natal family. In a separate analysis of two countries, children who live away from their mother and dead children who had survived to age 12 months were included in the sample. However, this made little difference to our results.

Table 1.1 Distribution of children, according to survival status and residence

Percent distribution of all children born 12-59 months before the survey, according to survival status, residence with mother, and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and rural-urban residence	Dead	Alive: Child lives away	Alive: Mother non-de jure	Alive: Mother de jure and non-de facto	Alive: Mother de jure and de facto	Total	Number of children
Burkina Faso							
Rural	15.2	2.4	2.5	0.0	79.9	100.0	3,067
Urban	10.6	4.2	4.4	0.0	80.8	100.0	1,556
Total	14.5	2.7	2.8	0.0	80.0	100.0	4,623
Cameroon							
Rural	10.4	6.3	4.3	0.0	79.1	100.0	1,264
Urban	8.8	8.6	3.5	0.0	79.1	100.0	1,392
Total	9.7	7.2	4.0	0.0	79.1	100.0	2,656
Kenya							
Rural	8.3	2.5	2.7	0.0	86.5	100.0	4,353
Urban	6.9	10.6	3.1	0.0	79.4	100.0	548
Total	8.2	3.5	2.8	0.0	85.5	100.0	4,901
Madagascar							
Rural	13.6	4.5	2.3	0.0	79.6	100.0	3,085
Urban	10.3	5.2	2.8	0.0	81.7	100.0	1,046
Total	13.2	4.6	2.4	0.0	79.9	100.0	4,131
Namibia							
Rural	7.4	15.3	3.9	0.0	73.4	100.0	2,102
Urban	6.9	26.3	7.3	0.0	59.5	100.0	949
Total	7.2	19.1	5.1	0.0	68.7	100.0	3,051
Niger							
Rural	26.3	4.1	1.4	0.0	68.2	100.0	3,395
Urban	15.2	5.2	2.3	0.0	77.3	100.0	2,054
Total	24.6	4.3	1.5	0.0	69.6	100.0	5,449
Nigeria							
Rural	16.1	3.8	1.0	0.0	79.0	100.0	4,039
Urban	11.6	5.8	0.5	0.0	82.0	100.0	2,159
Total	15.2	4.3	0.9	0.0	79.6	100.0	6,198
Rwanda							
Rural	11.8	2.8	2.1	0.0	83.3	100.0	3,772
Urban	12.4	4.6	1.4	0.0	81.7	100.0	619
Total	11.8	2.9	2.1	0.0	83.2	100.0	4,391
Senegal							
Rural	12.2	5.0	2.6	0.5	79.7	100.0	2,967
Urban	7.4	5.1	3.1	1.0	83.4	100.0	1,510
Total	10.6	5.0	2.8	0.6	81.0	100.0	4,477
Tanzania							
Rural	11.9	5.4	3.2	0.0	79.5	100.0	5,084
Urban	14.3	6.0	3.1	0.0	76.6	100.0	1,288
Total	11.9	5.4	2.8	0.0	79.5	100.0	6,372
Zambia							
Rural	16.6	3.3	4.2	0.0	75.9	100.0	2,800
Urban	14.2	3.8	3.1	0.0	78.9	100.0	2,048
Total	15.5	3.5	3.7	0.0	77.3	100.0	4,848

Note: Figures may not add to 100.0 because of rounding.

The results of the logistic model are presented in the form of odds ratios given by the exponential coefficient β_i. An odds ratio greater than 1 means that the child with a given characteristic is more likely than those in the reference category to be fully vaccinated. Values less than 1 signify that the variable acts to decrease the probability of full immunization relative to the omitted category. A value of 1 means that the variable has no effect. For continuous variables, the odds ratios measure the change in the health outcome per unit change in the variable.

The analysis of immunization is done separately for rural and urban areas. This distinction is important because of differentials in the availability of health services and living standards between urban and rural areas. Unfortunately, to maintain sufficient sample size, rural and urban areas were combined in the analysis of diarrhea treatment patterns.

2 Household Structure and Socioeconomic Level

2.1 CLASSIFICATION OF HOUSEHOLDS

In the DHS, a household is commonly defined as a person or group of persons living together and sharing a common source of food. However, it is difficult to come up with a definition of household structure that would fully capture the plethora of household forms that exist. In addition, the prevalence of polygyny and family compounds in which several households occupy adjacent dwellings on family-owned land complicates the delineation of household types. For the purpose of this study, households are categorized into two primary groups: elementary and extended. Elementary households are defined as consisting only of parents and their biological children. This definition includes (1) single-parent households consisting only of a head and his or her biological children, with no spouse or other persons present; (2) nuclear households consisting of a head, one spouse and their biological children, with no other persons present; (3) polygynous households consisting of a head, more than one spouse and their biological children, with no other persons present.

Extended households are defined as households consisting of parents, their biological children and other family members or nonrelatives. Extended households have been subdivided into two groups—three-generational and laterally extended—to capture cultural patterns of household formation in which different generations share the same housing unit, facilities and food. Three-generational households include the parents or parents-in-law of the head. They may also include the head and his or her grandchildren, with at least one biological child of the head and/or spouse present. Laterally extended households include primarily siblings, cousins and other relatives of the head. They were identified as a separate category to capture settings where cooperation in farming or cattle rearing is associated with the coresidence of brothers even after they marry and even after the death of their parents (see Timaeus and Graham, 1989 of Botswana; Stenning, 1958 of the pastoral Fulani). Households containing adults who are not related to the head are also defined as laterally extended. Overall, the primary distinction between three-generation and laterally extended households is the presence of at least one of the child's grandparents in the former. Thus defined, extended households are a complex amalgamation of other household types. However, a categorization was needed that would recognize all households that are not elementary in structure.

Before proceeding, it is necessary to point out some limitations in using cross-sectional data to examine household structure. First, cross-sectional data provide a snapshot of household structure at a particular point in time. However, household structure is in continual flux as people move through the domestic cycle and as families respond to changing opportunities and constraints. Events such as migration, mortality, separation and divorce are critical factors in the developmental cycle of the household (see Harpending and Pennington, 1990 for a discussion of Herero (Botswana) residential units; Uchendu, 1965 for the evolving composition of Igbo family compounds; Timaeus and Graham, 1989 for a discussion of the impact of migration and marriage dissolution on the developmental cycle of the household). Second, as discussed in the previous chapter, the African extended family is less related to eating or sleeping arrangements than to reciprocal obligations geared toward the maintenance of kinship ties and the distribution of economic costs over a wider network of family members. Hence, in terms of production, consumption, childrearing and resource availability, household boundaries may be flexible.

2.2 CHILDREN'S LIVING ARRANGEMENTS

Table 2.1 shows the distribution of children aged 12-59 months by household structure and rural-urban residence. Single-parent households are a relatively uncommon type of living arrangement. The proportion of children who reside in such households is less than 5 percent in all countries except Kenya, where it is as high as 15 percent. These variations in the prevalence of single-parent households across countries probably reflect differences in the extent to which family transitions such as premarital childbearing, divorce, widowhood and emigration of married men occur. Hence, the proportion of children residing in single-parent households may be a reflection of the degree to which life-course events lead to the integration of affected family units into other households to form or be part of three-generation or laterally extended households. With the exception of Kenya, where single-parent households are twice as prevalent among rural as urban children, there are no strong rural-

Table 2.1 Distribution of children, according to household structure and residence

Percent distribution of all children born 12-59 months before the survey, according to household structure and rural-urban, residence, Demographic and Health Surveys, 1990-1993

Country and rural-urban residence	Elementary			Extended			Number of children
	Single parent	Nuclear	Poly-gynous	Three-generation	Laterally extended	Total	
Burkina Faso							
Rural	1.1	27.5	28.1	24.2	19.1	100.0	2,449
Urban	1.1	26.3	7.1	24.0	41.6	100.0	1,256
Total	1.1	27.3	25.0	24.2	22.4	100.0	3,705
Cameroon							
Rural	1.5	28.6	15.3	31.0	23.6	100.0	997
Urban	3.5	22.3	5.3	23.4	45.4	100.0	1,095
Total	2.2	26.4	11.8	28.3	31.3	100.0	2,092
Kenya							
Rural	14.7	45.1	1.1	22.6	16.4	100.0	3,780
Urban	7.0	38.3	0.2	11.7	42.8	100.0	433
Total	13.8	44.4	1.0	21.4	19.4	100.0	4,213
Madagascar							
Rural	4.9	54.4	0.1	19.8	20.7	100.0	2,456
Urban	3.6	43.6	0.0	21.3	31.6	100.0	853
Total	4.7	53.0	0.1	20.0	22.2	100.0	3,309
Namibia							
Rural	3.1	18.1	0.4	46.9	31.5	100.0	1,558
Urban	3.6	14.4	0.3	25.8	55.8	100.0	570
Total	3.2	17.0	0.4	40.9	38.5	100.0	2,128
Niger							
Rural	1.0	36.2	15.8	29.1	17.9	100.0	2,316
Urban	1.2	29.6	13.7	19.0	36.5	100.0	1,591
Total	3.1	35.1	15.4	27.3	21.2	100.0	3,907
Nigeria							
Rural	2.8	42.7	20.6	17.8	16.1	100.0	3,145
Urban	4.0	47.3	10.1	12.0	26.6	100.0	1,779
Total	3.1	43.7	18.3	16.6	18.4	100.0	4,924
Rwanda							
Rural	4.6	73.5	0.1	8.3	13.5	100.0	3,142
Urban	4.1	45.0	0.0	9.4	41.5	100.0	504
Total	4.6	72.2	0.1	8.3	14.8	100.0	3,646
Senegal							
Rural	0.4	10.0	0.1	53.2	36.3	100.0	2,366
Urban	1.7	13.7	0.1	43.8	40.8	100.0	1,258
Total	0.8	11.3	0.1	49.9	37.9	100.0	3,624
Tanzania							
Rural	3.7	41.7	2.2	27.9	24.5	100.0	4,322
Urban	3.9	33.2	0.9	27.1	34.9	100.0	784
Total	3.7	41.7	2.2	27.9	24.5	100.0	5,106
Zambia							
Rural	2.3	43.8	2.8	20.9	30.2	100.0	2,120
Urban	1.4	30.5	0.5	20.0	47.6	100.0	1,616
Total	1.9	37.4	1.7	20.5	38.5	100.0	3,736

Note: Figures may not add to 100.0 because of rounding.

urban differences in the proportion of children who reside in single-parent households. Cameroon and Nigeria show a slightly higher prevalence of single-parent households among urban children, but the proportion of children that are found in such households is relatively small.

Most children who live in elementary household structures are found in nuclear households.[1] Nuclear households are clearly the dominant type of living arrangement in Kenya, Madagascar, Nigeria, Rwanda, Tanzania and rural Zambia. This type of living arrangement accounts for more than 70 percent of Rwandan children aged 12-59 months and more than half of all children in Madagascar. The lowest prevalence of nuclear households is found among children in Namibia (17 percent) and Senegal (11 percent). In general, nuclear living arrangements are more common among rural than urban children, particularly in Rwanda.

The proportion of children who reside in elementary polygynous households varies widely across countries, in part a reflection of regional variations in the level of polygyny between western and central Africa on the one hand and eastern and southern Africa, on the other. Overall, less than 2 percent of children in Kenya, Madagascar, Namibia, Rwanda and Zambia are found in elementary polygynous households (see Figures 2.1 and 2.2). Surprisingly, Senegal has a low prevalence of elementary polygynous living arrangements among children age 12-59 months, even though close to 50 percent of currently married Senegalese women of reproductive age are in polygynous unions (Ndiaye et al., 1994). The low prevalence of elementary polygynous households in this setting reflects a greater tendency toward extended-compound living arrangements. As expected, the prevalence of elementary polygynous households is higher among rural than urban children. In Burkina Faso, for example, 28 percent of rural children reside in elementary polygynous households, compared with 7 percent of their urban counterparts. In the analysis that follows, elementary polygynous households are combined with single-parent and nuclear households to form a single category to ensure an adequate number of cases for statistical comparisons across countries.

Countries with a low proportion of children residing in elementary households have a correspondingly high proportion who reside in extended households. The lowest prevalence of extended-family living arrangements is found among Nigerian and Rwandan children (less than 35 percent), and the highest prevalence levels are found in Namibia and Senegal. In the latter two countries, at least three-quarters of children aged 12-59 months reside in extended-family households. In total, children in extended households are almost equally distributed between three-generational and laterally extended households except in Senegal, where three-generational household structures are predominant, and Zambia, where laterally extended households are more common.

Most countries show notable rural-urban differences in the prevalence of these two types of extended households. In general, substantially more rural children reside in three-generational households, and urban children are more likely to be found in laterally extended households. Rwanda and Zambia are exceptions to this general pattern, having a greater proportion of children in laterally extended than in three-generational households in both rural and urban areas. The rural-urban differential in the proportion of children who reside in three-generational households ranges from 0 to 21 percentage points. The corresponding figures for laterally extended households are 4-28 percentage points.

2.3 THE HOME ENVIRONMENT

Table 2.2 describes selected characteristics of the home environment of children aged 12-59 months by household structure and rural-urban residence. The descriptive indicators shown include average household size (including the child), average number of adults (age 15 and over) and the dependency ratio.[2] It is observed that elementary households tend to be smaller on average than three-generation or laterally extended households, even in countries with a high proportion of polygynous residential arrangements. The mean household size among children in elementary households ranges from 5.7 in Namibia to 8.0 in Burkina Faso. Children from three-generational households average the most people per household, and children from laterally extended households occupy an intermediate position with respect to mean household size. This pattern is observed in all countries and in both rural and urban areas.

In most countries, the average household size is found to be smaller among urban than among rural children. However, the overall rural-urban difference in average household size varies across countries, from 0.2 in Cameroon to about 2 or more persons in Namibia and Senegal. The latter two countries also average the largest household sizes, 10 per-

[1]Note that no distinction is made between intact households (both biological parents) and stepfamilies.

[2]Dependency ratio = 100 * (number of persons age 0-14 years + number of persons age 60 years and over) / (number of persons age 15-59 years).

Figure 2.1 Percent distribution of rural children age 12-59 months, according to household structure and country, Demographic and Health Surveys, 1990-1993

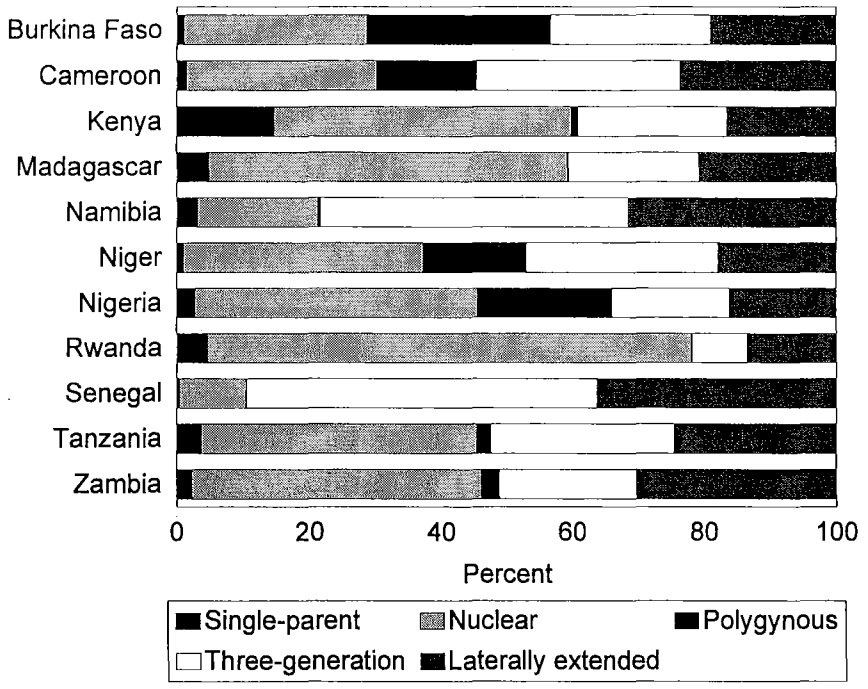


Figure 2.2 Percent distribution of urban children age 12-59 months, according to household structure and country, Demographic and Health Surveys, 1990-1993

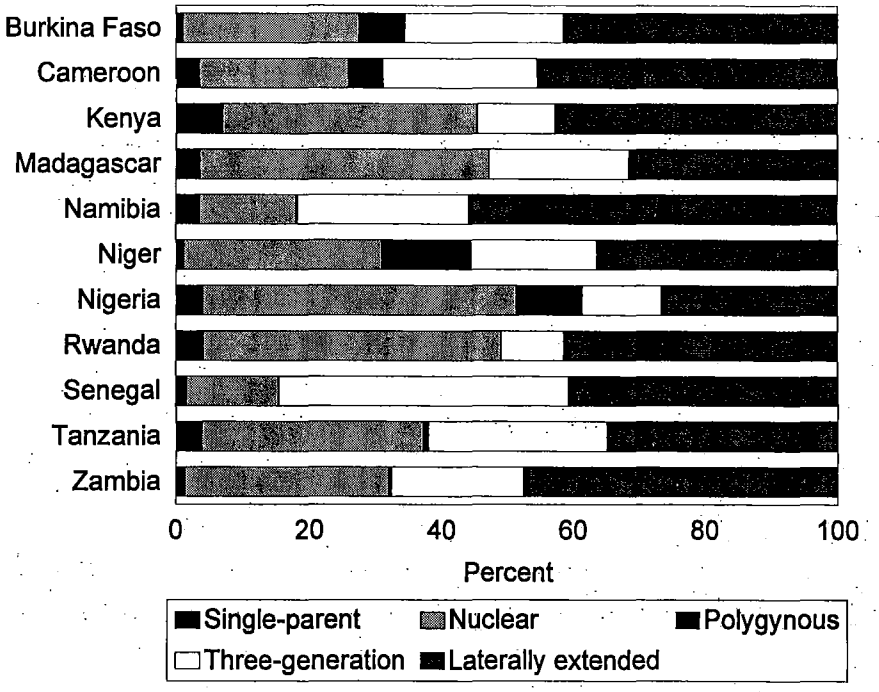


Table 2.2 Home environment of children, by household structure and residence

Selected indicators of the home environment of children aged 12-59 months, by household structure and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and household structure	Average household size		Average number of adults		Dependency ratio[1]	
	Rural	Urban	Rural	Urban	Rural	Urban
Burkina Faso						
Elementary	8.0	6.5	3.2	2.7	166.5	149.4
Three-generation	12.9	13.7	6.1	7.0	179.1	136.0
Laterally extended	11.3	9.1	4.6	4.4	174.1	127.5
All types	9.8	9.3	4.2	4.4	171.0	137.1
Cameroon						
Elementary	7.4	7.3	2.9	2.7	177.5	181.1
Three-generation	12.0	11.6	5.5	5.5	172.4	162.3
Laterally extended	9.0	8.9	3.7	4.0	172.1	149.6
All types	9.2	9.1	3.9	3.9	174.7	162.4
Kenya						
Elementary	6.1	4.7	2.1	2.0	219.5	145.8
Three-generation	9.2	8.3	4.4	4.3	182.3	138.4
Laterally extended	7.2	6.0	2.8	3.0	198.6	119.7
All types	7.0	5.7	2.7	3.0	207.7	133.7
Madagascar						
Elementary	5.9	5.5	2.3	2.3	176.7	153.0
Three-generation	9.5	9.6	4.6	5.0	158.6	147.6
Laterally extended	6.8	6.8	3.2	3.2	141.6	136.2
All types	6.8	6.8	2.9	3.2	165.8	146.5
Namibia						
Elementary	5.8	4.5	2.3	2.0	179.1	134.8
Three-generation	13.1	11.2	6.4	6.1	169.6	110.4
Laterally extended	8.9	8.0	4.1	4.4	165.1	98.5
All types	10.2	8.2	4.8	4.4	170.3	108.3
Niger						
Elementary	6.7	7.6	2.7	2.9	165.1	175.1
Three-generation	11.3	13.2	5.4	6.7	182.3	142.7
Laterally extended	10.0	10.0	4.4	4.4	152.5	148.1
All types	8.6	9.5	3.7	4.2	167.9	159.1
Nigeria						
Elementary	7.0	6.5	2.8	2.5	175.8	177.2
Three-generation	10.8	12.0	5.1	5.6	178.4	193.9
Laterally extended	9.4	8.0	4.2	3.6	164.7	159.9
All types	8.1	7.6	3.4	3.2	174.5	174.6
Rwanda						
Elementary	5.9	5.6	2.3	2.2	172.6	173.3
Three-generation	7.6	(9.7)	4.1	(5.6)	159.1	(115.0)
Laterally extended	6.4	6.5	2.9	3.3	147.7	112.0
All types	6.1	6.4	2.5	3.0	168.1	142.4
Senegal						
Elementary	6.4	5.9	2.5	2.4	187.6	164.9
Three-generation	16.2	14.8	7.6	7.4	166.9	148.1
Laterally extended	14.0	11.8	6.0	5.4	165.3	148.0
All types	14.4	12.2	6.5	5.8	168.5	150.6
Tanzania						
Elementary	6.0	5.5	2.4	2.4	173.4	146.1
Three-generation	12.1	9.2	6.0	4.6	156.0	139.9
Laterally extended	7.5	6.7	3.3	3.2	150.0	134.3
All types	8.0	6.9	3.6	3.3	163.4	140.3
Zambia						
Elementary	6.0	6.3	2.4	2.5	161.1	164.5
Three-generation	11.3	10.4	5.4	5.2	165.0	132.0
Laterally extended	8.0	7.7	3.4	3.6	153.3	135.7
All types	7.7	7.8	3.3	3.5	159.6	144.3

Note: Figures in parentheses are based on fewer than 80 unweighted cases.
[1]Dependency ratio = 100 * (number of persons age 0-14 years + number of persons age 60 years and over) / (number of persons age 15-59 years).

sons in Namibia and 14 in Senegal, compared with a relatively low mean household size of 6.1 persons in Rwanda and 6.8 in Madagascar.

Although the relationship between household structure and average household size remains constant across countries and residential areas, the magnitude of the differences in average household size between children in the three types of household formations varies among countries. For example, the difference in mean household size between children from elementary and three-generational households varies from about three persons among rural children in Kenya to more than seven among their counterparts in Namibia and Senegal.

When examining the difference in average household size between children living in elementary households and those living in laterally extended households, a difference of less than one person is found in rural Rwanda and Madagascar. In the remaining rural areas, the difference falls between one and three persons per household but reaches as high as seven in Senegal. Similar differentials in average household size are found in urban areas, but they tend to be of a smaller magnitude.

In some countries, there are larger differences in average household size between children living in the two extended household types than between those living in elementary households and laterally extended households. In rural Tanzania, for example, the average household size is 6.0 among children in elementary households, 7.5 among children in laterally extended households, and 12.1 among children in three-generation households. In rural areas of other countries, such as Burkina Faso, Niger and Senegal, three-generational and laterally extended households are more similar in size.

A relationship between household structure and mean number of resident adults is also evident in both rural and urban areas of the countries of analysis. Not surprisingly, children from elementary households average the lowest numbers of adult household members, compared with those from three-generational or laterally extended households. On average, children from three-generational households live with 2-5 more adults than those from elementary households. Rural-urban differences in the number of resident adults are generally small.

In general, countries in sub-Saharan Africa are characterized by relatively high dependency ratios, a reflection of high fertility levels and a correspondingly large population of children under age 15 (Ayad et al., 1994). This pattern is exemplified by the countries included in our analysis. In 10 of the 11 countries, the household dependency ratio falls between 160 and 175 among rural children and is as high as 208 in Kenya. Household dependency ratios tend to be much lower among urban than rural children, signifying a smaller ratio of children and the elderly to household members aged 15-59. Note that in Nigeria, there is virtually no difference in the household dependency ratio among rural and urban children.

Compared with the mean household size and the number of resident adults, there is a less clear relationship between the dependency ratio and household structure. In rural areas of seven countries (Cameroon, Kenya, Madagascar, Namibia, Rwanda, Senegal and Tanzania), higher dependency ratios are found among children residing in elementary households than among those in extended households. In the remaining four countries, rural children residing in three-generational households are characterized by higher household dependency ratios than those from elementary and laterally extended households. Household structure differences in the dependency ratio are more consistent in urban areas. In urban areas of all countries included in our analysis, the household dependency ratio is highest among children from elementary structures, and in eight of the countries examined, they are lowest among children from laterally extended households. Note that in Senegal there is virtually no difference in the urban household dependency ratio between children from three-generational and laterally extended household structures.

Another component of the home environment, educational achievement among adult household members, is presented in Table 2.3 by household structure and rural-urban residence. Three indicators are examined: (1) the percentage of children residing in a household headed by someone who has ever attended school, (2) the percentage residing with an adult who has secondary or higher education and (3) the percentage whose mothers have ever attended school. These indicators permit some assessment of the human resources that are available to children in various types of living arrangements.

As expected, urban children are more likely than rural children to live in households headed by someone who has attended school. These disparities in the educational status of the household head are particularly wide in Burkina Faso, Niger and Senegal, which also have lower levels of educa-

Table 2.3 Educational background of children, by household structure and residence

Selected indicators of the educational background of children aged 12-59 months, by household structure and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and household structure	Percent living in household with educated head		Percent living with adult who has secondary or higher schooling		Percent whose mothers are educated	
	Rural	Urban	Rural	Urban	Rural	Urban
Burkina Faso						
Elementary	10.8	34.9	2.4	22.9	5.8	29.1
Three-generation	5.8	27.9	5.1	44.5	7.4	31.2
Laterally extended	13.4	43.2	10.3	54.4	9.6	43.3
All types	10.1	36.6	4.5	41.2	6.9	35.5
Cameroon						
Elementary	40.4	63.2	17.9	45.2	33.1	61.5
Three-generation	53.7	56.1	42.7	73.5	68.6	71.6
Laterally extended	63.4	84.7	33.6	74.5	57.4	81.1
All types	49.9	71.3	29.3	65.2	49.8	72.7
Kenya						
Elementary	85.5	89.9	28.3	56.5	76.0	85.5
Three-generation	51.8	62.7	42.8	60.8	82.7	91.4
Laterally extended	88.7	98.0	44.0	83.0	84.9	94.2
All types	78.4	90.2	34.1	68.4	79.0	90.0
Madagascar						
Elementary	80.4	92.8	24.3	64.3	77.7	90.3
Three-generation	63.0	78.5	32.9	76.8	75.6	92.8
Laterally extended	84.4	92.9	36.1	84.0	80.2	94.8
All types	77.8	89.8	28.5	73.2	77.8	92.3
Namibia						
Elementary	63.5	82.9	25.9	69.7	69.4	86.9
Three-generation	41.3	70.2	50.4	81.4	81.2	90.8
Laterally extended	59.9	83.8	43.8	76.4	76.4	89.8
All types	52.0	80.2	43.0	76.4	77.1	89.5
Niger						
Elementary	4.0	21.3	1.5	16.6	5.0	19.4
Three-generation	3.7	19.8	3.0	42.8	5.1	32.2
Laterally extended	6.5	33.8	8.7	46.7	6.7	34.8
All types	4.4	25.6	3.2	32.6	5.3	27.4
Nigeria						
Elementary	34.5	63.8	17.8	47.2	25.4	53.1
Three-generation	32.6	44.3	37.5	58.8	42.1	59.8
Laterally extended	50.9	81.3	44.6	72.8	43.4	77.4
All types	36.8	66.1	25.6	55.4	31.3	60.3
Rwanda						
Elementary	65.4	81.9	33.5	52.0	48.8	64.1
Three-generation	32.5	(48.9)	38.5	(72.3)	54.2	(76.6)
Laterally extended	68.0	94.2	49.1	81.8	67.0	90.4
All types	63.0	83.9	36.0	66.3	51.7	76.2
Senegal						
Elementary	12.9	45.8	6.8	27.8	8.8	34.0
Three-generation	6.2	33.9	9.0	54.4	7.4	45.7
Laterally extended	9.2	37.8	12.3	47.0	7.5	35.1
All types	8.0	37.4	10.0	47.3	7.6	39.6
Tanzania						
Elementary	68.3	86.3	3.5	18.8	52.6	76.7
Three-generation	46.1	72.4	5.9	12.3	60.3	84.8
Laterally extended	70.4	81.0	11.1	33.6	64.7	86.0
All types	62.5	80.7	5.8	22.2	57.4	82.1
Zambia						
Elementary	81.5	96.6	19.9	63.5	66.3	91.8
Three-generation	71.0	89.4	39.0	77.7	76.4	96.9
Laterally extended	86.8	97.9	37.3	82.7	76.8	94.1
All types	80.9	95.8	29.2	75.5	71.6	93.9

Note: Figures in parentheses are based on fewer than 80 unweighted cases.

tion relative to the other countries included in the analysis. In these countries, no more than 10 percent of rural children live in a household where the head of that household has had some schooling. More than one-third of rural children in Nigeria and about one-half of the children in rural Cameroon and rural Namibia live in a household whose head has attended school, the proportion rising to more than 75 percent in rural areas of Kenya, Madagascar and Zambia.

There are striking variations in the educational status of the household head by household structure. The general pattern shows that children from three-generation households are less likely than those from elementary and laterally extended households to live in a household that is headed by someone who has ever attended school. This pattern is found in both urban and rural areas and is probably a reflection of the older average age of heads of three-generational households and the increase in educational opportunities over time. This particular pattern is not evident, however, in rural Cameroon. In this setting, elementary living arrangements are associated with lower educational status of the household head than extended living arrangements. Notwithstanding country variations in the educational status of household head, children from laterally extended households are most likely to live in households where the head has ever attended school, except in rural Tanzania. The differences in the educational status of the household head between children from elementary and laterally extended households are less substantial.

The percent of children who reside in a household with an adult who has attained secondary or higher schooling is also shown in Table 2.3. In all countries, children from elementary households face severe constraints in terms of the educational attainment of resident household members, compared with children from other households. These constraints are observed in both urban and rural areas, even though children from urban areas come from substantially higher educated household environments than those from rural areas. In most countries, the proportion of children who reside with a secondary or higher educated adult increases as one moves from elementary through three-generational to laterally extended households. In rural Nigeria, for example, the proportion of children who reside with a secondary or higher educated adult increases from 18 percent among those in elementary housenolds to 38 percent and 45 percent among those from three-generational and laterally extended households respectively.

With respect to mother's education, children from elementary households are generally more disadvantaged than those in other household formations. This pattern is found in both urban and rural areas, the only exceptions being rural Madagascar, rural Niger and rural Senegal. In these settings, there are no substantial household structure differences in the proportion of children whose mothers have ever attended school. For about one-half of the countries examined, the highest levels of mothers' education are found among children from laterally extended households. In the remaining countries, there are no substantial differences in mother's educational status between children from three-generational and laterally extended households, except in urban Burkina Faso, urban Cameroon, urban Nigeria and urban Senegal. As observed for the indicators of children's educational background, mothers' education varies widely across countries. In rural areas, the proportion of children whose mothers have ever attended school ranges from less than 10 percent in Burkina Faso, Niger and Senegal to at least 75 percent in Kenya, Madagascar and Namibia. Similar variations are found among urban children, though of a smaller magnitude. As expected, urban children are more likely than rural children to have mothers who have ever attended school, the disparity being wider in western than in eastern and southern Africa.

2.4 SOCIOECONOMIC LEVEL OF HOUSEHOLDS

The measurement of the household's socioeconomic level is problematic because the DHS did not collect information on income or levels of consumption. In this analysis, the indicator of the household's socioeconomic status is an index of living standards based on the availability of certain amenities and the possession of selected consumer durables. The index of socioeconomic level is constructed by looking for the presence of these six components: (1) some toilet facility; (2) piped drinking water; (3) electricity; (4) non-mud floor; (5) radio; (6) motorcycle or car. In each case, the component is scored 1 if the household has the item and 0 if it does not. Thus, the scores range from 0 to 6. This measure is not without shortcomings. First, it does not capture differences in the internal allocation of resources within households. In addition, remittances from family members residing elsewhere may ameliorate a household's economic constraints. However, although the socioeconomic index is a crude indicator of living standards, it seems to give a consistent picture of the relationship between poverty and access to health care.

Table 2.4 presents two indicators of the socioeconomic level of children's home environment. The first indicator is the proportion of children who reside in households with none of the six components specified in the socioeconomic index. The second is the mean value of the socioeconomic index. Huge variations are found across countries in children's overall living standards, particularly in rural areas. The proportion of rural children who live in households with none of the items specified in our socioeconomic index ranges from 4 percent in Rwanda to more than 33 percent in Burkina Faso, Madagascar, Niger and Zambia. In Niger, more than one-half of all rural children are found at the lowest socioeconomic level. Country differences in children's socioeconomic background are less dramatic in urban areas. The mean socioeconomic level among urban children ranges from 3.1 to 4.5. No more than 5 percent of urban children live at the lowest end of the socioeconomic index. In 7 of the 11 countries, less than 1 percent of urban children live in a household with a socioeconomic index of 0.

There is evidence of a relationship between household structure and socioeconomic status. The lowest socioeconomic levels tend to be found among children living in elementary households, except in Tanzania, where there is little variation in living standards across the three household types. Although some countries (notably Burkina Faso and Zambia) show that children living in three-generational households tend to be slightly worse off, compared with those living in laterally extended households, the differences in socioeconomic level between these two groups of children are minor.

The observed differences in relative poverty between households confirm a strong, though not necessarily causal, relationship between family structure and socioeconomic status. A previous study by Caldwell et al. (1982) found that in Bangladesh and Sri Lanka, nuclear families ranked lowest on the number of possessions per household. Another study that examined the relationship of household structure and nutritional status of children in a rural part of India showed that a higher percentage of nuclear families, compared with joint families, belonged to the lower per capita income group (Murthy et al., 1985).[3]

These differences in relative poverty between households could be in part a reflection of the differential composition of the households' workforce. As shown previously in Table 2.2, children in elementary households tend to reside with fewer adults than those in extended households. They also face severe constraints in terms of mother's education and are less likely to reside with adults who have had secondary or higher education (Table 2.3). Households with a larger number of workers or with members who are relatively well educated may be more likely to have at least one of the items specified in our socioeconomic index. However, given that the index captures measures of living standards that can be shared with varying numbers of household members, the impact of household composition on the socioeconomic index may be considerably diminished. This observation was made by Lloyd (1995) in an examination of the relationship between household structure and poverty in Cameroon, Egypt and the Philippines. Her findings indicate that even after adjusting for household size, household dependency ratio and urban/rural residence, nuclear households are socioeconomically worse off than extended households in all three countries. This result was found when using a mean-household-amenities score ranging from 0 to 10, and the percentage of households with a score of 3 or lower as measures of poverty.

2.5 SUMMARY

The findings in this chapter show wide variations across countries in children's living arrangements and differences in children's home environment by household type. Four countries (Nigeria, Rwanda, Kenya and Madagascar) show a higher proportion of children in elementary households than in extended households. In three countries (Burkina Faso, Niger and Tanzania), children are almost equally divided between elementary and extended households. In the four remaining countries covered in this analysis (Cameroon, Namibia, Senegal and Zambia), the majority of children live in extended households.

The distribution of children across household types varies by type of place of residence. In countries with predominantly elementary living arrangements, except Nigeria, urban children are more likely to live in extended households, and rural children are more likely to live in elementary households. Furthermore, children from extended households are more likely to live in three-generational households in rural areas and in laterally extended households in urban areas. This pattern is found in at least eight countries.

[3]In our analysis, a joint family is referred to as a laterally extended family. In the study by Murthy et al. (1985), three-generation families were classified as nuclear families.

Table 2.4 Socioeconomic level of children, by household structure and residence

Indicators of the socioeconomic level of children aged 12-59 months, by household structure and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and household structure	Percent with socioeconomic index of zero		Mean socioeconomic index level[1]	
	Rural	Urban	Rural	Urban
Burkina Faso				
Elementary	42.0	3.2	1.0	3.6
Three-generation	38.1	2.0	1.1	4.3
Laterally extended	29.5	0.2	1.5	4.5
All types	38.7	1.7	1.1	4.2
Cameroon				
Elementary	17.0	1.1	1.7	3.8
Three-generation	8.1	0.0	2.0	4.0
Laterally extended	8.5	0.0	2.2	4.6
All types	12.2	0.3	1.9	4.2
Kenya				
Elementary	13.4	0.0	1.6	3.5
Three-generation	9.3	0.0	1.8	3.5
Laterally extended	10.7	0.2	1.9	4.0
All types	12.0	0.1	1.7	3.8
Madagascar				
Elementary	36.3	5.5	1.0	3.0
Three-generation	30.4	3.3	1.1	3.3
Laterally extended	28.7	3.7	1.2	3.8
All types	33.6	4.5	1.1	3.3
Namibia				
Elementary	29.9	1.5	1.3	4.7
Three-generation	21.2	1.8	1.3	4.2
Laterally extended	20.0	0.0	1.5	4.5
All types	22.7	0.7	1.4	4.5
Niger				
Elementary	65.2	6.5	0.4	3.0
Three-generation	49.5	4.7	0.6	3.3
Laterally extended	46.5	2.7	0.7	3.6
All types	57.3	4.8	0.5	3.3
Nigeria				
Elementary	17.4	1.9	1.9	4.4
Three-generation	14.9	0.8	2.0	4.3
Laterally extended	13.2	1.6	2.4	4.7
All types	16.3	1.7	2.0	4.4
Rwanda				
Elementary	4.6	1.2	1.5	2.6
Three-generation	3.8	(0.0)	1.6	(2.8)
Laterally extended	3.1	0.0	2.0	4.2
All types	4.3	0.6	1.6	3.3
Senegal				
Elementary	24.5	0.0	1.4	3.9
Three-generation	14.5	0.2	2.0	4.3
Laterally extended	17.1	0.0	1.8	4.2
All types	16.5	0.0	1.9	4.2
Tanzania				
Elementary	13.5	0.0	1.3	3.0
Three-generation	12.4	0.0	1.3	2.7
Laterally extended	13.3	0.0	1.5	3.4
All types	13.2	0.0	1.4	3.1
Zambia				
Elementary	40.2	0.4	0.9	3.7
Three-generation	37.4	1.2	1.0	3.8
Laterally extended	32.2	0.3	1.3	4.1
All types	37.3	0.5	1.1	3.9

Note: Figures in parentheses are based on 25-49 unweighted cases.
[1]The socioeconomic index ranges from 0 to 6.

The home environment of children living in elementary households is different from that of children living in laterally extended and three-generation households. In more than one-half of the countries examined, children from elementary households tend to reside with fewer household members than those from extended households and to live in households with higher dependency ratios. The living standards of children and the human resources that are available to them also vary considerably by household type. In general, children from elementary households tend to be worse off than those from extended households in terms of the number of resident adults and mothers' educational status. Children from elementary households are more likely than those from three-generational households to live in a household that is headed by an adult who has had some schooling. However, children from elementary households are substantially less likely than children from other household types to reside with adult members who have had secondary or higher levels of education. Children from laterally extended households tend to be best off in terms of the educational composition of the household.

There are household-structure differences in relative poverty, particularly in rural areas. Using the percentage of children who reside in households with a socioeconomic index of 0 as a measure of poverty, we find that in nine countries, rural children from elementary households are socioeconomically more disadvantaged than those from extended households. However, the magnitude of this differential varies from country to country.

3 Immunization

3.1 ESTIMATING VACCINATION COVERAGE

In the DHS, information on vaccination coverage was collected in two ways: from vaccination cards shown to the interviewer and from mothers' recall. Mothers were first asked if their children under age 5 had a health card. If the mother was able to present the health card, the interviewer recorded the vaccination dates. If a vaccination card was presented, but a vaccine was not recorded on the card as given, the mother was asked to recall whether the child had ever received the vaccination in question, including the number of doses, if applicable. If a card was not presented at all, information on vaccination coverage was based solely on mothers' recall. Recall information pertained only to bacille Calmette-Guérin (BCG), measles, and polio vaccinations. Because polio and diphtheria-pertussis-tetanus (DPT) vaccinations are usually given around the same time, DPT coverage was not asked for children without a written record, as it was assumed to be the same as the mothers' report of polio vaccine. The only exceptions are Cameroon and Zambia, where specific questions were asked on DPT recall in the absence of a written record. To be fully vaccinated, a child must have received each of the following vaccines: BCG, measles, and three doses each of DPT and polio (that is, eight vaccinations in total).[1]

The proportion of health cards that was seen by the interviewer varies greatly among the 11 countries. Health cards were presented for close to 80 percent of children in Rwanda and about two-thirds of children in Tanzania, Burkina Faso and Zambia. Between 50 and 61 percent of children in Senegal, Madagascar, Namibia and Kenya had cards that were seen by the interviewer. Respondents presented cards for a smaller proportion of children in Cameroon (41 percent). In Niger and Nigeria, only 26 and 32 percent of children, respectively, had a health card that was seen by the interviewer.

Because a fair proportion of the information on children's immunization in these countries is based on maternal recall, data quality is of concern. Previous analysis of DHS-I data revealed that among children who were ever vaccinated, recall coverage for specific vaccines is typically 75 to 95 percent as high as card coverage, the only exception being BCG, for which recall coverage was the same or higher than card coverage in almost all countries (Boerma et al., 1990). Studies of the accuracy of mothers' reports about their children's vaccination have generally concluded that reliable estimates of true coverage rates can be obtained solely from mothers' recall. In one such study in Sudan, it was found that 78 percent of women knew the age at which their children had received the first dose of polio vaccine and that in 79 percent of the cases, recall information of the date of measles vaccination was specific, compared with the date on the vaccination card (Gareaballah and Loevinsohn, 1989). However, it has been found that the accuracy of mothers' recall of children's immunization declines with an increase in the age of the child and the number of doses received (Valdez and Weld, 1992). Overall, mothers' reports of their children's vaccination status result in substantially improved estimates of immunization coverage when combined with card information (Boerma et al., 1990; Goldman and Pebley, 1994). However, recall coverage immunization levels are usually lower than card coverage levels.

3.2 VACCINATION COVERAGE RATES

Vaccination coverage rates provide information about two aspects of the immunization program in a country or an area: first, whether children have had any contact with the immunization program; and second, whether they have had repeated contact with the program allowing them to receive all the recommended vaccinations. The coverage rates for BCG and the first doses of DPT and polio vaccines usually correlate closely with each other (Boerma et al., 1990; Sommerfelt and Piani, forthcoming), and either of these correlates with whether at least one vaccination was given. For the rural and urban children included in this report, BCG was found to approximate within 3 percentage points the proportion of children who had received at least one vaccination (data not shown), with the exception of rural children in Namibia and Madagascar, where the difference is slightly larger. To assess the second aspect of the immunization program, the coverage rates for measles vaccine, the third doses of DPT and polio vaccines, and for being

[1]According to World Health Organization guidelines, the recommended timing of immunization is: BCG at birth, three doses of DPT and oral polio vaccine at 6, 10, and 14 weeks, and measles immunization at 9 months. Note that in Niger and Burkina Faso, injectable polio vaccine is often given in the same injection as DPT. This vaccine is known as imovax. For the purpose of the analysis, the first two doses of imovax are considered equivalent to three doses of DPT and polio vaccines.

fully vaccinated are presented. These coverage rates are examined to evaluate whether the immunization program is capable of sustaining contact with children. Overall coverage rates in urban and rural areas are presented first before proceeding with a discussion of differentials in immunization coverage by household structure and socioeconomic level and the results of the multivariate analysis.

Table 3.1 presents estimates of immunization coverage for children aged 12-59 months by household structure and rural-urban residence, and Table 3.2 presents these differentials by socioeconomic level and rural-urban residence. These estimates are based on the combined information from health cards and mothers' reports. Immunization coverage varies widely among countries. Rural coverage rates are lower than urban rates for all vaccinations and in all countries. The rural-urban differentials are largest for the third doses of the multiple-dose vaccines, except in Niger, where the greatest difference is for BCG. The rural-urban differences in vaccination rates are most pronounced for the countries with the lowest overall coverage levels.

In the case of BCG, rural coverage rates vary from a very low level of 35 percent to a high of 97 percent. Judging from the BCG vaccination coverage rates, only one-third of children in rural Niger and one-half of those in Nigeria have had any contact with the immunization program. In urban areas, coverage rates are higher; at least 80 percent of children have received BCG vaccines in all the countries studied. Measles vaccination coverage in rural areas ranges from 27 percent in Niger to 92 percent in Rwanda. In virtually all countries, urban coverage levels are considerably higher (68-94 percent). As expected, because DPT and polio vaccines are usually administered to the child at the same time, the coverage rate for the third dose of polio vaccine (polio3) is virtually the same as that for the third dose of DPT (DPT3) in all countries, the only exception being urban Niger, where coverage rates for polio3 are about 4 percentage points lower than those of DPT3. Rural coverage rates for DPT3 and polio3 range from 14 to 91 percent, and urban coverage rates range from 58 to 94 percent.

Comparing measles vaccination coverage rates with those for the third dose of the multiple dose vaccines, for example, DPT, indicates which of these is most important in limiting the proportion of children who are classified as being fully vaccinated. DPT3 coverage rates are often considerably lower than measles vaccination rates when the immunization program lacks resources or is not well organized. It is more difficult for such programs to maintain the repeated contact required for delivery of three DPT injections than to give one injection against measles. Some immunization programs may also place a higher priority on vaccination against measles with the expected greater impact on lowering mortality. As Tables 3.1 and 3.2 indicate, there is little difference (less than 4 percentage points) in the proportion of children who have received measles vaccine and in the percentage who have received the third dose of DPT vaccine in both urban and rural areas of Rwanda, Kenya and Madagascar. Although differences in the coverage levels of DPT3 and measles vaccines tend to be small in urban areas of Tanzania, Zambia and Senegal, differences are somewhat larger in rural areas of these countries (5-7 percentage points), with coverage against measles being higher. The remaining countries (Namibia, Burkina Faso, Cameroon, Nigeria and Niger) show large differences between measles and DPT3 vaccination coverage, with coverage against measles being higher than the rates for DPT3 in both urban and rural areas.

There are great variations among the countries in the proportion of children who have received all the vaccinations. Vaccination coverage rates are relatively high in Rwanda, Kenya, Tanzania and Zambia. In these countries, the percentage of children aged 12-59 months who have received all eight vaccinations ranges from 67 to 88 percent in rural areas and from 79 to 90 percent in urban areas. Intermediate levels of full immunization coverage are seen in Namibia, Senegal, Madagascar and Burkina Faso. In these countries, between 42 and 62 percent of rural children and between 65 and 74 percent of urban children have received all eight vaccines. Cameroon, Niger and Nigeria have low levels of full immunization coverage. In these countries, coverage rates are only 12-30 percent for rural children and 52-59 percent in urban areas.

3.2.1 Differentials by Household Type

Differentials in vaccination coverage by household structure and socioeconomic level are not consistent across countries. The observed patterns vary according to rural or urban residence, the level of immunization coverage itself, and to some extent, the type of vaccine. Differences in vaccination coverage rates according to household type exceed 6 percentage points for at least one of the vaccinations in rural areas of eight countries. In three countries (Burkina Faso, Madagascar and Tanzania) there are smaller differences. Children from elementary households are clearly worse off than children from both of the other family types in all but one of the eight countries that show modest-to-

Table 3.1 Percent of children receiving specific vaccines, by household structure and residence

Percent of children aged 12-59 months who had received specific vaccines by the time of the survey (according to vaccination card or mother's report), by household structure and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and household structure	BCG[a]		Measles		DPT3[b]		Polio3[c]		Fully vaccinated	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Burkina Faso										
Elementary	83.4	94.7	69.3	77.8	44.6	72.5	44.8	73.4	40.3	64.4
Three-generation	84.5	95.0	67.3	81.7	48.4	75.4	48.9	75.7	44.0	68.1
Laterally extended	87.4	95.8	69.7	84.1	48.7	79.9	48.9	80.0	41.9	73.2
All types	84.4	95.2	68.9	81.4	46.3	76.3	46.6	76.8	41.5	68.9
Cameroon										
Elementary	66.7	83.6	47.0	64.0	32.2	56.8	33.1	58.7	26.7	49.2
Three-generation	77.0	91.7	59.9	75.0	38.5	64.8	39.2	65.2	32.0	58.0
Laterally extended	71.9	93.6	54.9	80.6	37.9	71.4	40.9	72.5	32.8	65.4
All types	71.1	90.0	52.9	74.1	35.5	65.3	36.8	66.5	29.8	58.6
Kenya										
Elementary	94.6	98.7	81.2	85.4	84.2	88.5	82.5	88.5	73.9	78.7
Three-generation	97.9	95.7	90.3	86.1	87.0	89.7	86.1	89.7	81.2	82.7
Laterally extended	96.6	98.6	88.1	89.1	88.1	93.9	87.6	93.9	81.1	83.9
All types	95.7	98.3	84.4	87.1	85.5	91.0	84.2	91.0	76.7	81.4
Madagascar										
Elementary	77.5	89.1	63.3	72.2	63.4	74.9	63.4	74.9	51.0	62.8
Three-generation	74.7	85.1	61.8	64.6	57.9	71.3	57.9	70.7	48.0	55.8
Laterally extended	79.6	90.7	67.0	81.0	59.9	81.8	59.9	81.8	52.1	75.1
All types	77.4	88.7	63.8	73.4	61.6	76.3	61.6	76.2	50.6	65.2
Namibia										
Elementary	87.4	96.3	77.7	86.6	68.8	80.0	68.8	80.0	60.1	72.4
Three-generation	88.8	93.0	84.6	84.6	70.6	75.8	70.6	75.8	64.0	68.0
Laterally extended	88.8	90.8	81.2	80.5	69.9	74.4	69.9	74.4	60.5	66.0
All types	88.5	92.4	82.0	82.7	70.0	75.8	70.0	75.8	62.0	67.7
Niger										
Elementary	32.9	87.2	27.0	69.4	13.3	61.5	13.4	57.5	11.6	50.3
Three-generation	37.1	85.2	27.2	71.0	13.5	58.5	13.2	55.4	11.9	49.1
Laterally extended	40.2	89.1	28.2	75.2	15.7	69.1	15.9	64.7	12.8	56.8
All types	35.4	87.5	27.2	71.8	13.8	63.7	13.8	59.7	11.9	52.4
Nigeria										
Elementary	48.6	77.3	41.0	64.1	25.0	54.5	24.9	54.7	22.3	48.2
Three-generation	61.1	77.2	51.6	63.3	33.8	54.7	33.8	54.7	30.9	49.3
Laterally extended	61.5	87.0	50.4	78.0	35.9	67.5	35.9	67.8	33.8	63.1
All types	52.9	79.9	44.4	67.7	28.3	58.0	28.3	58.2	25.7	52.3
Rwanda										
Elementary	97.2	97.6	92.7	91.9	91.5	92.7	91.5	92.7	88.6	88.3
Three-generation	96.5	(97.9)	89.2	(93.6)	85.8	(95.7)	85.8	(95.7)	80.8	(93.6)
Laterally extended	97.2	99.0	92.5	95.2	92.0	94.3	92.0	94.3	88.2	91.9
All types	97.1	98.2	92.4	93.5	91.1	93.7	91.1	93.7	87.9	90.3
Senegal										
Elementary	76.7	91.2	55.0	74.7	46.6	75.3	46.2	75.3	41.8	(67.5)
Three-generation	85.1	95.6	65.8	83.7	59.0	81.7	59.1	81.7	52.4	75.0
Laterally extended	83.0	95.3	62.7	81.3	55.2	81.5	55.4	81.9	49.2	74.5
All types	83.5	94.8	63.6	81.3	56.3	80.6	56.4	80.8	50.1	73.6
Tanzania										
Elementary	93.4	99.7	80.4	92.8	77.4	91.2	75.5	89.5	69.4	86.7
Three-generation	93.3	99.7	80.4	95.8	73.7	95.5	72.1	95.0	67.6	91.9
Laterally extended	93.9	97.6	85.5	94.9	78.5	91.1	77.1	91.1	74.0	88.2
All types	93.5	99.0	81.5	94.4	76.6	92.3	74.9	91.5	69.9	88.6
Zambia										
Elementary	91.6	98.1	77.9	83.4	71.0	83.8	70.7	81.1	64.7	73.7
Three-generation	98.1	98.8	85.9	87.9	79.3	87.0	76.2	85.8	70.6	80.2
Laterally extended	95.0	98.4	82.6	88.3	77.5	89.7	77.9	88.0	69.8	81.7
All types	93.9	98.4	80.9	86.6	74.6	87.3	74.0	85.3	67.4	78.8

Note: Figures in parentheses are based on 25-49 unweighted cases.
[a]BCG is bacille Calmette-Guérin
[b]DPT3 is the third dose of the diphtheria-pertussis-tetanus vaccine
[c]Polio3 is the third dose of the polio vaccine

Table 3.2 Percent of children receiving specific vaccines, by socioeconomic level and residence

Percent of children aged 12-59 months who had received specific vaccines by the time of the survey (according to vaccination card or mother's report), by socioeconomic level and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and socioeconomic level	BCG[a]		Measles		DPT3[b]		Polio3[c]		Fully vaccinated	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Burkina Faso										
Low	82.2	90.4	67.0	76.7	43.3	67.1	43.6	68.5	39.0	58.9
Medium	88.8	93.6	72.1	75.8	51.5	66.7	51.8	67.3	45.8	59.6
High	96.8	96.1	81.9	83.7	66.0	80.2	66.0	80.5	58.5	72.9
All levels	84.4	95.2	68.9	81.4	46.3	76.3	46.6	76.8	41.5	68.9
Cameroon										
Low	58.0	72.6	40.6	53.4	23.6	50.5	25.2	47.0	18.6	41.8
Medium	77.5	82.1	57.7	55.1	38.1	43.8	39.4	44.7	31.8	34.3
High	92.7	94.2	77.2	82.2	66.7	73.7	66.7	75.4	60.2	68.1
All levels	71.1	90.0	52.9	74.1	35.5	65.3	36.8	66.5	29.8	58.6
Kenya										
Low	94.2	(100.0)	78.7	(93.3)	80.7	(44.4)	78.9	(44.4)	70.0	37.7
Medium	96.8	97.5	88.1	82.1	89.0	90.2	88.0	90.2	81.3	79.0
High	99.0	98.6	94.5	89.9	92.9	94.0	92.9	94.0	88.9	85.0
All levels	95.7	98.3	84.4	87.1	85.5	91.1	84.2	91.0	76.7	81.4
Madagascar										
Low	74.2	79.9	58.8	53.5	56.7	59.0	56.7	59.0	45.0	46.5
Medium	84.2	87.6	75.4	72.4	72.5	72.8	72.5	72.4	63.9	60.3
High	95.5	92.6	85.1	80.9	89.6	84.7	89.6	84.7	76.1	74.9
All levels	77.4	88.7	63.8	73.4	61.6	76.3	61.6	76.2	50.6	65.2
Namibia										
Low	86.8	(77.7)	80.8	(67.1)	68.8	(57.3)	68.8	(57.3)	59.7	(47.6)
Medium	90.4	91.2	84.0	78.0	69.8	74.4	69.8	74.4	64.3	63.2
High	95.7	93.5	84.8	84.6	79.9	77.4	79.9	77.4	72.9	69.9
All levels	88.5	92.4	82.0	82.7	70.0	75.8	70.0	75.8	62.0	67.7
Niger										
Low	33.3	75.7	25.7	61.7	12.1	46.2	12.1	44.2	10.4	37.4
Medium	57.6	85.0	45.0	68.7	32.5	59.5	32.5	56.1	27.8	49.1
High	(88.9)	93.6	(72.2)	78.2	(50.0)	73.6	(55.6)	68.3	(44.4)	60.7
All levels	35.4	87.5	27.2	71.8	13.8	63.7	13.8	59.7	11.8	52.5
Nigeria										
Low	43.7	51.0	35.2	38.8	19.2	25.7	19.1	25.7	16.7	20.0
Medium	54.8	67.4	46.3	57.0	29.4	34.7	29.4	34.7	27.0	32.6
High	72.2	83.8	63.9	71.4	48.8	64.3	48.8	64.6	45.7	57.8
All levels	52.9	79.9	44.4	67.7	28.3	58.0	28.3	58.2	25.7	52.3
Rwanda										
Low	96.8	97.0	90.9	89.6	90.2	92.5	90.2	92.5	86.3	88.1
Medium	97.5	97.4	94.0	92.2	92.1	90.9	92.1	90.9	89.6	87.5
High	98.7	99.5	94.7	96.1	92.1	97.1	92.1	97.1	90.8	94.1
All levels	97.1	98.2	92.4	93.5	91.1	93.7	91.1	93.7	87.9	90.3
Senegal										
Low	77.0	(88.9)	56.0	(72.2)	46.4	(55.6)	46.5	(55.6)	41.6	(52.8)
Medium	87.6	95.0	67.4	72.6	61.4	69.0	61.6	69.0	54.4	62.4
High	92.5	95.0	78.1	84.6	73.6	73.6	85.5	85.7	66.4	78.3
All levels	83.5	94.8	63.6	81.3	56.3	80.6	56.4	80.8	50.1	73.6
Tanzania										
Low	91.3	100.0	77.8	92.9	71.6	98.5	69.9	98.1	64.7	91.5
Medium	97.3	98.2	87.5	93.3	85.5	92.7	83.9	91.8	78.8	89.2
High	99.2	99.8	96.6	96.3	92.7	89.9	91.9	89.2	89.9	86.7
All levels	93.5	99.0	81.5	94.4	76.6	92.3	74.9	91.5	69.9	88.6
Zambia										
Low	92.4	(91.1)	78.4	(71.1)	71.4	(71.1)	70.6	(71.1)	64.1	(64.4)
Medium	97.3	97.9	86.6	82.4	81.2	82.2	81.4	80.7	73.9	71.8
High	100.0	98.9	92.7	89.1	92.7	90.2	90.6	88.0	85.4	82.5
All levels	93.9	98.4	80.9	86.6	74.6	87.3	74.0	85.3	67.4	78.8

Note: Figures in parentheses are based on 25-49 unweighted cases.
[a] BCG is bacille Calmette-Guérin
[b] DPT3 is the third dose of the diphtheria-pertussis-tetanus vaccine
[c] Polio3 is the third dose of the polio vaccine

large differences in vaccination coverage by household structure. In Rwanda, the lowest coverage levels are found among children from three-generational households. Tanzania shows a similar pattern for DPT3, polio3, and full immunization; for the other two vaccines, there is little difference in coverage rates between children from elementary and those from three-generational households.

In three countries (Namibia, Senegal and Cameroon) the highest rural coverage rates are seen among children from three-generational households; in two countries (Rwanda and Niger) the laterally extended households have the highest coverage levels. In the remaining countries (Kenya, Zambia and Nigeria), there are no substantive differences between laterally extended and three-generational households; for some vaccinations the highest levels are for the laterally extended household, and for others the highest levels are for three-generational households. The differentials in coverage rates according to household type tend to be somewhat larger in countries with lower coverage rates. The largest difference (13 percentage points) between the households with the lowest and those with the highest coverage levels is seen in Senegal, Cameroon and Nigeria. The differences according to household type tend to be somewhat larger for measles and the third dose of the multiple-dose vaccines than for BCG.

The picture is similar for urban areas. In seven countries, the differences in vaccination coverage for at least one of the vaccinations according to household type exceed 6 percentage points, while in four countries (Kenya, Namibia, Rwanda and Tanzania), the differences are smaller. In general, it appears that in countries that have achieved high levels of vaccination coverage, there are only minimal household structure differences in the proportion of children who are fully immunized. In Burkina Faso, Cameroon, Senegal and Zambia, the lowest coverage rates are found among children from elementary households, and in the remaining three countries (Madagascar, Niger and Nigeria), the lowest coverage rates are in three-generational households. Children from laterally extended households have the highest coverage levels in all but one of these seven countries that show substantive differences in immunization by household type. In Senegal, urban coverage levels are slightly higher in three-generational households than in laterally extended households. The largest household structure differences in urban coverage rates tend to be found in countries with the lowest levels of full immunization. In Cameroon, Madagascar and Nigeria, these differences reach 15-19 percent.

3.2.2 Differentials by Socioeconomic Level

Table 3.2 presents vaccination coverage rates by socioeconomic level and rural or urban residence. Note that the socioeconomic index has been categorized into three groups: (1) low, indicating a value of 0-1; (2) medium, indicating a value of 2-3; and (3) high, indicating a value of 4-6. Not surprisingly, the examination of differences in vaccination coverage levels according to the socioeconomic index yields more consistent and predictable results than was seen for differences according to household type. Without exception, the worst coverage rates in rural areas are seen for children from households with the lowest socioeconomic status score, and the best rates are for those with the highest score. The coverage rate differences for at least one vaccination between the socioeconomic status group with the worst coverage rate and that with the best coverage rate tend to be larger for countries with lower overall coverage rates. The difference exceeds 6 percentage points in all but one of the rural areas (Rwanda). The differences range from 23 to 33 percentage points in six countries (Burkina Faso, Madagascar, Nigeria, Senegal, Tanzania and Zambia) and reach 43 and 56 percentage points in Cameroon and Niger, respectively. The differences are generally larger for measles vaccine and the third dose of the multiple-dose vaccines, except in the three countries with the lowest overall coverage rates (Cameroon, Niger and Nigeria), where the differences are about equally large for all the vaccinations.

There are also consistent differences in vaccination coverage rates by socioeconomic level in urban areas. In all but one urban area, coverage rates are generally best for those who have the highest score on the socioeconomic index, and the worst rates are found for those with the lowest socioeconomic score. The reverse is true in Tanzania, where the best coverage levels tend to be for those with the lowest socioeconomic score, and the worst coverage is for those with the highest socioeconomic score. It should, however, be kept in mind that all groups have very high coverage levels in Tanzania. The coverage rate differential for at least one of the vaccinations between the socioeconomic group with the worst coverage level and that with the best coverage level exceeds 6 percentage points in all countries and the differences tend to be smaller than in rural areas. The differentials between socioeconomic groups tend to be larger in countries with lower coverage levels. Urban Kenyan children are an exception to this; in Kenya there is a much greater gap between the lowest and highest socioeconomic groups in urban than in rural areas. In most countries, the

smallest differences are seen for BCG, and the largest differences for the third dose of the multiple dose vaccines.

3.3 MULTIVARIATE ANALYSIS

Tables 3.3 and 3.4 present the effects of household structure and socioeconomic level on the likelihood of being fully vaccinated in rural and urban areas, respectively. Model 1 presents the zero-order estimates for the household structure variables. Model 2 provides a test of the hypothesis that household structure differences in the likelihood of full immunization are attributable to socioeconomic differences. By comparing the coefficients from Model 2 with those from Model 1, the extent to which differences in socioeconomic level account for any of the association between household structure and the likelihood that a child is fully immunized can be assessed. Model 3 adds controls for differences in mothers' characteristics and region of residence, in addition to controlling for the number of other adults in the household and child's age, sex and number of siblings age 0-5. To simplify the discussion, this analysis focuses on the estimated effects of household structure; the means of variables included in the analysis and the results of the full-scale model are presented in Appendix Tables A.1-A.3. First, the results obtained for rural areas and then those for urban areas are discussed.

At the bivariate level (Model 1, Table 3.4), rural children from elementary households are less likely than those from laterally extended households to be fully immunized. This relationship holds in all countries except Rwanda and is statistically significant in Kenya, Nigeria, Senegal and Tanzania. In contrast, the direction of association between residence in three-generational households and full immunization is fairly inconsistent. Positive effects—that is, odds ratios exceeding 1.0—are noted in 5 of the 11 countries of analysis. The effects of three-generational households are statistically insignificant in all countries except Rwanda and Tanzania, where they are associated with lower odds of full immunization coverage.

Model 2 shows that socioeconomic level is a highly significant predictor of full immunization coverage in all of the countries examined. The higher the socioeconomic status of the household, the greater is a child's chance of being fully immunized. Furthermore, although socioeconomic level mediates the influence of household structure in Kenya and Senegal, it does not do so in Nigeria, Rwanda and Tanzania. When comparing Models 1 and 2 in Table 3.4, only a slight change is observed in the odds ratios for elementary households in Nigeria and Tanzania, and for three-generational households in Rwanda.

Upon controlling for the effects of other confounding factors in Model 3, the full-scale model, the differentials in the odds of full immunization between elementary and laterally extended households narrow and become insignificant at the 5-percent level in Nigeria. However, the odds ratios for three-generational households in Rwanda and elementary households in Tanzania remain virtually unchanged and statistically significant. This suggests that in these two countries, household structure differences in the likelihood of full immunization are not explained by any of the variables included in our full-scale model. The negative effect of elementary households is significant only in three countries (Kenya, Nigeria and Tanzania), and the negative effect of three-generational households is statistically significant only in Rwanda.

Household structure has more noticeable effects on the likelihood of full immunization coverage in urban areas (see Table 3.4). Model 1 shows significant negative effects of elementary households on full immunization coverage at the bivariate level in all countries except Kenya, Namibia, Rwanda and Tanzania. In addition, in Burkina Faso, Madagascar, Niger and Nigeria, urban children from three-generational households are significantly less likely than those from laterally extended households to be fully immunized. The effect of three-generational households is different in Rwanda, where it is positive and significant.

To what extent are urban household structure differences in full immunization attributable to socioeconomic level? After controlling for socioeconomic level in Model 2, the effect of elementary households narrows and becomes insignificant in Niger and Senegal, indicating that in these countries, household structure differences in immunization coverage in urban areas are explained by differences in socioeconomic level. In the remaining five countries (Burkina Faso, Cameroon, Madagascar, Nigeria and Zambia), the odds ratios for elementary households remain significant, though of a smaller magnitude, after adjusting for socioeconomic level in Model 2. This implies that in these five countries, differences in socioeconomic level do not fully explain differences in full immunization coverage between elementary and laterally extended households. Upon controlling for socioeconomic level in Model 2, the effect of three-generational households is reduced and becomes insignificant in Burkina Faso, Niger, Nigeria, and Rwanda.

Table 3.3 Regression results: Vaccination of rural children

Odds ratios and standard errors from the logistic regressions on the likelihood of rural children being fully vaccinated, Demographic and Health Surveys, 1990-1993

Country and household characteristic	Model 1 Odds	Model 1 Standard error	Model 2 Odds	Model 2 Standard error	Model 3a Odds	Model 3a Standard error
Burkina Faso						
Elementary	0.896	0.122	0.981	0.136	1.017	0.148
Three-generation	1.115	0.180	1.191	0.194	1.160	0.200
Socioeconomic level	NA	NA	1.205***	0.055	1.226***	0.061
Log likelihood	-1068.127		-1059.761		-1030.166	
Cameroon						
Elementary	0.812	0.176	1.047	0.243	1.431	0.366
Three-generation	1.129	0.267	1.280	0.320	0.962	0.274
Socioeconomic level	NA	NA	1.637***	0.115	1.356***	0.108
Log likelihood	-387.516		-360.830		-328.654	
Kenya						
Elementary	0.735**	0.095	0.820	0.108	0.785*	0.108
Three-generation	1.118	0.177	1.193	0.191	1.158	0.209
Socioeconomic level	NA	NA	1.439***	0.067	1.344***	0.067
Log likelihood	-1453.019		-1420.058		-1375.988	
Madagascar						
Elementary	0.922	0.112	1.031	0.129	0.919	0.126
Three-generation	0.802	0.121	0.841	0.131	0.889	0.164
Socioeconomic level	NA	NA	1.574***	0.080	1.382***	0.079
Log likelihood	-1215.195		-1171.715		-1097.281	
Namibia						
Elementary	0.845	0.143	0.875	0.149	0.788	0.149
Three-generation	1.083	0.159	1.123	0.166	1.211	0.204
Socioeconomic level	NA	NA	1.169***	0.063	1.146**	0.073
Log likelihood	-704.164		-699.743		-652.894	
Niger						
Elementary	0.847	0.176	0.946	0.201	1.007	0.233
Three-generation	0.877	0.204	0.914	0.216	0.853	0.210
Socioeconomic level	NA	NA	1.709***	0.155	1.731***	0.165
Log likelihood	-576.344		-560.078		-542.317	
Nigeria						
Elementary	0.542***	0.074	0.626***	0.089	0.759*	0.116
Three-generation	0.886	0.146	0.966	0.165	0.974	0.178
Socioeconomic level	NA	NA	1.430***	0.052	1.332***	0.053
Log likelihood	-1125.189		-1075.376		-1001.867	
Rwanda						
Elementary	1.045	0.198	1.205	0.232	1.295	0.258
Three-generation	0.534**	0.132	0.599**	0.149	0.542**	0.162
Socioeconomic level	NA	NA	1.438***	0.121	1.394***	0.125
Log likelihood	-877.949		-867.922		-855.946	
Senegal						
Elementary	0.718*	0.126	0.785	0.140	0.800	0.157
Three-generation	0.995	0.124	0.993	0.126	0.951	0.131
Socioeconomic level	NA	NA	1.284***	0.057	1.222***	0.060
Log likelihood	-870.678		-854.007		-797.090	
Tanzania						
Elementary	0.726***	0.078	0.750***	0.082	0.764**	0.088
Three-generation	0.793*	0.098	0.820	0.102	0.981	0.141
Socioeconomic level	NA	NA	1.573***	0.081	1.484***	0.080
Log likelihood	-1748.880		-1705.702		-1654.431	
Zambia						
Elementary	0.822	0.104	0.941	0.122	1.120	0.155
Three-generation	1.234	0.210	1.382*	0.240	1.108	0.225
Socioeconomic level	NA	NA	1.462***	0.083	1.460***	0.092
Log likelihood	-957.322		-931.903		-893.682	

Note: Laterally extended households are the reference category for elementary and three-generational households.
NA = Not Applicable; [a]After controlling for child's sex, age, and number of siblings age 0-5; mother's age, marital status, education, and cash-work status; number of resident adults excluding the child's mother; and region of residence.
*** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

Table 3.4 Regression results: Vaccination of urban children

Odds ratios and standard errors from the logistic regressions on the likelihood of urban children being fully vaccinated, Demographic and Health Surveys, 1990-1993

Country and household characteristic	Model 1 Odds	Model 1 Standard error	Model 2 Odds	Model 2 Standard error	Model 3[a] Odds	Model 3[a] Standard error
Burkina Faso						
Elementary	0.611***	0.101	0.748*	0.129	0.710*	0.132
Three-generation	0.697*	0.135	0.762	0.150	0.941	0.207
Socioeconomic level	NA	NA	1.235***	0.062	1.223***	0.071
Log likelihood	-550.786		-541.904		-526.069	
Cameroon						
Elementary	0.530***	0.092	0.661**	0.120	0.693*	0.142
Three-generation	0.863	0.174	1.011	0.212	1.038	0.239
Socioeconomic level	NA	NA	1.489***	0.086	1.323***	0.088
Log likelihood	-483.834		-458.343		-426.417	
Kenya						
Elementary	0.877	0.273	1.014	0.325	0.996	0.353
Three-generation	0.883	0.403	0.993	0.460	0.736	0.404
Socioeconomic level	NA	NA	1.313**	0.163	1.351**	0.188
Log likelihood	-154.658		-152.282		-147.738	
Madagascar						
Elementary	0.577***	0.114	0.696*	0.142	0.599**	0.136
Three-generation	0.453***	0.108	0.514***	0.126	0.521**	0.149
Socioeconomic level	NA	NA	1.315***	0.071	1.272***	0.080
Log likelihood	-408.972		-395.764		-383.551	
Namibia						
Elementary	1.145	0.319	1.099	0.309	0.996	0.316
Three-generation	0.909	0.225	0.952	0.237	1.016	0.291
Socioeconomic level	NA	NA	1.150**	0.077	1.004	0.081
Log likelihood	-265.929		-263.740		-250.491	
Niger						
Elementary	0.693***	0.098	0.815	0.119	0.789	0.127
Three-generation	0.701**	0.124	0.789	0.144	1.100	0.232
Socioeconomic level	NA	NA	1.319***	0.053	1.251***	0.058
Log likelihood	-700.725		-676.087		-640.586	
Nigeria						
Elementary	0.549***	0.074	0.605***	0.084	0.723**	0.109
Three-generation	0.620**	0.132	0.710	0.155	0.788	0.184
Socioeconomic level	NA	NA	1.409***	0.068	1.380***	0.074
Log likelihood	-850.200		-822.943		-791.948	
Rwanda						
Elementary	0.700	0.259	0.921	0.398	1.192	0.605
Three-generation	1.647**	1.287	2.101	1.697	3.000	2.936
Socioeconomic level	NA	NA	1.184	0.164	1.119	0.183
Log likelihood	-118.466		-117.714		-105.601	
Senegal						
Elementary	0.690*	0.150	0.748	0.166	0.781	0.191
Three-generation	1.088	0.209	1.102	0.215	0.991	0.213
Socioeconomic level	NA	NA	1.346***	0.092	1.287***	0.104
Log likelihood	-424.272		-414.749		-401.068	
Tanzania						
Elementary	0.911	0.271	0.911	0.274	0.768	0.245
Three-generation	0.864	0.297	0.864	0.299	1.093	0.434
Socioeconomic level	NA	NA	1.000	0.096	1.040	0.112
Log likelihood	-207.725		-207.725		-202.210	
Zambia						
Elementary	0.626***	0.100	0.697**	0.114	0.757	0.137
Three-generation	0.848	0.171	0.908	0.185	0.866	0.204
Socioeconomic level	NA	NA	1.249***	0.079	1.315***	0.094
Log likelihood	-594.520		-588.330		-565.694	

Note: Laterally extended households are the reference category for elementary and three-generational households. NA = Not Applicable; [a]After controlling for child's sex, age, and number of siblings age 0-5; mother's age, marital status, education, and cash-work status; number of resident adults excluding the child's mother; and region of residence. *** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

Further controls for the region of residence, number of adults in the household, and mother's and child's characteristics suggest smaller but still significant effects of elementary households in several countries. In the final model, urban children from elementary households are significantly more disadvantaged than those from laterally extended households in Burkina Faso, Cameroon, Madagascar and Nigeria. In addition, a significantly lower likelihood of full immunization coverage is found among urban children living in three-generational households in Madagascar.

As in rural areas, the effect of socioeconomic level on full immunization coverage is positive and significant in almost all countries examined. For example, in Cameroon the odds of full immunization rise by at least one-third for every increase in the household's socioeconomic level. The effects of socioeconomic level point indirectly to economic constraints that the household may face in taking children to immunization sites. There is evidence from the literature that the private costs of immunization in terms of transportation (and time) may even exceed the variable costs per vaccine incurred by the government (Makinen, 1979 of Cameroon, cited by Leslie, 1989). Furthermore, even though vaccinations may be provided at little or no cost to the consumer, vaccines are frequently unavailable through public outlets; families thus may have to purchase them in private pharmacies where they may be several times more expensive (Amin et al., 1992 of Freetown, Sierra Leone; Fassin and Jeannee, 1989 of urban Senegal).

The effects of some of the other variables controlled in Model 3 are also worthy of note (see Appendix Tables A.2 and A.3). According to expectations, in all 11 countries, children whose mothers are educated are more likely than those of uneducated mothers to be fully immunized. This effect is statistically significant except in Rwanda, rural Burkina Faso, urban Kenya, urban Madagascar, urban Namibia and urban Tanzania. In comparison, the relationship between mothers' cash-work and children's immunization is quite inconsistent. On the one hand, one would expect that mother's work for cash would augment the economic resources available for health care and other household needs.[2] On the other hand, where mothers are primarily responsible for taking children to health facilities, work for cash may exert a negative impact on mothers' time for the utilization of health services. The results of the final model indicate that in about one-half of the countries, rural children are less likely to be fully immunized if their mother works for cash, but this effect is significant only in Rwanda and Zambia. It is only in rural Niger that mothers' cash-work has a significant positive effect on the odds of a child being fully immunized. Similar observations are made in urban areas, but the effect of mothers' cash-work is significant only in Rwanda, where it serves to greatly reduce the odds of full immunization. With respect to child's age, the likelihood of a child being fully immunized is significantly lower among children age 12-23 months in the rural areas of seven countries and in urban areas of two countries. These findings point to the untimely nature of vaccination coverage, particularly in rural areas. This is not surprising in view of the fact that many rural communities may not have a health center, and mobile clinics or immunization campaigns held at periodic intervals may provide the only opportunity for rural children to receive recommended vaccines. In Rwanda, urban children age 12-23 months are twice as likely to be fully vaccinated as their older counterparts, implying that the immunization program in that country may have intensified over time.

Overall, child's sex is not a strong predictor of the odds of full immunization. The only context in which the effect of sex of the child is statistically significant at the 5-percent level is in urban Niger, where male children are significantly less likely to be fully vaccinated than their female counterparts. The reasons for these differences are unknown. In addition, it is observed that having many siblings reduces a child's chances of immunization in the rural areas of all but three countries, and significantly so at the 5-percent level in Namibia and Tanzania. In urban areas, the effect of number of siblings is significant only in Burkina Faso, where the odds of full immunization decline by 21 percent for each additional sibling aged 0-5.

3.4 SUMMARY

An examination of vaccination coverage rates reveals differences according to household type in the rural areas of eight countries. In seven of these, elementary households have the lowest vaccination coverage levels. In one of the rural areas, three-generational households have the lowest coverage. The highest coverage levels are in laterally extended and three-generational households. In contrast to the urban pattern, rural areas tend to show less difference according to household type in countries with the lowest levels of vaccination coverage, and more differences when

[2] In some circumstances, mother's work for cash may be an indication of low socioeconomic status.

coverage levels are higher. The exception is Nigeria, where overall coverage levels are low, yet differences according to household type are substantial.

Seven countries show differences according to household structure in urban areas for at least one of the coverage rates examined (i.e., BCG, measles, DPT3, polio3, or full immunization). In six of these countries, the highest vaccination coverage rates are seen for laterally extended households. Children in these households are clearly better off in terms of vaccination coverage than children from the other two household types. In one country, the highest coverage rates are in three-generational households. The lowest coverage levels are found in elementary households in four of the urban areas. Three-generational households had the lowest levels in three countries.

There are large and consistent differences in vaccination coverage rates according to socioeconomic level. The difference between the subgroup with the worst coverage rates, i.e., those with the lowest socioeconomic score, and the subgroup with the best coverage rates, i.e., those with the highest socioeconomic score, increases with decreasing coverage levels for being fully vaccinated. Countries with the highest coverage rates show more socioeconomic differentials in vaccination coverage in rural than in urban areas.

The results of this multivariate analysis provide some support for the hypothesis that the likelihood of a child being fully immunized is greatly influenced by the household's socioeconomic level and, to a lesser extent, by its overall structure. Compared with socioeconomic level, the direction and level of significance of the effect of household structure show more variation across countries. At the bivariate level, more significant household structure differences are found in urban than in rural areas (seven versus four countries). The hypothesis that household structure differences in full immunization coverage are mediated by socioeconomic level receives partial support in rural Kenya, rural Senegal, urban Niger and urban Senegal, where the effects of household structure become reduced and insignificant after controlling for socioeconomic status. In the remaining two rural and five urban areas, household structure differences persist, even after controlling for socioeconomic level. The results of the final model indicate that there is a negative association between elementary household structures and full immunization coverage in six rural areas and ten urban areas. However, after controlling for all the variables in the full-scale model, this association is statistically significant at the 5-percent level only in rural Tanzania, urban Madagascar and urban Nigeria. In rural Rwanda and urban Madagascar, it is also worth noting that children from three-generational households are significantly less likely to be fully vaccinated than those from laterally extended households, even after controlling for socioeconomic level and other factors.

4 Diarrhea

The prevalence of diarrhea is assessed through two main questions. For each child born in the five years preceding the survey, respondents were first asked whether the child had experienced diarrhea in the past 24 hours. If the child had not had diarrhea in the past 24 hours, the interviewer asked whether the child had experienced diarrhea in the past 2 weeks. Questions were also asked about the duration of diarrhea and the presence of blood in the stool in order to assess the persistence and severity of the illness. In addition, mothers were asked to list any type of treatment given for diarrhea. Questions on type of treatment gave special emphasis to fluid intake, feeding patterns, oral rehydration therapy and contact with health services. Information was also obtained on knowledge and ever-use of oral rehydration therapy for all mothers with children under age five.

Because the DHS did not define diarrhea, the data obtained are based solely on the subjective assessment of the respondent. This may present a problem, because mothers' reports of their children's symptoms can be affected seriously by socioeconomic and cultural factors. Where diarrhea is a common reality of life, mothers may not show a high degree of concern for all episodes of the condition unless there is a symptom of severity such as bloody stools, vomiting, fever, diarrhea of increased duration, a change in the color of the stool or a sudden increase in frequency (Bentley, 1988). Therefore, early episodes of diarrhea may be underreported and the accuracy and completeness of reporting for diarrhea may vary considerably across countries and between socioeconomic groups (Boerma et al., 1991).

4.1 PREVALENCE LEVELS

Table 4.1 displays the prevalence of diarrhea in the two weeks preceding the survey for children aged 12-59 months by household structure and rural or urban residence. Children reported to have had diarrhea in the last 24 hours are included in the two-week prevalence rate. Table 4.1 also shows the prevalence of bloody diarrhea, usually associated with dysentery, by similar characteristics. The prevalence of diarrhea in the two weeks preceding the survey ranges from 11 to 27 percent of children in rural areas and from 11 to 20 percent in urban areas. There is not much difference in the prevalence of diarrhea by rural-urban residence in Kenya, Madagascar and Rwanda, but in most countries, children in rural areas have a higher prevalence of diarrhea in the two weeks preceding the survey than children in urban areas. The only exception is Tanzania, where the diarrhea prevalence is slightly higher among urban than among rural children in the two weeks preceding the survey.

In general, bloody diarrhea, an indication of dysentery, is not common, although it is reported more often by mothers in rural (2-9 percent) than in urban areas (less than 1-4 percent). In Madagascar, Rwanda and Tanzania, the reported occurrence of bloody stools is essentially the same in urban and rural areas.

4.1.1 Differentials by Household Type

As far as diarrhea prevalence is concerned, the direct effect of household structure is expected to be minimal, compared with the effects of other factors such as the availability of adequate toilet facilities and piped drinking water. However, some indirect effects of household structure may be expected because households vary in their socioeconomic level, and two of the components of the socioeconomic index—toilet facilities and piped drinking water—have a direct impact on diarrheal disease. This would imply that socioeconomic level would have a stronger relationship to diarrhea prevalence than household structure.

Table 4.1 shows that, according to expectations, differences in the two-week diarrhea prevalence by household type are generally small in most of the urban and rural areas studied, and no clear patterns emerge. Among the rural areas, the only exception is Namibia, where there are statistically significant differences according to household type; fewer children (18 percent) from elementary households are reported to have had diarrhea in the last two weeks than children from three-generational or laterally extended families (both 28 percent). In urban areas, statistically significant differences are found in Namibia, Niger and Rwanda. In these three countries, the highest prevalence levels among urban children are found in three-generational families. In Namibia and Niger, the lowest prevalence levels in the two weeks preceding the survey among urban children are found in elementary households (6 percent and 15 percent, respectively), but in Rwanda they are found in laterally extended households (14 percent).

Household structure differences in the prevalence of bloody diarrhea are significant only in urban Tanzania,

Table 4.1 Percent of children with diarrhea in last two weeks, by household structure and residence

Percent of children age 12-59 months who had diarrhea or diarrhea with blood in the two weeks preceding the survey, by household structure and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and household structure	Diarrhea in past two weeks		Diarrhea with blood in past two weeks	
	Rural	Urban	Rural	Urban
Burkina Faso				
Elementary	20.5	15.9	5.4	2.5
Three-generation	20.7	17.6	4.9	4.3
Laterally extended	21.4	18.8	4.7	2.1
All types	20.7	17.5	5.1	2.8
Cameroon				
Elementary	21.4	17.2	4.4	2.7
Three-generation	15.2	15.3	2.9	0.8
Laterally extended	17.4	15.4	2.6	2.3
All types	18.6	15.9	3.5	2.1
Kenya				
Elementary	12.9	16.0	2.4	0.7
Three-generation	12.7	12.7	2.9	0.0
Laterally extended	13.6	9.0	3.4	0.5
All types	13.0	12.6	2.7	0.5
Madagascar				
Elementary	10.5	11.7	1.7	1.2
Three-generation	12.5	12.2	1.6	1.1
Laterally extended	13.4	10.4	2.2	1.5
All types	11.5	11.4	1.8	1.3
Namibia				
Elementary	18.0	6.3	6.6	0.0
Three-generation	28.9	17.3	8.1	3.5
Laterally extended	29.0	13.3	9.2	1.9
All types	26.6***	13.1**	8.1	1.9
Niger				
Elementary	26.9	14.7	10.3	1.7
Three-generation	26.3	21.0	8.2	3.7
Laterally extended	27.5	18.8	7.0	3.0
All types	26.8	17.4	9.1	2.5
Nigeria				
Elementary	18.8	10.9	5.4	2.1
Three-generation	20.2	12.5	5.2	2.2
Laterally extended	18.6	12.1	6.4	1.8
All types	19.0	11.4	5.5	2.0
Rwanda				
Elementary	19.7	23.0	3.1	4.0
Three-generation	20.0	(31.9)	5.0	(6.4)
Laterally extended	21.9	14.4	4.0	2.4
All types	20.0	20.2***	3.4	3.6
Senegal				
Elementary	18.5	13.9	3.6	1.0
Three-generation	23.0	17.1	4.3	1.6
Laterally extended	22.5	12.9	4.8	0.8
All types	22.3	14.9	4.4	1.2
Tanzania				
Elementary	11.0	16.6	2.0	4.0
Three-generation	11.6	16.9	2.0	0.9
Laterally extended	11.1	10.8	2.1	0.9
All types	11.2	14.6	2.0	2.1**
Zambia				
Elementary	25.9	21.8	4.7	2.7
Three-generation	21.9	20.4	5.9	2.8
Laterally extended	25.4	18.7	4.9	2.6
All types	25.0	20.0	5.0	2.7

Note: Significance levels are based on a one-way analysis of variance. Figures in parentheses are based on 25-49 cases. *** ($p < 0.01$); ** ($p < 0.05$)

where children from elementary households have higher reported rates (4 percent) of blood in the stools than children from the other two household types (less than 1 percent). However, it is interesting to note that the highest proportion with blood in the stool is found for children from three-generational families in six rural areas and in seven urban areas. The highest levels are found in laterally extended families in only two rural areas and one urban area. As the differences are small, this apparent trend may not be important.

4.1.2 Differentials by Socioeconomic Level

As indicated in Table 4.2, there are clear patterns in the diarrhea prevalence levels by socioeconomic status. The only countries that do not show statistically significant socioeconomic differences for at least one of the two indicators of diarrhea are Burkina Faso, Madagascar and Niger. Concerning diarrhea in the two weeks preceding the survey, the lowest prevalence levels are found among children from households of high socioeconomic status. Most rural areas show similar diarrhea prevalence levels for children from low-status households and for those from medium-status households. The only exception is rural Zambia, where households of medium socioeconomic status have the lowest prevalence of diarrhea in the past two weeks.

In contrast, there is a wider range in the magnitude of the socioeconomic differential in the prevalence of diarrhea in the past two weeks in urban than in rural areas (2-37 percentage points, compared with 2-17 percentage points, respectively). In most urban areas, the percentage of children with diarrhea in the past two weeks declines steadily with an increase in the socioeconomic status of the household. For example, in urban Rwanda the percentage of children with diarrhea in the past two weeks is 45 percent for households of low socioeconomic status, 21 percent for those of medium status and 15 percent for those of high status. Urban areas of Niger, Senegal, Tanzania and Zambia are exceptions to this general pattern. In Senegal and Zambia, the highest diarrhea prevalence levels in the two weeks preceding the survey are found in medium-status households, but in Niger and Tanzania, there is little difference in the prevalence of diarrhea between children from medium- and high-status households. Overall, socioeconomic differentials in diarrhea prevalence levels in the two weeks preceding the survey are significant in four rural areas (Cameroon, Namibia, Rwanda and Zambia) and in six urban areas (Cameroon, Kenya, Namibia, Nigeria, Rwanda and Zambia).

As previously mentioned, the prevalence of bloody diarrhea is relatively low. Only two countries show statistically significant differences by socioeconomic level in the proportion of rural children with bloody diarrhea—Namibia and Senegal. In both areas, the lowest levels are among children from the highest socioeconomic category. Rural Senegal shows only a slight difference in the prevalence of bloody diarrhea between children from households of medium socioeconomic status and those from households of high socioeconomic status, but in rural Namibia, highest prevalence levels are clearly found among children in the low socioeconomic category. In urban areas, there are statistically significant differences in Namibia, Nigeria, Tanzania and Zambia. In these four countries, the lowest prevalence of bloody diarrhea is found among children with a high socioeconomic score, and the highest prevalence among those from low-status households, except in Madagascar, where children from medium-status households have the highest prevalence of bloody diarrhea.

4.2 KNOWLEDGE AND EVER-USE OF ORS

Dehydration associated with diarrhea is a major cause of morbidity and even death among young children. It is preventable by the administration of oral rehydration therapy (ORT). In most countries, ORT is administered by use of either commercially prepackaged oral rehydration salts (ORS) that are reconstituted at the time of use or a home-made solution of sugar, salt and water. In some countries, ORT is promoted through the preparation of various grain-based rehydration fluids, such as rice water or maize water. In this section, the focus is on knowledge and ever-use of ORS packets.

4.2.1 Differentials by Household Type

Table 4.3 shows the proportion of children aged 12-59 months whose mothers know about and have ever used ORS packets, by household structure and rural or urban residence. Knowledge of ORS varies widely across countries. The proportion of children whose mothers know about ORS packets ranges from 14 to 95 percent in rural areas and from 23 to 97 percent in urban areas. In all countries except Namibia, the proportion of children whose mothers know about and have ever used ORS is substantially higher in urban than in rural areas. In Kenya, Nigeria, Senegal, Rwanda, Tanzania and Zambia, the rural-urban differential in knowledge of ORS ranges from 2 to 12 percentage points. With the exception of Nigeria and Senegal, these are among the

Table 4.2 Percent of children with diarrhea in last two weeks, by socioeconomic level and residence

Percent of children age 12-59 months who had diarrhea or diarrhea with blood in the two weeks preceding the survey, by socioeconomic level and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and socioeconomic level	Diarrhea in past two weeks		Diarrhea with blood in past two weeks	
	Rural	Urban	Rural	Urban
Burkina Faso				
Low	20.6	17.8	5.4	4.1
Medium	21.7	19.9	4.8	3.7
High	14.9	16.9	3.2	2.4
All levels	20.7	17.6	5.1	2.8
Cameroon				
Low	19.6	22.1	4.5	1.8
Medium	20.0	19.7	3.3	2.8
High	9.8	14.1	0.8	1.8
All levels	18.6**	15.9**	3.5	2.1
Kenya				
Low	13.9	a	3.0	a
Medium	12.3	18.2	2.5	0.8
High	11.3	7.4	0.9	0.3
All levels	12.9	12.6***	2.6	0.5
Madagascar				
Low	11.6	15.3	1.9	1.4
Medium	12.1	11.0	1.6	2.8
High	(6.0)	10.3	(0.0)	0.2
All levels	11.5	11.4	1.8	1.3
Namibia				
Low	27.9	(45.1)	9.3	(9.6)
Medium	28.3	24.9	7.1	4.1
High	11.4	8.4	1.7	1.0
All levels	26.7***	13.2***	8.2***	2.0***
Niger				
Low	26.8	22.4	9.3	2.0
Medium	28.5	16.4	8.0	3.2
High	a	16.0	a	2.2
All levels	26.9	17.2	9.1	2.6
Nigeria				
Low	19.5	22.5	6.4	7.5
Medium	19.4	13.6	4.6	1.1
High	16.9	10.5	5.5	1.9
All levels	19.0	11.4***	5.5	2.0***
Rwanda				
Low	20.5	34.3	3.1	7.5
Medium	20.0	20.7	3.8	3.4
High	6.6	15.1	2.6	2.4
All levels	20.0**	20.2***	3.4	3.6
Senegal				
Low	22.9	(13.9)	4.6	(0.0)
Medium	23.3	17.2	5.0	1.3
High	17.5	14.1	1.7	1.2
All levels	22.4	14.8	4.4**	1.2
Tanzania				
Low	10.6	16.7	1.9	4.2
Medium	12.6	14.7	2.1	0.9
High	11.2	14.4	4.0	3.4
All levels	11.3	14.8	2.0	2.1**
Zambia				
Low	26.7	(17.8)	5.4	(8.9)
Medium	19.5	28.8	3.9	3.3
High	21.9	16.3	3.1	2.1
All levels	25.0***	20.1***	5.0	2.7**

Note: Significance levels are based on a one-way analysis of variance. Numbers in parentheses are based on 25-49 unweighted cases.
[a]Figure is based on fewer than 25 unweighted cases and has been suppressed.
*** ($p < 0.01$); ** ($p < 0.05$)

Table 4.3 Mothers' knowledge and ever-use of oral rehydration salts, by household structure and residence

Percent of children age 12-59 months whose mothers know about and have ever used oral rehydration salt packets, by household structure and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and household structure	Know about ORS packets		Ever used ORS packets	
	Rural	Urban	Rural	Urban
Burkina Faso				
Elementary	45.7	81.5	32.1	59.8
Three-generation	41.3	76.4	28.5	53.8
Laterally extended	51.7	80.3	40.0	60.7
All types	45.8***	79.8	32.7***	58.8
Cameroon				
Elementary	25.2	55.4	17.7	36.9
Three-generation	41.7	69.0	26.9	52.6
Laterally extended	39.1	65.9	26.4	41.4
All types	33.6***	63.4***	22.6***	42.6***
Kenya				
Elementary	80.7	84.5	62.4	61.4
Three-generation	79.0	89.7	57.5	64.7
Laterally extended	82.8	95.2	68.2	69.4
All types	80.7	89.7***	62.2***	65.2
Madagascar				
Elementary	36.4	70.5	26.0	52.6
Three-generation	34.1	69.1	21.4	54.7
Laterally extended	42.0	85.1	31.6	61.3
All types	37.1**	74.8***	26.2***	55.8
Namibia				
Elementary	81.2	63.8	69.3	50.7
Three-generation	88.2	87.6	77.8	76.8
Laterally extended	89.9	84.1	82.8	75.0
All types	87.2***	81.3***	77.5***	70.9***
Niger				
Elementary	52.7	89.3	27.0	74.4
Three-generation	55.6	90.8	29.1	71.4
Laterally extended	56.9	90.9	30.6	74.5
All types	54.3	90.2	28.2	73.8
Nigeria				
Elementary	12.5	23.0	7.1	16.5
Three-generation	12.2	19.1	5.7	15.3
Laterally extended	24.2	23.4	17.9	18.3
All types	14.3***	22.6	8.6***	16.8
Rwanda				
Elementary	85.5	94.4	57.4	75.8
Three-generation	86.2	(93.6)	56.2	(68.1)
Laterally extended	88.2	98.1	67.7	77.0
All types	85.9	95.8	58.7***	75.6
Senegal				
Elementary	40.6	52.6	30.5	38.1
Three-generation	44.0	55.4	31.2	44.3
Laterally extended	44.2	56.9	31.9	42.7
All types	43.7	55.6	31.4	42.7
Tanzania				
Elementary	92.6	96.0	79.2	85.5
Three-generation	93.3	95.9	79.2	84.5
Laterally extended	94.9	97.6	81.4	89.9
All types	93.3	96.6	79.7	86.8
Zambia				
Elementary	94.5	97.9	78.8	87.2
Three-generation	95.9	97.5	74.9	87.6
Laterally extended	96.4	97.8	84.2	89.9
All types	95.3	97.8	79.7***	88.6

Note: Significance levels are based on a one-way analysis of variance. ORS is oral rehydration salts. Figures in parentheses are based on 25-49 cases.
*** ($p < 0.01$); ** ($p < 0.05$)

countries with the highest rural knowledge levels, ranging from 83 to 95 percent. In the remaining four countries (Burkina Faso, Cameroon, Madagascar and Niger), the rural-urban differential in knowledge of ORS ranges from 30 to 38 percentage points. In Burkina Faso, Cameroon, Madagascar and Niger, rural-urban differences in ever-use of ORS are very large—about 20 to 45 percentage points—but in the remaining countries, the difference is 17 percentage points or less.

Some patterns do emerge when looking at the differentials in ORS knowledge and use by household type. In Zambia, there are virtually no household structure differences in knowledge of ORS in urban areas. In the remaining countries, the lowest level of knowledge about ORS is never in laterally extended households. Generally, this type of household constellation has the highest levels of knowledge, although in a few instances this is not the case. In Cameroon and urban Namibia, the highest level of knowledge is found in three-generational households. The lowest levels of knowledge are seen in either elementary or three-generational households.

Household structure patterns in ever-use of ORS are somewhat similar to those for level of knowledge. Regardless of whether differences by household type are statistically significant or not, the lowest ORS use levels are never in the laterally extended households. The differentials are statistically significant in eight rural areas, but in only two urban areas. Focusing on countries where statistically significant differences are seen, the lowest ever-use of ORS is seen in either elementary (Cameroon and Namibia) or three-generational families (rural Burkina Faso, rural Kenya, rural Madagascar, rural Nigeria and rural Zambia). In rural Rwanda, the levels are about equally low in elementary and three-generational families. These household structure variations in level of knowledge and use of ORS may be attributed to differences between households in their educational composition (hence, their exposure to a wide range of information on treatment practices), the number of adults in the household who could serve as an immediate though informal network for the exchange of ideas on the effective management of diarrhea, or the differences in the level of economic resources, which may have a direct impact on the use of ORS.

4.2.2 Differentials by Socioeconomic Level

Table 4.4 shows differentials in knowledge and ever-use of ORS by the socioeconomic level of the household. There are marked and consistent differences in knowledge of ORS according to socioeconomic status in both urban and rural areas. In rural areas, the lowest levels of knowledge are without exception found among children from low-status households. In most rural areas, the highest levels of knowledge are found among those from high-status households. The exceptions are Namibia (where the highest level of knowledge is found among children from households of medium socioeconomic status) and Senegal (where the knowledge level is similar for those from households of medium and high socioeconomic levels). In all rural areas, socioeconomic differences in knowledge of ORS are statistically significant at the 1-percent level. In urban areas, there are statistically significant differences in seven countries. In all seven urban areas, the lowest knowledge levels are among children from low-status households, and the highest levels are generally found among those from high-status households.

Socioeconomic differences in ORS ever-use rates are much more clear and pronounced than household structure differences. The lowest rates of ever-use of ORS are never found among the highest socioeconomic status group either in urban or in rural areas. There are statistically significant differences for all but one rural area and for four urban areas; in all of these, the lowest levels are seen in elementary families. The highest levels are seen in the laterally extended elementary families in rural Burkina Faso, rural Cameroon, rural Madagascar, Niger, rural Nigeria, rural Rwanda, rural Senegal, rural Tanzania and Zambia. The highest level is in the three-generational families in urban Madagascar and in rural Namibia.

4.3 TREATMENT PATTERNS

Treatment practices for children who had diarrhea in the two weeks preceding the survey are examined for urban and rural areas combined, as the number of cases is too low for separate analyses. First, fluid therapy during diarrhea is examined, and then contact with health facilities and providers is examined. Finally, household structure and socioeconomic differences in the proportion of children who receive no treatment at all are examined.

4.3.1 Fluid Therapy

It is recommended that children with diarrhea receive fluids to treat dehydration, which sometimes accompanies diarrhea, and to prevent the development of dehydration. As mentioned previously, the diarrhea-control pro-

Table 4.4 Mothers' knowledge and ever-use of oral rehydration salts, by socioeconomic level and residence

Percent of children age 12-59 months whose mothers know about and have ever used oral rehydration salts packets, by socioeconomic level and rural-urban residence, Demographic and Health Surveys, 1990-1993

Country and socioeconomic level	Know about ORS packet		Ever used ORS packet	
	Rural	Urban	Rural	Urban
Burkina Faso				
Low	40.9	74.0	29.3	47.9
Medium	53.8	74.1	37.8	52.9
High	74.5	82.0	59.6	61.6
All levels	45.6***	79.6***	32.7***	58.7
Cameroon				
Low	19.6	47.7	10.6	31.5
Medium	41.9	55.3	31.0	41.2
High	52.0	67.4	33.3	44.1
All levels	33.6***	63.4***	22.6***	42.6
Kenya				
Low	78.0	a	60.4	a
Medium	82.1	85.8	63.6	65.7
High	89.6	91.8	64.1	63.8
All levels	80.7***	89.6	62.2	65.1
Madagascar				
Low	32.5	48.6	23.1	36.1
Medium	46.9	72.4	32.5	60.7
High	71.6	85.4	52.2	59.2
All levels	37.2***	74.8***	26.3***	55.8***
Namibia				
Low	84.7	(86.7)	75.0	(77.1)
Medium	93.1	77.7	83.7	74.0
High	89.4	81.7	78.6	70.1
All levels	87.3***	81.3	77.6***	71.1
Niger				
Low	52.5	82.5	26.3	67.7
Medium	74.2	90.0	47.7	70.4
High	a	93.0	a	79.1
All levels	54.2***	90.1***	28.0***	73.9***
Nigeria				
Low	7.5	7.4	3.9	7.4
Medium	14.2	21.7	8.5	14.8
High	31.7	23.5	20.1	17.7
All levels	14.3***	22.6***	8.5***	16.8
Rwanda				
Low	82.7	90.0	54.7	68.7
Medium	89.3	95.3	62.7	73.7
High	(98.7)	98.5	(80.3)	80.0
All levels	86.0***	95.8***	58.8***	75.6
Senegal				
Low	37.4	(50.0)	25.6	(44.4)
Medium	48.7	50.5	35.3	35.6
High	47.9	57.6	37.3	45.0
All levels	43.6***	55.7	31.3***	42.7**
Tanzania				
Low	91.2	94.4	76.2	88.1
Medium	96.7	97.4	85.8	87.6
High	98.6	96.2	88.2	85.2
All levels	93.2***	96.7	79.7***	86.8
Zambia				
Low	94.3	(93.3)	77.6	(71.1)
Medium	98.2	95.2	84.8	87.8
High	100.0	99.1	89.6	89.6
All levels	95.4***	97.8***	79.7***	88.5***

Note: Significance levels are based on a one-way analysis of variance. Numbers in parentheses are based on 25-49 unweighted cases.
[a]Figure is based on fewer than 25 unweighted cases and has been suppressed.
*** ($p < 0.01$); ** ($p < 0.05$)

grams in most countries promote the use of an oral rehydration solution prepared from a packet of salts and sugar. Increasingly, programs are also encouraging the use of fluids made from ingredients that are readily available in the home, so-called home fluids or recommended home fluids. In the past, many programs specified that such home fluids should be made from sugar, salt and water. More recently, it has been recognized that many other fluids can serve the purpose of treating and preventing dehydration equally well. In addition to promoting the use of fluids for children with diarrhea, diarrhea-control programs emphasize the need to increase the amount of fluid offered to the child. Caretakers are also encouraged to continue feeding during the diarrheal illness to prevent the development of undernutrition.

In each country considered in the analysis, questions were asked about ORS. With the exception of Kenya, all countries include information about a home fluid. However, in some countries, the questionnaire specified the sugar, salt and water solution, while in others, the question referred to a recommended home fluid. Although increasing the amount of liquid that is offered to the child with diarrhea was part of international recommendations at the time the surveys were conducted, it is likely that there was a greater emphasis on the need to give the child ORS or a recommended home fluid. Information on continued feeding during diarrhea is not included in this evaluation because this information was not included in the DHS surveys at the time. Three variables that reflect oral rehydration practices are included in Table 4.5: ORS, home fluids and either ORS and/or home fluids. These three variables are sometimes collectively referred to as fluid therapy or fluid treatment.

4.3.1.1 Overall Treatment Rates

As Table 4.5 indicates, there is great variation in the ORS treatment rate from country to country. The lowest rates are seen in Burkina Faso, Cameroon, Madagascar, Niger, Nigeria and Senegal, where only 7-18 percent of children receive ORS. The highest ORS use rates are in Namibia, Tanzania and Zambia, where 53-64 percent of children with diarrhea receive ORS. Intermediate rates of 33 and 29 percent, respectively, are seen in Kenya and Rwanda. There is somewhat less variation among countries in the proportion of children who receive home fluids, compared with those who receive ORS. The lowest rates are in Burkina Faso (7 percent) and Namibia (2 percent). The remaining countries range from 10 percent in Niger to 26 percent in Cameroon.

The diarrhea-control programs in some countries emphasize ORS, while others place greater importance on recommended home fluids. Looking at the combined variable, ORS and/or home fluid, gives a better picture of whether children are given fluid for diarrhea. There is wide variation in the proportion of children with diarrhea who receive ORS and/or home fluid, ranging from 16-18 percent in Burkina Faso, Niger and Senegal to 64-67 in Namibia, Tanzania and Zambia. Intermediate levels of 24-37 percent are found in Cameroon, Kenya, Madagascar, Nigeria and Rwanda. Figure 4.1 shows the proportion of children who receive both ORS and a home solution, ORS only, and a home solution only. Where levels of ORS use are low, the use of oral rehydration fluids represents an increasingly larger proportion of the children who receive oral rehydration therapy.

4.3.1.2 Differentials by Household Type

Although the pattern is not consistent for all countries or all three measures of fluid treatment, some patterns are discerned in the treatment rates analyzed according to household type (see Table 4.5). The lowest fluid treatment rates are never seen in children from laterally extended households. There are seven countries where there are no substantial differences according to household type: Kenya, Madagascar, Namibia, Niger, Rwanda, Senegal and Tanzania. Clear and statistically significant differences according to household type are seen for only four countries. In Burkina Faso and Nigeria, the lowest fluid-treatment rates are seen among children from elementary households or three-generational households; the highest rates are in those from laterally extended households. In both countries there are statistically significant differences for all three measures of fluid therapy: ORS, home fluid, and ORS and/or home fluid. The ORS and/or home fluid treatment rate is 13 percent for children from three-generational households in Burkina Faso, compared with 22 percent for those from laterally extended households. The figures for Nigeria are 24 percent for children from elementary and 36 percent for those from laterally extended households, respectively. In both these countries, the fluid-treatment rates for children from three-generational households are similar to those for children from elementary households. In Cameroon and Zambia, the highest fluid-treatment rates are seen for children from three-generational households, and the lowest rates are for those from elementary households. Twenty-four percent of children from elementary households in Cameroon are given ORS and/or home fluids as treatment for diarrhea, compared with 42 percent of those from three-generational

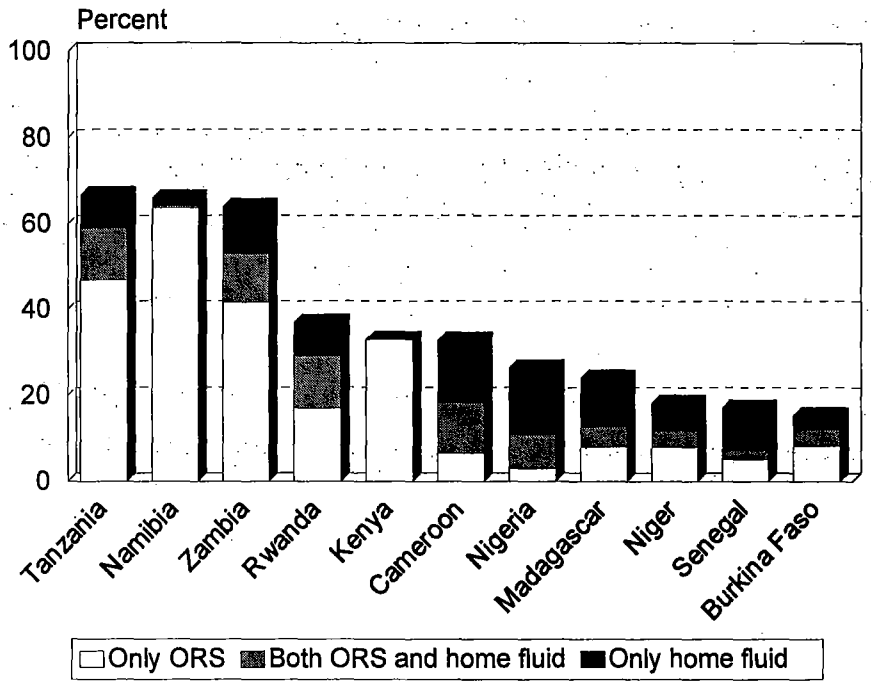
Table 4.5 Percent of children with diarrhea who received oral rehydration therapy, by household structure

Percent of children age 12-59 months who had diarrhea in the two weeks preceding the survey and who received oral rehydration therapy and increased fluids, by household structure and type of treatment, Demographic and Health Surveys, 1990-1993

Country and household structure	ORS treatment	Home-based fluid treatment	ORS and/or home fluids	Taken to a medical facility	Received no treatment	Number of children
Burkina Faso						
Low	11.5	5.7	13.9	15.5	33.0	386
Medium	8.5	5.9	12.6	9.7	36.7	176
High	17.8	11.6	22.1	21.4	24.6	166
All levels	12.2**	7.1**	15.4**	15.4**	32.0**	728
Cameroon						
Low	13.8	18.1	23.9	15.5	35.0	162
Medium	27.4	33.2	42.2	24.7	21.1	86
High	18.1	33.0	39.0	22.1	23.1	102
All levels	18.4**	26.1***	32.8***	19.7	28.2**	350
Kenya						
Low	33.6	NA	33.6	41.3	25.7	314
Medium	32.0	NA	32.0	43.4	27.9	109
High	32.3	NA	32.3	31.7	31.1	97
All levels	33.0	NA	33.0	40.0	27.2	520
Madagascar						
Low	12.9	15.1	24.1	32.7	32.7	204
Medium	10.4	15.2	22.1	30.9	35.6	82
High	14.9	18.9	26.0	38.3	29.0	94
All levels	12.8	16.0	24.2	33.7	32.4	380
Namibia						
Low	56.5	3.4	59.9	62.5	19.4	73
Medium	66.6	2.6	68.7	66.5	25.3	252
High	64.1	1.1	64.8	68.9	22.2	199
All levels	64.2	2.2	66.0	66.9	23.3	524
Niger						
Low	9.7	9.0	16.5	9.8	49.5	458
Medium	12.5	9.9	16.9	11.2	46.3	249
High	15.7	13.5	24.1	13.3	36.6	187
All levels	11.8	10.2	18.2	10.9	45.9**	894
Nigeria						
Low	8.9	21.2	24.1	23.1	65.2	507
Medium	11.5	22.1	25.8	24.5	61.4	140
High	17.8	32.0	35.8	25.4	61.9	139
All levels	10.9**	23.3**	26.5**	23.8	63.9	786
Rwanda						
Low	28.1	20.0	35.5	20.8	32.2	554
Medium	35.2	12.9	42.8	32.2	28.7	63
High	30.8	22.7	40.9	30.7	32.9	113
All levels	29.2	19.8	36.9	23.3**	32.0	730
Senegal						
Low	5.5	9.6	15.1	23.3	41.1	73
Medium	6.3	12.0	15.7	25.8	41.8	383
High	9.3	12.4	19.7	23.2	33.6	259
All levels	7.3	11.9	17.1	24.6	38.7	715
Tanzania						
Low	55.5	16.6	61.9	58.1	26.0	283
Medium	60.8	25.6	71.2	63.6	18.2	177
High	64.5	18.7	70.9	63.4	16.4	136
All levels	59.1	19.8	66.7	60.9	21.5**	594
Zambia						
Low	48.8	20.2	59.1	50.1	22.5	391
Medium	60.3	26.9	71.8	61.5	14.7	156
High	54.6	22.5	66.3	55.2	17.6	306
All levels	53.0**	22.3	64.0**	54.0**	19.3	853

Note: Significance levels are based on a one-way analysis of variance. ORS is oral rehydration salts.
Figures in parentheses are based on 25-49 unweighted cases.
NA = Not Applicable; *** ($p < 0.01$); ** ($p < 0.05$)

Figure 4.1 Percent of children age 12-59 months receiving treatment for diarrhea in the last two weeks, by type of treatment and country, Demographic and Health Surveys, 1990-1993



Note: ORS is oral rehydration salts.

and 39 percent of those from laterally extended households. In Zambia, the treatment rates are much higher for all groups, but a similar pattern of differences is seen: 59 percent of children from elementary households receive ORS and/or home fluids, compared with 72 and 66 percent for children from three-generational and laterally extended households, respectively.

4.3.1.3 Differentials by Socioeconomic Level

Table 4.6 shows fluid treatment rates by the socioeconomic level of the household. The patterns are generally similar for all three of the variables that reflect fluid therapy. As expected, practices tend to be worst among children from households with a low socioeconomic level and best among those in the high-status category. The only three countries where there are essentially no differences according to socioeconomic status score for any of these three measures of fluid-treatment practices are Kenya, Namibia and Senegal. Namibia has one of the highest ORS and combined ORS/home fluid use rates, and Kenya shows intermediate levels of ORS use. It should be kept in mind, however, that the Kenya questionnaire did not collect information about home fluids.

In seven countries (Burkina Faso, Cameroon, Madagascar, Niger, Nigeria, Tanzania and Zambia) there are statistically significant differences for one or more of these indicators of fluid therapy. It is not surprising that all these countries, with the exception of Tanzania and Zambia, are among the six countries with the lowest ORT treatment rates (see Figure 1). In Burkina Faso, there are consistent and substantial differences in the treatment of children depending on the socioeconomic status score for all the measures. Children from households with a low socioeconomic score are less likely to receive ORS and/or home fluid when they have diarrhea, compared with children from households with a high score. Children from households with a medium score have intermediate levels. For example, only 10 percent of children from households with a low socioeconomic score receive ORS, compared with 24 percent of those whose households have a high score. The corresponding percentages for the children who receive either ORS and/or a home fluid are 13 and 27 percent, respectively.

Table 4.6 Percent of children with diarrhea who received oral rehydration therapy, by socioeconomic level

Percent of children age 12-59 months who had diarrhea in the two weeks preceding the survey and who received oral rehydration therapy and increased fluids, by socioeconomic level and type of treatment, Demographic and Health Surveys, 1990-1993

Country and household structure	ORS treatment	Home-based fluid treatment	ORS and/or home fluids	Taken to a medical facility	Received no treatment	Number of children
Burkina Faso						
Low	9.7	5.4	12.6	14.9	32.2	442
Medium	13.3	8.5	17.6	11.4	36.9	202
High	24.2	13.7	26.8	30.0	19.5	79
All levels	12.3***	7.2**	15.6***	15.6***	32.1***	723
Cameroon						
Low	8.6	20.8	22.5	16.3	30.0	117
Medium	22.9	27.6	37.2	20.9	28.6	148
High	24.0	30.9	39.2	22.2	24.9	85
All levels	18.4***	26.1	32.8**	19.7	28.2	350
Kenya						
Low	35.9	NA	35.9	34.8	22.9	225
Medium	30.9	NA	30.9	42.2	30.8	248
High	(28.6)	NA	28.9	(49.7)	(31.2)	41
All levels	32.9	NA	32.9	39.6	27.4	514
Madagascar						
Low	9.8	14.0	21.2	29.8	37.1	249
Medium	15.9	18.6	27.4	39.2	26.0	104
High	(29.3)	(25.5)	38.9	(47.6)	(13.5)	27
All levels	12.8**	16.0	24.2	33.7	32.4**	380
Namibia						
Low	62.9	2.5	65.0	66.9	23.6	330
Medium	67.7	1.4	68.6	66.3	21.9	157
High	62.5	2.3	64.8	68.4	25.2	60
All levels	64.2	2.2	66.0	66.9	23.3	548
Niger						
Low	8.3	8.9	14.4	9.0	48.5	742
Medium	26.4	18.5	36.8	17.8	36.4	92
High	33.3	15.0	38.3	26.0	26.9	52
All levels	11.6***	10.2***	18.1***	10.9***	46.0***	886
Nigeria						
Low	6.3	14.6	18.4	16.7	66.3	304
Medium	8.3	24.3	25.6	26.7	66.1	292
High	21.8	36.3	40.5	30.9	56.2	186
All levels	10.7***	23.3***	26.4***	23.8***	63.8**	782
Rwanda						
Low	24.9	19.0	33.6	20.3	34.8	393
Medium	34.6	20.6	40.9	26.2	29.0	318
High	(32.8)	(22.3)	41.9	(34.9)	(23.2)	16
All levels	29.3**	19.8	36.9	23.2	32.0	727
Senegal						
Low	6.1	9.0	12.7	16.0	45.1	244
Medium	8.6	11.4	18.6	23.8	41.0	290
High	6.7	16.1	20.0	37.2	26.7	180
All levels	7.3	11.8	16.9	24.5***	38.8***	714
Tanzania						
Low	52.4	17.1	61.5	53.9	22.6	282
Medium	73.9	24.7	81.3	74.5	13.5	237
High	(37.8)	(12.2)	38.9	(43.0)	(44.8)	65
All levels	59.5***	19.6**	67.0***	61.1***	21.4***	584
Zambia						
Low	46.4	16.7	54.1	46.1	26.1	425
Medium	57.3	28.9	72.0	61.3	12.9	225
High	61.6	27.3	75.8	62.6	12.1	198
All levels	52.8***	22.4***	63.9***	54.0***	19.3***	848

Note: Significance levels are based on a one-way analysis of variance. ORS is oral rehydration salts.
Figures in parentheses are based on 25-49 unweighted cases.
NA = Not Applicable; *** ($p < 0.01$); ** ($p < 0.05$)

A similar picture is seen in Nigeria, where there are large socioeconomic differentials in treatment patterns. For example, the percentage of children with a low socioeconomic score who received ORS and/or a home fluid is 18, compared with 41 for children with a high score. The situation in Madagascar is also similar to that described for Burkina Faso and Nigeria, with the worst practices among children from families with a low socioeconomic score, and somewhat better practices from those with a high score. The differences are statistically significant for ORS use. The percentage of children who were given either ORS and/or a home fluid is 21, 27 and 39 percent, respectively, for children from families with a low, medium and high socioeconomic status score. In Cameroon fluid-treatment rates also increase with the socioeconomic level of the household. Statistically significant differences are found for the two variables reflecting ORS use—ORS; and ORS and/or home fluids. ORS and/or home fluid use is considerably higher for children with a medium or high socioeconomic score (37 and 39 percent, respectively) than for those with a low score (23 percent). In Niger, there are statistically significant differences for all three measures of fluid therapy. The lowest fluid-treatment rates are seen for children with a low socioeconomic score for all three variables. The fluid-treatment rates are fairly similar for children with a medium and those with a high socioeconomic score. The differences for home fluid are small and the highest treatment rate is for children with a medium socioeconomic score for this variable. More than twice as many children with a high socioeconomic score (38 percent) received ORS and/or home fluid as children with a low score (14 percent). The pattern in Zambia is similar to that seen in Niger, with the lowest fluid-treatment rates for children with a low score and the highest rates for children with either a medium or a high score. Differences according to socioeconomic status are substantial. Among children with a low score, 54 percent receive either ORS and/or home fluid, compared with 72 and 76 percent among children with medium and high scores, respectively.

In Rwanda, there are statistically significant differences only for one of the fluid variables. The ORS treatment rate is moderately lower for children with a low socioeconomic score (34 percent), compared with those with medium or high scores (about 40).

In Tanzania the situation is reversed, compared with that seen in most of the countries. Although there are statistically significant differences for all three measures of fluid therapy, the lowest fluid-treatment rates are for children with a high socioeconomic score and the highest rates are for those with a medium score. For instance, 39 percent of children with a high score received ORS and/or home fluids, compared with 81 and 62 percent, respectively, for children with medium and high scores.

4.3.2 Health Facility

The percentage of children who had contact with health facilities or providers for diarrhea and the percentage receiving no treatment at all are shown in Table 4.5 by household structure and in Table 4.6 by socioeconomic level. Findings from these tables are discussed concurrently because each treatment practice is addressed separately. There is considerable variation in the proportion of children reported to have been taken to a health provider or facility for advice or treatment. The percentage of children who are taken to a medical facility or provider for consultation or advice is lowest in Burkina Faso and Niger (15 and 10 percent, respectively). Twenty to 40 percent of children in Cameroon, Kenya, Madagascar, Nigeria, Rwanda and Senegal are reported to have been taken to a health facility. The highest proportions reported taken to a health facility are in Namibia, Tanzania and Zambia (54-67 percent).

As indicated in Table 4.5, children from laterally extended households tend to be most likely to have been taken to a health facility for treatment or advice for the diarrhea, and children from elementary families are least likely to receive such consultation. In three countries, the differences are statistically significant. In Rwanda and Zambia, children from elementary households are least likely and those from three-generational households are most likely to receive consultation, the difference being about 10 percentage points in both countries. In Burkina Faso, children from three-generational households are least likely to have been taken for care, and those from laterally extended families are most likely to have been taken. There is a 12-percentage-point difference.

Differences by socioeconomic status tend to be greater than those seen for household type (Table 4.6). Children from households of low socioeconomic levels tend to be much less likely than those from high-status households to be taken to a health facility for treatment of diarrhea. In four of the six countries with statistically significant differences, the percentage taken to a health facility is lowest for households with the lowest socioeconomic score and highest for those with the highest score, with differences ranging from 14 to 21 percentage points (Niger, Nigeria, Senegal and

Zambia). In Burkina Faso, there is a 19-percentage-point difference between the medium socioeconomic group, where the lowest percentage of children with diarrhea is taken to a health facility, and the high group, with the highest percentage seeking care from a health professional. In Tanzania the typical pattern is reversed, with the highest proportion reported to have been taken to a health facility among the medium socioeconomic group and the lowest percentage in the highest socioeconomic group; the difference is large (32 percentage points).

4.3.3 No Treatment

The proportion of children who were reported to have received no treatment at all ranges from 19 to 39 percent in all countries except Niger and Nigeria, where 46 and 64 percent, respectively, are said not to have received anything for diarrhea. No treatment at all tends to be more common among elementary households and least common among laterally extended households, although this is not a clear or consistent picture. Differences by household type are statistically significant in four countries. In three of these, the highest percentage with no treatment is among children from elementary families (Cameroon, Niger and Tanzania). In Burkina Faso, the proportion of children who received no treatment for diarrhea is highest among children from three-generational families.

Differences in the percentage receiving no treatment by socioeconomic status are more consistent than those seen for household type, and somewhat larger differences are seen in some countries. There is a tendency toward no treatment being higher among children with a low socioeconomic score. There are statistically significant differences in seven countries. In all but one of these (Tanzania), lack of treatment is highest among children from households of low socioeconomic status (Burkina Faso, Madagascar, Niger, Nigeria, Senegal and Zambia). The lowest rate of no treatment is usually for children with a high socioeconomic score, the exception being Burkina Faso, where the highest proportion of children who received no treatment are observed for medium-status households. In Tanzania nontreatment is highest among children from high socioeconomic status households and lowest among those from low-status households. The difference ranges from 10 to 31 percentage points for these seven countries.

4.4 MULTIVARIATE ANALYSIS

In the multivariate analysis, three outcomes are focused on, each of which represents one dimension of the management of diarrhea. The first outcome variable is whether the child received any treatment at all. Although this outcome does not take into account the appropriateness of the type of treatment that the child received, it permits an identification of the circumstances in which children suffering from diarrhea may have a greater risk of adverse outcome resulting from lack of treatment. The second outcome variable is whether the child received oral rehydration therapy, and the third outcome variable is whether the child was taken to a medical facility or provider for consultation. The analysis pertains to children who had diarrhea in the two weeks preceding the survey. One child per household is randomly selected in order to control for the problems of intra-household correlation.

As with immunization, the multivariate analysis of diarrhea treatment is conducted in three stages. Model 1 is the baseline model and examines household-structure differences in the likelihood of receiving the treatment specified. Then an adjustment is made for the effect of socioeconomic level as a test of the hypothesis that this variable mediates the effect of household structure on treatment patterns. Model 3 controls for the full set of independent variables, the effects of which are shown in Appendix Tables A.4-A.7. Because of the relatively small number of cases, we do not conduct the analysis separately for urban and rural areas.

The independent variables included in the analysis of diarrhea-treatment patterns differ from those included in the regressions of immunization in two other ways. First, mothers' marital status was excluded from the analysis because of insufficient variation in some countries. Second, controls are included for urban residence, the duration of diarrhea, and the presence of blood in the stool. The duration of diarrhea is a continuous variable measuring the number of days the diarrhea lasted, and the presence of blood in the stool is a dichotomous variable. A positive association is expected between the persistence and severity of diarrhea and each of the outcome variables in the multivariate analysis.

4.4.1 Any Treatment

Table 4.7 presents odds ratios from logistic regressions of the likelihood of a child with diarrhea receiving any type of treatment for his or her condition. At the bivariate level, children from elementary households are less likely those from laterally extended households to receive any treatment for diarrhea in 9 out of 11 countries. This effect is statistically significant in Burkina Faso, Niger, Senegal and Zambia. In comparison, the direction of association between three-generational household structures and diarrhea treatment is somewhat inconsistent across countries. Statistically significant effects occur at the bivariate level in three countries: Burkina Faso, Niger and Senegal. In these three countries, children living in three-generational households are significantly less likely to receive any treatment for diarrhea than those from laterally extended household structures.

The effect of three-generational household structures is enduring in Burkina Faso and Senegal and remains statistically significant after controlling for socioeconomic level and other factors in Models 2 and 3. In comparison, the effect of elementary household structures is not significantly different from that of laterally extended households in these two countries, once socioeconomic level and other factors are controlled. A similar pattern is observed in Zambia. Of the four countries, it is only in Niger that the importance of the effect of elementary households remains essentially unchanged and statistically significant after controlling for the full set of independent variables.

Surprisingly, socioeconomic level does not have the same strong effect on diarrhea treatment as it had on full immunization. As Model 3 indicates, the effect of socioeconomic level is significant only in Madagascar, Namibia and Niger. In all countries except Cameroon, Kenya and Tanzania, socioeconomic level increases the odds of a child with diarrhea receiving any treatment for the condition.

The effects of the other independent variables are shown in Appendix Table A.5. As expected, children are more likely to receive treatment for diarrhea, the greater the severity of their symptoms. Presence of blood in the stool is positively and significantly related to diarrhea treatment in 7 of 11 countries. A positive effect is also observed for the number of days diarrhea lasted, and this is significant in 5 countries. Child's age has a significant positive association with the odds of treatment in Burkina Faso, Cameroon, Rwanda and Senegal. In these countries, children aged 12-23 months were more likely than older children to receive some kind of treatment for diarrhea. In the vast majority of countries, children are more likely to receive treatment for diarrhea if their mother has ever attended school. Number of siblings has a significant effect on the odds of treatment only in Nigeria, where each additional sibling aged 0-5 reduces the likelihood of a child with diarrhea being given any treatment for the condition by about 33 percent. Mothers' cash-work has inconsistent effects across countries. In Burkina Faso, for example, children with diarrhea are significantly more likely to receive treatment if their mother works for cash, whereas in Madagascar, mothers' work for cash has a significant negative effect on diarrhea treatment.

4.4.2 Oral Rehydration Therapy

Table 4.8 examines specifically the importance of household structure in determining the likelihood of a child receiving ORT. Household structure does not have statistically significant effects in all countries; even so, the findings accord well with the argument that household structure is important in determining the management of childhood diarrhea. The results show lower odds of receiving oral rehydration therapy at the bivariate level among children from elementary households than among those from laterally extended households in 10 out of 11 countries. This effect is statistically significant in Burkina Faso, Cameroon, Niger, Senegal and Zambia. Statistically significant effects of three-generational households on ORT are found in Niger.

There is no consistent evidence that these household-structure effects are conditioned by socioeconomic level. In Burkina Faso, Cameroon, Niger and Zambia, the effect of household structure is considerably reduced once socioeconomic level is held constant. However, in Senegal the effect of household structure remains significant even after controlling for the full set of independent variables in Model 3. Overall, socioeconomic level has the expected positive effect on ORT in the majority of countries, but its effects are somewhat stronger in Burkina Faso, Madagascar, Namibia, Niger and Zambia.

Appendix Table A.6 shows the effects of the other independent variables that are included in Model 3. Child's sex does not have a strong relationship with the odds of receiving ORT. Where the effect of this variable attains a minimal level of significance, lower odds of ORT are found among males than females in Rwanda and Tanzania, and the opposite effect in Zambia. With respect to child's age, higher odds of oral rehydration therapy are found among chil-

Table 4.7 Regression results: Likelihood of receiving treatment for diarrhea, by household characteristic

Odds ratios and standard errors from the logistic regressions on the likelihood of receiving any type of treatment for diarrhea, by household characteristic, Demographic and Health Surveys, 1990-1993

Country and household characteristic	Model 1		Model 2		Model 3[a]	
	Odds	Standard error	Odds	Standard error	Odds	Standard error
Burkina Faso						
Elementary	0.610**	0.153	0.755	0.200	0.808	0.227
Three-generation	0.455***	0.133	0.509**	0.151	0.504**	0.175
Socioeconomic level	NA	NA	1.155**	0.069	1.060	0.101
Log likelihood	-290.404		-287.369		-268.744	
Cameroon						
Elementary	0.629	0.217	0.712	0.257	1.008	0.433
Three-generation	1.210	0.539	1.282	0.578	1.346	0.669
Socioeconomic level	NA	NA	1.091	0.101	0.812	0.120
Log likelihood	-137.454		-136.999		-119.837	
Kenya						
Elementary	1.302	0.384	1.291	0.383	1.381	0.446
Three-generation	1.157	0.414	1.149	0.412	1.041	0.428
Socioeconomic level	NA	NA	0.975	0.099	0.939	0.112
Log likelihood	-213.177		-213.146		-203.445	
Madagascar						
Elementary	0.819	0.255	0.956	0.307	0.932	0.338
Three-generation	0.756	0.286	0.833	0.323	0.762	0.339
Socioeconomic level	NA	NA	1.384***	0.146	1.407**	0.205
Log likelihood	-171.926		-166.485		-154.958	
Namibia						
Elementary	0.895	0.338	0.968	0.374	1.059	0.464
Three-generation	0.861	0.250	0.895	0.262	0.886	0.305
Socioeconomic level	NA	NA	1.096	0.106	1.483***	0.223
Log likelihood	-181.610		-181.142		-161.823	
Niger						
Elementary	0.483***	0.103	0.592**	0.131	0.519***	0.127
Three-generation	0.551**	0.133	0.652*	0.161	0.706	0.185
Socioeconomic level	NA	NA	1.291***	0.079	1.237**	0.112
Log likelihood	-404.658		-395.204		-379.746	
Nigeria						
Elementary	0.800	0.191	0.829	0.200	0.810	0.214
Three-generation	0.899	0.262	0.974	0.288	1.102	0.356
Socioeconomic level	NA	NA	1.099	0.060	1.091	0.075
Log likelihood	-356.090		-354.600		-337.945	
Rwanda						
Elementary	1.243	0.301	1.325	0.330	1.339	0.365
Three-generation	1.544	0.589	1.625	0.625	1.760	0.770
Socioeconomic level	NA	NA	1.115	0.106	1.084	0.125
Log likelihood	-347.508		-346.837		-321.315	
Senegal						
Elementary	0.556*	0.176	0.577*	0.186	0.658	0.234
Three-generation	0.542***	0.125	0.529***	0.124	0.509***	0.128
Socioeconomic level	NA	NA	1.235***	0.080	1.149	0.110
Log likelihood	-262.946		-257.369		-242.484	
Tanzania						
Elementary	0.932	0.297	0.937	0.300	1.050	0.357
Three-generation	1.004	0.363	1.008	0.366	0.686	0.287
Socioeconomic level	NA	NA	1.017	0.111	0.930	0.135
Log likelihood	-203.998		-203.986		-193.448	
Zambia						
Elementary	0.594**	0.134	0.679*	0.156	0.774	0.207
Three-generation	1.245	0.433	1.298	0.455	0.916	0.359
Socioeconomic level	NA	NA	1.211***	0.079	1.110	0.118
Log likelihood	-303.151		-298.577		-266.840	

Note: Laterally extended households are the reference category for elementary and three-generational households.
NA = Not Applicable
[a]After controlling for presence of diarrhea with blood, number of days diarrhea had lasted, child's sex, age, and number of siblings age 0-5; mother's age, marital status, education, and cash-work status; number of resident adults excluding the child's mother; and region of residence.
*** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

Table 4.8 Regression results: Likelihood of receiving oral rehydration therapy, by household characteristic

Odds ratios and standard errors from the logistic regressions on the likelihood of receiving oral rehydration therapy, by household characteristic, Demographic and Health Surveys, 1990-1993

Country and household characteristic	Model 1		Model 2		Model 3[a]	
	Odds	Standard error	Odds	Standard error	Odds	Standard error
Burkina Faso						
Elementary	0.615*	0.162	0.944	0.275	0.969	0.296
Three-generation	0.629	0.209	0.780	0.267	0.725	0.293
Socioeconomic level	NA	NA	1.298***	0.084	1.278**	0.138
Log likelihood	-231.440		-223.182		-214.567	
Cameroon						
Elementary	0.466**	0.153	0.568	0.198	0.628	0.255
Three-generation	1.026	0.386	1.123	0.430	1.046	0.444
Socioeconomic level	NA	NA	1.154	0.101	1.010	0.132
Log likelihood	-142.712		-141.381		-130.850	
Kenya						
Elementary	1.020	0.289	1.029	0.294	1.356	0.427
Three-generation	1.102	0.376	1.110	0.380	1.300	0.517
Socioeconomic level	NA	NA	1.027	0.098	0.957	0.111
Log likelihood	-235.512		-235.473		-220.246	
Madagascar						
Elementary	0.799	0.247	0.979	0.318	0.913	0.369
Three-generation	0.716	0.281	0.821	0.333	1.061	0.527
Socioeconomic level	NA	NA	1.364***	0.123	1.357**	0.198
Log likelihood	-163.605		-157.568		-128.426	
Namibia						
Elementary	0.948	0.305	1.013	0.334	1.234	0.460
Three-generation	1.186	0.300	1.226	0.313	0.991	0.293
Socioeconomic level	NA	NA	1.078	0.088	1.294**	0.157
Log likelihood	-222.056		-221.622		-204.364	
Niger						
Elementary	0.511***	0.122	0.714	0.181	0.794	0.229
Three-generation	0.598*	0.162	0.785	0.225	0.904	0.281
Socioeconomic level	NA	NA	1.440***	0.088	1.223**	0.117
Log likelihood	-303.078		-285.512		-265.620	
Nigeria						
Elementary	0.762	0.197	0.834	0.220	0.973	0.288
Three-generation	0.851	0.270	1.043	0.341	1.106	0.396
Socioeconomic level	NA	NA	1.254**	0.076	1.075	0.081
Log likelihood	-308.398		-301.318		-282.358	
Rwanda						
Elementary	0.850	0.202	0.901	0.220	0.898	0.234
Three-generation	1.120	1.396	1.175	0.419	1.095	0.449
Socioeconomic level	NA	NA	1.099	0.098	1.176	0.128
Log likelihood	-366.415		-365.852		-347.352	
Senegal						
Elementary	0.343**	0.175	0.352**	0.180**	0.303**	0.168
Three-generation	0.786	0.220	0.781	0.219	0.799	0.242
Socioeconomic level	NA	NA	1.163**	0.091	1.082	0.132
Log likelihood	-180.144		-178.303		-166.655	
Tanzania						
Elementary	0.916	0.236	0.936	0.242	0.917	0.252
Three-generation	0.991	0.288	1.010	0.295	1.287	0.442
Socioeconomic level	NA	NA	1.070	0.095	1.043	0.117
Log likelihood	-278.413		-278.118		-267.318	
Zambia						
Elementary	0.640**	0.118	0.753	0.143	0.858	0.184
Three-generation	1.481	0.406	1.575	0.439	1.327	0.410
Socioeconomic level	NA	NA	1.263***	0.067	1.384***	0.125
Log likelihood	-400.146		-389.976		-366.381	

Note: Laterally extended households are the reference category for elementary and three-generational households.
NA = Not Applicable
[a]After controlling for presence of diarrhea with blood, number of days diarrhea had lasted, child's sex, age, and number of siblings age 0-5; mother's age, marital status, education, and cash-work status; number of resident adults excluding the child's mother; and region of residence.
*** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

dren aged 12-23 months than among older children in nine of the countries examined. These effects are statistically significant at the 5-percent level in Namibia, Rwanda and Senegal. Cameroon and Tanzania show contrasting effects of child's age. Although these effects are not significant at the 5-percent level, they are of programmatic importance, because diarrhea-related deaths are often higher among infants and young children. Note that number of siblings does not have a strong relationship with ORT except in Cameroon, where the number of siblings aged 0-5 increases a child's chances of receiving oral rehydration therapy. A negative relationship between number of siblings and ORT is found in 7 of the remaining 10 countries.

According to expectations, children whose mothers have ever attended school are more likely to receive ORT in the vast majority of countries, with this effect attaining a high level of significance in Niger, Nigeria and Senegal. In comparison, the effect of mothers' work for cash varies markedly in direction and intensity. In six countries, mothers' cash work increases the odds of a child receiving ORT, but this effect is significant only in Burkina Faso and to a lesser extent in Kenya. Of the remaining five countries, only Madagascar shows a statistically significant negative relationship between mothers' work for cash and oral rehydration therapy. As observed in Table A.6, there is no strong relationship between mothers' age and ORT, although somewhat lower odds of receiving this type of treatment are seen among children of older mothers, particularly in Nigeria.

Appendix Table A.6 also shows the effects of the presence of blood in the stools and the duration of diarrhea on the odds of receiving ORT. The presence of blood in the stool shows a positive association with oral rehydration therapy in all countries except Cameroon. This relationship is significant at the 1-percent level in Madagascar and Rwanda. It is noteworthy that the effect of the duration of diarrhea does not vary in direction across countries. Longer durations are more likely to be those for which ORT is received, particularly in Madagascar, Rwanda and Zambia.

4.4.3 Medical Assistance

Table 4.9 presents odds ratios from logistic regression models of the likelihood of a child with diarrhea being taken to a medical facility or provider. At the bivariate level, the effect of household structure is significant in Burkina Faso, Niger and Rwanda. In all three countries, children from elementary households are significantly less likely than those from laterally extended households to have received medical assistance for diarrhea. As hypothesized, this relationship is conditioned to a large extent by socioeco-nomic level. The effect of socioeconomic level is in the ex-pected direction and is significant in Burkina Faso, Mada-gascar, Nigeria and Zambia. Surprisingly, the number of resident adults makes little difference to a child's chances of being taken to a medical facility or provider for treatment of diarrhea except in Cameroon, where its effects are positive and attain a minimal level of significance.

When only household structure is considered, it is interesting that in Kenya, three-generational household structures have no statistically discernible effects on a child's chances of being taken for medical consultation. However, the importance of the association between three-generational household structures and children's odds of medical treatment could have been totally obscured if variations in socioeconomic level had been ignored. As indicated in Model 2, the effect of three-generational households becomes statistically significant, though at a minimal level, once socioeconomic level is considered. This effect is noteworthy, given that the number of children in the multivariate analysis may be insufficient to achieve a higher level of significance in many cases. It is further observed that the effect of elementary households becomes stronger and significant at the 5-percent level after controlling for the full set of independent variables in Model 3. Contrary to the general pattern, elementary households in Kenya are positively related to the utilization of health services for the treatment of diarrhea, even after controlling for confounding factors, including socioeconomic level and the severity of symptoms.

Of the other variables included in Model 3, the effects of child's age, mother's education, presence of blood and duration of diarrhea are noteworthy (see Appendix Table A.7). These factors generally have more similar effects across countries on a child's chances of being taken to a medical facility or provider than variables such as child's sex and mother's age or work for cash. In all countries, children aged 12-23 months are more likely to be taken for medical consultation, particularly in Cameroon, Namibia and Senegal, where the effects are significant at the 5-percent level. Similarly, mothers' education increases a child's chances of being taken for medical consultation in all countries. However, this effect is statistically significant only in Burkina Faso, Cameroon, Namibia and Zambia.

Table 4.9 Regression results: Likelihood of being taken to a provider for treatment of diarrhea, by household characteristic

Odds ratios and standard errors from the logistic regressions on the likelihood of being taken to a medical facility or provider for treatment of diarrhea, by household characteristic, Demographic and Health Surveys, 1990-1993

Country and household characteristic	Model 1		Model 2		Model 3[a]	
	Odds	Standard error	Odds	Standard error	Odds	Standard error
Burkina Faso						
Elementary	0.631*	0.161	1.023	0.290	1.077	0.327
Three-generation	0.483**	0.164	0.605	0.213	0.593	0.249
Socioeconomic level	NA	NA	1.341***	0.086	1.214*	0.132
Log likelihood	-239.207		-228.447		-214.337	
Cameroon						
Elementary	0.621	0.237	0.724	0.295	1.074	0.542
Three-generation	1.126	0.486	1.204	0.526	1.093	0.554
Socioeconomic level	NA	NA	1.114	0.112	0.832	0.134
Log likelihood	-115.362		-114.786		-94.951	
Kenya						
Elementary	1.346	0.372	1.427	0.399	1.907**	0.592
Three-generation	1.768	0.585	1.857*	0.619	1.898*	0.733
Socioeconomic level	NA	NA	1.171*	0.108	1.134	0.128
Log likelihood	-250.155		-248.672		-232.018	
Madagascar						
Elementary	0.945	0.275	1.090	0.328	1.015	0.343
Three-generation	1.110	0.396	1.231	0.449	1.536	0.634
Socioeconomic level	NA	NA	1.252***	0.106	1.263*	0.159
Log likelihood	-185.055		-181.491		-168.509	
Namibia						
Elementary	0.723	0.231	0.735	0.240	0.822	0.301
Three-generation	0.918	0.232	0.926	0.236	0.819	0.242
Socioeconomic level	NA	NA	1.018	0.081	0.947	0.108
Log likelihood	-223.472		-223.448		-207.024	
Niger						
Elementary	0.567**	0.156	0.792	0.231	0.907	0.292
Three-generation	0.748	0.229	0.987	0.316	1.230	0.430
Socioeconomic level	NA	NA	1.403***	0.094	1.093	0.114
Log likelihood	-248.025		-235.698		-218.533	
Nigeria						
Elementary	0.775	0.210	0.838	0.231	0.819	0.250
Three-generation	0.872	0.290	1.045	0.357	1.148	0.428
Socioeconomic level	NA	NA	1.228***	0.077	1.194**	0.098
Log likelihood	-285.298		-279.965		-265.431	
Rwanda						
Elementary	0.581**	0.147	0.647*	0.169	0.665	0.184
Three-generation	0.904	0.338	0.987	0.375	0.887	0.393
Socioeconomic level	NA	NA	1.186*	0.114	1.166	0.138
Log likelihood	-309.084		-307.527		-293.584	
Senegal						
Elementary	0.788	0.319	0.831	0.343	0.902	0.404
Three-generation	1.235	0.330	1.236	0.337	1.260	0.366
Socioeconomic level	NA	NA	1.315***	0.096	1.147	0.129
Log likelihood	-205.915		-198.731		-186.177	
Tanzania						
Elementary	1.077	0.269	1.151	0.291	1.163	0.314
Three-generation	0.928	0.260	0.981	0.278	1.134	0.380
Socioeconomic level	NA	NA	1.239**	0.110	1.136	0.128
Log likelihood	-289.962		-286.954		-273.259	
Zambia						
Elementary	0.817	0.145	0.924	0.168	1.056	0.216
Three-generation	1.448	0.362	1.513	0.382	1.227	0.343
Socioeconomic level	NA	NA	1.180**	0.058	1.170*	0.096
Log likelihood	-424.786		-419.039		-398.570	

Note: Laterally extended households are the reference category for elementary and three-generational households.
NA = Not Applicable
[a]After controlling for presence of diarrhea with blood, number of days diarrhea had lasted, child's sex, age, and number of siblings age 0-5; mother's age, marital status, education, and cash-work status; number of resident adults excluding the child's mother; and region of residence.
*** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

Overall, the longer the duration of diarrhea, the greater the odds that a child suffering from diarrhea will be taken for medical assistance. In Madagascar, for example, each additional day that a child experiences diarrhea increases the odds of medical consultation by nearly 11 percent. Further, children who experience blood in the stools are more likely to be taken for medical assistance, particularly in Madagascar and Rwanda, where the odds increase by at least 70 percent. Of the other variables included in the detailed model, child's sex and mother's age have relatively little influence on medical treatment. Surprisingly, the number of coresident adults other than the child's mother makes little difference to a child's chances of being taken to a medical facility or provider for the treatment of diarrhea, except in Cameroon, where its effects are positive and significant at the 10-percent level.

4.5 SUMMARY

The examination of the prevalence of diarrhea by household structure reveals no consistent patterns across countries. Clearer patterns emerge for differentials in diarrhea-prevalence levels by socioeconomic status. In most urban areas, the percentage of children with diarrhea in the two weeks preceding the survey declines steadily with an increase in the socioeconomic level of the household. In most rural areas, the lowest prevalence of diarrhea in the two weeks preceding the survey is found among children from high-status households; there is generally little difference in prevalence levels between children from medium-status households and those from low-status households.

Laterally extended households are rarely found to have the lowest level of knowledge and ever-use of oral rehydration salts, particularly in rural areas. As expected, there are marked socioeconomic differentials in knowledge and ever-use of ORS. With regard to knowledge of ORS, low socioeconomic status is associated with the lowest levels of knowledge. In most cases, the highest levels of knowledge and use are found among mothers from the high socioeconomic group. These socioeconomic differences are statistically significant in all rural areas and in seven urban areas. Similarly, the lowest levels of ever-use of ORS are never found in the high socioeconomic category.

Treatment practices for children who had diarrhea in the two weeks preceding the survey were also examined. Generally, the lowest fluid-treatment rates are almost never seen in laterally extended households. In the four countries that show clear and statistically significant differences in fluid treatment by household type, the lowest rates are found in elementary families and the highest rates in laterally extended households in two countries, and in three-generational households in the other two countries. Concerning the effect of socioeconomic level on fluid treatment, practices tend to be worst among children from low-status households and best among children from high-status households. In 8 out of 11 countries of analysis, there are statistically significant differences in treatment rates by socioeconomic level for at least one of the three indicators of fluid therapy.

In addition, children from laterally extended households tend to be most likely to have received medical treatment for diarrhea and that children from elementary households are least likely to receive such consultation. Differences in medical consultation by socioeconomic level are more pronounced than differences by household structure. The percentage taken to a health facility tends to increase with an increase in the socioeconomic level of the household. There are few differences in the use of home remedies for the treatment of diarrhea by household structure, but an examination of socioeconomic differences reveals that home remedies tend to be used more often by low-status households.

The multivariate analysis shows that, with regard to the likelihood of treatment, the effect of household structure is enduring and statistically significant, even after controlling for socioeconomic level and other factors in three countries (Burkina Faso, Niger and Senegal). In Burkina Faso and Senegal, children from three-generational households are less likely than those from laterally extended households to receive any treatment for diarrhea episodes in the past two weeks. In Niger, this significant negative effect is seen for elementary households. It is only in Burkina Faso that socioeconomic level mediates the effect of household structure (elementary households) on the likelihood of treatment.

Concerning the use of oral rehydration therapy, elementary household structures have a negative impact on this type of treatment in all but one of the countries examined. However, there is no consistent evidence that household-structure effects are conditioned by socioeconomic level. In four of the five countries in which the effects are statistically significant at the bivariate level, the effect of household structure is considerably reduced once socioeconomic level is controlled. But in Senegal the effect of household structure remains significant even after controlling for the full set of independent variables.

At the bivariate level, household structure has significant effects on the odds of medical assistance for diarrhea in 3 out of 11 countries. In all three countries, children from elementary households are significantly less likely than those from laterally extended households to be taken for medical assistance, but this effect is conditioned to a large extent by socioeconomic level. In contrast, the data for Kenya reveal a significant positive relationship between elementary household structures and medical treatment after controlling for the full set of independent variables included in the analysis.

5 Conclusions and Recommendations

This report has examined the relationship between household structure, socioeconomic level and children's health in 11 countries of sub-Saharan Africa. The analysis was guided by the expectation that the relationship between household structure and socioeconomic level is socially conditioned, and that contrary to conventional wisdom, nuclear-type households would be more disadvantaged in terms of socioeconomic and human resources than extended households in the context of sub-Saharan Africa. These disadvantages were expected to translate into poorer health outcomes among children from elementary households, compared with those from extended households. Socioeconomic resources were hypothesized to be the predominant explanation for household variations in children's health outcomes. The main health outcomes considered in the multivariate analysis were full immunization and diarrhea-treatment practices (any treatment, ORT, and medical assistance).

The analysis reveals considerable variation across countries in children's living arrangements. Elementary households are the predominant living arrangement in only 4 of the 11 countries examined in our analysis. In 4 other countries, extended households are predominant, and in the remaining countries, children are almost equally divided between elementary and extended households. More important, the examination of household structure, urban residence and socioeconomic status confirms our assertions that some fundamental assumptions about families and households are not easily transferred from culture to culture. The data show little evidence of a convergence toward nuclear household structures in urban areas, even in countries that are characterized by predominantly elementary living arrangements. There is also little evidence that children in extended households are worse off than those in nuclear households in terms of living standards or the human resources that are available in their household of residence. Rather, the reverse is the case, and more so in rural than in urban areas. In 9 out of 11 countries, rural children from elementary households are socioeconomically more disadvantaged than those from extended households, the magnitude of this differential varying from country to country.

The analysis provides partial support for our hypotheses. With regard to full immunization, household-structure differences are of greater significance in urban than in rural areas. As expected, children from elementary households tend to be more disadvantaged in terms of immunization coverage than those in laterally extended households (in 6 rural areas and 10 urban areas). However, in more than one-half of the cases where household-structure differences in full immunization are statistically significant at the bivariate level, they are not mediated by socioeconomic level. Although most countries do not show significant differences in the likelihood of full immunization between children from three-generational households and those from laterally extended households, this distinction is important in two countries. In rural Rwanda and urban Madagascar, children from three-generational households are significantly less likely to be fully vaccinated than those from laterally extended households. Once again, these findings underscore the importance of treating each country's situation as a unique case in examining issues pertaining to the wider implications of family structure for children's well-being.

The analyses of diarrhea-treatment practices also partially confirm the expectations about family structure differences. Laterally extended households are rarely found to have the lowest level of knowledge and ever-use of oral rehydration salts, particularly in rural areas. The lowest fluid-treatment rates are almost never seen in laterally extended households. In addition, children from laterally extended households are most likely to be taken for medical treatment of diarrhea. However, the magnitude and significance of the effects of household structure on treatment of diarrhea vary by type of treatment. Focusing on oral rehydration therapy, which is of great programmatic importance, children with diarrhea are less likely to be given ORT in elementary than in laterally extended households in all but one of the countries examined. However, there is no consistent evidence that household-structure effects are mediated by socioeconomic level. In Senegal the effect of household structure remains significant even after socioeconomic level and other factors are controlled, while in Burkina Faso, Cameroon, Niger and Zambia, household-structure differences in ORT are largely explained by socioeconomic difference. Regarding medical treatment for diarrhea, the three countries showing significant household-structure effects at the bivariate level are characterized by lower levels of medical consultation in elementary than in laterally extended households. In each of these three countries, the household-

structure effect is conditioned largely by socioeconomic status. The only situation in which elementary household structures are significantly and positively related to any of the health outcomes examined is the case of medical consultation for diarrhea in Kenya.

The results show unequivocally that the socioeconomic level of a household is an important determinant of children's immunization coverage. In most cases, socioeconomic level shows a stronger relationship with children's health outcomes than household structure. The analysis shows that the higher the socioeconomic level of the household, the more likely a child is to be fully vaccinated. This relationship is significant in rural areas of all the countries examined and in urban areas of eight countries. The effect of socioeconomic level on full immunization is not significant in urban Namibia, urban Rwanda and urban Tanzania. It is important to note that the latter two countries have levels of full immunization coverage that are close to 90 percent. Undoubtedly, as countries achieve higher levels of full vaccination coverage, children's likelihood of being fully immunized will become less dependent on their socioeconomic background. But unless there are concerted efforts to bridge the gap in immunization levels between urban and rural areas, one may continue to find stronger and enduring effects of socioeconomic level in rural areas.

Compared with full immunization, diarrhea-treatment practices appear be less dependent on socioeconomic status. The results of the multivariate analysis show significant effects of socioeconomic level on ORT in only five countries of analysis. Medical consultation for diarrhea was significantly related to socioeconomic level only in Nigeria. The likelihood of receiving any treatment was significantly related to socioeconomic level only in Madagascar, Namibia and Niger.

Unfortunately, little is known about the mechanisms through which these family situations operate to influence children's health, or exactly what it is about elementary households that is related to poorer treatment practices for diarrhea or to lower levels of immunization coverage. Socioeconomic status is the predominant explanation for household-structure variations in child health in many countries but more so for immunization coverage than for diarrhea-treatment practices. The number of adults in the household did not prove to be a critical factor in the relationship of household structure with immunization and diarrhea treatment. It is possible that household structure variations in children's health outcomes may result from differences in how households identify and evaluate symptoms and in their beliefs regarding the nature and cause of illness. These attitudes may have a strong influence on treatment practices and the utilization of vaccination clinics and other health services. Unfortunately, this relationship could not be explored due to lack of data but is clearly one area that future research needs to address.

One limitation of the study is that differences in socioeconomic status between households may not be captured well by the socioeconomic index in all circumstances. As described earlier in this report, the socioeconomic index is based on items that are shared with varying numbers of household members and captures some measures of a household's standard of living. Yet in an environment in which the vast majority of the population does not work for a wage, and given the absence of information of levels of household consumption or expenditure, it has proved to be an adequate (if not perfect) measure of relative poverty or wealth, particularly in rural areas. It is also possible that detailed information on the internal allocation of resources within these households may provide greater explanatory power than the general indicator of the living standards that are examined in this analysis. This is particularly relevant to polygynous households, which have rarely been observed to represent a unified economy. More often than not, each wife is responsible for providing for the needs of herself and her children. Thus, at every given level of socioeconomic status, the polygynous husband's contribution to the costs of meeting his children's needs tends to be smaller than in a monogamous family, because this contribution is spread over a larger number of children. Although mother's work for cash is controlled for in the equations, it is important to understand how resources are distributed internally in complex households and whether the presence of extended family members moderates the economic disadvantages of polygynous households. This is clearly an issue for further research.

For comparative purposes, combining single-parent households, nuclear families and elementary polygynous families into one category—elementary households—is necessary. This decision was made because in some countries, the number of children from at least one of these household types was too small to allow them to be analyzed separately. However, previous research suggests that these family situations may imply different levels of well-being for children. In the United States, for example, children from single-parent families have been found to be disadvantaged in several domains of well-being, compared with children from

intact families (see for example, Astone and McLanaham, 1991; Haurin, 1992). In the context of sub-Saharan Africa, there is a general lack of research on the importance of these family situations for children's well-being, but in an earlier study of family structure and full immunization in Niger and Nigeria, we examined the influence of nuclear (including single-parent) households and elementary polygynous households separately (Gage et al., 1995). The findings of this study showed that in urban areas of both countries, children living in elementary polygynous families were significantly less likely to be fully vaccinated than those living in laterally extended households, even after holding constant socioeconomic level and other factors. In addition, elementary households had negative and enduring effects on full immunization in urban and rural areas of Nigeria. In rural and urban areas of both Niger and Nigeria, lower odds of full immunization are observed for elementary polygynous than for nuclear households, suggesting that children's utilization of health care facilities is probably lower in the former household type than in the latter.

From a policy perspective, community-level health interventions should be adapted to meet the needs of children in various families. However, targeting health interventions to specific households requires a clear understanding of the linkages between household structure and poverty in a particular country. As observed, the tendency toward extended family structures may not imply vulnerability in all circumstances. Children from elementary households tend to be most disadvantaged in several health domains, although in a few countries, those residing in three-generational households constitute the most disadvantaged group. Such an understanding of the importance of family structure for child health would aid community health workers in identifying situations in which children may not be receiving recommended health care or adequate treatment.

Of equal importance is the need to bridge the gap between rural and urban coverage levels. In many countries, the provision of outreach services in rural areas is hampered by transportation and logistic difficulties, and as the results show, children's likelihood of full immunization coverage is more dependent on socioeconomic status in rural than in urban areas. In this study, information on housing conditions and the possession of consumer durables has proved to be useful for identifying socioeconomic environments in which children are poorly vaccinated, even though such measures are often considered poor indices of household wealth. From a programmatic standpoint, a rough appraisal of basic housing conditions and living standards in rural areas that are served by mobile clinics may help identify households where children could be poorly immunized, thereby minimizing the number of missed opportunities for vaccination coverage.

References

Acock, A., and Kiecolt, K. 1989. Is it family structure or socioeconomic status? Family structure during adolescence and adult adjustment. *Social Forces* 68:553-571.

Amato, Paul R. and Bruce Keith. 1991. Parental divorce and the well-being of children: A meta-analysis. *Psychological Bulletin* 110:26-46.

Amin, Ruhul, Robert M. Hill, S.A. Horton, Clifford Kamara, and Jamir Chowdury. 1992. Immunization coverage, infant morbidity and infant mortality in Freetown, Sierra Leone. *Social Science and Medicine* 35(7):851-856.

Angel, Ronald and Jacqueline Lowe Worobey. 1988. Single motherhood and children's health. *Journal of Health and Social Behavior* 29(1):38-52.

Astone, Nan Marie and Sara S. McLanahan. 1991. Family structure, parental practices and high school completion. *American Sociological Review* 56(3):309-320.

Ayad, Mohamed, Andrea L. Piani, Bernard Barrère, Koffi Ekouevi, and James Otto. 1994. *Demographic Characteristics of Households*. DHS Comparative Studies, No. 14. Calverton, Maryland: Macro International Inc.

Becker, Gary S. 1981. *A Treatise on the Family*. Cambridge, Massachusetts: Harvard University Press.

Bentley, Margaret E. 1988. The household management of childhood diarrhea in rural North India. *Social Science and Medicine* 27(1):75-85.

Bledsoe, Caroline. 1994. "Children are like young bamboo trees": Potentiality and reproduction in sub-Saharan Africa. In *Population, Economic Development, and the Environment*, ed. Lindahl-Kiessling and Hans Landberg. Oxford: Oxford University Press. 105-138.

Bledsoe, Caroline and Anastasia J. Brandon. 1992. Child fosterage and child mortality in sub-Saharan Africa: Some preliminary questions and answers. In *Mortality and Society in Sub-Saharan Africa*, ed. Etienne van de Walle, Gilles Pison, and Mpembele Sala-Diakanda. Oxford: Clarendon Press. 279-302.

Bledsoe, Caroline and Uche Isuigo-Abanihe. 1989. Strategies of child-fosterage among Mende grannies in Sierra Leone. In *Reproduction and Social Organization in Sub-Saharan Africa*, ed. Ron J. Lesthaeghe. Berkeley: University of California Press. 442-474.

Boerma, J. Ties, A. Elisabeth Sommerfelt, Shea O. Rutstein, and Guillermo Rojas. 1990. *Immunization: Levels, Trends and Differentials*. DHS Comparative Studies, No. 1. Columbia, Maryland: Institute for Resource Development/Macro Systems, Inc.

Boerma, J. Ties, A. Elisabeth Sommerfelt, and Shea O. Rutstein. 1991. *Childhood Morbidity and Treatment Patterns*. DHS Comparative Studies, No. 4. Columbia, Maryland: Institute for Resource Development/Macro International, Inc.

Caldwell, John C., George Immerwahr, and Lado T. Ruzicka. 1982. *Illustrative Analysis: Family Structure and Fertility*. WFS Scientific Reports No. 39. Voorburg, Netherlands: International Statistical Institute.

Coreil, Jeannine. 1983. Allocation of family resources for health care in rural Haiti. *Social Science and Medicine* 17(11):709-719.

Dasgupta, Satadal, Christine Weatherbie, and Rajat Subhra Mukhopadhyay. 1993. Nuclear and joint family households in West Bengal villages. *Ethnology* XXXII(4):339-358.

Davis, Kingsley. 1955. Institutional patterns favoring high fertility in underdeveloped areas. *Eugenics Quarterly* 2:33-39.

Desai, Sonalde. 1992. Children at risk: The role of family structure in Latin America and West Africa. *Population and Development Review* 18(4):689-717.

DeVos, Susan. 1993. Is there a socioeconomic dimension to household extension in Latin America? *Journal of Comparative Family Studies* 24(1):21-34.

DeVos, Susan. 1987. Latin American Households in Comparative Perspective. *Population Studies* 41(3):501-517.

Fassin, Didier and Emile Jeannee. 1989. Immunization coverage and social differentiation in urban Senegal. *American Journal of Public Health* 79(4):509-511.

Gage, Anastasia J., A. Elisabeth Sommerfelt, and Andrea L. Piani. 1995. Family structure and child health in sub-Saharan Africa. Presented at the annual meeting of the Population Association of America, April, San Francisco, California.

Gareaballah, E.T. and B.P. Loevinsohn. 1989. The accuracy of mothers' reports about their children's vaccination status. *Bulletin of the World Health Organization* 67(6):669-674.

Geronimus, Arline T., Sanders Korenman, and Marianne M. Hillemeier. 1994. Does young maternal age adversely affect child development? Evidence from cousin comparisons in the United States. *Population and Development Review* 20:585-609.

Goldman, Noreen and Anne R. Pebley. 1994. Health cards, maternal reports and the measurement of immunization coverage: The example of Guatemala. *Social Science and Medicine* 38(8):1075-1089.

Gomes, Melba. 1984. Family size and educational attainment in Kenya. *Population and Development Review* 10(4):647-660.

Guyer, Jane I. 1981. Household and community in African studies. *African Studies Review* Vol. XXIV(2/3):87-137.

Hackenberg, Robert, Arthur D. Murphy, and Henry A. Selby. 1984. The urban household in dependent development. In *Households: Comparative and Historical Studies of the Domestic Group*, ed. Robert McNetting et al. Berkeley: University of California Press. 187-216.

Harpending, Henry and Renee Pennington. 1990. Herero households. *Human Ecology* 18(4):417-439.

Haurin, R. Jean. 1992. Patterns of childhood residence and the relationship to young adults outcomes. *Journal of Marriage and the Family* 54(November):846-860.

Isuigo-Abanihe, Uche C. 1993. Parenthood in sub-Saharan Africa: Child fostering and its relationship with fertility. In *The Onset of Fertility Transition in Sub-Saharan Africa*, ed. Thérèse Locoh and Véronique Hertrich. Liege: Derouaux Ordina Editions. 163-174.

Leslie, Joanne. 1989. Women's time: A factor in the use of child survival technologies? *Health Policy and Planning* 4(1):1-16.

Lloyd, Cynthia B. 1995. *Household Structure and Poverty: What are the Connections?* Population Council Research Division, Working Paper No. 74. New York: The Population Council.

Lloyd, Cynthia B. and Ann K. Blanc. 1995. *Children's Schooling in Sub-Saharan Africa: The Role of Fathers, Mothers, and Others*. Population Council Research Division, Working Paper No. 78. New York: The Population Council.

Lorimer, Frank. 1954. *Culture and Human Fertility*. Paris: UNESCO.

Louat, Frédéric, Margaret E. Grosh, and Jacques van der Gaag. 1993. *Welfare Implications of Female Headship in Jamaican Households*. Living Standards Measurement Study Working Paper No. 96. Washington, D.C.: The World Bank.

Murthy, P.S., T. Ramnath, K. Vijayaraghavan, and N. Pralhad Rao. 1985. Nutritional profile of joint and nuclear families in rural Andhra Pradesh. *Journal of Family Welfare* 32(3):80-7.

Ndiaye Salif, Papa Demba Diouf, and Mohamed Ayad. 1994. *Enquête Démographique et du Santé au Sénégal (EDS-II) 1992/93*. Calverton, Maryland: Ministère de l'Economie, des Finances et du Plan, Direction de la Prévision et de la Statistique, Division des Statistiques Démographiques and Macro International Inc.

Schmink, M. 1984. Household economic strategies: Review and research agenda. *Latin American Research Review* 19:87-101.

Schuster, Ilsa M. Glazer. 1981. *New Women of Lusaka*. Palo Alto, California: Mayfield Publishing Company.

Shavit, Yossi and Jennifer L. Pierce. 1991. Sibship size and educational attainment in nuclear and extended families. *American Sociological Review* 56(3):321-330.

Sommerfelt, A. Elisabeth and Andrea L. Piani. Forthcoming. *Childhood Immunization: DHS Surveys 1990-1994*. DHS Comparative Studies. Calverton, Maryland: Macro International Inc.

Thomson, Elizabeth, Thomas L. Hanson, and Sara S. McLanahan. 1994. Family structure and child well-being: Economic resources vs. parental behaviors. *Social Forces* 73(1):221-242.

Timaeus, Ian, and Wendy Graham. 1989. Labor circulation, marriage, and fertility in southern Africa. In *Reproduction and Social Organization in Sub-Saharan Africa*, ed. Ron J. Lesthaeghe. Berkeley: University of California Press. 364-400.

Uchendu, Victor C. 1965. *The Igbo of Southeast Nigeria*. New York: Holt, Rinehart and Winston.

Valadez, Joseph J., and Leisa H. Weld. 1992. Maternal recall error of child vaccination status in a developing nation. *American Journal of Public Health* 82(1):120-122.

Appendix

Regression Results

Table A.1 Means of variables in regression on full immunization

Means of variables included in the logistic regression of the likelihood of a child being fully immunized, Demographic and Health Surveys, 1990-1993

Urban/rural residence by country	Household structure: Elementary	Household structure: Three-generation	Socio-economic index	No. of other adults in household	Child's characteristics: Male	Child's characteristics: Age 12-23 months	Child's characteristics: Number of siblings age 0-5	Mother's characteristics: Age 15-24	Mother's characteristics: Age 35 or over	Mother's characteristics: Currently married	Mother's characteristics: Educated	Mother's characteristics: Works for cash	Fully vaccinated
Burkina Faso													
Rural	0.60	0.22	1.03	2.76	0.51	0.25	0.64	0.27	0.27	0.98	0.08	0.42	0.41
Urban	0.36	0.21	4.16	3.04	0.52	0.24	0.57	0.26	0.22	0.95	0.39	0.49	0.70
Cameroon													
Rural	0.48	0.28	1.86	2.57	0.51	0.25	0.70	0.30	0.26	0.92	0.46	0.50	0.29
Urban	0.32	0.22	4.27	2.66	0.52	0.29	0.74	0.33	0.18	0.89	0.78	0.44	0.61
Kenya													
Rural	0.62	0.22	1.74	1.65	0.50	0.23	0.66	0.28	0.23	0.86	0.81	0.44	0.77
Urban	0.47	0.13	3.73	1.70	0.51	0.31	0.50	0.36	0.10	0.86	0.88	0.53	0.82
Madagascar													
Rural	0.60	0.19	1.06	1.86	0.53	0.28	0.79	0.29	0.26	0.82	0.77	0.67	0.51
Urban	0.48	0.20	3.35	2.09	0.53	0.25	0.63	0.26	0.26	0.85	0.93	0.62	0.65
Namibia													
Rural	0.24	0.44	1.35	3.42	0.48	0.30	0.69	0.25	0.31	0.67	0.79	0.19	0.58
Urban	0.19	0.25	4.33	3.16	0.46	0.31	0.45	0.28	0.28	0.66	0.90	0.49	0.65
Niger													
Rural	0.56	0.27	0.48	2.52	0.56	0.24	0.64	0.28	0.22	0.98	0.05	0.39	0.12
Urban	0.44	0.19	3.28	2.99	0.52	0.26	0.73	0.28	0.21	0.91	0.31	0.41	0.53
Nigeria													
Rural	0.66	0.18	1.89	2.26	0.49	0.26	0.67	0.25	0.26	0.96	0.30	0.45	0.23
Urban	0.63	0.10	4.40	1.93	0.50	0.24	0.70	0.20	0.23	0.96	0.64	0.58	0.54
Rwanda													
Rural	0.78	0.09	1.55	1.53	0.51	0.25	0.68	0.15	0.35	0.88	0.52	0.08	0.88
Urban	0.48	0.10	3.24	1.95	0.49	0.26	0.66	0.15	0.28	0.83	0.76	0.14	0.91
Senegal													
Rural	0.15	0.50	1.71	4.45	0.48	0.23	0.80	0.24	0.32	0.97	0.08	0.44	0.49
Urban	0.21	0.39	4.16	4.17	0.48	0.24	0.82	0.22	0.29	0.87	0.40	0.45	0.74
Tanzania													
Rural	0.53	0.25	1.37	2.19	0.50	0.29	0.74	0.29	0.28	0.86	0.58	0.38	0.73
Urban	0.40	0.22	3.32	2.29	0.51	0.28	0.60	0.34	0.19	0.83	0.80	0.48	0.88
Zambia													
Rural	0.53	0.18	1.04	1.99	0.48	0.28	0.59	0.33	0.25	0.86	0.71	0.45	0.67
Urban	0.34	0.19	3.92	2.44	0.51	0.27	0.60	0.30	0.20	0.84	0.93	0.55	0.79

Table A.2 Odds ratios on likelihood of full immunization for rural children

Odds ratios from the full logistic model (Model 3) of the likelihood of a child being fully immunized for rural children, Demographic and Health Surveys, 1990-1993

Variable	Burkina Faso	Cameroon	Kenya	Madagascar	Namibia	Niger	Nigeria	Rwanda	Senegal	Tanzania	Zambia
Household characteristics											
Household structure											
Elementary	1.017	1.431	0.785*	0.919	0.788	1.007	0.759*	1.295	0.800	0.764**	1.120*
Three-generation	1.160	0.962	1.158	0.889	1.211	0.853	0.974	0.542**	0.951	0.981	1.108
Laterally extended	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Socioeconomic index	1.226***	1.313***	1.344***	1.382***	1.146**	1.731***	1.332***	1.394***	1.222***	1.484***	1.460***
Number of other adults in household	1.010	1.103*	0.973	1.044	0.979	0.999	0.993	1.084	0.999	0.941	1.020
Child's characteristics											
Sex											
Male	1.097	1.378*	0.905	1.039	1.018	0.898	0.935	1.235*	0.802*	0.903	1.091
Female	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Age											
12-23 months	0.530***	1.106	0.977	0.537***	1.008	0.652**	0.796*	0.910	0.450***	0.777***	0.601***
24-59 months	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Number of siblings age 0-5	0.938	1.117	0.884*	0.975	0.801**	1.021	1.021	0.990	0.993	0.846***	0.959
Mother's characteristics											
Age											
15-24 years	0.851	0.975	1.171	0.875	0.830	1.184	0.982	1.087	0.826	0.974	1.212
25-34 years	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
35 years or over	1.218	1.273	0.809*	0.979	0.860	0.847	1.266*	0.864	1.056	1.184	1.003
Current marital status											
Married	1.043	0.666	1.163	1.233	1.326*	2.300	0.885	1.065	0.552*	0.942	0.576***
Unmarried	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Education											
Educated	1.093	3.405***	1.500***	1.567***	1.465**	2.899***	2.082***	0.987	3.160***	1.522***	1.906***
Uneducated	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Works for cash											
Yes	0.841	0.812	0.862	1.146	1.094	1.479**	1.136	0.611**	1.186	1.122	0.796**
No	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Number of children	1,581	644	2,695	1,755	1,039	1,020	2,114	2,424	1,260	2,999	1,516

Note: Models include controls for region of residence.

*** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

Table A.3 Odds ratios on likelihood of full immunization for urban children

Odds ratios from the full logistic model (Model 3) of the likelihood of a child being fully immunized for urban children, Demographic and Health Surveys, 1990-1993

Variable	Burkina Faso	Cameroon	Kenya	Madagascar	Namibia	Niger	Nigeria	Rwanda	Senegal	Tanzania	Zambia
Household characteristics											
Household structure											
Elementary	0.710*	0.693*	0.996	0.599**	0.996	0.789	0.723**	1.192	0.781	0.768	0.757
Three-generation	0 941	1.038	0.735	0.521**	1.016	1.100	0.788	2.999	0.991	1.092	0.866
Laterally extended	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Socioeconomic index	1.223***	1.323***	1.351**	1.272***	1.004	1.251***	1.380***	1.119	1.287***	1.040	1.315***
Number of other adults in household	0.942	0.955	1.006	0.959	1.003	0.953*	1.043	1.129	1.029	0.873*	1.011
Child's characteristics											
Sex											
Male	1.020	1.100	0.823	0.812	0.979	0.723**	0.868	0.802	1.133	0.853	1.164
Female	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Age											
12-23 months	0.959	0.773	1.203	0.709*	0.863	1.165	0.987	2.413*	0.503***	0.772	0.801
24-59 months	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Number of siblings age 0-5	0.793**	0.999	0.973	1.047	0.742*	0.881	0.969	1.436	0.901	1.026	1.172
Mother's characteristics											
Age											
15-24 years	0.818	0.992	1.295	1.286	1.115	0.934	0.900	0.637	0.698	0.927	0.970
25-34 years	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
35 years or over	0.871	0.946	0.856	1.318	0.692	1.241	0.892	0.651	0.868	0.904	0.620**
Current marital status											
Married	1.386	0.950	0.605	1.043	1.072	2.382***	1.308	1.387	0.838	1.040	0.902
Unmarried	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Education											
Educated	1.546**	2.805***	1.435	1.195	1.385	1.921***	1.399**	1.751	1.695***	1.372	2.149***
Uneducated	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Works for cash											
Yes	1.017	1.289	0.981	0.964	1.224	1.102	0.935	0.263***	1.112	0.680	0.876
No	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Number of children	909	735	329	641	411	1,020	1,248	384	746	582	1,169

Note: Models include controls for region of residence.

*** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

Table A.4 Means of variables in regression on diarrhea treatment

Means of variables included in the logistic regressions of diarrhea treatment, Demographic and Health Surveys, 1990-1993

Variable	Burkina Faso	Came-roon	Kenya	Mada-gascar	Nami-bia	Niger	Nigeria	Rwanda	Sene-gal	Tan-zania	Zambia
Household characteristics											
Household structure											
Elementary	0.51	0.47	0.59	0.52	0.17	0.50	0.64	0.74	0.15	0.50	0.47
Three-generation	0.21	0.21	0.21	0.21	0.43	0.26	0.19	0.09	0.49	0.27	0.16
Socioeconomic index	2.00	2.74	1.83	1.54	1.50	1.18	2.24	1.62	2.31	1.67	1.96
Number of other adults in household	2.80	2.29	1.74	2.02	3.84	2.66	2.22	1.53	4.72	2.12	2.05
Urban location	0.33	0.46	0.11	0.24	0.20	0.29	0.21	0.15	0.27	0.17	0.38
Child's characteristics											
Male	0.55	0.56	0.54	0.59	0.46	0.58	0.54	0.53	0.51	0.50	0.53
12-23 months	0.39	0.41	0.45	0.47	0.45	0.36	0.42	0.46	0.41	0.50	0.43
Number of siblings age 0-5	0.51	0.61	0.54	0.70	0.54	0.59	0.58	0.61	0.71	0.58	0.51
Mother's characteristics											
Age											
15-24 years	0.32	0.34	0.40	0.35	0.35	0.30	0.28	0.17	0.25	0.40	0.39
35 years or over	0.25	0.20	0.18	0.21	0.24	0.24	0.22	0.33	0.30	0.22	0.19
Educated	0.17	0.54	0.83	0.79	0.80	0.11	0.31	0.54	0.16	0.63	0.80
Works for cash	0.45	0.49	0.44	0.59	0.19	0.40	0.48	0.11	0.44	0.40	0.48
Severity of illness											
Presence of blood	0.23	0.15	0.18	0.16	0.31	0.31	0.26	0.18	0.15	0.18	0.18
Duration of diarrhea in days	5.26	5.95	4.82	4.59	6.07	5.24	5.56	6.39	3.91	4.51	5.26
Treatment											
Any treatment	0.71	0.73	0.73	0.70	0.80	0.57	0.39	0.68	0.59	0.83	0.80
Oral rehydration therapy	0.18	0.31	0.34	0.27	0.69	0.21	0.27	0.37	0.18	0.67	0.64
Taken to medical facility or provider	0.20	0.19	0.43	0.37	0.69	0.15	0.23	0.25	0.22	0.62	0.54
Number of children	488	237	369	281	361	600	533	557	394	437	620

Note: Data pertain to children who had diarrhea in the two weeks preceeding the survey. Reference categories are omitted from the table. Means for region of residence are not shown.

Table A.5 Odds ratios on likelihood of receiving treatment for diarrhea

Odds ratios from the full logistic model (Model 3) of the likelihood of receiving any type of treatment for diarrhea, Demographic and Health Surveys, 1990-1993

Variable	Burkina Faso	Cameroon	Kenya	Madagascar	Namibia	Niger	Nigeria	Rwanda	Senegal	Tanzania	Zambia
Household characteristics											
Household structure											
Elementary	0.808	1.008	1.381	0.932	1.059	0.519***	0.810	1.339	0.658	1.050	0.774
Three-generation	0.504**	1.346	1.041	0.762	0.886	0.706	1.102	1.760	0.509***	0.686	0.916
Laterally extended	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Socioeconomic index	1.060	0.812	0.939	1.407**	1.483***	1.237**	1.091	1.084	1.149	0.930	1.097
Number of other adults in household	0.991	1.042	1.048	1.014	0.960	0.949	0.967	0.933	1.043	1.128	1.151
Location											
Urban	1.862*	2.796**	1.451	0.826	0.695	1.536	1.315	1.428	1.144	1.383	1.937
Rural	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Child's characteristics											
Sex											
Male	0.870	1.922**	0.840	1.222	0.936	1.161	0.982	0.649**	1.114	0.715	1.175
Female	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Age											
12-23 months	1.714**	2.598**	1.208	1.601	1.099	1.049	0.939	1.589**	1.539*	0.778	1.352
24-59 months	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Number of siblings age 0-5	0.982	1.151	1.222	0.729	1.044	1.024	0.667***	1.062	1.014	1.058	0.893
Mother's characteristics											
Age											
15-24 years	0.756	0.749	1.297	1.024	0.693	0.933	1.201	0.557**	0.582*	1.829*	0.679
25-34 years	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
35 years or over	1.417	0.717	0.982	0.477*	0.962	1.106	0.833	1.036	1.000	1.147	0.778
Education											
Educated	1.042	2.298*	1.134	1.335	2.477***	1.449	0.904	1.041	1.721	1.395	0.940
Uneducated	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Works for cash											
Yes	1.652**	1.332	1.068	0.596*	1.502	0.946	0.879	1.579	0.818	0.834	1.115
No	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Severity of illness											
Presence of blood in stool											
Yes	1.173	1.508	1.380	1.629	2.093**	1.621**	1.761***	1.863**	2.669***	2.310*	3.122***
No	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Duration of diarrhea in days	1.096***	1.046	1.066*	1.013	1.035	1.071***	1.015	1.042**	1.053	1.039	1.210***
Number of children	488	237	369	281	361	600	535	557	394	440	620

Note: Models include controls for region of residence.
*** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

Table A.6 Odds ratios on likelihood of receiving oral rehydration therapy

Odds ratios from the full logistic model (Model 3) of the likelihood of receiving oral rehydration therapy, Demographic and Health Surveys, 1990-1993

Variable	Burkina Faso	Cameroon	Kenya	Madagascar	Namibia	Niger	Nigeria	Rwanda	Senegal	Tanzania	Zambia
Household characteristics											
Household structure											
Elementary	0.969	0.628	1.356	0.913	1.234	0.794	0.974	0.898	0.303**	0.917	0.858
Three-generation	0.725**	1.046	1.300	1.061	0.991	0.904	1.106	1.095	0.799	1.287	1.327
Laterally extended	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Socioeconomic index	1.278**	1.010	0.957	1.357**	1.294**	1.223**	1.075	1.176	1.082	1.042	1.384***
Number of other adults in household	0.993	1.018	1.072	1.102	1.059	0.992	1.030	1.045	0.971	0.948	1.083
Location											
Urban	1.573	1.398	2.027*	1.010	0.691	2.397***	1.804**	0.741	0.973	0.745	0.927
Rural	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Child's characteristics											
Sex											
Male	0.968	1.299	1.219	1.411	1.192	0.988	1.060	0.716*	1.146	0.676*	1.408*
Female	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Age											
12-23 months	1.195	0.826*	1.242	1.182	1.692**	1.259	1.220	1.786***	1.824**	0.933	1.261
24-59 months	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Number of siblings age 0-5	1.011	1.706**	1.124	0.629*	1.074	0.796	0.959	0.918	0.959	0.784	0.938
Mother's characteristics											
Age											
15-24 years	1.178	0.891	1.061	0.671	1.281	0.858	0.715	0.614*	0.639	0.851	0.883
25-34 years	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
35 years or over	0.649	0.826	0.746	0.701	1.504	1.391	0.582*	0.909	1.653	0.800	0.743
Education											
Educated	0.628	1.644	1.176	0.863	1.607	2.536***	1.785**	1.132	2.487**	1.258	1.117
Uneducated	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Works for cash											
Yes	1.744**	0.801	1.550*	0.512**	1.128	0.929	1.353	0.692	1.097	1.037	0.930
No	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Severity of illness											
Presence of blood in stool											
Yes	1.340	0.544	1.058	3.601***	1.508	1.092	1.522*	1.925***	1.887*	1.309	1.186
No	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Duration of diarrhea in days	1.038*	1.028	1.046*	1.100***	1.029	1.049	1.004	1.019**	1.075	1.019	1.148***
Number of children	488	237	369	281	361	600	535	557	394	440	620

Note: Models include controls for region of residence.
*** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

Table A.7 Odds ratios on likelihood of being taken to a provider

Odds ratios from the full logistic model (Model 3) of the likelihood of being taken to a medical facility or provider for treatment of diarrhea, Demographic and Health Surveys, 1990-1993

Variable	Burkina Faso	Cameroon	Kenya	Madagascar	Namibia	Niger	Nigeria	Rwanda	Senegal	Tanzania	Zambia
Household characteristics											
Household structure											
Elementary	1.077	1.075	1.907**	1.015	0.822	0.907	0.819	0.665	0.902	1.163	1.057
Three-generation	0.593	1.093	1.898*	1.536	0.819	1.230	1.148	0.887	1.260	1.134	1.227
Laterally extended	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Socioeconomic index	1.214*	0.832	1.134	1.263*	0.947	1.093	1.194**	1.166	1.147	1.136	1.170*
Number of other adults in household	1.011	1.230*	1.120	0.903	1.062	1.008	0.970	1.019	1.046	0.965	1.066
Location											
Urban	1.716	2.002	2.207*	1.200	1.471	4.157***	1.177	1.367	1.472	1.784*	1.041
Rural	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Child's characteristics											
Sex											
Male	0.841	1.999*	1.000	0.834	1.188	1.475	0.902	0.896	0.984	0.935	1.287
Female	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Age											
12-23 months	1.130	2.475**	1.150	1.677*	1.795**	1.584*	1.151	1.361	1.815**	1.379	1.296
24-59 months	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Number of siblings age 0-5	0.857	0.535**	0.990	0.801	1.057	0.825	0.550***	0.898	1.279	0.983	1.057
Mother's characteristics											
Age											
15-24 years	0.982	0.762	1.303	0.806	0.915	0.975	0.621*	0.818	0.723	1.131	0.998
25-34 years	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
35 years or over	0.875	0.925	0.876	1.274	1.507	1.618	0.497**	0.669	1.588	0.990	1.254
Education											
Educated	1.866**	3.121**	1.466	1.079	1.669*	1.643	1.251	1.055	1.812	1.262	1.509*
Uneducated	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Works for cash											
Yes	1.437	0.489*	1.375	0.753	1.526	1.375	1.439	0.776	0.694	0.783	0.821
No	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Severity of illness											
Presence of blood in stool											
Yes	1.212	0.610	1.164	2.081**	1.285	1.028	1.564*	1.732**	1.287	1.429	1.160
No	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Duration of diarrhea in days	1.078***	1.032	1.075***	1.106***	1.067	1.053**	1.001	1.011	1.059	1.050*	1.089***
Number of children	488	237	369	281	361	600	535	557	394	440	620

Note: Models include controls for region of residence.
*** ($p < 0.01$); ** ($p < 0.05$); * ($p < 0.10$)

Demographic and Health Surveys Analytical Reports Series

1 Gage, Anastasia, A. Elisabeth Sommerfelt, and Andrea L. Piani. 1996. ***Household Structure, Socioeconomic Level, and Child Health in Sub-Saharan Africa.***