# HOUSEHOLD HEALTH AND NUTRITION IN NAMIBIA

**Report on a Survey**
**in Katutura**
**and selected northern areas of Namibia**
**in April - May 1990**

UNICEF Namibia

for the
Ministry of Health and Social Services
Government of the Republic of Namibia

with technical support from the
Food Studies Group
Queen Elizabeth House
University of Oxford
U.K.

Windhoek, September 1990

UNIVERSITY OF OXFORD
QEH
QUEEN ELIZABETH HOUSE

# Report on a Survey of Household Health and Nutrition in Katutura and selected Northern areas of Namibia

by

Dr Bruce Cogill, PhD
Consultant
Food Studies Group
University of Oxford
U.K.

and

Dr Simon Kiugu, MD
Kenya Medical Research Institute
Nairobi, Kenya

September, 1990

# Republic of Namibia


## Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Old State Hospital Building
Harvey Street
Windhoek

Tel: (061) 32170 Ext 100
Telefax: (061) 221332

Enquiries: **Dr Solly Amadhila**

Reference No: **NAM/PS/UNICEF/003/231190** Date: **11/23/90**


## PREFACE

BY

THE HONOURABLE MINISTER OF HEALTH AND SOCIAL SERVICES,

DR NICKEY IYAMBO

The Ministry of Health and Social Services welcomes the publication by UNICEF of the results of the Household Health and Nutrition Survey which was planned by UNICEF in the period immediately preceeding Independence and implemented shortly after Namibia`s accession to Nationhood with full support and cooperation of the Ministry of Health.

The results of this Survey was undertaken in the region of Owambo and Katatura and provide an important addition to the limited information available about families in general and on problems facing children and women in particular such as low income, poor health, and malnutrition. The information generated by the Survey will be of significant assistance to the Ministry of Health and Social Services in planning of primary health care programmes to address the priority problems of children and women in Namibia. We also hope that the results will be of use to other Government Ministries, Non-government organizations and to inter-national agencies.

Dr Nickey Iyambo,
MINISTER
MINISTRY OF HEALTH AND SOCIAL SERVICES

WINDHOEK

## ACKNOWLEDGEMENTS

UNICEF Namibia wishes firstly to thank the more than 10 000 Namibians who provided the source for the data in this Report. Their enthusiasm and goodwill, shortly following the Independence of their country, made the collection of data possible in a relatively short period of time.

The newly-formed Ministry of Health and Social Services has encouraged and supported the work at every stage. Their backing and interest in the findings of the Survey have been essential to its success. UNICEF also wishes to thank Dr Abisai Shejavali and Mr Immanuel Dumeni of the Council of Churches in Namibia for their support and assistance in various ways.

In northern Namibia, invaluable support was received from Bishop Dumeni and Chief Taapopi, as well as from many other church and local authorities. The support of the Namibia Broadcasting Corporation was also essential to the implementation of the project, particularly in this area. In Katutura, the Municipality was most helpful in providing maps and other information for use in sampling, and acknowledgement is made particularly to Ms Du Toit.

Many Namibians participated directly in the project through the management of survey teams, enumeration and clerical work, direction of field operations, in the design of the Survey and in the training of staff. We wish to thank them all for their contributions, but in particular, Dr Teopolina Tueumuna, Ms Adolphine Mushimba, and Ms Rosa Namises.

Data entry was carried out with the assistance in programming of Mr Malcolm Simpson of the University of Namibia, and of seven data entry clerks who were students of the University. Their contributions were essential and highly appreciated. The advice of Dr Chris Tapscott in various aspects of the Survey is also acknowledged with thanks.

The Survey Manager was Dr Simon Kiugu, who carried out a wide range of challenging tasks with great dedication and competence. UNICEF wishes to thank him as well as the Director of the Kenya Medical Research Institute for arranging for his availability.

The Food Studies Group, University of Oxford, has provided extensive support for the survey's design, implementation, data analysis and report writing. We wish to thank them for their assistance. Particular acknowledgement is made to the Group Consultant Dr Bruce Cogill, who undertook the major tasks in survey and questionnaire design, production of training materials for survey staff, co-supervision of data entry, data cleaning, data analysis and the main write-up of the Survey results as they appear in this report. The contribution of Dr Cogill, on behalf of the Food Studies Group, has been pivotal and his dedication and skills are highly appreciated.

It should be noted that limitations exist, as indicated in the Report, for the applicability of the Survey results from the specific survey areas to other parts of Namibia or for the nation as a whole. Taking these into account, we trust that the results will be of interest and use to national policy makers, community leaders, non-Governmental authorities and researchers alike, and to all those concerned with the welfare of children, women and disadvantaged groups in Namibia.

UNICEF Windhoek
September 1990

## TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

## ABBREVIATIONS

| | |
|---|---|
| CCN | Council of Churches of Namibia |
| CDC | Centre for Disease Control |
| DHNW | Department of National Health and Welfare |
| FAO | Food and Agricultural Organisation of the U.N. |
| FSG | Food Studies Group, Univ. of Oxford |
| HH | Household |
| HOH | Head of Household |
| Ht | Height (cms) |
| Ht/Age | Height-for-Age |
| IMR | Infant Mortality Rate |
| NCHS | National Centre for Health Statistics |
| NFNC | National Food and Nutrition Commission |
| UNDP | United Nations Development Programme |
| UNICEF | United Nations Children Fund |
| Wt | Weight (kgs) |
| Wt/Age | Weight-for-Age |
| Wt/Ht | Weight-for-Height |

CURRENCY UNITS = South African Rands
Exchange Rate $US 1.00 = R 2.85 (April 1990)

# Executive Summary

1 Unicef Namibia, in association with the Ministry of Health and Social Services and the Council of Churches in Namibia, carried out a comprehensive survey of households in five locations during April and May 1990. The aim of the survey was to collect data on the levels of income, other measures of welfare and on the health and nutrition of women and children. The primary objective of the survey was to provide household-level data to the Government for programme planning and monitoring purposes in sectors concerned with the welfare of women and children.

## General Characteristics

2 The survey covered five separate study sites. Four of these were located in the North of the country: the expanding peri-urban area of Oshikati/Oluno and the three rural areas of Onyaanya, Engela and Tsandi. The fifth survey site was Katutura, a township located near the capital. Within each site a random sample of households was selected, using a two-stage stratified selection process. A total of 1,561 households were surveyed in the five sites. Overall, the sample from the northern sites included 5,251 people this is thought to be about 1 per cent of the Ovambo population. In Tsandi and Katutura, the sampling fractions represented more than two per cent of the population in these areas.

3 Within the study sites, households were selected at random to participate in the survey. Within the general constraints of the expected level of sampling error and with some provisos for specific items of information, the information presented in this report can be considered to be representative of the whole population in these areas. The study sites themselves, however, do not represent a random sample of the whole of Namibia or even of any region or part. The sites were deliberately selected to provide information about areas which were thought to be representative of other parts of the country. The focus on the northern areas, for example, was dictated by the fact that the majority of the population live there and that there is very little systematic information available about the situation of the people.

4 Another aspect of the study was to collect information about people who had returned to Namibia in the period leading up to Independence. Katutura was included, partly to provide a contrast to the northern sites, but also to provide information on the condition of returnees who now live in urban centres. The township was also chosen because a number of earlier studies had been carried out there and it was therefore possible to monitor how conditions had changed over the past few years.

5 The results of the study should not be seen as representing conditions in the whole of Namibia. In a number of tables and figures, totals and means for the whole study area are reported. These should not be considered as representing national figures. Strictly

speaking they only refer to the total population of the five study sites. The data are provided in the report mainly for the purposes of comparisons between the sites.

6 Where the results of the study are likely to be important in the national context, however, is in the comparison of key indicators between the different sites. In this respect, the comparisons between the rural and peri-urban areas in the North and between these areas and the urban area of Katutura are likely to have wider significance. In particular, the study identifies a number of ways in which the condition of the population differs in these three types of area and indicates issues that are likely to have a wider concern.

7 The study has demonstrated that it is possible to collect detailed information about the economic, social, health and nutritional situation of different types of households in Namibia. As such, therefore, it may be seen as a model which could be applied in other localities as resources permit.

Summary of Main Findings

8 The residents of the northern study areas are significantly worse off when compared to households in Katutura. These disadvantages are shown in a number of key characteristics.

- o Income levels are up to eight times lower in the rural sites in the North and two to three times lower in the peri-urban area than in Katutura. Cattle ownership is common in over half of the rural households, but also forms part of the asset base of one in four of Katutura households.

- o Literacy: While poorer than their compatriots in the urban location, the Northern Namibians in the study areas have relatively high levels of literacy (over 70 per cent of heads of households were classified as literate) and education levels as well as access to information via radios. However, both literacy rates and education levels are lower in female headed households.

- o Employment: The level of unemployment among household heads ranges from 21 per cent in Katutura to as low as 2 per cent in Tsandi. The rural areas have lower unemployment due to the predominance of agricultural activities. Eight out of ten adult returnees are unemployed in Katutura, this proportion is slightly lower in the North.

- o In Katutura, most households receive their income from formal employment, particularly from government jobs. Over half of the wives of male heads of households in Katutura work for wages. In the northern areas, self-employment is more important, although even here, one third of households are dependent on formal employment. The lack of employment opportunities in the north is acute and partly illustrated by the reliance on income from pensions and remittances.

- Income Source: The diverse income sources of all households reflects strategies to reduce risk and to cope with external events such as drought and market failure. There is a strong seasonal pattern to incomes, particularly in rural areas.

- Agriculture: Agriculture is an important economic activity for all the survey households especially in the north, but also in Katutura. Millet and sorghum are the most important crops grown, followed by beans and maize. Livestock husbandry and especially cattle herding were important sources of livelihood for many households. Over fifty per cent of the northern households surveyed have cattle; in Katutura one household in four reported cattle ownership.

- School attendances: Strong regional and gender differences exist in the pattern of school attendance. Katutura has a greater number and a higher percentage of children in secondary and tertiary education than the other study areas. Children in Katutura are four times more likely to be at secondary school than either their counterparts in the four northern areas. At tertiary level, the differences are even more marked with a ten-fold difference.

- By secondary school, girls are attending school in numbers double those of boys of the same age. This female bias is most evident in the peri-urban area and Engela. Female headed households in the rural north were less likely to have female children in secondary school. The differences in the peri-urban north were in the same direction but with a three-fold difference favouring male students. The impediment for female secondary students in female headed households could reflect the demand for child care and other related work activities for female children. The low level of boys attending secondary school is of concern. Seasonal demands for stock care and the tradition of males seeking employment outside rural areas (in the mines and farms) combine to reduce the educational achievement of boys.

- Illness patterns: No significant differences were found between the locations comparing periods of illness. There was a weak result suggesting that children in male headed households were ill for longer than children living in female headed households in the northern sites. This finding tends to contradict other results which suggest that female headed households are generally more disadvantaged. The level of illness appears to decrease in older children, possibly demonstrating improved immunocompetence. No significant relationship was detected between the period of time ill and household income, household size, immunization status, access to water, or child gender.

- Immunization: Comparing the survey results with coverage in neighbouring countries suggests that measles vaccination rates in the study areas are at levels below even Angola. Across all age groups, of the 1,752 pre-schoolers in the survey, only 15 per cent had completed their measles course. This compares with about 42 per cent having completed their Polio and DPT vaccinations. BCG remains as the most successful immunization, with a coverage of over 84 per cent of children. Tsandi has the lowest coverage, followed by the peri-

urban site in the north. The survey results indicate that improving immunization coverage of children must be a key priority for the immediate future.

- Breast Feeding: A decline in the duration and prevalence of breast feeding with urbanization is apparent from the survey. There are three groups of women in the study area with increasing duration and prevalence of breast feeding. They are the women of Katutura, then the women living in the peri-urban survey site in the north and finally, the women living in the rural areas.

- Child Nutrition: Pre-school children from the northern study sites are three times more likely to be undernourished than children from Katutura. More alarming is the eight-fold difference in severe malnutrition in northern children. Northern children experience twice the level of wasting (low weight-for-height) and 50 per cent more stunting than children of Katutura.

- About 21 per cent of the children surveyed in Katutura were classified as either moderately or severely stunted. This indicates that even in the better-off urban area, there is still an unacceptably high rate of chronic malnutrition. The prevalence of stunting in Katutura suggests that there are important issues of poverty and deprivation to be addressed there.

- A multivariate analysis of factors associated with malnutrition for the whole sample suggests that a number of factors contribute to worsening nutritional status. The main factors that were identified as being statistically significant were: living in the northern study sites; low household income; coming from a female headed household; poor education of the head of the household; living in the rural study sites; increased illness and fever; poor health knowledge; late introduction of solid food; and being an older child. No significant difference was detected in nutritional status between returnee and non-returnee children.

- Child Mortality: Indirect estimates of infant and child mortality have been calculated from the study data, based on questions about the survival of children born to women of reproductive age in the selected households. The estimates of infant mortality for the whole sample range from 47 to 74 deaths per thousand live births. These figures are relatively low when compared with estimates of infant mortality for neighbouring countries, but because they are not based on a representative national sample should be taken as being indicative of the level for the whole of Namibia.

- In the northern study areas, it is estimated that about seven children in 100 live births die before their first birthday; about 11 children out of a hundred may be expected to die before their fifth birthday. The estimated mortality rates for the northern sites are between 50 to 60 per cent higher than in Katutura.

- Demographic characteristics: The high level of fertility among women in the northern sites and the rate of recent in-migration, particularly into the peri-urban area has resulted in a high rate of population growth. The estimated rate of population growth in Katutura is lower, but this result is likely to be distorted due to the large percentage of women and children absent at the time of the survey. The survey average of about 3 per cent increase in population per year is similar to earlier estimates for the whole of Namibia.

- Maternal Fertility: Comparison between the survey locations shows a consistent pattern of one in five women having given birth before the age of 20 years. There is a difference between women in the peri-urban area and the rural based women. The women from the peri-urban site generally have their first child at a much earlier age than the others. Almost forty per cent of these women were mothers by their twentieth year, four times the level for the women of Tsandi and three times that of the other rural sites.

- For the whole sample, the total fertility rate was estimated at about 5.9. On average, one in seven pregnancies resulted in a stillbirth. This ratio increases for women of Onyaanya and Engela where almost two out of ten pregnancies, ended in a miscarriage or a stillbirth.

- Women living in female headed households are generally younger than those living in households headed by men. On average, however, they tend to have had about the same number of children. This implies that they have a higher fertility rate or have more children at an earlier age. Since female headed households generally tend to be poorer, this has important welfare considerations for these women and their children. Returnee women in the sample, while younger than non-returnees, also experienced significantly fewer miscarriages but not child deaths.

- Regression results point to the marked location differences found in the static analysis of maternal fertility and child survival. With the exception of Tsandi, the women with low parity are at higher risk of miscarriage. The survival of their children is associated with where the mothers live (the northern study sites are worse except for Tsandi) and the age and parity of the mother.

- Maternal Mortality: The Sisterhood method, an indirect technique, was used to estimate Maternal Mortality. The results translate into a sample average of 371 maternal deaths for every 100,000 live births. As with child mortality, the figures were higher in the northern sites, almost double that found in Katutura. The rate for maternal mortality in the peri-urban area was double that of Katutura. The rate for Katutura was similar to that of neighbouring Botswana while the northern sites approached the levels found in West Africa. The data point to the problems of maternal mortality in the North especially among the young and fecund women of the peri-urban area.

o Contraception: The data clearly show that use of contraception practices is limited and in many cases non-existent. In excess of 8 out of 10 women do not use contraception in the sample as a whole. Contraception is more widely practised in Katutura, but even here, two out of three women do not use any method. Of those women using contraception, injection is the most common method followed by the pill. The high level of fertility evident in the northern areas, and especially in the rapidly growing peri-urban are, suggests that a programme to support family planning should be a priority.

## Specific Findings

9 This section of the summary details the findings that were referred to above. The order follows the main report.

### General Characteristics

10 Katutura households compared with the northern study sites are more likely to be or have:

- male headed,
- more adult males,
- fewer children under fifteen years,
- a person absent from the household seeking work or already employed
- better educated members,
- renting their housing (average rents are R160 per month),
- electricity and a metal roof for the house,
- using electricity for cooking,
- watching television (33 per cent have television), using a refrigerator and have a phone (30 per cent),
- using their own car (25 per cent),
- experiencing unemployment among heads of households,
- employed in the formal sector earning wages or salaries
- a spouse who works outside the home for wages,
- receiving income from the Government,
- receiving less income from remittances, pensions and food aid,
- unemployed adult returnees,
- earning incomes 2 to 3 times greater than households in the peri-urban site in the North,
- earning incomes 6 to 8 times greater than households in the rural northern sites, and
- in possession of large numbers of cattle although by fewer households.

11 The households in the peri-urban site, compared with their rural counterparts are more likely to be or have:

- more children under five years of age,
- younger women with more children,
- fewer pre-schoolers if the household has a returnee living there,

- fewer Lutherans,
- better educated heads of households,
- lived in the area about six years less than rural areas,
- have a metal roof and electricity, but still overwhelmingly use wood for cooking and lighting,
- using a refrigerator (6 per cent) and radio,
- experiencing unemployment among heads of households,
- self employed but not necessarily in agriculture,
- have wives that are engaged in self-employment,
- receiving income from self-employment,
- still receiving income from agriculture,
- unemployed adult returnees,
- receiving less income from remittances, pensions, and food aid,
- earning incomes 3 to 4 times greater than rural areas, and
- less likely to own cattle.

12 Female headed households (almost 42 per cent of the total sample) are likely to be or have:

- Damara/Nama or Herero speakers in Katutura,
- household heads that are less likely to have been to school but equal numbers in the higher grades,
- household heads that are less likely to be able to read especially in the North,
- household heads that are older than males who are heads of households, and
- involved in agriculture and self-employed in the peri-urban northern site.

13 The characteristics of returnee households compared with non-returnees are as follows:

- they comprise 22 per cent of the total sample,
- they are more prevalent in the northern sites, especially in the Tsandi region,
- have larger households sizes (by 2 people),
- have younger household heads,
- are more likely to have adult males especially in Katutura,
- less likely to have small children,
- have similar education levels to non-returnee households (except for Engela -- higher),
- have similar literacy levels except for Engela and Katutura (significantly higher), and
- are experiencing severe employment problems, unemployment in adults ranges from 80 per cent in Katutura to 30 per cent in Tsandi.

Household Structure and Composition

14 Female headed households and returnees are well represented in the sample, with 42 per cent of households being female headed and 6 per cent of people being returnees. Males dominate the returnee population especially in Katutura. Katutura has fewer children compared with the rural north due to the placement of children by Katutura parents with relatives in the rural areas.

15 The average houschold size inn the sample was 6.7 people, with female headed households being significantly larger by about two people. The age and sex structure of the sample suggests that differences do exist between the rural and the peri-urban/urban areas. Urban households have fewer children and more men while the peri-urban households had greater numbers of women and children. The women of the peri-urban site have had children earlier and in greater numbers.

16 Dependency ratios are highest in the north and least in Katutura. Katutura households have the largest number of family members not present at the time of the survey reflecting the transient nature of this population. One in five households members in Katutura are absent from the Katutura home.

Returnees

17 Returnees make up 6 per cent of the total sample and are living with non-returnees in 343 households. One in four households in the northern sites included at least one returnee (in the whole sample the ratio was one in five). Returnees were mostly adult males and in Katutura, adult males outnumber females by 2:1. In general, households with returnees tend to have fewer pre-schoolers, especially in the peri-urban site and in Katutura. Onyaanya, with its high female population, has the highest percentage of returnee households that are female headed (over 55 per cent).

Language and Religion

18 The Oshiwambo language is most commonly spoken in the sample with 96 per cent of the northern households speaking it. In Katutura, Damara/Nama was most common (31 per cent) followed by Oshiwambo (27 per cent). Lutherans are the most common denomination in the North (80 per cent) followed by Roman Catholics. Katutura residents display a wider range of language and religious affiliation.

Education

19 A comparison of the education levels of male and female heads of households shows significantly lower education levels among the women. This contrast is most striking in the rural sites in the North. The low level of female education has important implications for communication and literacy, although wives were more likely to be able to read than their husbands in all locations. In Engela and Tsandi, one in three household heads cannot read. Overall, 84 per cent of male heads of households in the sample can read compared with 69 per cent of female heads.

Housing and Assets

20 Residents of the peri-urban survey site are the most recent arrivals having lived in their present location for an average of seven years, significantly less than in the other sites. Unlike Katutura households, the households of the north do not pay rent for their housing. Only 5 per cent of households own their house outright in Katutura while another 20 per cent have a mortgage. The average rent in Katutura was R 160 per month. In Katutura, as household income rises, the amount of rent paid increases and the time lived there decreases. The more recent residents tend to have higher incomes.

21 Radio, television, refrigerator, and phone ownership was quite high in Katutura with one-third of households owning a television, 79 per cent with a radio, 61 per cent with a refrigerator and 30 per cent with a phone. Car ownership was found in one in four households in Katutura. In the rural northern sites, ten per cent of households owned a car, this proportion increases to 12 per cent in the peri-urban area. The relatively high rate of ownership of cars is possibly due to the general lack of public transport both in Katutura and the North.

22 The northern households have wide access to radios. Engela has the lowest rate of ownership at 50 per cent of households, increasing to 68 per cent in the peri-urban area. The high use of radios has important implications for communication. Comparisons with earlier studies indicate that the northern areas are less integrated into the modern economy than the South, but that radios are increasing their coverage and must remain the main source of communication for most Namibians.

Fuel and Energy Use

23 Use of wood for cooking and lighting is most common in the northern areas while electricity is used in 68 per cent of Katutura households. The reliance on wood in the peri-urban North is a cause for concern as the available sources of wood fuel are being reduced as a result of urbanization.

Employment and Income Source

24 The level of unemployment identified from the survey ranges from 21 per cent in Katutura to as low as 2 per cent in Tsandi. The rural areas have lower unemployment due to the predominance of agricultural activities. In Katutura and the peri-urban site, one in five households report unemployment.

25 Not surprisingly, the family farm dominates the economic activities of the heads of households in the rural areas. A point worthy of note is the importance of self-employment in the peri-urban area in the North. This site has recently seen rapid growth in commercial activities. The fact that one in four heads of households are self-employed tends to confirms this.

26 The survey clearly demonstrates the diverse sources of income of the survey households in both the rural and urban areas. Wages from a formal sector job were reported for over half the households in Katutura. One in five households receive income from a government job. Self-employment is important in both Engela and Onyaanya as well as in the peri-urban area. Onyaanya relies less on the family farm than the other rural areas, but one-third of the peri-urban households are still largely dependent on agriculture as an income source. The diversity of income sources of all households in part reflects strategies to buffer households against external risk. It also illustrates the strong seasonal influences on income levels.

27 Transfers are an important supplementary source of income for many households. The combination of remittances, pensions and food aid are very significant in the northern rural areas. Over half of the rural households receive remittances while one third get a pension. The proportion of households in receipt of pension income in the peri-urban site and in Katutura is much less, in part because of the somewhat younger age structure. Food aid figures reflect the food distribution component of the returnees programme. One in four households in Tsandi receives food aid which reflects the distribution of returnees in the sample.

Income levels

28 The income data provides a ranking of locations into three main groupings. Katutura residents have income levels twice that of the peri-urban sample which, in turn, is three times better off than the rural areas. Tsandi reported the lowest average household income at 900 Rand per year (about $US 315 or $47 per person per year) compared with Katutura ($US 389 per person per year). The mean income for Katutura was very close to the value found in a study conducted in 1988/89.

| | | |
|---|---|---|
| Katutura | - | R 7,419 per year |
| Peri-urban North | - | 4,336 |
| Rural North | - | 1,547 |
| -Onyaanya | - | 1,802 |
| -Engela | - | 1,986 |
| -Tsandi | - | 900 |
| All Regions | - | 3,881 |

29 Over 35 per cent of the total number of cattle identified in the survey is owned by Katutura residents. Ownership, however, is highly skewed and concentrated among the wealthier households. In Katutura, 23 per cent of households own cattle compared with 48 per cent in the rural sample. Few of the peri-urban households own cattle (17 per cent of households owning an average of 2.2 animals each). Onyaanya residents are actively involved in cattle and livestock ownership.

30 The poorest 20 per cent of households in the peri-urban sample have income levels of one-third of the poorest 20 per cent in Katutura. This difference drops to a little under a half in the highest quintile. The conclusion is that the differences found between the locations for average incomes is maintained when comparisons are made by stratifying the sample by income level.

31 Data on distribution of income shows that the richest 20 per cent of Katutura households earn 46 per cent of the total income while the poorest forty per cent earn only 13 per cent. This suggests that income in this area is less unequally distributed than the average for neighbouring countries.

32 A comparison with data for 1986 after allowing for inflation suggests that income inequality in Katutura has declined. Fewer households are in the lower income categories in the 1989 survey. Almost one in five households in Katutura still have monthly incomes less than R 174 per month (compared with one in three in 1986).

Employment and Gender of the Head of Household

33 Male heads are more likely to be in wage employment (by at least 50 per cent) than female heads. In the peri-urban sample, where self employment is most common, female headed households are more likely to be self employed. The familiar small shops and cafes in the area are evidence of such types of employment. Women's traditional role in family agriculture is reflected by the greater numbers of female headed households in agriculture. The data suggest that female headed households, despite their poorer education and resources, are actively engaged in income earning opportunities.

34 Wives of male heads of households are economically active outside the traditional activities in the home. For the whole sample, forty per cent of wives were employed outside the home or farm. This figure increases to 58 per cent in Katutura. Roughly half of the households whose wives work in Katutura include young children. The practice of placing small children with rural relatives appears to be a practical response to the demands of employment.

Employment of Returnees

35 The employment situation for adult returnees is much worse than for heads of households. As many as 57 per cent of returnees are unemployed in the sample as a whole, increasing to 80 per cent in Katutura. In Katutura, the returnee adult is five times more likely to be unemployed than the head of the household. In Tsandi, an area with a high concentration of returnees, the situation is slightly better. Here, family farming absorbs most of the labour of the returnees. Less than 10 per cent of the returnees in the sample are in wage employment. Other than farming, the adult returnee faces a bleak employment prospect. This has important policy implications.

## Agriculture

36 Agriculture is an important activity of many survey households. About 25 per cent of the apparently urban Katutura households engage in crop production or livestock farming, although the emphasis is on the latter (more than third of households have livestock, but only 8 percent planted a crop in the past season). In the rural locations, the primary activities are crop production in Tsandi while Engela and Onyaanya households practice mixed farming. Cattle are predominant in Onyaanya while goat husbandry is prevalent in Engela.

37 The possession of key agricultural implements such as a plough or a cart reflects both the level of investment in agriculture and the level of resources for improved production. It is apparent from the data that the level of investment overall is quite low. Only in Tsandi do more than half the rural households possess a plough.

38 The number of cattle per person in Onyaanya is almost double the rate in Engela and Tsandi. The largest herd size encountered in the survey was 350 head, almost half the households enumerated did not have any cattle.

39 Donkey ownership is relatively common in the northern sites, but Tsandi has the largest concentration. Engela with the least number of cattle and donkeys has the largest number of goats. Based on data on the time required to plough the fields, Onyaanya appears to be least constrained by land availability. Households in Engela appear to be the most land constrained of the three rural locations. Comparison of time to plough the millet fields across income quintiles (determined by the average rural income level) indicated a significant trend. Thee poorest 40 per cent of households are ploughing less land than the wealthiest households. The trend reflects the larger land areas and the improved asset base of the wealthier households. Income is closely related to land availability in the rural sample sites.

## Cropping Patterns

40 Millet and sorghum were the most common crops grown in the North followed by beans and maize. Engela farmers grew less maize but more pumpkins in the 1988/89 growing season. In general, the cropping season that year was delayed due to poor and late rainfall. Households in Onyaanya grew fewer field crops than the other sites, preferring to produce vegetables. Peanuts were grown by 10 per cent of Tsandi households.

## Ploughing

41 The main method of ploughing used by Engela farmers was the hand hoe, reflecting the low level of investment and small land area there. Nearly three quarters of Tsandi ploughed with donkeys. In Onyaanya and Engela on third of farmers used oxen as their source of draught power. Tractors were used by 37 per cent of the peri-urban farmers.

42 Many farmers in the sample hired draught power, particularly in Katutura and the peri-urban farmers sites. More than one-third of households relied on hired draught power in these areas. Engela displayed the highest rate (82 per cent) of ploughing with own resources.

Reported Needs for Improving Agricultural Production

43 The most important constraint, identified by farmers was water. Engela was the only location where water was not mentioned as the most important requirement, here the main need is for fertilizer. Engela respondents gave greater weight to relatively high technology inputs such as insecticide, fertilizer and improved seeds, compared to the other locations. This may well reflect recent extension efforts in the region.

44 The most common constraint, other than water, might have been expected to be labour, particularly as a result of the migration of adult males away from rural areas and the large number of female headed households. Yet only Onyaanya households identified a labour constraint. There was a relatively high proportion of female headed households in Onyaanya. Availability of land was considered a constraint in the peri-urban site but not in the other areas.

School Attendances

45 Of all the survey sites, Katutura has the greatest number and percentage of children in secondary and tertiary education. Children in Katutura are four times more likely to be at secondary school than their counterparts from the northern sites. At the tertiary level, the differences are even more marked with a ten-fold difference.

46 Northern rural households send more children to school per household, but they are overwhelmingly primary school children. In part, the predominance of primary school children in these areas is because many of the Katutura households do not contain children of primary school age. The peri-urban households send significantly fewer children to primary school compared with their rural neighbours. The higher numbers of rural children attending school per household reflects the fact that many per-urban mothers leave their children in the rural areas to attend school.

47 Children are more likely to only attend primary school in the north (over 90 per cent of school attenders are in primary school) compared with Katutura where almost 30 per cent are attending secondary school. Gender differences in attendances were apparent in the rural and peri-urban sample. By secondary school, girls are attending school in numbers double that of boys of the same age. This female bias is most evident in the peri-urban area and in Engela. In Tsandi, females are in the majority in primary school and this continues onto secondary school. Female headed households in the rural sample were less likely to have female children in secondary school. The differences in the peri-urban site were similar, but with a three-fold difference favouring male students. The impediment for female secondary students

in female headed households could reflect a demand for child care and other work for female children.

48 The failure of the males to attend secondary schooling is of concern. Seasonal demands for stock care and the tradition of males seeking employment outside the rural areas (for example, in the mines and commercial farms) combine to reduce the educational achievement of male children.

Water and Sanitation

49 The water and sanitation situation in the northern sites is critical. The survey found households in both the urban and rural areas seriously deficient in even the basic provisions of adequate water and waste disposal. Most acute is the lack of toilet facilities in the peri-urban area where over 80 per cent of households were without a latrine. With the lower population density in rural areas, this figure is in excess of 95 per cent. Only Katutura approaches minimal provision of services with ready access to tap water and almost universal availability of toilet facilities.

50 The time to collect water in the dry season reflects the time burden placed on households especially in rural areas. Typically this burden falls to women and children. Of all the survey sites, Tsandi households have the greatest distances to travel to fetch water. Households in Tsandi spend over three hours per day, on average, to fetch water during the dry season.

51 A comparison of the distance to the dry season water source between income groups (determined by the average income level in the rural sites) indicated a significant trend. For the rural north and especially for Tsandi, the poorest households have to spend twice as much time to get water (2.5 hours versus 1.1 hour) than the wealthiest households.

52 Female headed households in the rural areas of the North are significantly further away from water sources in the dry season, by as much as 20 minutes on average. The time required to fetch water in the dry season is a major time and resource constraint for rural households. Ready access to water in the peri-urban areas must rank as an important incentive to relocate.

Illness Patterns

53 The pattern of illness displayed by households in the peri-urban are is similar to that of the rural households, with two main exceptions; the high level of reported fever in Tsandi region and the high level of measles in Engela. These figures are consistent with another study of the disease outbreak in the North. There was little difference found in the average amount of time ill between the survey sites.

54 Illness in under-five children is common. Children from female headed households are more likely have reported an illness, especially in the rural areas. This is likely

to be due to a number of factors. Female headed households have less adult labour to care for children as well as less income to have the child treated when illness does occur. In general, these households are poorer and tend to have poorer access to water and sanitation.

55 The incidence of illness among returnee children was slightly lower than with non-returnee children. By the second half of the first year, infants are suffering diarrhoea, fevers and coughs that will accompany them for the next few years. Diarrhoea reporting peaks in the second year of life while fever begins as early as the second six months. The incidence of coughs increases over the first five years. For diarrhoea, the most critical period is the second year of life. These patterns are similar in all locations. When these age trends are compared with the prevalence of malnutrition, the data points to the need to intervene in the first year of life before the child is further weakened by increasing malnutrition.

56 Households in the survey areas generally had poor knowledge of the appropriate treatments for child diarrhoea. Although potentially harmful practices such as stopping breast feeding were not widely practised, some forms of traditional medicine are used especially in the north. Most respondents appear to rely on the health centre for treatment, but given the common occurrence of diarrhoea at certain times of the year, this practice, while positive, should be supported by more home treatment with ORS.

57 Respondents from female headed households are more likely to adopt negative behaviour towards diarrhoea. In some areas, female headed households are significantly more likely to stop breast milk, not treat it at all or not to take the child to the health centre. The reason for these practices are not obvious, but point to the general concern about the welfare of children in these households. In general, the use of ORS is limited and is an area where intervention may well be required.

58 Returnee households were generally much more familiar with the use of Oral Rehydration Salts to treat diarrhoea. In Katutura, returnee households were almost twice as likely to give home prepared ORS solution to their child with diarrhoea. The results support the contention that returnee households are better informed and educated.

Illness and General Determinants -- Regressions results

59 No significant differences among the locations were found when comparing percentage of time ill.

60 There was little difference between male and female headed households. In the northern study sites, the average time ill in male headed households was weakly significantly higher than in female headed households. This finding is contrary to other trends observed in the data.

61 As the child ages, the level of illness decreases, demonstrating immunocompetence.

62 Household income, size, immunization status, access to water, and child gender were not related to the percentage of time ill.

Immunization

63 An immunization book was held by the caretaker of the child in 66 per cent of cases. This means that two in three children have a vaccination record. Older children are just as likely to have a book as younger children. It can be assumed that the issuing of books was as common four years ago as it was in the second half of 1989.

BCG

64 Coverage of BCG immunization is by far the best of the main antigens. More than 85 per cent of the survey children had received their BCG shots, on average 1.5 months after birth. Tsandi and Katutura have the best coverage with over 90 per cent immunized. These high levels correspond with the high frequency of deliveries at health centres in these locations where over 90 per cent of births take place in a health centre or hospital. Engela consistently shows up as having poor health facilities and it also has the poorest BCG coverage. The poor BCG coverage is consistent with the high level of home births and the lateness of the BCG shot. Older children have had the same coverage as younger children. This result indicates little change over the in the level of BCG coverage over the past five years.

DPT

65 The coverage of DPT is much worse than BCG. Over one-third of the children had not received any DPT shots at any age and only half of the children had completed the course by the time they were one year old. The current situation falls below the full immunization guideline for children aged one year.

66 The situation in the northern sites is considerable worse than in Katutura. In Katutura, with quite good access and facilities, full DPT coverage is at 55 per cent of children. At least 70 per cent of Katutura children have received at least one DPT shot. The coverage in the peri-urban site is quite close to that of Katutura.

67 Less than a month between DPT booster shots renders the effort technically faulty. On average 24 per cent of the DPT2 shots were technically faulty while 21 per cent of the DPT3 shots were given less than a month after DPT2. Katutura DPT shots were considerable less faulty than vaccinations given in Tsandi (32 per cent faulty) or the peri-urban site. In total, the northern locations record faulty vaccinations in 21 to 32 percent of the cases (compared with 14 per cent for Katutura). Fewer faults were observed with DPT3, but the overall pattern was similar.

Polio

68 By the child's first birthday, approximately 52 per cent of the surveyed children had not received any polio drops. The surveyed areas of Namibia fall behind its neighbours in their coverage of Polio immunizations. As noted with DPT, Katutura is not much better than more isolated areas of the country (Table 36). This unacceptable situation in Katutura is also found in Tsandi and Onyaanya where only half the children have obtained the full course by their first birthday. Interestingly, Engela has a better polio and DPT coverage than Katutura.

Measles

69 The coverage for measles vaccine was the poorest reflecting the lack of maternal and child health services especially in the northern areas. Even in Katutura, only 6 per cent had received the complete course by age two years and 18 per cent by age three. Coverage was much better in the peri-urban site than in Katutura with 47 per cent with full immunization by age two years.

70 Comparing the survey results with coverage in neighbouring countries places measles vaccination at levels below even Angola. Across all the ages, of the 1,752 pre-schoolers, only 15 per cent had completed their measles course. This low figure compares with about 42 per cent having completed their Polio and DPT. BCG remains as the most successful at over 84 per cent of children. Tsandi again emerges as the location with the poorest coverage followed by the peri-urban north.

Gender of Head of Household and Immunization

71 Women of female headed households were significantly less likely to have an immunization book for their child especially for children older than 24 months. This could be a reflection of the movements and poverty of females in female headed households. Female headed households tend to have lived in their locations for a shorter period than households headed by men.

Returnee Children and Immunization

72 No significant differences were detected in the percentages or means for the different indicators of immunization between returnee and non-returnee children. The immunization patterns of children from returnee households or the poorer female headed households do not differ from the other households. This is encouraging as the economic disadvantages of these groups has not translated into worsening immunization coverage. BCG shots, however, tend to be given significantly later in households with returnees.

Breast Feeding

73 The practice of breast-feeding in the study was universal at least for the first month of life. As the child ages, the percentage of women who choose to breast feed declines rapidly. Four months is the recommended time for the introduction of solid foods. The women of Katutura and Onyaanya introduced solid foods two to three weeks earlier. The earlier introduction of solid foods in Katutura reflects the more urbanized nature of the community including the availability of alternative commercially available infant food. Onyaanya women reflected a more urbanized pattern of breast feeding than other rural women.

74 The Katutura mother only breast feeds for 8.7 months on average, at least eight months shorter then women of the rural north. While breast feeding duration is shorter in Katutura, it does not appear to be associated with worsening malnutrition.

75 The decline in duration and prevalence of breast feeding with urbanization is apparent in Namibia. The duration of breast feeding among peri-urban women is significantly shorter than for rural women.

76 The women of Katutura have a wide range of choices in food stuffs (admittedly only if they can afford the prices) and a cleaner environment in which to prepare food. Early weaning and earlier introduction of solid foods probably does not adversely affects the health of the child in these conditions. The women of the north, however, do not have the cash or water and sanitation suitable for further declines in breast feeding. The practice of peri-urban women placing their young children with households in the rural areas is likely to be putting pressures on the nutritional status of these children. Development and health education should be directed to encouraging:

- o the current positive behaviour of breast feeding from birth,
- o the development and promotion of appropriate weaning foods, and
- o the promotion of breast feeding as long as possible.

Malnutrition

77 The children from the northern sites are three times more likely to be undernourished than children from Katutura. More alarming is the eight-fold difference in severe malnutrition in northern children. Children suffering from severe under-nutrition are at high risk of mortality.

78 Stunting (low height-for-age) shows a similar pattern to under-nutrition, but with a slightly lagged or delayed fall. The delay is probably because of the longer period for stunting to manifest itself. Nevertheless, stunting is already evident by 9-12 months of age long before the second year of life that is typically the focus for action programmes. Curative services need to be targeted to the 9 to 24 month age group, but the prevention of child stunting must begin earlier and no later than the second six months of life.

Malnutrition and Returnee children

79 Compared with non-returnee children, the 79 returnee children in the sample are generally better off nutritionally, but this difference is not statistically significant. The differences between the returnee and non-returnee children are more marked when a comparison is made with long-term indicators of malnutrition. As a cautionary indication of future problems, wasting shows very close levels to that found among the children in the northern sites. In other words, the better nutritional status gained in exile may be weakened by the difficulty of life in the rural north. Such short-term hardships are supported by the data showing reliance on food and income transfers and the lack of employment among the returnee households.

Malnutrition and Gender of the Head of the Household

80 Stunting, an indicator of long-term deprivation, is significantly worse in female-headed households for all locations taken together and for Onyaanya separately. Furthermore, female headed households in Onyaanya have worse wasting and under-nutrition than is found in households headed by men. The higher rates of malnutrition in these households is both an indication of hardship and a signal for further action.

Malnutrition and Income

81 The data indicate that long-term malnutrition is more serious in households from rural areas, with female heads and from specific locations such as Engela. As income increases, stunting levels drop in a roughly linear manner. This pattern is repeated for under-nutrition (weight-for-age), but is not evident for wasting (weight-for-height). The trend is most apparent in the northern sites, particularly the rural areas. The relationship is not necessarily causal. Increased income is only associated with improved nutrition. Higher income households may have better food security, better access to services, better child care, and better water and sanitation. Improving income without improved environmental conditions including health, water and sanitation will not necessarily translate into improved nutrition.

Regression Results:

82 Katutura has less stunting, under-nutrition and wasting even after controlling for differences in income, education of head, illness patterns, and access to water, etc. This finding is important as the eight-fold difference in household income between the North and the South could have been the main reason for the difference in nutritional status. The differences in nutritional status are partly due to income variation, but must also be explained in terms of environmental factors such as health status, water and sanitation, and food quality, quantity and utilization. The only exception found in the results was Onyaanya, which was not worse for stunting when compared with Katutura.

83 No differences were found when comparing the peri-urban North with Engela or Tsandi except that Onyaanya has less long-term malnutrition (stunting and wasting) than the peri-urban North.

84 Female headed households are not different nutritionally from male headed households for all locations. The initial analysis clearly showed a significant difference in stunting between female and male headed households. The regression results indicate that this difference is no longer significant after controlling for income, education, and the other variables. In other words, when children from female-headed households are placed on equal footing with children from male-headed households, the differences found in stunting no longer appears.

85 Returnee children are not better nourished than non-returnees children.

86 The level of education of the head of the household was highly significant and positively related to better nutrition in all locations. The consistency of the finding in the regressions supports that assertion that improvements to education for all Namibians is an important objective. The analysis is not able to demonstrate whether or not the nutrition is directly related to education (for example, through literacy and better knowledge of nutrition and child care) or acts through intermediary variables such as income (ie, better educated people earn more). In Katutura, where measured income was a better reflection of household wealth, the positive relationship of education was found supporting the contention that education is independent of income as a major determinant of improved nutrition.

87 Girls in the North experienced less stunting when compared with boys and controlling for age. The explanation as to why boys are more stunted is not obvious. The greater mobility of boys and their requirements for looking after small animals, even at early ages, has been suggested as one explanation.

88 Increasing income is positively associated with better long-term nutrition in the northern sites. The regression analysis did not find a statistically significant relationship between wasting and income. The positive relationship for stunting and under-nutrition was not strong and as discussed earlier, doubling or increasing income ten-fold is only associated with a small change in levels of stunting or under-nutrition. Nevertheless, given the problems of accurately measuring household income, a significant and positive relationship was found with nutrition. Clearly, other factors than income play a role.

89 The time spent ill is positively related to the level of malnutrition, the relationship is highly significant when the outcome variable of wasting is used. The result for stunting probably reflects that fact that the illness variable is a proxy for overall household welfare. A poorer environment measured in terms of the time the child is ill may well be related to the cumulative effect on growth reflected in stunting. Short-term wasting is directly related to illness events in the past two weeks and this was reflected in the data.

90 The more familiar a guardian was with more positive health behaviour, the more likely the child was to be less wasted. In other words, failure by guardians to seek treatment for diarrhoea in general situations was related to more wasting in the child. Health education, therefore, is an area for special consideration, especially in areas similar to the northern sites.

91 Later introduction of solid food in Katutura infants was associated with poorer wasting and under-nutrition. This weakly significant relationship was found after controlling for household income and other variables. The finding is difficult to explain. The result should not necessarily be interpreted to suggest that solid foods should be introduced earlier than the recommended mean of four months. Katutura parents usually have access to good quality weaning foods, fuel and clean water.

92 Older children experience more malnutrition (especially wasting) than younger children. These patterns of worsening malnutrition with age confirms the need to present nutrition data disaggregrated by the age of the child. The relationship between age and malnutrition may well not be linear. In other words, wasting may be low in the first six months of age, then increase for the next 18 months but then decrease as the child grows older. Such a relationship is "U" shaped and will not be identified correctly just using linear regression models.

93 The relationship between malnutrition and access to health services and the protection afforded by immunization was difficult to test. The level of immunization by DPT or polio was introduced into the model to test for a possible relationship. The analysis found that the level or completeness of immunization was not related to nutrition other than a weakly significant relationship for stunting in the all areas analysis. In other words, a relationship between full immunization or utilization of services and malnutrition was not detected in the analysis.

94 The numbers of people in the household and the percentage under 15 years of age were not related to nutrition. Within the range of household size found in the survey and after controlling for the educational level of the head, income, etc no relationship was detected between nutrition and household size. The same result occurred using the percentage of household members under 15 years variable.

Child Mortality

95 Results of regressions relating the level of child mortality to different independent variables show the following.

- o Tsandi emerges as having significantly better child survival than other locations including Katutura, even after controlling for household income, women's age etc.

- o Engela has significantly worse child survival rates than the peri-urban site which, in turn, is significantly worse than Katutura.

- o Women from female headed households have the same level of child death as women of male headed households.

- o A significant relationship between household income and child survival was not detected for the models tested.

- o As women age, the numbers of their children who die increases, reflecting the deaths due to many factors unrelated to maternal health.

- o As the size of the household increases, the numbers of children dying decreases even after controlling for the age of the woman. This would indicate that large household sizes are not associated with reduced survival in children.

- o As the number of live births per woman increases (Parity) so does the risk of death in her children. This variable is correlated with the age of the woman so it is not surprising that the results are similar.

- o Coming from a farming household and having a better educated mother is associated with reduced risk of death in children.

- o In the northern sites, the survival rates of children of returnee women is worse than for children of non-returnees. This may reflect past hardships experienced by the returnees.

Population Growth

96 A high rate of population increase in the peri-urban site is a result of a high level of fertility in-migration. The level of population increase in Katutura is low, but this figure is distorted because of the large percentage of women and children absent at the time of the survey.

97 The rapid growth in population in the study area is due to a young population with a high birth rate and a low and declining death rate. It is expected that the picture obtained from the survey will be the same for much of the North. The rate of population increase poses a number of problems in maintaining economic and food security there.

98 The relatively low mortality rate and high birth rate results in estimated life expectancies in the sample which are comparable to the levels found in middle-income developing countries in Africa. These data, it must be stressed, are tentative and may well over-estimate life expectancies. Clearly, more reliable estimates based on national samples or derived from a complete population census are required.

Maternal Fertility

99 Comparisons between the survey locations show a consistent pattern of one in five women having given birth before the age of 20 years. Women from the peri-urban site are tend to have children at a much earlier age than the others. Almost forty per cent of these women were mothers by their twentieth year, four times the level of the women of Tsandi and three times that of the other rural areas. Tsandi lies at the other extreme with the lowest level of child births.

100 For the survey women as a whole one pregnancy in seven ended in a stillbirth or a miscarriage. For Onyaanya and Engela this ratio increases to almost two pregnancies in ten. Tsandi, on the other hand, has the lowest level of terminated pregnancies while the number of children born per woman is similar to the other rural sites. Only ten per cent of children are born at home in Tsandi reflecting the higher levels of pre- and post-natal care in the region.

101 The women in the peri-urban site were significantly younger than their rural counterparts (by between 10 to 12 years) and they have had approximately one extra child by their mid-thirties. Women in the 25 to 30 age group have also experienced significantly greater child deaths than the same aged women in Tsandi, Onyaanya and Katutura. These results raise the issue of whether it is the environment of the Oshikati/Oluno region that causes these deaths in young children or is it that poverty and social turmoil forces the women to move the peri-urban area resulting in increased child deaths.

Household Gender and Fertility

102 Women living in female headed households have had about the same number of children as those living with a male head, but on average they are younger. This implies that these women have a higher fertility rate or have children at an earlier age. Since female headed household tend to be poorer, this has important welfare considerations for these women and their children.

103 The percentage of pregnancies ending in a miscarriage (10 per cent end in miscarriage) was not significantly different between women of female and male headed households. Neither was there any difference in the proportion of children dying.

Returnee Women and Fertility

104 Returnee women make up 5 per cent of the total sample of adult women and are significantly younger than non-returnee women. About 20 per cent of returnee women had not experienced pregnancy. Because they were younger, returnee women had had fewer children (or lower parity). Returnee women while younger also experienced significantly fewer miscarriages but not fewer child deaths.

Maternal Mortality

105 The Sisterhood method is an indirect technique to estimate maternal mortality and uses the proportions of adult sisters dying during pregnancy, childbirth, or in puerperium (pre- and ante-natal). The method is based on the relationship of the proportion of sisters dying to the probability of dying from maternal causes by a specified age. The lifetime risk of maternal mortality is 0.022 for the whole sample, or 1 in 46. This figures increases to 0.027 (or 1 in 37) for the rural sites and 0.040 for the peri-urban area (or 1 in 25). The results translate into a whole sample average of 371 maternal deaths for every 100,000 live births. As with child mortality, the figures were higher in the north, almost double that found in Katutura.

Contraception

106 Nine out of ten women in the northern sites did not use any form of contraception; there was little difference between the locations. In theory, the women in the peri-urban area may be better served by health services and have easier access to contraceptive advice, but the women in this survey area were only very slightly more likely to use contraception than their rural counterparts. In Katutura, however, two women in three reported some contraception use.

107 The most popular form of contraception among the Katutura women was by injection which provides protection for up to six months. The Pill was the most common method used in the northern sites.

Miscarriages

108 Based on regression models to relate the percentage of pregnancies ending in a miscarriage to different independent variables, the conclusions were as follows.

- Women in the northern sites are far more likely to have a miscarriage than the women in Katutura, even after allowing for the effect of other factors. Tsandi, to a certain extent, is the exception; it emerges as having significantly better pregnancy outcomes than other locations, including Katutura, even after controlling for household income, women's age, etc.

- Engela has a significantly worse miscarriages rate than the peri-urban site, which itself is significantly worse than Katutura.

- In Katutura, women from female headed households have fewer miscarriages than women of male headed households. This result was not found in the other sites.

- As the number of live births per woman increases (Parity) the percentage of miscarriages declines. This result is the opposite to that found for the proportion of children who die. The implication is that there is a higher risk of miscarriage among younger women.

- No significant relationship was detected between the miscarriage rate and household income, woman's education, time to get water, or farm area.

## Chapter 1 Introduction and Conceptual Framework

Sound programming is based on an understanding of the current and past situation in a region or country. Newly independent Namibia is not necessary lacking in data. It does lack, however, credible data at the household and individual level. Nowhere is this more apparent than in the embattled northern regions of the country.

A comprehensive income, health and nutrition survey was suggested to address the need for meaningful baseline information with a focus on women and children of poor households. This focus was extended to include households in selected regions of the country and with particular attention on several groups; namely, Katutura residents, the newly emerging peri-urban and urban areas of the north and the neglected rural household (see map -- Figure 1). Because of the special problems faced by returnees and households headed by women, the sample was extended to include these groups.

The selection of the North has several practical benefits. The region has not been studied in detail before. The greatest population concentration is found there and the region has been affected by war and drought for many years. A sample of households living in the north and Katutura thus reflects the areas where the majority of Namibia's population live.

The design of the questionnaire and the writing of the analysis plan for this study was underpinned by a simplified view of the household and its environment in Namibia. This was a necessary first step as it is essential to have a framework on which to base an analysis of the linkages between agriculture, welfare and health. The relationship of child nutrition to maternal welfare or sanitation needs to be explored to ensure the right questions are asked and most importantly, the answers that result from the survey are amenable to appropriate action or intervention to improve the situation. Careful study of the conceptual framework (Figure 2) and an understanding of the existing data enabled the following modules to be developed.

1. Household structure
2. Household literacy and education
3. Household assets and income
4. Agricultural activities
5. Returnee status and employment
6. Household Expenditure and Consumption
7. Child descriptive
8. Child Morbidity
9. Child Anthropometry
10. Child Feeding
11. Child Immunization
12. Maternal reproductive history

**Figure 1 Map of Namibia Showing the Survey Sites**

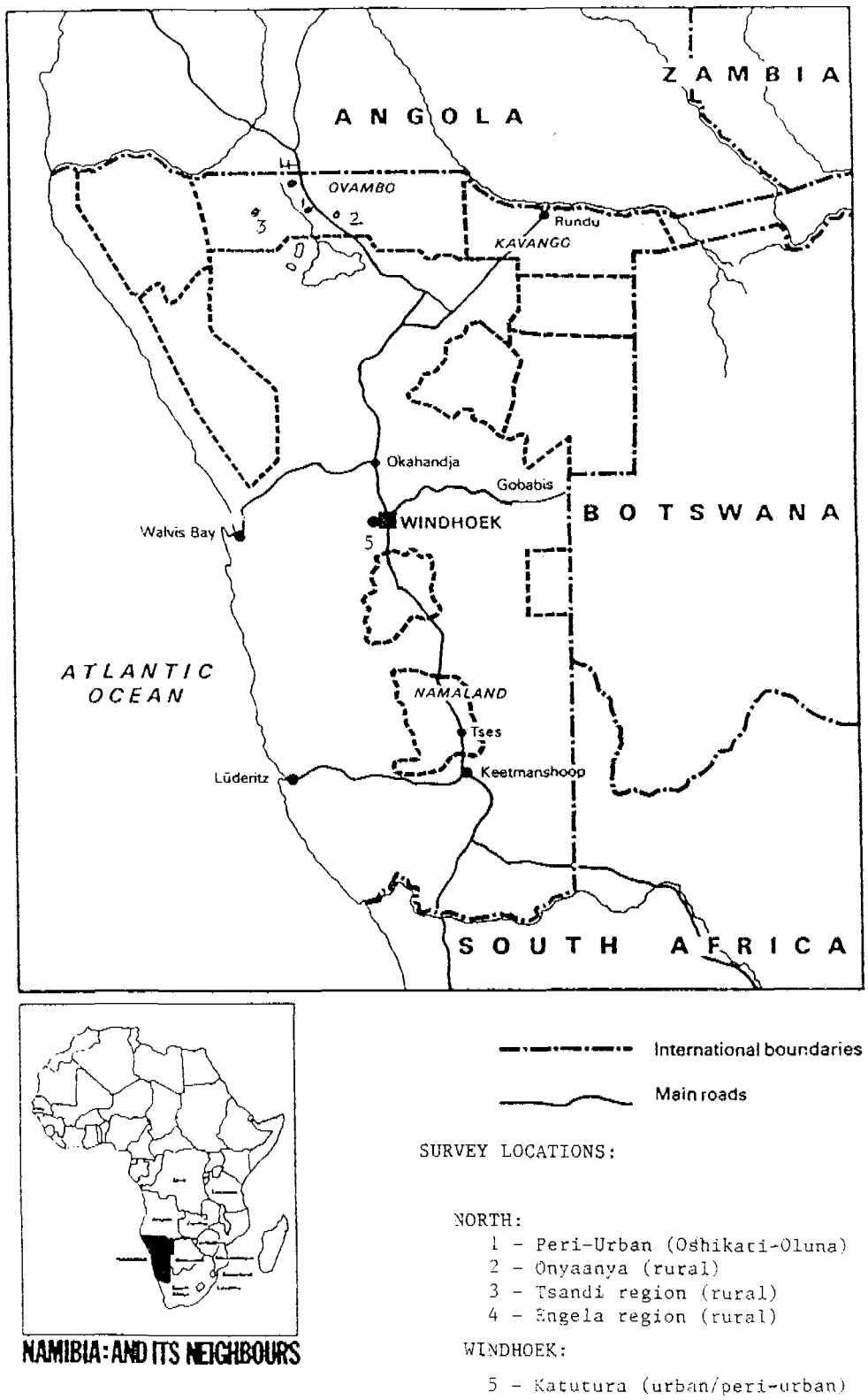
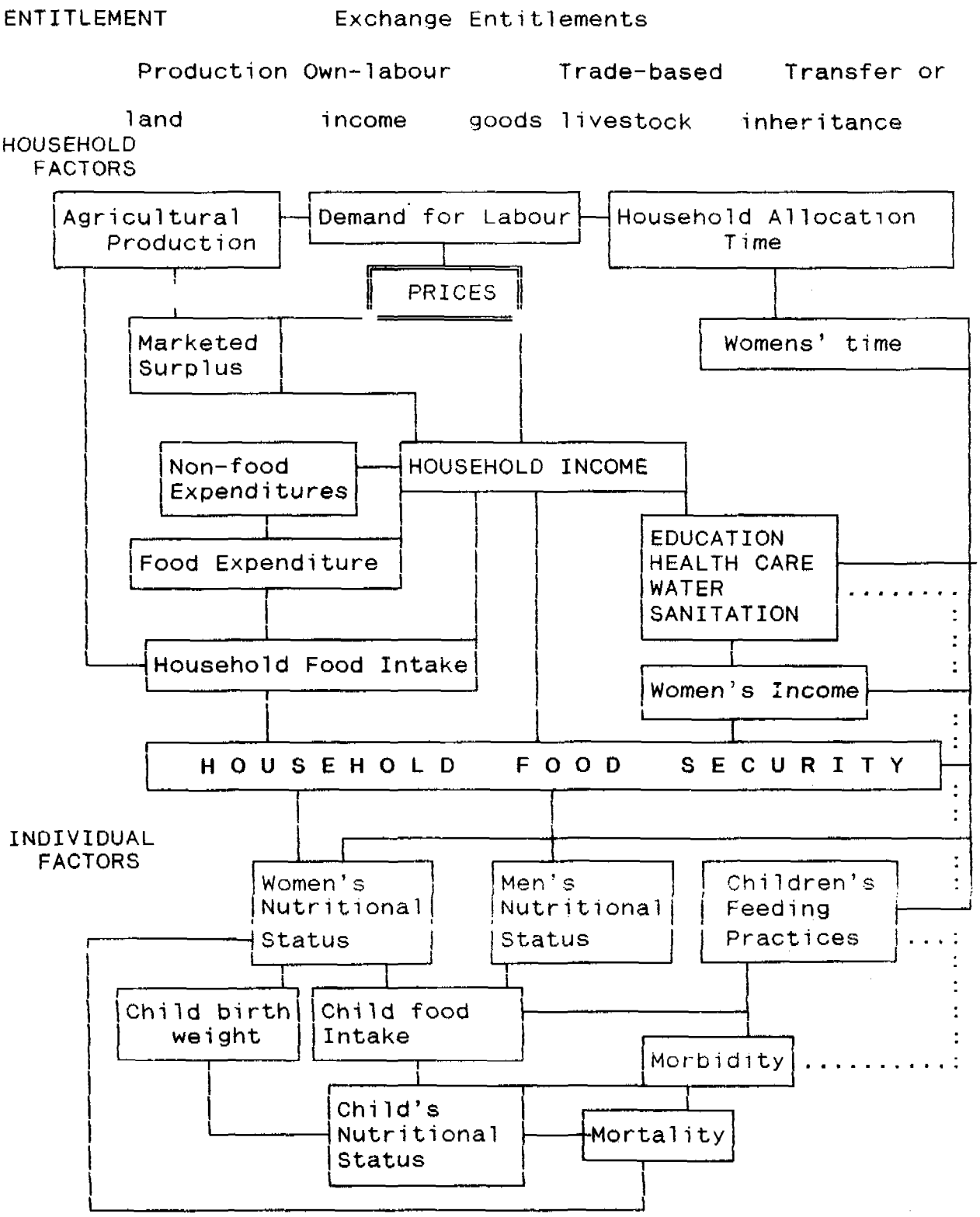


**Figure 2: Some Determinants of Household Food Security and Its Relationship to Individual Well-Being**



## Chapter 2 Methods

The study was designed to ensure the efficient and timely collection and processing of data. In addition, the materials and procedures were developed with the view that the study could be repeated in different areas of Namibia in the future. The questionnaire was divided into modules to make it relatively simple to substitute different modules in the future. The framework has been established for simple replication.

The questionnaire length was kept to a minimum to reduce the burden on the households. The survey consisted of a series of distinct phases. The basis for the survey is the questionnaire which consists of a series of structured questions designed to elicit an unbiased response from a qualified respondent. Copies of the questionnaire and the accompanying manual are available (see Cogill, 1990). In designing the questionnaire, a review was made of survey formats beings developed by the World Bank to ensure comparability with large scale multi-subject surveys being carried out elsewhere. These surveys are being undertaken as part of the study of the impact of structural adjustment programmes in selected African countries.

The following sections outline the instruments (questionnaire), procedures for conducting the survey (training, sensitization, etc), timing and sampling. A brief note has been appended on the data entry, cleaning and analysis procedures.

### 2.1 Survey Instruments

The data collection methods were based on three techniques:

a) interviewing of appropriate respondents, usually mothers of children under five years,
b) observations, especially of physical household amenities, and
c) measurements of weights and heights of children under five years of age.

The questionnaire was divided into thirteen sections or modules. Each of these modules included values or observations for variables measured at the household or individual level data (refer to the questionnaire). The procedures for measurements and questioning were detailed in the manual prepared for the survey (Cogill, 1990). The structure of the questionnaire was designed to enable linkage of each part for future analysis. The modules are:

1. household location and identification,
2. household demographic structure,
3. housing and assets, employment and income,
4. food and items consumed,
5. household expenditures,
6. child education and health attitudes (diarrhoea),
7. basic information on health and nutrition for child identification,
8. child feeding patterns,
9. child anthropometry,

10. child morbidity,
11. child immunizations,
12. reproductive history of household women (child mortality),
13. pregnancy survival of sisters of adult women (maternal mortality).

Interviews were conducted by trained enumerators with the appropriate respondents, usually mothers of the under-fives in the households. In addition to questions to qualified respondents, a number of measurements were taken.

### 2.2 Survey Team Selection, Training, and Deployment

Critical to the success of any survey is the careful selection, training and supervision of the team members. All the team members were selected on criteria among others things, based on their academic and professional experience, languages spoken, their empathy with the respondents and their willingness to work under difficult conditions. This latter requirement was particularly necessary in the North where large distances had to be covered.

All team members, including the assistant managers, supervisors and enumerators had to be trained before deployment to the field. The assistant managers and the supervisors had five days of training conducted in Windhoek between 19 and 25 February 1990. At this time further revisions were made to the questionnaire based on the comments of the staff and the responses from some test households.

The trained assistant managers and the supervisors became the trainers of the enumerators and clerks who had seven days of training conducted in a location in the North from 25 March to 1 April 1990.

The classroom training was based on the Enumerators Instruction Manual (Cogill 1990) and on the questionnaire itself. Descriptions of the measurement techniques used are given in Appendix E.

Translations of questionnaire were made from english to Oshidonga and Oshikwanyama, the languages of the north. Key words and other technical terms were all translated into the local languages.

The field and practical training (including a pilot survey) enumerated selected households in the North as well as earlier in Katutura. Each enumerator had the chance to weigh and measure the length of a child using the hanging spring balance and the length measuring board. All had a chance to interview a family and complete all the sections of the questionnaire.

Techniques to determine the ages of children, to measure their weights and lengths to one decimal place were practised under strict supervision in the field during the two pretest days.

## 2.3 Organization of the Fieldwork

The survey operations were managed by a team leader, supported by two assistant team leaders, one for the North and the other for Katutura, near Windhoek. Each of the two assistant team leaders were in turn supported by supervisors and a clerk. Each supervisor was responsible for one trained enumerator and one assistant enumerator or helper. Every supervisor was responsible for data collection in their assigned study locations.

## 2.4 Timing

The timing of the survey was chosen to ensure compatibility with earlier studies in Katutura and to straddle the series of celebrations around Independence. Both the "Katutura Revisited" (Garnier, 1986) and Oxfam Study (Hughson, 1986) were conducted during the first quarter of the year. In addition the DHNW 1988/89 survey of rural Namibia (Rossouw and Tonder 1989) covered the latter half of 1988 and the first quarter of 1989. It is important to be able to reduce the strong seasonal patterns that affect current nutritional status, morbidity, food availability and incomes.

A total of 21 enumerators collected data on 1,561 households over a two month period from 2 April 1990 to 18 May 1990, with the majority of the enumeration completed by the end of April.

## 2.5 Cooperation from the Households and Community

The survey was conducted during a period of major change in the country. Independence was achieved on 21 March 1990 with the survey taking place at the same time. Some areas of the North had been the scene of turmoil and there existed a climate of suspicion of data collection and authorities. It was essential, therefore, to seek the support of the community and households in the survey. The goodwill that arose out of the Independence celebrations, combined successfully with the hard work of the authorities and the churches in ensuring widespread participation in the study.

During visits to the households very little resistance to the survey was found. Approximately twenty-five households (1.6 per cent) refused outright to participate in the enumeration and this is well within acceptable limits for field surveys. Each enumerator visited between 70 and 103 households, or approximately six percent of the sample. Any suspicion or concerns expressed by the respondents were handled by the team staff. Participation in the survey was voluntary and the purpose and nature of the survey was explained to each respondent before interviewing began.

## 2.6 Sampling

The survey was based on a two-stage random stratified sample selected at random from the study area. For an outline of how the sampling was carried out refer to Appendix B. The two-stage stratified sample procedure was adopted in a situation of limited population data especially in the North. Due to the nature of the survey, there was a weighting to households with children under the age of five years.

### 2.6.1 Determining the sample size and location

The locations included in the survey are identified in Table 1. The sample was selected to reflect the peri-urban and rural areas of the north and the peri-urban area of Katutura. A representative sample of households was based on the mapping of the five locations. In the case of Katutura, this was based on detailed up-to-date maps provided by the Windhoek municipality, which identifies each household in the area. It must be noted that the municipality listing excludes illegal constructions and multiple occupancy of dwellings.

The listing provided by the municipality implied that Katutura consists of at least 7,550 households and the sampled 489 households represents 6.5 percent of this estimated total. More recent estimates, however, place numbers of households much higher at about 12,000. Pendleton et al. (1990) estimated the Katutura 1989 population at 47,565 which is likely an underestimate when compared with the projections of the Municipality (between 55,000 and 60,000, Du Toit 1987).

The current survey covered 3,336 Katutura residents which is roughly 5.6% of the estimated population. Katutura residents make up at least 50 per cent of the Windhoek population so that the characteristics of the Katutura sample are likely to be representative of a large proportion of the population of the city.

In Katutura, as elsewhere in Namibia, the definition of a household is not straightforward. For the purposes of this survey, a household was defined as:

> *A unit of people, not necessarily related by marriage or blood, but living together and sharing resources including consumption.*

This definition includes the live-in boarder or servant as part of the household. It does not, however, include the absent husband working on the coast. The definition is meant to reflect the social and economic activities of the household that influence its welfare at the time of the survey.

Approximately 18 per cent (or 88 households) of the Katutura sample did not have children under 15 years. Only three per cent of the northern sample had no children under 15 years. The higher percentage of childless households in Katutura reflects the fact that fewer children live in Katutura but rather remain with the extended family in the rural area (Garnier 1986). In addition, Katutura has a high proportion of households of young adults seeking or engaged in employment.

The absence of pre-schoolers (children under five years of age) is most evident in Katutura with 42 per cent of households having no children under five, compared with the total sample average of 28 per cent. Tsandi has a high percentage of households without pre-schoolers (38.3 percent) compared with 25.7 percent for Onyaanya and 24 percent for Engela. All households in the peri-urban area of Oshikati have pre-schoolers.

Sampling in the peri-urban Oshikati/Oluno area provided more of a challenge. No reliable census has been undertaken in the north and it was necessary to use a combination of aerial photographs from 1985 with ground observation for the peri-urban areas. The aerial photos

were carefully traced and the location of the housing plotted. Cluster of houses, including the shanty towns, were identified and numbered into 13 clusters. Households were randomly selected within each of the clusters.

The selection of the study area in the Peri-Urban North was straightforward given the recent rapid growth in the area. The choice of the rural locations was more difficult. After consultation with local and church officials it was decided to focus on three main locations. They were selected to be representative of areas of the north, in particular reflecting the special problems of a high concentrations of returnees and the persistence and severity of conflict of the past fifteen years. Another important factor was the level of support that could be expected from the communities.

Three rural locations were selected: Tsandi, Engela and Onyaana. The Tsandi region covers the Uukwaluudhi area and the term "Tsandi or Otshandi" is used to refer to this area. Similarly, Engela and Onyaanya are the main centres but the study area includes selected wards around these points.

Earlier maps of the North (prepared in the mid-seventies) enabled a mapping of the three rural areas to be prepared. It is thought likely that the Oshikati/Oluno population is in the vicinity of 50,000 to 75,000 with a permanent population closer to the lower boundaries.

The Survey covered 1,886 Oshikati/Oluno residents in 299 households which is about 2 percent of the population. The Tsandi region has about 70,000 people and the sample included 1,883 Tsandi residents in 277 households or approximately 2.7 percent of the total population. An estimate of the sampling percentage for Engela and Onyaanya is difficult because of the absence of reliable population estimates, but the areas are though to be approximately the same size as the Tsandi region.

The Northern sample of 5,251 people is expected to be close to about one percent of the Northern Namibia population (see Appendix A, Table A.1). In summary, the following are the estimated percentages of the population represented by the sample:

| | | Approximate percentage of the total population |
|---|---|---|
| 1. | Katutura | 5 |
| 2. | Peri-Urban North | 2 |
| 3. | Ovambo North | 1 |
| 4. | Onyaanya | 2 |
| 5. | Engela | 2 |
| 6. | Tsandi | 3 |

## 2.7 Supervision, Validation and Editing of Data

The data collection exercise began in the field on 2 April 1990 and ended on 18 May 1990. All the five areas had transport available to facilitate movement of enumerators and supervisors. Each supervisor made supervisory visits regularly to each enumerator. Field

checks were made which included checks on accuracy of measurements to evaluate the reliability and quality of the anthropometric data and the age reporting.

Interviews with the appropriate respondents were also witnessed from the beginning to the end. These checks were meant to gather information on the enumerator performance and equip the supervisors and managers with the ability to correct any non-sampling errors that might be identified.

Three editing clerks were deployed in the field offices, one in Katutura and two in the North. These undertook manual editing of the questionnaires as soon as the were received from the field. More extensive editing and data cleaning was performed at the central office.

### 2.8 Limitations of the Survey and Data

This survey attempted to collect data from a minimum sample of approximately 1,500 households, 1,000 in the North and 500 in Katutura. It was estimated before the survey started that this sample size was the maximum achievable in the circumstances prevailing and given the resource limitations. It was no feasible to design a sample which would be representative of the whole of the whole country, or even of the whole of the North.

Within the study areas, the selected households were selected at random. Within the constraints of sampling error, therefore and given the provisos outlined below, the results of the sample can be considered to be representative of the five study areas. Because these areas themselves were chosen deliberately, however, it is not possible with any certainty to say that results from the whole survey are representative of any wider area. The survey totals, means and other estimates cannot be considered to represent the whole of Namibia or even any one part, other than the selected study areas.

This does not necessarily mean, however, that the survey results cannot be used to provide an indication of the situation of women and children in other areas of the country. Any interpretation of this kind will need to be undertaken with considerable care. It will be necessary to consider to what extent the study areas can be considered to be similar to other locations and what effect key differences will make. To a large extent this will be a matter of judgement, the design of the survey precludes any formal estimation of sampling error for estimates outside the five study areas.

The enumeration faced a number of technical problems. In the North movement from household to household was not always easy because of the large distances involved. Replacement of non-respondents and absent households was done according to criteria set beforehand and with consultation with the supervisors. Replacement was carried out mainly in the urban and peri-urban locations. Re-visits by appointment was carried out on households where necessary and this meant that the enumeration took a little longer than originally envisaged.

Surveys relying on respondents recalling recent and past events are prone to biases. These errors were largely recognized and corrective action was taken where possible. For example, complementary questions were included in the questionnaire in order to check on the consistency of answers. Respondents who deliberately modify their responses to distort the

information provided are a nagging problem in any household survey. In this case, it is thought that this problem is most common for the questions on cattle ownership and income. These data, therefore, are likely to be under-reported to some extent. It is still possible to use the data, however, provided that analysis is limited to relative statements rather than the estimation of absolute values. For example, it may be possible to say that group A earns twice as much as group B but not to determine the average income of either group.

### 2.9 Data Entry

The survey questionnaire was precoded to include only numeric data to make it easier for direct data entry. A dBASE III+ programme was prepared for data entry. Data were entered directly into three desktop IBM compatible microcomputers by two shifts of three data entry clerks who were specially trained for the task. Minimal data cleaning was undertaken at this stage but all questionnaires had been manually checked for completeness and consistency especially of key identification variables such as the household identification code.

### 2.10 Data Cleaning

Soon after the data entry, data cleaning was undertaken by the survey management team. All the questionnaire sections were cleaned separately. The exercise took six weeks to bring the data set up to acceptable levels of consistency. Both dBASE III and SPSSPC+ as well as other software were used in cleaning. Reference to the original questionnaires was necessary in order to correct identified errors.

### 2.11 Data Analysis

All data were compiled and analyzed by computer using SPSSPC+ (Ver. 3.1) as well as other software (CASP, Lotus, and various graphics programmes). Standard parametric statistical tests were performed on variables classified according to three main criteria:

1. Location (five areas)
2. Gender of head of household
3. Returnee status

In addition to descriptive statistics being presented and compared, data were also analyzed using multiple regression. A discussion of the procedures used is given in the relevant sections in the text.

## Chapter 3 Household Description

### 3.1 Sample Size

The distribution of households is presented in Table 1. As noted above, the 1,561 households represent a random sample of Katutura, Oshikati/Oluno, Tsandi, Engela and Onyaanya regions. The Northern households include 5,251 people, approximately 1 per cent of the Ovambo total. Percentages of the population for Tsandi and Katutura are in excess of three percent of the total (Table 2).

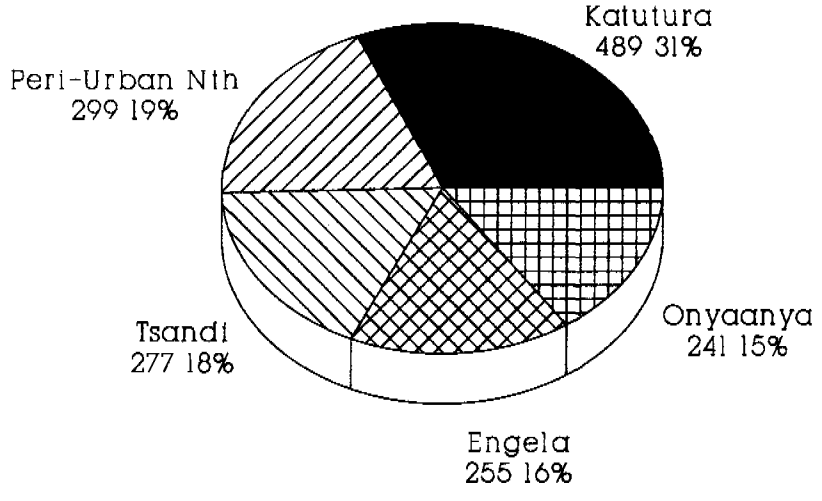
Table 3 shows the key characteristics of the sample households. They sample includes urban, peri-urban and rural populations. In addition, there is a high proportion of female headed households (41.6 per cent of households) and a reasonable representation of returnees. The number of returnees, 636 or 6.1 per cent of the sample, is though to be reasonably close to the proportion of returnees in the total population of the North. During 1989, about 44,000 people are thought to have returned to this area. While the majority of returnees returned to homes in the rural north, Katutura attracted 21% of the survey returnees (Table 2) which is close to the actual percentages of returnees that now reside in Katutura. The data show that returnee adult males are more common than females. In a later section, the employment activities and general welfare of returnees are discussed. There is mounting concern for the social and economic welfare of the 44,000 returnees.

The age and sex structure in Table 2 reveals some important aspects of life in Namibia; namely the absence of adult males in rural areas. The pattern of migratory males is common in Southern Africa. Temporary absences tend to become permanent and the high proportion of female headed household results. In the Rural North, for example, there were 30 per cent more women aged 15 to 50 years than males in the sample households. In addition, the situation of children remaining in rural areas is quite evident. Katutura has fewer children and the Rural North greater numbers relative to the numbers of adults (Tables 2 and 3).

**Table 1: Location and Number of Survey Households**

| Location | Number of Households | Percentage of Sample |
|---|---|---|
| WINDHOEK: | | |
| PERI-URBAN | | |
| Katutura | 489 | 31 |
| NORTH: | | |
| PERI-URBAN | | |
| Oshikati/Oluno | 299 | 19 |
| RURAL | | |
| Onyaanya | 241 | 8 |
| Engela | 255 | 16 |
| Tsandi | 277 | 17 |
| Total | 1,561 | 100 |

**Figure 3: Distribution of Survey Households**




**Source: Unicef Namibia Survey 1990**

**Table 2: Age and Sex Structure of Households and Returnees by Location**

**All Households**

| | All Regions | | Rural North | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| Age (yrs) | | | | |
| 0- 4.9 | 851 (8) | 901 (9) | 399 (8) | 438 (8) |
| 5-14.9 | 1496 (14) | 1528 (15) | 940 (18) | 945 (18) |
| 15-29.9 | 1460 (14) | 1468 (14) | 571 (11) | 588 (11) |
| 30-54.9 | 913 (9) | 1056 (10) | 276 (5) | 505 (10) |
| 55+ | 321 (3) | 474 (4) | 229 (4) | 360 (7) |
| Total | 5041 (48) | 5427 (52) | 2415 (46) | 2836 (54) |

| | Katutura | | Peri-Urban North | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 0- 4.9 | 222 (7) | 218 (6) | 230 (12) | 245 (13) |
| 5-14.9 | 371 (11) | 377 (11) | 185 (10) | 206 (11) |
| 15-29.9 | 625 (19) | 533 (16) | 264 (14) | 347 (18) |
| 30-54.9 | 469 (14) | 393 (12) | 168 (9) | 158 (8) |
| 55+ | 68 (2) | 60 (2) | 24 (1) | 54 (3) |
| Total | 1755 (53) | 1581 (47) | 871 (46) | 1010 (54) |

**Returnees**

| | All Regions | | Rural North | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 0- 4.9 | 44 (7) | 42 (7) | 30 (7) | 32 (8) |
| 5-14.9 | 40 (6) | 39 (6) | 30 (7) | 26 (6) |
| 15-29.9 | 188 (30) | 127 (20) | 136 (33) | 75 (18) |
| 30-54.9 | 115 (18) | 39 (6) | 52 (13) | 27 (7) |
| 55+ | - (-) | 2 (0) | - (-) | - (-) |
| Total | 387 (61) | 249 (39) | 248 (61) | 160 (39) |

| | Katutura | | Peri-Urban North | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 0- 4.9 | 4 (3) | 3 (2) | 10 (11) | 7 (8) |
| 5-14.9 | 8 (6) | 6 (4) | 2 (2) | 7 (8) |
| 15-29.9 | 34 (26) | 32 (24) | 18 (19) | 20 (21) |
| 30-54.9 | 34 (26) | 10 (8) | 27 (29) | 2 (2) |
| 55+ | 2 (1) | - (-) | - (-) | - (-) |
| Total | 82 (62) | 51 (38) | 57 (61) | 36 (39) |

Percentages of people in each age grouping for each location in parentheses.

**Table 3: Some Characteristics of Survey Households**

| | HH size | Female headed | No under fives | Under-5 yrs | Under-15 yrs | HH Members absent |
|---|---|---|---|---|---|---|
| | | --- % households --- | | ---------- % of members ---------- | | |
| Katutura | 6.8 | 36 | 42 | 12 | 33 | 25 |
| Peri-urban North | 6.3 | 40 | - | 29 | 45 | 12 |
| Rural North | 6.8 | 45 | 30 | 16 | 50 | 16 |
| -Onyaanya | 6.8 | 46 | 26 | 16 | 51 | 17 |
| -Engela | 7.2 | 49 | 24 | 17 | 53 | 16 |
| -Tsandi | 6.4 | 40 | 38 | 14 | 47 | 13 |
| ALL REGIONS | 6.7 | 42 | 28 | 17 | 44 | 18 |

HH Members Absent refers to the percentage of the current household away from the household for extended periods.

### 3.2 Household Structure

Higher dependency ratios among rural households means higher demands on limited resources and less time for women to be involved in income enhancing activities. The high frequency of female headed households[1] contrasts with the findings of Pendleton et al. (1990) who found 18 per cent in Katutura compared with 36.2 per cent for the current survey. The survey results illustrate the large percentages of female headed households in both rural and urban areas (Table 3 and Figure 4). These findings have important implications for development programmes and the legal system.

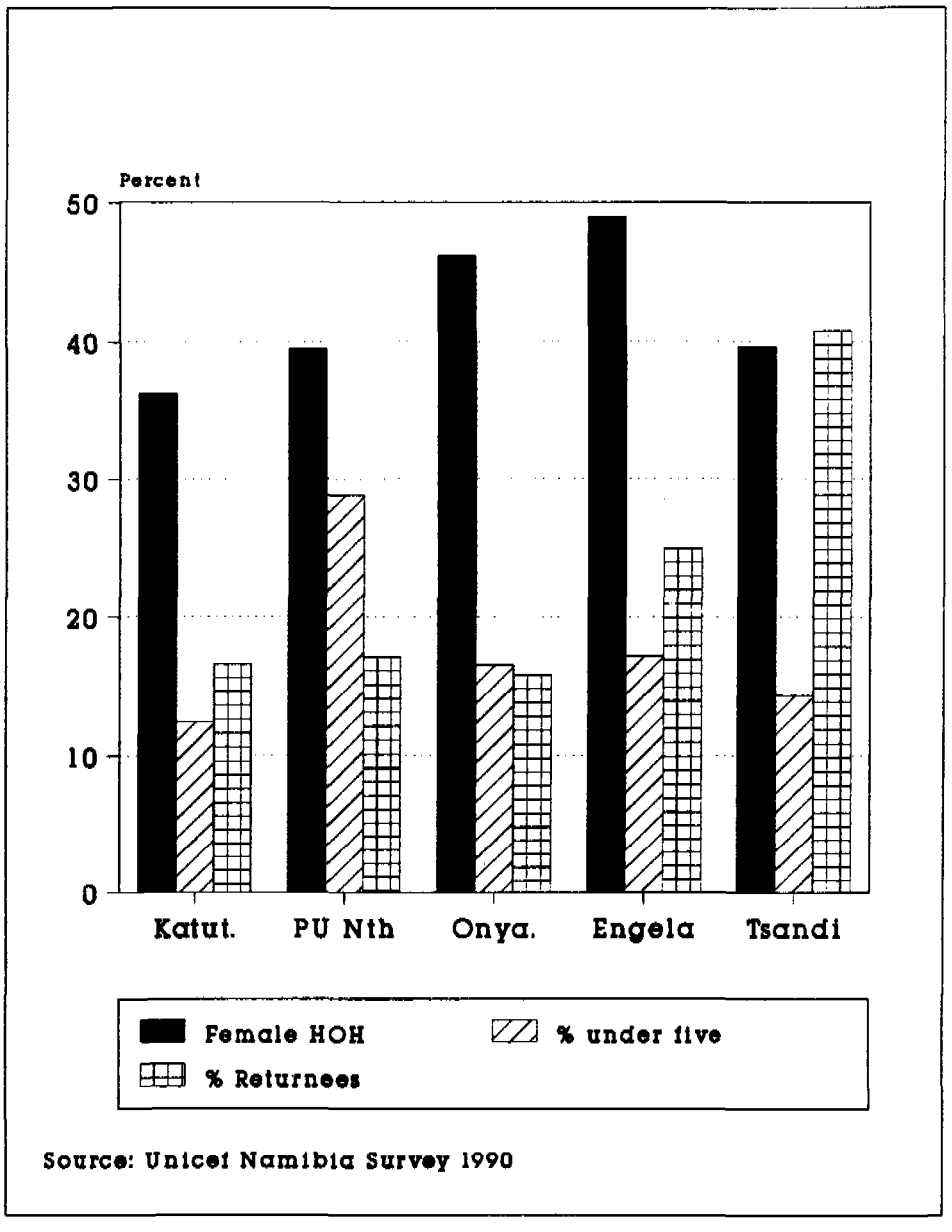
The results for Engela for this study will demonstrate a pattern that is suggestive of problems. We begin here by noting the high percentage of female headed households. Female headed households are, on average, significantly larger by about two people indicating the burden on these households.

Household sizes are quite similar between the study locations. The household sizes encountered in the survey ranged from the smallest of 1 member to a maximum of 29. Pendleton's 1988 study of Katutura found a similar household size for Katutura while the comprehensive Windhoek municipality study (Du Toit 1987) found the household size to be 5.8. Yet while household size for the study was consistent with other studies and it was uniform across the country, the results from Table 2 suggest a different age and gender structure.

---

[1] Female headed households are defined in terms of the determinants of welfare of women and children. If a woman, in the absence of a partner, is a caretaker of a child or group of people such that they are dependent for resources (e.g. food, clothing, fuel, health care etc) she is the head of household. If her partner is there infrequently but brings or sends money or cash-in-kind then she retains her status as head of household. Note that in the current survey, approximately 7 per cent of households have women with partners who visit occasionally. The remaining 33 per cent are women heads of households without partners.

**Figure 4: Female Headed Households, Under Fives and Returnee Households**




Source: Unicef Namibia Survey 1990

**Table 4: Some Characteristics of Survey Households with Returnees**

| | No. Hhs | Percent of all Hhs | Adult Male /Female ratio | Percent Persons Under 5 | Percent Persons Under 15 | Percent Female Headed |
|---|---|---|---|---|---|---|
| Katutura | 81 | 17 | 2.0 | 10 | 28 | 27 |
| Peri-urban North | 51 | 17 | 1.1 | 24 | 44 | 38 |
| Rural North | 211 | 27 | 1.2 | 14 | 48 | 42 |
| -Onyaanya | 38 | 16 | 1.3 | 12 | 47 | 55 |
| -Engela | 69 | 25 | 1.1 | 17 | 49 | 38 |
| -Tsandi | 69 | 41 | 1.1 | 13 | 46 | 40 |
| All Areas | 343 | 22 | 1.3 | 15 | 42 | 36 |

The Peri-Urban Area of the North is characterized by younger households with more women. Children from this area are approximately 7 months younger than children from all the other locations and there are larger numbers of pre-schoolers in these households. In addition to younger children (Figure 4), the rapidly growing Peri-Urban area has a large number of young women. In a later chapter (Chapter X), we will find that these women are having children earlier and in greater numbers that Katutura or Rural women.

Katutura has the least number of households with pre-schoolers possible reflecting the location of children in the rural areas. Only 33 per cent of members of Katutura households are below 15 years of age. In other areas of the country, this figure approaches 50 per cent. Katutura households have the largest number of family members not present at the time of the survey reflecting the transient nature of the Katutura households (Table 3). One in five households members in Katutura are absent from the Katutura home. The people of Katutura, a twenty-five year old settlement, are people from somewhere else and going somewhere. As Pendleton's (1974) work on Katutura in the sixties is titled:

*"... a place where we do not stay..."*

Onyaanya has a larger representation of women, a high number of female headed households and a high percentage of people away from the household (absenteeism -- Table 3) compared with other rural locations.

### 3.2.1 Returnees

A major concern of the study is the situation of returnees. Some demographic characteristics of returnees are presented in Table 4 and Figure 4.

Note that 636 people (or 6 per cent of the total sample) live in 343 households throughout the study area. Returnees do not only live with returnees. In fact, only 12 houses were made up of exclusively returnees. The 636 returnees of the study share a household with a total of 2,796 people or 27 per cent of the total sample. These numbers reflect that over one in five households included at least one returnee.

In the North, returnees were evident in over one in four households (Table 4) with Tsandi having the highest concentration. The representation of returnees in the sample approximates the official estimates of 44,000, most of whom returned to the North.

A review of the male and female numbers in Table 2 for returnees indicates that there are more adult male returnees. The male to female ratio in Table 4 confirms the trend in Table 2. Katutura has attracted a large number of adult male returnees (ratio is 2:1). Later in this report, the low level of employment among these men will be discussed (Table 15). This disconcerting relationship between numbers of adult male returnees and low employment must be a source of concern.

In general, households with returnees tend to have fewer pre-schoolers on a percentage basis especially in the Peri-Urban North and Katutura. Again this reflects the additional adult males in these households. Onyaanya,with its high female population, has the highest percentage of returnee households that are female headed (over 55 per cent -- Table 4).

### 3.3 Household Language and Religion

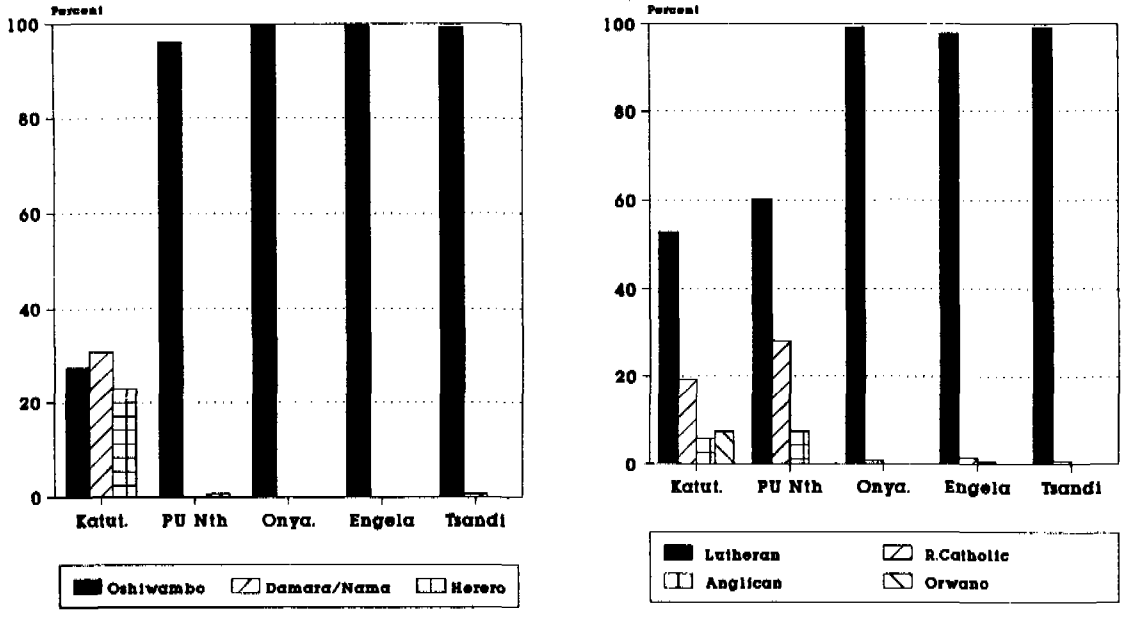
An understanding of the language and religious affiliations of households has practical implications for policy makers. Namely, these aspects of a person's cultural environment are important in facilitating effective and targeted communication. A knowledge of the spoken language will assist in tailoring education and extension interventions. Religious denomination is important as the church has played an integral role in maintaining a social and cultural thread during years of occupation and turmoil.

This study did not set out to determine ethnicity as it was not considered relevant to the types of actions to be taken to improve the overall well-being of Namibians. However, by carrying out the survey in the North, an majority of one ethnic group in the sample was inevitable. In Katutura ethnicity was not used for stratification; the aim of the sample was to achieve a cross-section of socio-economic groups.

The lack of an ethnic classification does hinder the analysis in one aspect. Earlier studies in Namibia invariable classify the sample (or population) by ethnic group or race. For comparison purposes, it is useful to be able to categorize by ethnic group. In the present study, the focus is on socio-economic group and the closest approximation to ethnicity remains language. These data are presented in Table 5 and Figure 5.

Not surprisingly, Oshiwambo is the most common language in the north. The different languages spoken in Katutura are of relevance to improving communications with the people. The percentages of the different languages for the current study are close to those listed by Pendleton et al. (1990) with the possible exception of a larger proportion speaking Oshiwambo and less speaking Afrikaans. Languages listed under "other" include Xhosa, Kavango, Tswana, Portuguese, English and German.

**Figure 5: Language and Religious Denomination**




Source: Unicef Namibia Survey 1990

**Table 5: Main Languages Spoken and Religious Denomination of Survey Households by Location**

a: Language

| | Owambo | Damara/ Nama | Herero | Afrikaans | Other |
|---|---|---|---|---|---|
| Katutura | 27 | 31 | 23 | 12 | 7 |
| Peri-Urban N | 96 | 0 | 1 | 0 | 3 |
| Rural North | 100 | 0 | 0 | 0 | 0 |
| -Onyaanya | 100 | 0 | 0 | 0 | 0 |
| -Engela | 100 | 0 | 0 | 0 | 0 |
| -Tsandi | 99 | 1 | 0 | 0 | 0 |
| All regions | 76 | 10 | 7 | 4 | 3 |

**Table 5: Main Languages Spoken and Religious Denomination of Survey Households by Location**

b: Religion

| | Lutheran | Roman Catholic | Anglican | APC | Orwano | Other |
|---|---|---|---|---|---|---|
| Katutura | 53 | 19 | 6 | 3 | 7 | 12 |
| Peri-Urban N | 60 | 28 | 7 | 1 | 0 | 3 |
| Rural North | 79 | 3 | 17 | 0 | 0 | 0 |
| -Onyaanya | 99 | 1 | 0 | 0 | 0 | 0 |
| -Engela | 98 | 1 | 0 | 0 | 0 | 0 |
| -Tsandi | 99 | 1 | 0 | 0 | 0 | 0 |
| All regions | 67 | 13 | 12 | 1 | 2 | 4 |

The heading "Other" refers to both Protestant denominations and no religion. APC is the Apolistic Church.

Religious denomination in the North is largely Lutheran (80 per cent plus) but is more diverse in Katutura. The comparison with the 1988/9 study (Pendleton et al. 1990) indicates the current study has fewer Roman Catholics but similar levels of the other denominations.

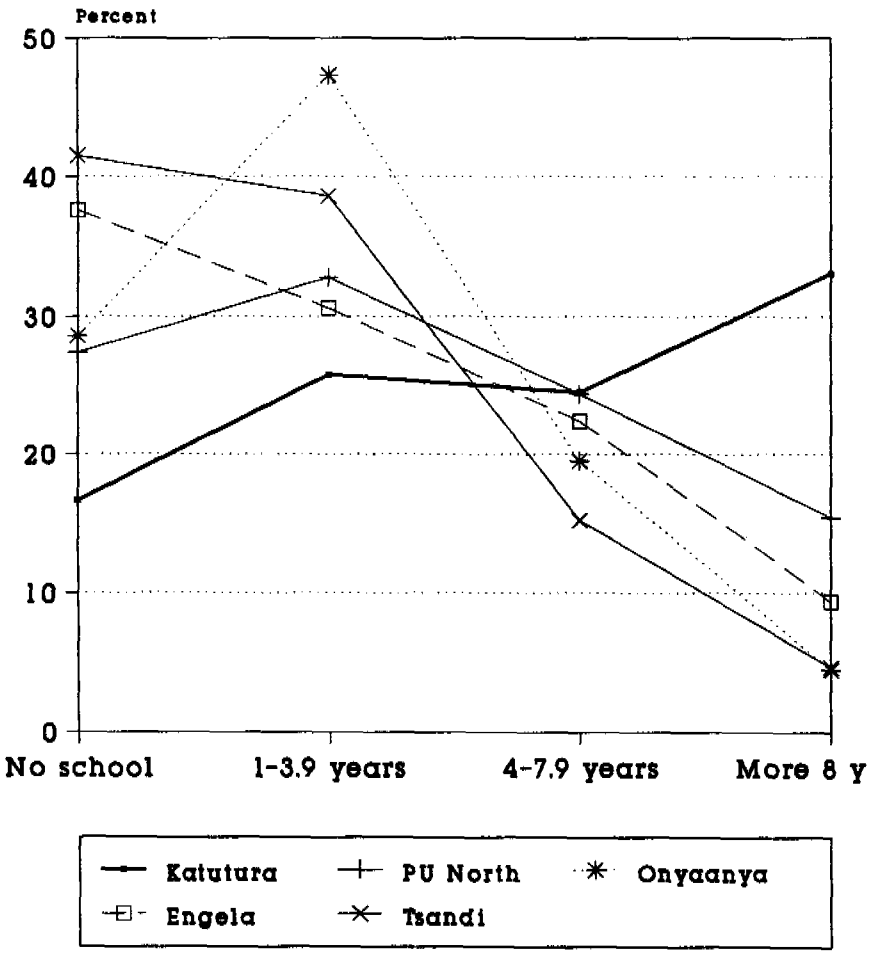
### 3.4 Gender of Head of Household and Returnee Status

A comparison of female and male headed households indicates no difference in either language or religion for the North. In Katutura, female headed households were significantly more evident in households speaking Damara/Nama (39.5 per cent versus 25.6 per cent for male headed) and Herero (31.1 per cent versus 18.3 per cent for male headed). This is likely a reflection of the proximity of Katutura to the areas where the Damara/Nama and Herero speakers come from. Absence of husbands are more likely if employment is sought by these groups outside the Windhoek region. In contrast, the Oshiwambo speakers in Katutura were more likely to be male headed (14.7 per cent vs. 34.6 per cent for female headed). No differences were found for household religion by gender of head of household. Similarly, no differences were found when comparison were made of religion and language between households with returnee members and households without returnees.

### 3.5 Household Head Education

Data on the level of education and on literacy was collected for the head of the household and the spouse of the head. It was necessary to analyze the data by gender of head of household for two reasons. First, women tend to receive less education than men in many countries and societies and second, female headed households are so widespread in the sample. The results are presented in Table 6. The results for the combined data are also presented in Figure 6.

**Figure 6: Education Levels of Head of Households**




Source: Unicef Namibia Survey 1990

**Table 6: Education Level of Head of Household for Male and Female-headed Households by Location**

| | No Schooling | | | 1 to 4 Years | | | 4 to 8 Years | | | 8 or More Years | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | Tot | M | F | Tot | M | F | Tot | M | F | Tot |
| Katatura | 17 | 16 | 17 | 27 | 24 | 26 | 21 | 31 | 24 | 36 | 29 | 33 |
| Peri-Urban N | 24 | 33 | 27 | 37 | 26 | 33 | 25 | 23 | 24 | 14 | 18 | 15 |
| Rural North | 26 | 49 | 36 | 46 | 30 | 39 | 21 | 16 | 19 | 8 | 4 | 6 |
| -Onyaana | 25 | 32 | 29 | 48 | 46 | 47 | 22 | 17 | 20 | 5 | 4 | 4 |
| -Engela | 22 | 54 | 38 | 41 | 20 | 31 | 24 | 21 | 22 | 14 | 5 | 9 |
| -Tsandi | 29 | 58 | 42 | 47 | 27 | 39 | 18 | 11 | 15 | 6 | 3 | 5 |
| All Regions | 22 | 37 | 28 | 38 | 28 | 34 | 22 | 22 | 22 | 18 | 13 | 16 |

Statistical comparison of female and male headed households indicate highly significant differences in frequencies (Chi-square=46.5; P<.001).

The above data show a clear distinction between the education levels of the North and Katutura and between the Peri-Urban North and the Rural North. Not only are the urban heads of households better educated, they are twice as likely to have been to secondary school.

### 3.6 Gender of Head of Household

The comparison of the education levels of male and female headed households (Table 6) shows significant and lower education levels among women heads of households. Most striking were the poorer education levels of women found in the rural areas of the north. This low level of education has important implications for communication and literacy. Wives of male heads of households were more likely not to have attended school than their husbands. Interestingly, wives were more likely to be able to read than their husbands in all locations.

Women who head households were significantly older (50.8 years) than their male household heads (47.5 years) for the whole sample and by 4 years in the peri-urban areas of the north and Tsandi area. Older women who are head of households would be expected to have lower education levels, but the differences found in Table 6 must also be explained in terms of poverty.

The 1988/89 Rossouw and Tonder report (1989) shows that 48 per cent of their sample of 3,067 non-white and non-Ovambo women had no or limited schooling with the same number having difficulty reading. These data for 1989 are comparable to the rural North results for the current study.

When asked about the head of household's ability to read a letter, newspaper or bible the respondents gave answers that closely approximate the results for education level. In other words, assuming that illiterate people are more likely not to have attended any school, the head of households ability to read closely approximated the results for percentages of "no schooling" (Table 6). In Engela and Tsandi, over 33 per cent of household heads cannot read. Similarly, 84 per cent of male headed household heads can read compared with 69 per cent

of female heads (P<.001 using Chi-square=47.5). The lower education levels of female household heads demands further attention.

**Table 7: Education Level of Head of Household for Returnee and Non-Returnee Households by Location**

| | No school | | 1 to 4 Yrs | | 4 to 8 Yrs | | 8 or More Yrs | |
|---|---|---|---|---|---|---|---|---|
| | R | NR | R | NR | R | NR | R | NR |
| Katutura (n=81:408) | 10 | 18 | 42 | 22 | 18 | 26 | 30 | 34 |
| Peri-Urban N (n=51:248) | 26 | 28 | 37 | 32 | 18 | 26 | 20 | 14 |
| Rural North (n=211:562) | 36 | 36 | 39 | 39 | 17 | 20 | 8 | 5 |

R -- Returnee; NR -- Non-Returnee household.
The sample size for Returnee and Non-Returnee households are in parentheses. R is Returnee household and NR is Non-Returnee household. Statistical comparison of returnee and non-returnee households indicates significant differences in frequencies for Katutura only (Chi-square=14.7; P<.01).

### 3.7 Household Education and Returnees

Households with returnee members were studied extensively in the study. Did the returnees enter into homes with different characteristics than their surrounding households? Table 7 presents the results of a comparison of education levels of the head of household of returnee and non-returnee households. Note that the head of household may not necessarily be a returnee him or herself. The results show that for the north, the education levels were similar. The only exception (not shown) was for Engela where the education level of the head of households were significantly higher (Chi-square, P<.05) for households with returnees. As noted above, the relationship of education levels with ability to read was maintained in all locations. Engela (80 per cent for returnee compared with 58.6 per cent for non-returnee) along with Katutura (96.3 per cent and 89.5 per cent respectively) have significantly higher literacy (P<.01).

An analysis of the job status of heads of households shows no differences between returnee and non-returnee households. Household sizes were significantly greater in Katutura and the peri-urban areas of the north. On average, returnee households have two extra people compared with the sample average of 6.7. These results are suggest overcrowding problems.

In summary, the above findings suggest that heads of households with returnees are younger and slightly better educated (especially in Katutura and Engela) but have larger household sizes. No major differences exist in the job status of the heads of households.

### 3.8 Housing characteristics

The length of time a family has lived in their current dwelling is presented in Table 8. Residents of Tsandi have remained the longest in their present house, on average over 10 years longer than residents of the peri-urban northern strip of Oshikati/Oluno. The latter households have recently moved to the area as a result of displacement from the rural areas due to the protracted war and economic opportunities. The resulting urbanization of the 50 kilometre stretch has created a large number of immediate and long term issues. These issues will be explored below.

While ownership or rent free accommodation is almost universal in the North, in Katutura only 4.7 per cent of households own their house. Over 71 per cent of the households were renting their houses paying an average of R160 per month. The current result is the same as was paid in 1986 of R101 per month (Garnier 1986) if inflation of approximately 16 percent per annum is taken into account. In a later section we will examine the current income levels of the respondents and will determine if the levels of income are comparable with the 1986 survey of 706 houses.

**Table 8: Length of Time in Current House, House Ownership, Type of Roof and Electricity Use by Location**

| | Time in Present House (in years) | Owner Occupier (% of hhs) | Metal Roof (% of hhs) | Electricity (% of hhs) |
|---|---|---|---|---|
| Katutura | 11 | 5 | 93 | 80 |
| Peri-urban North | 7 | 100 | 74 | 5 |
| Rural North | 13 | 100 | 9 | 2 |
| -Onyaanya | 11 | 100 | 11 | 2 |
| -Engela | 11 | 99 | 6 | 4 |
| -Tsandi | 18 | 100 | 9 | 1 |
| All Regions | 11 | 71 | 48 | 27 |

Statistical tests of duration in current house shows that the Peri-Urban North was significantly less than all others (P<.001). Tsandi significantly longer than all others (P<.001) and the Rural North longer than the Katutura households (P<.001).

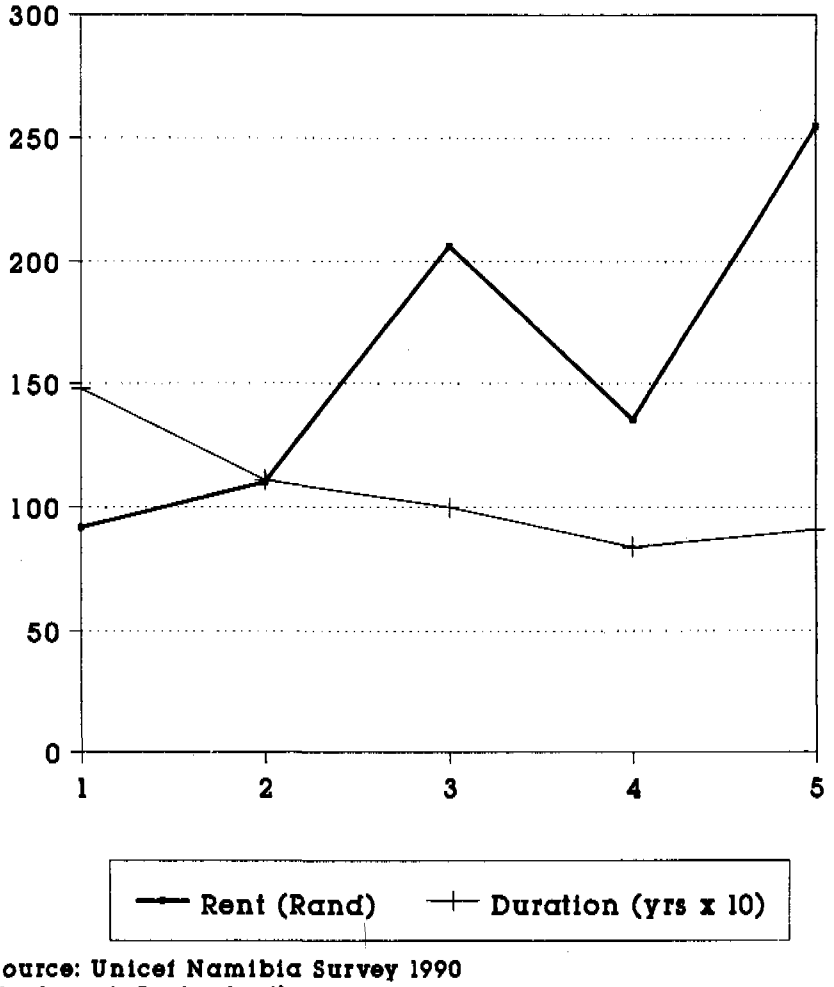
As the incomes of Katutura residents increase, so does the amount paid in rent. After dividing and ranking the Katutura households based on annual household income into five equal groups or quintiles it is possible to compare the rents paid (Table 9 and Figure 7).

The poorest 20 percent of households pay almost one third of the rent than the wealthiest households (the difference is significant at P<0.05 using an analysis of variance test). Interestingly, these same poorest 20 percent of households have lived in the Katutura area significantly longer. It is the more recent arrivals who are earning higher levels of income.

**Table 9: Rent and Duration of Residence in Katutura Categorized by the Level of household Annual Income**
(1 represents the poorest 20 %, 5 represents the richest 20%)

| | Household Annual Income Groups | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Monthly rent in Rands (F=2.3;P<.05) | 92 | 110 | 206 | 135 | 255 |
| Duration (yrs) (F=8.1;P<.001) | 14.8 | 11.1 | 10.0 | 8.4 | 9.1 |

**Figure 7: Monthly Rent and Duration by Annual Income Quintile for Katutura**




Source: Unicef Namibia Survey 1990
(1 = lowest; 5 = highest)

Renting is only part of the Katutura housing environment. Mortgages of houses accounted for 20.7 per cent of the Katutura sample of 489 households. Only one in four households in the Katutura sample have complete ownership or ownership in progress and this has important implications for poverty alleviation and wage negotiations.

Pendleton et al. (1990) found that households rented their accommodation in 51 per cent of cases and owned their houses in 46 per cent of cases. The level of ownership had increased fifty-fold from the figure from the 1968 study of Katutura (Pendleton, 1974). Clearly, the 1988 Pendleton found double the level of ownership of houses than the current study (25 per cent including mortgages). It should be noted for comparison purposes that the rent found in the 1988 study was R140 per month which is comparable to the figure of R160 per month found in 1990.

Questions on housing materials were included in the survey as a reflection of the wealth of the households, especially in the north. A metal roof was most common in the peri-urban areas (74 per cent -- see Table 8) and this was considerable greater than in the rural areas. It is not correct, however, to conclude that the Oshikati/Oluno houses are of better quality than the rural houses which are mostly roofed with thatch.

Of concern must be the overwhelming numbers of peri-urban households without electricity. While these houses are concentrated along a 50 kilometre stretch of sealed road, 85 per cent use wood for cooking. The lack of electricity and dependence on wood and plant material for lighting and cooking has important implications for deforestation.

Wood is still used for cooking in 8 per cent of Katutura households compared with 68 per cent who use electricity for cooking. The 1988 Pendleton study found that 78 per cent of the 211 households in the Katutura sample had electricity which is close to the 80 per cent figure found in the current study.

### 3.9 Household Assets

Radio, TV, refrigerator, and phone ownership was quite high in Katutura with one-third of households with a TV, 79 per cent with a radio, 61 per cent with a refrigerator and 30 per cent with a phone (Table 10). Car ownership was found in one in four households in Katutura. About 10 per cent of households in the rural North owned cars, this level increased to 12 per cent in the peri-urban area. The relatively high level of car ownership is probably related to the general lack of public transport both in Katutura and the North.

The northern households in the Survey have wide access to radios. Engela has the lowest ownership at 50 per cent of households increasing to 68 per cent in the peri-urban area (Table 10). The high use of radios has implications for communication.

The studies of 1988 and 1968 (Pendleton et al. (1990), Pendleton (1974)) found that Katutura residents had increased ownership of radios eight fold from 10 per cent to 87 per cent in twenty years. The slightly lower figure for the current study of 79 percent compares favourable with Pendleton's 1988 figure of 87 percent. Pendleton found in 1988 that 45 per cent had telephones and 48 percent had TVs. In both cases, he found a level of ownership of these items about fifty per cent higher than the current study.

**Table 10: Percentage of Study Households Possessing Various Consumer Items by Location**

| | TV | Radio | Fridge | Phone | Car |
|---|---|---|---|---|---|
| Katutura | 33 | 79 | 61 | 30 | 24 |
| Peri-Urban N | 3 | 68 | 6 | 2 | 12 |
| Rural North | 0 | 56 | 2 | 1 | 10 |
| -Onyaanya | 0 | 66 | 1 | 0 | 16 |
| -Engela | 1 | 50 | 3 | 1 | 8 |
| -Tsandi | 0 | 54 | 1 | 1 | 7 |
| All Regions | 11 | 66 | 21 | 10 | 15 |

In a later section, we will examine the income differences between the two studies to partly explain the higher ownership of housing, TVs and telephones found in Pendleton's 1988 survey.

The national rural sample conducted in 1988/89 in areas other than the North (Rossouw and Tonder, 1989) recorded the possession of the same household assets. They found figures for possession of TVs and refrigerators higher than in the rural North households, but lower than Katutura. Twenty-three percent of the 1988/89 survey households had a refrigerator and 9 per cent had a TV. While those figures were higher than for the rural households, radio ownership (53 per cent) was at the same level as the current study. Electricity was available in 24 per cent of households, a level higher than found among the rural households. The results suggest, therefore, that the North is less integrated into the modern economy than the South, but that radios are becoming increasingly more widely available and radio broadcasts will be the main method of communicating with most Namibians.

### 3.10 Employment Status of the Head of the Household

The employment status of the head of household is an important indicator of the overall well being of the household. Questions were included in the Survey covering the employment of the head of household and his or her spouse. In addition, to complement this information, the sources of income for the household was asked. The summary results are shown in Table 11.

The proportion of people reporting no employment ranges from 21 per cent in Katutura to 2 percent in Tsandi. The rural areas have lower unemployment due to the predominance of agricultural activities. It is alarming that both Katutura and the peri-urban North households display high levels of unemployment among household heads. One in five households report unemployment in these areas.

Other studies in Katutura have found 28 per cent of heads unemployed in 1988 (Pendleton et al. 1990). These figures, of course are not representative of the whole country. The

Garnier (1986) study of 706 households found that 43 percent of the adult population, including both men and women were jobless. Compare these Katutura figures with those found in the Namibia DHNW study of Rossouw and Tonder (1989). They found that 22 percent of husbands of these rural women were seeking work. Interestingly, 79 per cent of the women reported that their husbands had income, mostly from wages or salaries (92 per cent) the remaining percentage coming from small businesses, pensions, etc.

Although the determination of overall unemployment levels is impossible without a complete survey of all adults in the household, the evidence from the Survey suggests that the level of unemployment has not decreased in recent years in Katutura.

Several trends are worth noting in Table 11 which indicates the types of employment of heads of households. Rural areas in the North have a relatively high level of wage earning among heads of households (25 per cent). While not as high as Katutura (68 per cent), this figure reflects the integration of the formal sector into the rural areas. Information was not collected on the type of wage employment.

**Table 11: Employment Status of Head of Households by Location**
(Percent of Households)

| | Wage earner | Self Employed | Family Farm | House Work | Other Work | No Work |
|---|---|---|---|---|---|---|
| Katutura | 68 | 5 | 0 | 4 | 2 | 21 |
| P.U.N. | 31 | 26 | 16 | 7 | 1 | 18 |
| R. North | 24 | 2 | 62 | 14 | 1 | 3 |
| -Onya. | 29 | 1 | 65 | 0 | 1 | 4 |
| -Engela | 22 | 3 | 68 | 1 | 2 | 5 |
| -Tsandi | 21 | 0 | 45 | 30 | 2 | 2 |
| All Areas | 39 | 7 | 32 | 8 | 2 | 12 |

P.U.N. -- Peri-Urban North;

Not surprisingly, the family farm dominates activity of the heads of households in the rural North. Tsandi diverges slightly due to the listing as " House-Work" as the primary activity. Note that the heads of households are often retired and may list house-work as an activity. A final point worthy of noting is the importance of self employment in the Peri-Urban North. This region has recently seen rapid growth in various activities, especially in the informal sector. The fact that one in four heads of households are self-employed confirms this finding. The lower figure for Katutura possible reflects the embryonic nature of small businesses in the area.

Table 12: Employment Status of Male and Female Head of Households by Selected Location
(Percentage of households)

| | Wage earner | | Self employed | | Family farm | | House work | | Other work | | No work | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | M | F |
| Kat. | 74 | 55 | 6 | 3 | 0 | 0 | 0 | 12 | 1 | 3 | 18 | 25 |
| PUN | 37 | 23 | 22 | 32 | 7 | 29 | 4 | 11 | 1 | 1 | 28 | 3 |
| RN | 33 | 13 | 2 | 1 | 52 | 67 | 6 | 16 | 2 | 0 | 4 | 3 |
| All | 48 | 26 | 8 | 7 | 25 | 42 | 4 | 14 | 2 | 1 | 14 | 9 |

KAT -- Katutura; PUN -- Peri-Urban North; RN -- Rural North; All -- All regions. Sample sizes: Kat: 312:177 for male and female headed households; PUN: 181:118; RN: 419:354; All: 912:649.

**Table 13: Employment Status of the Wives of Male Head of Households by Location**
(Percentage of households)

| | Wage Earner | Self Employed | Family Farm | House Work | Other Work | No Work |
|---|---|---|---|---|---|---|
| Katutura (n=244) | 46 | 10 | 3 | 24 | 2 | 16 |
| PUN (n=176) | 7 | 28 | 19 | 43 | 1 | 2 |
| Rural N (n=102) | 10 | 1 | 64 | 25 | 0 | 0 |
| All Areas (n=822) | 20 | 10 | 36 | 28 | 1 | 5 |

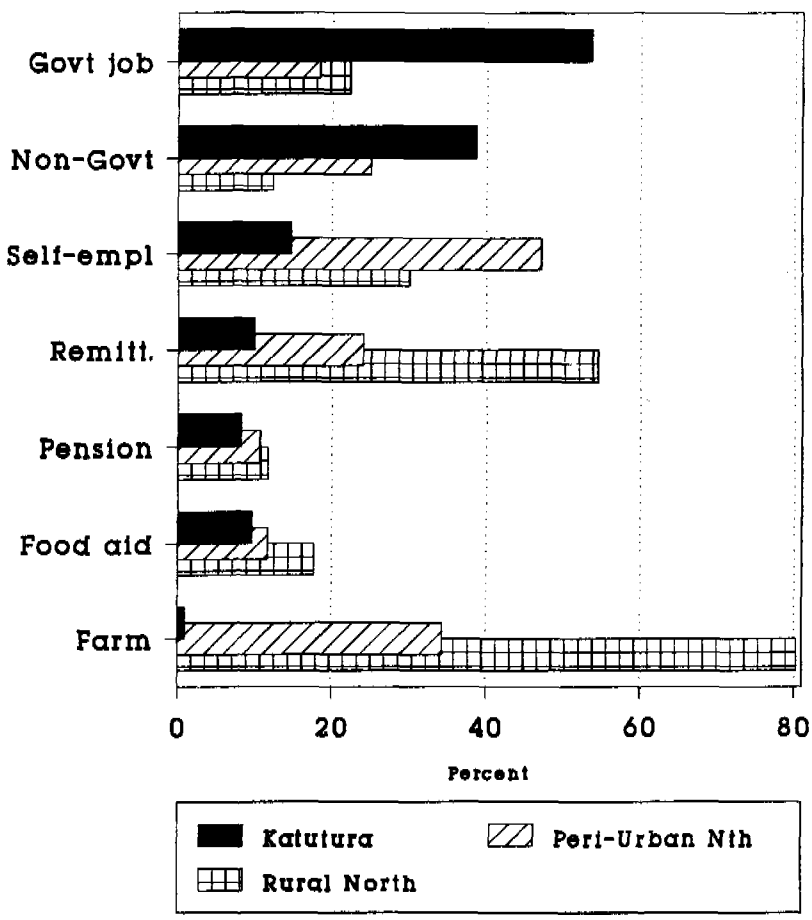
PUN -- Peri-Urban North; All -- All regions.
Numbers in parentheses are sample sizes.

### 3.11 Source of Income

So far the employment information has been presented for the head of households only. Table 14 (and Figure 8) summarises the source of income for the different locations. Some of the patterns observed with the head of household employment is repeated. Namely, self-employed income remains as significant for the Peri-Urban North. Wages from a government or non-government job were reported for over half the households in Katutura. Work for the government in the rural areas dominates the source of wage income. One in five households receive income from a government job. Self-employment is evident in both Engela and Onyaanya as in the Peri-Urban North. Households in Onyaanya rely less on the family farm than do households in the other rural areas, whereas one-third of the Peri-Urban North households still have strong links to the rural income source.

The diverse income sources of all households reflects strategies to buffer households against down turns in different sectors. It also illustrates the strong seasonal influences on level income.

**Figure 8: Income From Various Sources for Selected Locations**




Source: Unicef Namibia Survey 1990

The importance of transfer income is illustrated in Figure 8. The combination of remittances, pensions and food aid are particularity significant in the rural North. Over half of the rural households receive remittances while one third get a pension. This figure for pensions is much higher than the younger households in the Peri-Urban region and Katutura receive. Food aid figures reflect the food distribution programme as part of support to the returnees. One in four households in Tsandi receive food aid while the Rural North figure is one in four households. These data reflect the distribution of returnees in the sample.

**Table 14: Household Sources of Income from Various Sources by Location**
(Percentage of households)

| | Govt job | Other job | Self empl. | Family farm | Remittances | Pension | Food aid |
|---|---|---|---|---|---|---|---|
| Katutura | 54 | 39 | 15 | 1 | 10 | 8 | 10 |
| PUN | 18 | 25 | 47 | 34 | 24 | 11 | 12 |
| Rural N | 22 | 12 | 30 | 80 | 54 | 30 | 18 |
| -Onya. | 22 | 8 | 34 | 60 | 45 | 36 | 10 |
| -Engela | 24 | 13 | 49 | 92 | 48 | 34 | 15 |
| -Tsandi | 21 | 16 | 9 | 87 | 69 | 22 | 27 |
| All Areas | 31 | 23 | 29 | 47 | 35 | 20 | 14 |

PUN -- Peri-Urban North.

### 3.12 Gender and Household Employment

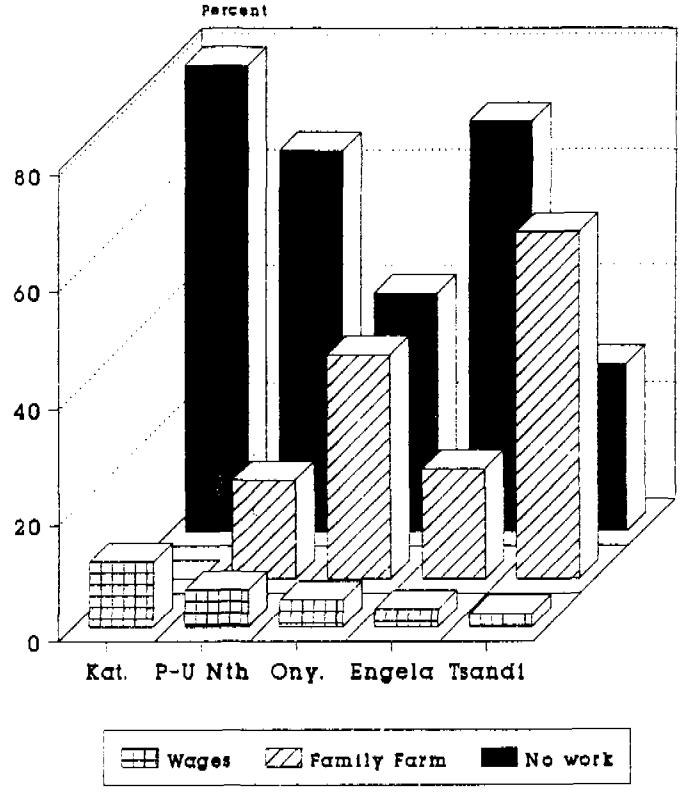
The high proportion of female heads of households demands that we examine the employment patterns by the gender of the head of the household. Table 12 lists work activities by the gender of the head of the household for some of the locations found in Table 11. Male heads are more likely to be wage employed (by at least 50 per cent) than female heads. In the Peri-Urban North where self employment is most common, female headed households are more likely to be self employed. The familiar small shops and cafes in the area are evidence of such types of employment.

Women's traditional role in family agriculture is reflected by the greater numbers of females headed households in agriculture (Table 12). The data suggest that female headed households despite their poorer education and resources, are actively engaged in income earning opportunities. In a later section, we will examine the level of income earned by female headed households in the different regions.

In addition to examining the employment of the heads of households, Table 13 presents the data for the wives of the male heads of households. These data are interesting as they illustrate that women are economically active outside the traditional activities of the home. For the whole sample, forty per cent of wives were employed outside the home or farm. This figure increases to 58 per cent in Katutura. The 46 per cent of Katutura wives that receive wages is surprisingly high. These women are employed in service jobs (e.g. domestic

workers) and the amount of money they earn is unknown, but it must be seen as an important buffer against economic change.

**Figure 9: Employment of Recently Returned Adults**




Source: Unicef Namibia Survey 1990

Furthermore, the high level of working wives in Katutura must be examined in terms of the impact that this employment has on the welfare of small children. The practice of placing small children with rural relatives for care is likely to be a practical response to the demands of maintaining incomes.

One final point on Table 13 is the familiar pattern of self employment in the Peri-Urban North. Almost 30 percent of wives are self employed reflecting the importance of the informal sector in welfare in this region.

### 3.13 Employment for Adult Returnees

The employment situation of returnee adults is presented in Table 15. The situation is decidedly worse than the head of households job position presented in Table 11. Returnee adults make up 74 percent of all returnees (see Table 2) with males dominating at

64.3 percent of the sample. The overall level of unemployment among returnees at 57 per cent with no work, is alarming. In Katutura, the returnee adult is five times more likely to be unemployed than heads of households. In Tsandi, an area with a high concentration of returnees (Table 4), the situation is slightly better with the lowest unemployment rate. Family farming absorbs most of the labour of the returnees in Tsandi.

Wage employment for returnees attracts less than 10 percent of the sample. Other than farming, the adult returnee faces a bleak employment prospect. This has important policy implications.

**Table 15: Employment Status of Adult Returnees (over 15 Years of Age) by Location**
(Percentage of households)

| | Wages | Self-emplyd | Family farm | House work | Other work | No work | N |
|---|---|---|---|---|---|---|---|
| Katutura | 11 | 1 | 0 | 0 | 8 | 80 | 107 |
| PUN | 6 | 0 | 17 | 5 | 6 | 66 | 64 |
| Rural N | 4 | 0 | 43 | 1 | 5 | 47 | 283 |
| -Onya | 5 | 0 | 39 | 0 | 9 | 41 | 45 |
| -Engela | 3 | 0 | 19 | 2 | 5 | 71 | 99 |
| -Tsandi | 2 | 1 | 60 | 0 | 6 | 29 | 139 |
| All Areas | 6 | 0 | 29 | 0 | 6 | 57 | 454 |

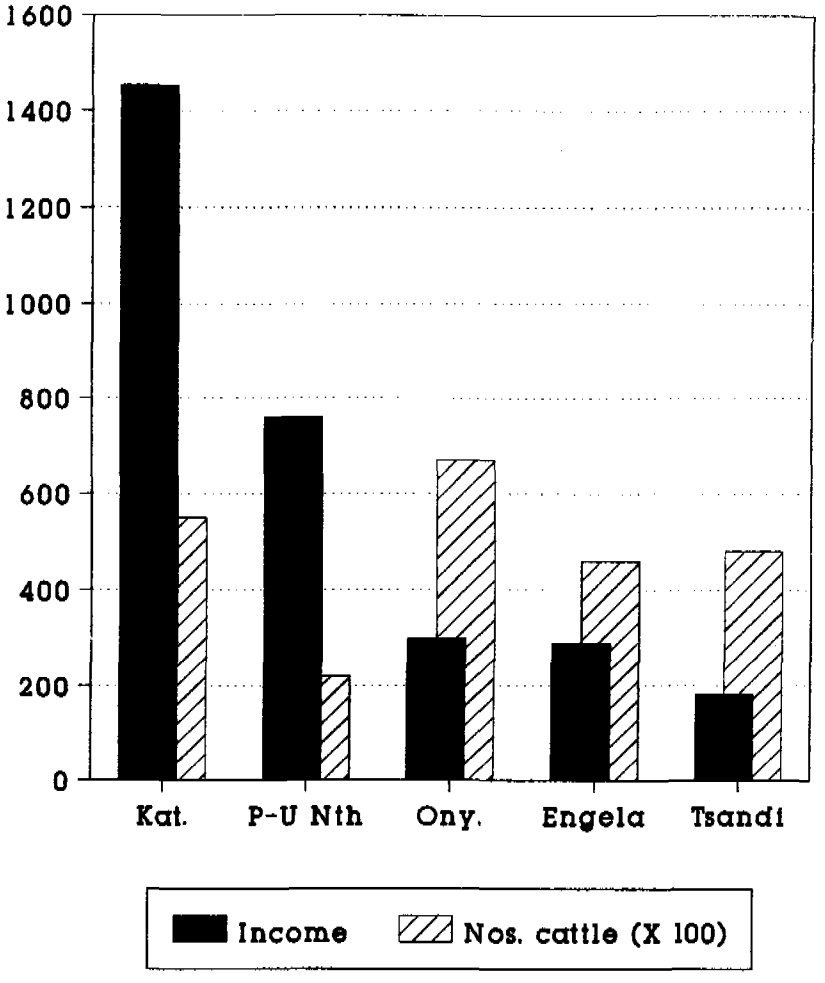
PUN refers to Peri-Urban North. N is the number of returnee adults over the age of 15 years.

### 3.14 Household Income Levels

The respondents were asked to report the amount of income earned in the previous 12 months and in the past month. We were initially apprehensive about the willingness of the respondents to report their income, and in rural circumstances, about their knowledge of their net income, given the diverse and often non-cash basis of transactions. As a result, exhaustive analysis was performed to compare the income information with complementary data on assets, rent, livestock ownership and malnutrition levels. The results were surprisingly good. While serious limitations do exist with these data, they do enable some degree of confidence especially when making relative statements. The following analysis presents only part of the available data.

The income data provides a ranking of locations into three main groupings. Katutura residents have income levels twice that of the Peri-Urban North which is, in turn, three fold greater than the rural areas (Table 16 and Figure 10). Tsandi reported the lowest income at 900 Rand per household per year. The same pattern emerges when comparisons are made of the income expressed in per capita terms. Note that the differences between Katutura and the rest, between Peri-Urban North and the rural locations are statistically significant at $P<.001$.

**Figure 10: Annual Household per Capita Income Levels by Location**




Source: Unicef Namibia Survey 1990

The reported annual income ranged from 2 to 87,480 Rand for the survey households. This wide range of income results in high standard deviations, often half of the reported means. Garnier (1986) reported Katutura incomes ranging between R 1,200 to R 3,600 per year which would be expected to be between R 2,000 and R 6,000 in 1990 levels (assuming a 16 per cent per year inflation). It would appear that since 1986 the income levels have increased or that Garnier's sample are poorer households. Pendleton et al. (1990) reports median household income for the 1988 survey of between R 7,200 to R 9,588 which is comparable with the current study value of R 7,419 per annum.

Reported income levels do not adequately reflect the income of households engaged in agriculture. To compensate for the bias against income levels for rural areas, the ownership of cattle is reported in Table 16. Cattle are important sources of wealth for Namibians. This is well illustrated by the fact that over 35 per cent of the survey's cattle are owned by Katutura residents (Table 21). While the average number of head in Katutura is among the highest (Table 16), data on the percentage of households without cattle (Table 21) indicates that ownership of cattle is highly skewed to wealthier households. In Katutura, 23.3 percent of households own cattle compared with 47.7 percent in the rural North. The Peri-Urban households have low ownership of cattle with 2.2 per households while only 17.4 percent of households possess these cattle.

**Table 16: Reported Household Income and Livestock Ownership by Location**

| | N | Income per year | Income per capita | Cattle numbers | Livestock[1] per capita |
|---|---|---|---|---|---|
| Katutura | 452 | 7419 | 1454 | 5.5 | 1.0 |
| Peri-Urban North | 276 | 4336 | 759 | 2.2 | 0.5 |
| Rural North | 739 | 1547 | 255 | 5.3 | 1.0 |
| -Onyaanya | 246 | 1802 | 299 | 6.7 | 1.2 |
| -Engela | 259 | 1986 | 290 | 4.6 | 0.8 |
| -Tsandi | 452 | 900 | 181 | 4.8 | 1.0 |
| All Regions | 1467 | 3881 | 719 | 4.8 | 0.9 |

Source: Unicef Namibia Health and Nutrition Survey, April 1990. N is the number of households with reported incomes -- note that 94 households are missing. Missing households affect the households size generally lowering the average household size.

[1] Livestock units were calculated using the current price for the animals in the North.
A livestock unit = Number cattle + (Donkeys/3) + (Goats/8).

Note the results for monthly income were similar to the annual figures and only the annual are presented. Statistical comparison of means using T-Test show for Income: Katutura was significantly greater than all other locations (P<.001). Katutura cattle and livestock significantly greater than the Peri-urban north (P<.05). The peri-urban North is significantly greater in income than the three rural areas and significantly less cattle and livestock (P<.001). Tsandi has significantly less income than all other locations including Onyaanya and Engela (P<.001). Onyaanya has significantly more cattle and livestock than either Tsandi or Engela (P<..05).

The conclusion is that the Katutura resident not only earns more income than the rural north, livestock ownership does not compensate for this loss. Katutura residents have cattle back on their farms. This reflects the diversified nature of the township economy.

Households reported that they had between 0 to 350 head of cattle. Livestock patterns are similar to that found with cattle numbers. The calculation of a livestock index was necessary to capture the diversity in types of livestock. In addition to Katutura's strong position in livestock, the households in Onyaanya are also quite active in livestock (Table 16). In a later Chapter (III), the agricultural situation in the sample will be explored.

So far the data has concentrated on average incomes. Of particular interest is the distribution of income found in Table 17. Here the data are divided into five equal categories called quintiles. The quintiles are derived using various criteria based on a ranking of all households by the annual income for the household. Three criteria were used and include the whole sample income for the All Regions averages. The Katutura and Peri-Urban households were ranked using their own income levels while the rural locations used the income for the Rural North.

**Table 17: Distribution of Per Capita Annual Income by Quintile Group and by Location (Rands)**

| | Household Income Groups (Quintiles) | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Total |
| Katutura[1] | 253 | 594 | 1105 | 1959 | 3436 | 1454 |
| Peri-Urban N[1] | 83 | 219 | 460 | 929 | 2075 | 759 |
| Rural North[1] | 15 | 54 | 138 | 244 | 837 | 255 |
| -Onyaanya | 15 | 52 | 138 | 264 | 644 | 299 |
| -Engela | 16 | 52 | 138 | 235 | 999 | 290 |
| -Tsandi | 15 | 57 | 135 | 224 | 1074 | 181 |
| All regions[1] | 31 | 150 | 307 | 804 | 2310 | 719 |

Source: Unicef Namibia Health and Nutrition Survey, April 1990

Note: Quintile 1 is the lowest and 5 is the highest rank.
[1] Ranking of survey households was carried out using various criteria. The annual income, monthly income, livestock ownership and per capita terms were used. Presented here are the results for ranking based on: Annual Household income for ALL households -- All regions category; Rural North annual household income -- Rural North, Onyaanya, Engela, and Tsandi; Peri-Urban North -- Peri-urban household annual income.

The results in Table 17 show increasing income levels expressed in per capita terms with increasing income quintiles. The results for Tsandi with its low average income reflect the skewed nature of the income to the higher quintiles. This could mean either maldistribution or the poor reporting of incomes for the area.

The poorest 20 per cent in the Peri-Urban North (Quintile 1) have levels one-third that of the poorest 20 percent in Katutura. This differences drops to a little under half in the highest quintile. Comparisons within quintiles between the Rural North and Katutura are quite striking. The conclusion is that the differences found between the locations for average incomes is maintained when comparisons are made by stratifying the sample by income level.

The ranking in Table 17 was repeated using livestock ownership to create quintiles reflective of the wealth tied up in cattle. The approach was intuitively based on the fact that rural communities do not necessarily reflect their wealth by wages or income. The results for distribution based on numbers of cattle and livestock were mixed for the locations in the north. Too many households reported zero ownership of cattle. These households fell out of the ranks and it was not meaningful. For the ranking to be successful, ownership would have to be more widespread.

The preceding analysis attempted a description of the distribution of income in the sample. The analysis can be taken further using the distribution of the income within each quintile. The results of this analysis are given in Table 18. The household annual income is summed for all households in the lowest 40 per cent (or Quintiles 1 and 2) of households and divided by the total income earned by all the households for the particular location. The result is expressed as a percentage and the exercise is repeated for the top 20 percent of quintile. Note that the figure for "All Regions" is based on different criteria than used for the Rural North or the Peri-Urban North. This approach is useful as it allows a comparison across populations independent of local currencies or economies. The technique assumes that income can be quantified and a suitable sampling frame has been established.

**Table 18: Distribution of Household Income by Location**

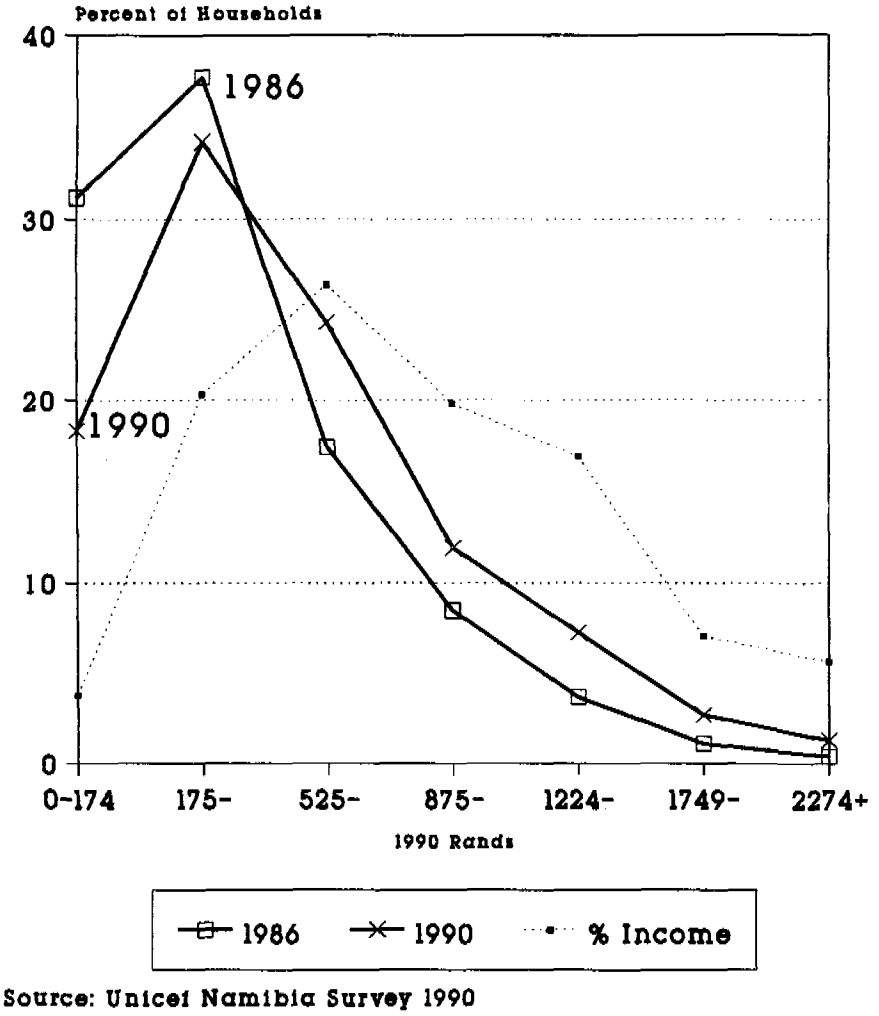
| | Percentage Share of Total Income[1] | |
|---|---|---|
| | Poorest 40 Per Cent (Bottom Two Quintiles) | Richest 20 Per Cent (Top Quintile) |
| Katutura | 13 | 46 |
| Peri-Urban North | 6 | 66 |
| Rural North | 5 | 67 |
| -Onyaanya | 6 | 70 |
| -Engela | 4 | 74 |
| -Tsandi | 11 | 53 |
| All regions | 4 | 65 |

[1] Ranking of survey households into quintiles was carried out using various criteria. The annual incomes for the different locations were used. Presented here are the results for ranking based on: Annual Household income for All households -- All regions category; Katutura -- annual income for Katutura residents only; Rural North annual household income -- Rural North, Onyaanya, Engela, and Tsandi; Peri-Urban North -- Peri-urban household annual income.

Clearly, there are considerable disparities in the distribution of income in the study area. Table 18 shows that the top 20 percent of Katutura earn 46 percent of the income while the poorest forty percent earn only 13 percent of the income. The distribution of income in the Northern areas is much less equal. Here, the poorest 40 per cent of households earn 4 per cent of the income, while the richest 20 per cent earn 65 per cent. These data are in line with income distribution data from other countries in Africa.

Other studies have presented income by categories (Pendleton et al. 1990; Garnier 1986; Du Toit, 1987) and for purposes of comparison with the 1986 study, data have been adjusted to make the two studies comparable. Table 19 and Figure 11 takes Garnier's monthly income figures and allocates the percentage of households falling into the category. Two columns are presented from the data of the current study. The first is an unadjusted distribution of households and the second the 1986 income categories adjusted to reflect 1990 figures using an annual inflation rate of 15 percent.

**Figure 11: Distribution of Katatura Households By Income in 1986 and 1990**




Source: Unicef Namibia Survey 1990

**Table 19: Distribution of Katatura Households by Monthly Per Capita Income in 1986 and 1990**

(Percentage of households)

| Income Group | 1986 "Katutura revisited"[1] | 1990 (no adjust.)[2] | 1990 (15% inflation)[3] |
|---|---|---|---|
| < 100 | 31 | 9 | 18 |
| 100- 299 | 38 | 20 | 34 |
| 300- 499 | 17 | 21 | 24 |
| 500- 699 | 8 | 11 | 12 |
| 700- 999 | 4 | 16 | 7 |
| 1000-1299 | 1 | 6 | 3 |
| 1300 plus | 0 | 10 | 1 |

[1] Data from the February-March 1986 survey of 706 households (Garnier 1986).
[2] The 1990 unadjusted figures were with no adjustment to the 1986 categories of monthly household income.
[3] The 1990 adjusted figures assume an inflation of 15 per cent since 1986. Results for a 5 and 7 per cent inflation per annum increase were similar. Categories of monthly household income in 1990 Rand were: 0-174 175-524 525-874 875-1223 1224-1748 1749-2273 2274+. category.

The comparison with 1986 using the inflated categories for income show that distribution of income has improved. Fewer households are in the lower income categories. In 1986, 31 per cent of households earned less than R 100 per month. By 1990 in adjusted terms (less than R 174), this figure drops to 18 per cent of households, almost a 100 percent drop. In the higher income categories, the drop is less dramatic but evident. This shift towards higher incomes for lower groups could reflect different methodological approaches in the two studies. Most significant would be if the 1986 sample was biased to poorer households.

# Chapter 4 Agriculture

## 4.1 Introduction

The analysis in the previous chapter identifies agriculture as one of the most important economic activities of households in the study area. Not only is agriculture important as a source of income for the Peri-Urban North and the rural locations, but it is also part of the income for Katutura households. This chapter describes the agricultural activities of the sample households. The data collected on agriculture were not extensive but the survey represents a partial representation of the current situation among the farmers of the North. More importantly, it is the first such survey conducted in the rural North.

## 4.2 Household Agricultural Activity

The percentage of households engaged in various agricultural activities is reported in Table 20. One in four Katutura households is involved in farming and this proportion increases to almost half the households in the Peri-Urban North. In the rural areas, not surprisingly, agriculture is almost universal. A distinction is made between access to land (Land variable) and the actual planting of a crop in the past season (Crop variable). It would appear that the distinction is minor as most of the households who report access to land actually planted a crop.

Katutura households prefer to engage in livestock farming where over one-third of households engage in stock husbandry, but only 8 per cent planted a crop in the past season. Stock ownership in the north parallels crop farming but with slightly more farmers engaged in cropping especially in Engela. Over half of the Peri-Urban Households have farmed and have livestock. Links to the rural community are very real for the Northern Peri-Urban household.

**Table 20: Farming Activities of all Households by Location**
(Percentage of households)

| | Farm | Land | Crop | Stock | Cart | Plough | Tractor |
|---|---|---|---|---|---|---|---|
| Katutura | 27 | 8 | 8 | 33 | 2 | 4 | 1 |
| Peri-Urban N | 52 | 48 | 49 | 51 | 0 | 8 | 1 |
| Rural North | 100 | 99 | 99 | 93 | 10 | 57 | 1 |
| -Onyaanya | 100 | 100 | 100 | 95 | 14 | 55 | 2 |
| -Engela | 100 | 100 | 99 | 87 | 1 | 45 | 0 |
| -Tsandi | 99 | 99 | 98 | 96 | 14 | 71 | 0 |
| All Areas | 68 | 61 | 61 | 66 | 6 | 31 | 1 |

"Farm" represents any farming activity taking place. "Land" is land available for growing millet. "Crop" was the growing of any crop in the past season. "Stock" is any kind of stock ownership.

Possession of assets potentially useful for farming or in businesses related to farming varied greatly. The possession of fewer livestock related assets (cart and plough) in Engela partly reflects the smaller livestock numbers in Engela (Table 16 and 21) but may also have something to do with the concentration of the border clashes in the region. Onyaanya and Tsandi represent two ends of the range of cropping and livestock. Onyaanya has fewer ploughs but equal numbers of carts with Tsandi but the highest number of cattle per capita (Table 16). The possession of tractors in Onyaanya is the highest (along with Katutura).

The possession of key implements such as a plough or cart reflect both the level of investment in agriculture and the level of resources for improved production. It is apparent from the data that the level is quite low. If more than half the rural households lack a plough than the opportunities for expanded production is limited.

### 4.3 Livestock Ownership

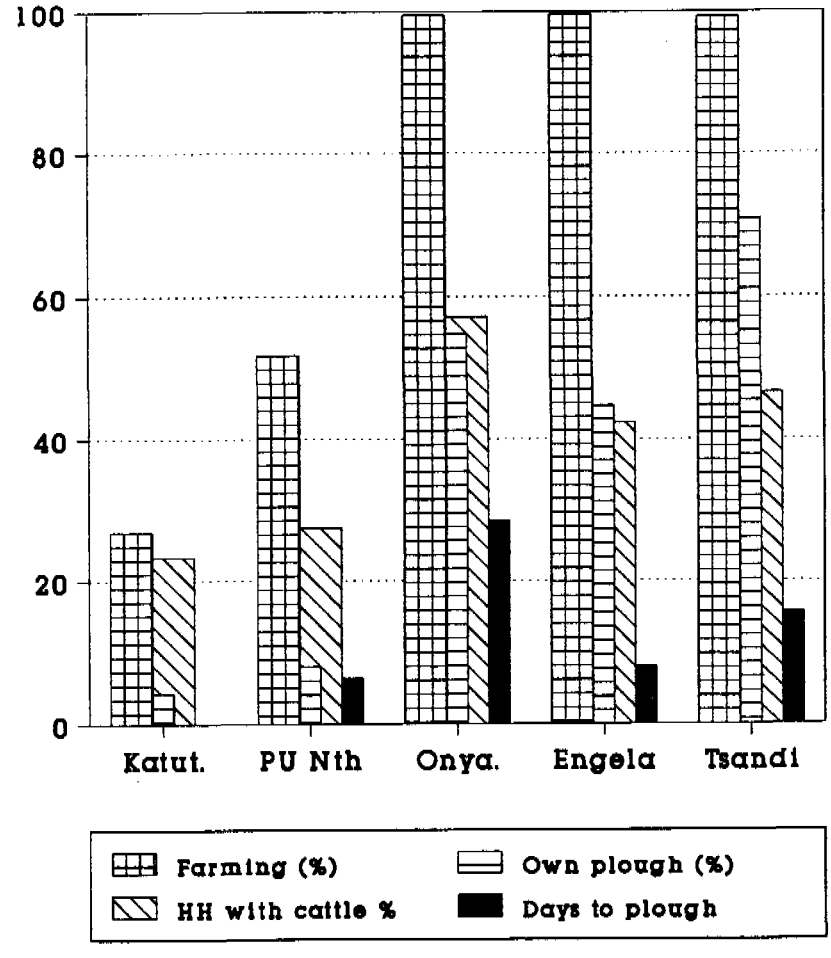
Cattle ownership is important to the people of the North. The study enumerated a total of 7,451 cattle, 64 per cent owned by households in the North (Table 21). It was surprising to encounter the significant numbers of cattle in Katutura (36 per cent of the number enumerated). In Table 16 the average numbers of cattle and livestock units expressed on a per capita basis were presented.

Onyaanya has almost double the per capita numbers of cattle when compared with Engela and Tsandi indicating their greater livestock activity (Table 21). This difference was significant. As noted earlier, the largest herd size was 350 but as can seen in Table 21, almost half the households did not have any cattle. In Katutura, the average number of cattle in households who have cattle is 23.4 head. In the Rural North, the average in households with cattle increases to 11.3 head.

Donkey ownership is relatively common in the North but Tsandi has the largest concentrations. Engela with the least number of cattle and donkeys has the largest number of goats.

Another indication of assets of households was the number of buildings (Table 22). Rural households have three times the number than Peri-Urban households and significantly more than the households of Katutura. These numbers reflect the local architecture, availability of space and demands on rural families.

**Figure 12: Agricultural Activities**




Source: Unicef Namibia Survey 1990

**Table 21: Livestock Ownership by all Households by Location**

| | Percent Hhs With No Cattle | Cattle | | Donkeys | | Goats | |
|---|---|---|---|---|---|---|---|
| | | No | Mean | No | Mean | No | Mean |
| Katutura | 77 | 2669 | 5.5 | 193 | 0.4 | 3915 | 8.0 |
| Peri-Urban N | 83 | 662 | 2.2 | 29 | 0.1 | 1155 | 3.9 |
| Rural North | 52 | 4120 | 5.3 | 1122 | 1.5 | 7707 | 10.0 |
| -Onyaanya | 43 | 1624 | 6.7 | 434 | 1.8 | 2352 | 9.8 |
| -Engela | 58 | 1171 | 4.6 | 142 | 0.6 | 2649 | 10.4 |
| -Tsandi | 53 | 1325 | 4.8 | 546 | 2.0 | 2706 | 9.8 |
| All Areas | 66 | 7451 | 4.8 | 1344 | 0.9 | 12777 | 8.2 |

Statistical comparison of mean livestock numbers using T-Test. Cattle -- Peri-urban numbers are significantly less than all other locations including Katutura (P<.001). Onyaanya is significantly more than Engela or Tsandi (P<.05). Donkeys: Peri-urban significantly less than all other locations (P<.001). Tsandi has significantly more than Engela, Peri-Urban North and Katutura. Onyaanya has more than Engela (P<.01) and Katutura and the Peri-Urban area. Goats: Peri-Urban North significantly less than the three rural locations and the rural north average (P<.001) but not different to Katutura.

**Table 22: Number of Buildings and Hours to Plough Millet for Farming Households Only**

| | Number of Buildings | Hours to Plough Fields |
|---|---|---|
| Katutura | 1.3 | 0.4 |
| Peri-Urban North | 3.2 | 51.8 |
| Rural North | 9.0 | 135.2 |
| -Onyaanya | 9.9 | 227.1 |
| -Engela | 8.0 | 64.4 |
| -Tsandi | 9.2 | 124.6 |
| All regions | 5.5 | 77.2 |

Statistical comparison of means using T-tests found for Number of buildings: Katutura significantly less than all other regions. Peri-Urban north significantly less than rural locations (P<.001). Engela is significantly less than Onyaanya and Tsandi (P<.001). Hours of ploughing: Katutura significantly less than all other regions (P<.001). Peri-Urban north significantly less than rural locations except Engela (P<.001). Engela is significantly less than Onyaanya and Tsandi (P<.001). And Tsandi is significantly less than Tsandi P<.001).

## 4.4 Farm Area

The respondents who had access to land were asked how many hours it would take to plough their fields with two oxen or two donkeys. The question was hypothetical and was designed to elicit the approximate area available to the household on which to grow crops. Table 22 presents the findings of the question. The appropriate comparison is only for the North where Onyaanya appears to be least constrained by land. Engela displays the least time and is likely to be the most land constrained of the three locations.

Comparison of time to plough the millet fields across income quintiles (determined by Rural North income level) indicates a significant trend. For the rural North, the poorest 40 percent of households are ploughing with less hours than the wealthiest households. This trend of decreasing ploughing time with decreasing income was significant at the P<.001 level (F=4.8) and reflects the larger land areas or availability of assets to utilize agricultural land of the wealthier households. Income reflects land areas and vice versa, at least for the rural North.

**Table 23: Crops Grown in the 1989/90 Growing Season by Location**
(Percentage of households)

| | Millet | Sorghum | Maize | Pumpkin | Beans | Peanuts | Vegs |
|---|---|---|---|---|---|---|---|
| Katutura | 78 | 54 | 39 | 22 | 58 | 12 | 0 |
| Peri-Urban North | 97 | 80 | 11 | 30 | 58 | 2 | 3 |
| Rural North | 100 | 80 | 11 | 24 | 69 | 5 | 7 |
| -Onyaanya | 100 | 85 | 17 | 3 | 73 | 0 | 21 |
| -Engela | 99 | 63 | 3 | 62 | 63 | 3 | 0 |
| -Tsandi | 100 | 93 | 14 | 8 | 72 | 10 | 1 |
| All regions | 98 | 79 | 12 | 25 | 67 | 4 | 6 |

**Table 24: Methods of Ploughing for Farming Households by Location**
(Percent of households)

| | Own Hand | Own Oxen | Own Donkey | Own Tractor | Hired | N |
|---|---|---|---|---|---|---|
| Katutura | 36 | 17 | 27 | 20 | 33 | 41 |
| Peri-Urban N | 44 | 16 | 3 | 37 | 37 | 147 |
| Rural North | 34 | 24 | 37 | 6 | 12 | 763 |
| -Onyaanya | 34 | 33 | 24 | 8 | 9 | 240 |
| -Engela | 50 | 37 | 12 | 2 | 13 | 253 |
| -Tsandi | 18 | 2 | 73 | 7 | 14 | 270 |
| All regions | 35 | 22 | 31 | 11 | 17 | 951 |

N is the number of agricultural households

### 4.5 Cropping patterns

In addition to livestock numbers, specific questions were asked on the crops grown in the current growing season. The percentage of households reporting growing major crops is presented in Table 23. For the North, millet and sorghum dominate the cropping pattern. Engela households grow slightly less sorghum but appear to place emphasis on pumpkin. It should be noted that the 1988/89 growing season was delayed due to late rains.

Maize was more common in Onyaanya and Tsandi with the Engela farmers growing less maize. Peanuts or groundnuts were grown in 10 percent of Tsandi households which was the highest percentage.

### 4.6 Method of Ploughing

The methods used to plough are indicated in Table 24. Engela, reflecting its low level of investment and small land area, mostly relies on the hoe. Tsandi farmers utilize a large numbers of donkeys; 73 percent of households use donkeys to plough the fields. One third of Onyaanya and Engela farmers employ oxen to plough. Tractors are not widely used except in the northern Peri-Urban areas where 37 per cent of farmers reported use of tractors.

In Katutura and the Peri-Urban areas, over one third of farmers hired draught power (Table 24). Engela had the highest percentage (82 per cent) of own ploughing method while only two-thirds of Tsandi and Onyaanya agricultural households had their own draught power. The Tsandi farmers borrow or hire draught animals in twenty per cent of farms.

### 4.7 Reported Needs for Improving Agriculture

Each respondent was asked to identify the need for key inputs to increase the production of the most important crop: millet. Table 25 presents the answers to this question. The most important need was water. Only in Engela was water not the most frequently mentioned need; here the requirement for fertilizer was identified more often than water.

Engela respondents also listed inputs such as insecticide, fertilizer and improved seeds more frequently than the other areas. This may reflect recent extension efforts in the region. The most common constraint, other than water, could be expected to be labour due to adult male absences and the large number of female headed households. Yet only in Onyaanya was the need for more labour mentioned by more than one household in six. Onyaanya had a large percentage of female headed households. Availability of land was considered a constraint in the Peri-Urban North but not in other areas. While the need for more draught power was reported in Tsandi, the need for more tractors was not widely mentioned.

**Table 25: Requirements for Improving the Production of Millet by Location**
(Percentage of farming households)

| | Water | Fertilizer | Insect-icide | Seed | Land | Labour | Tools | Draught | Tractors |
|---|---|---|---|---|---|---|---|---|---|
| Katutura | 58 | 51 | 20 | 21 | 29 | 2 | 0 | 0 | 2 |
| Peri-Urban N | 90 | 44 | 24 | 16 | 17 | 3 | 1 | 4 | 1 |
| Rural N | 76 | 66 | 11 | 11 | 8 | 14 | 3 | 4 | 4 |
| -Onyaanya | 99 | 50 | 0 | 6 | 7 | 38 | 0 | 0 | 1 |
| -Engela | 53 | 82 | 19 | 21 | 9 | 2 | 6 | 2 | 5 |
| -Tsandi | 78 | 67 | 13 | 6 | 8 | 4 | 3 | 9 | 3 |
| All regions | 78 | 62 | 13 | 12 | 10 | 12 | 3 | 4 | 3 |

# Chapter 5 The Child

Chapters 5 to 9 present the results of an analysis of situation of children in the study area. The condition of children can often reflect the overall situation facing the population of an area. Information collected about the child not only tells us a great deal about the households in which the children live, but also can suggest appropriate action for programmes to improve their welfare. The study was fortunate in having a large sample size on which detailed information was collected. Information on child education includes all school-aged children in the household (N=3,604). Data on child feeding, immunization and health were collected on 1,752 children under five years. All children in the enumerated households that were in this age group were included in the study.

## 5.1 Child Education

Education for All is an objective set by the United Nations that has a sound basis when the benefits in terms of reduced morbidity and mortality are considered. The advent of independence has accelerated the move towards the provision of educations services to all Namibians. This survey provides basic data on current levels of education in areas of the North and in Katutura.

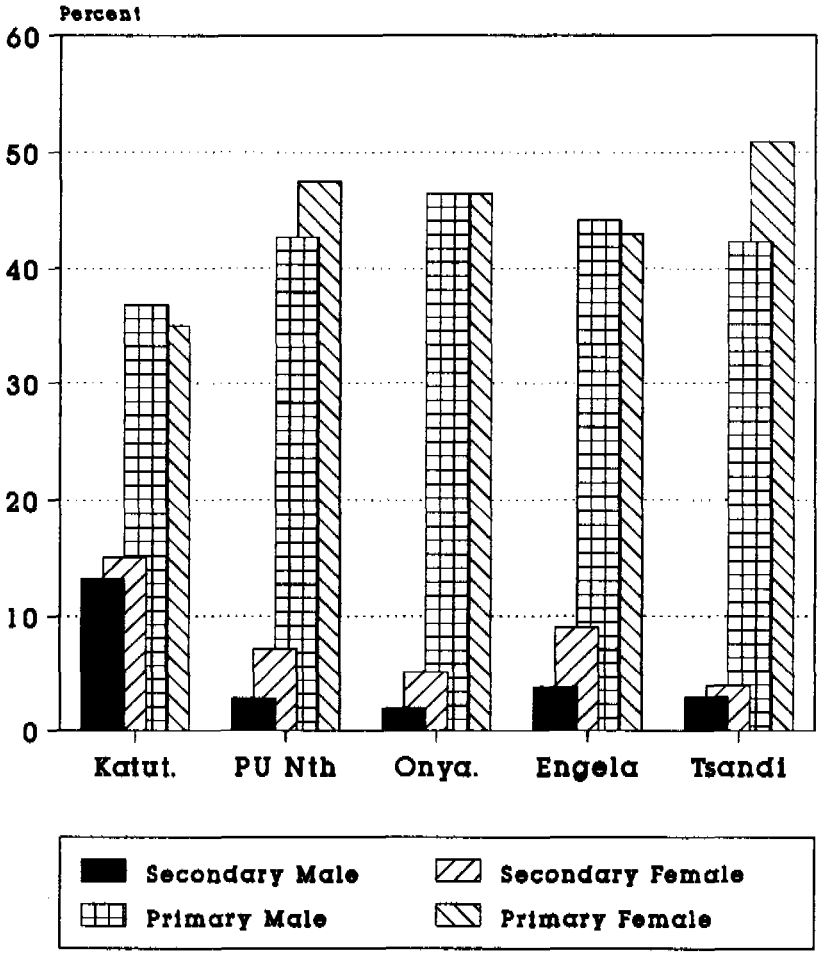
The age and gender breakdown of school attendances illustrate some interesting trends partly reflective of access to facilities and of demands placed on children in the functioning of the rural household (Table 26 and Figure 13). First, as would be expected, the urban region of Katutura has greater numbers and percentages of children in secondary and tertiary education. Children in Katutura are four times more likely to be at secondary school than either their Northern Peri-Urban or their rural counterparts. At tertiary level, the contrast is even more marked with a ten-fold difference.

**Table 26: School Attendance by Gender, Level of Education and by Location**
(Percentage of children attending school)

| | Average No. of Children per Hh | Percent female | Primary | | Secondary | | Tertiary | | N |
|---|---|---|---|---|---|---|---|---|---|
| | | | M | F | M | F | M | F | |
| Katutura | 1.9 | 49 | 37 | 35 | 12 | 14 | 2 | 2 | 930 |
| PUN | 1.3 | 52 | 43 | 48 | 3 | 7 | 0 | 0 | 396 |
| Rural Nth | 3.0 | 54 | 44 | 47 | 3 | 7 | 0 | 0 | 2278 |
| -Onyaanya | 3.0 | 53 | 46 | 46 | 2 | 5 | 0 | 0 | 719 |
| -Engela | 3.0 | 52 | 44 | 43 | 4 | 8 | 0 | 1 | 737 |
| -Tsandi | 3.0 | 56 | 42 | 51 | 3 | 4 | 0 | 0 | 822 |
| All | 2.3 | 52 | 42 | 44 | 5 | 8 | 0 | 0 | 3604 |

M and F denote to male and female. N is the number of children. Statistical comparisons of Average Number of school pupils indicates that Peri-Urban North (PUN) was significantly less than the rural locations of the north and with Katutura (P<.001).
Children are more likely to only attend primary school in the north (over 90 per cent of school attenders are in primary school) compared with Katutura where nearly two thirds are above the primary school level.

**Figure 13: School Attendance by Gender and Location**




Source: Unicef Namibia Survey 1990

Northern rural households send more children to school per household but they are overwhelmingly primary school children. Furthermore, the emphasis on primary school children in the North is more evident due to the larger numbers of households in Katutura without children or with fewer young children. The peri-urban areas in the north send significantly fewer primary school children to school compared with their rural neighbours. These differences are not explained by smaller household sizes in the north. The higher numbers of rural children attending school per household in the rural area reflects the fact that mothers in the Peri-Urban areas tend to leave their children with relatives in rural areas. Note that these differences are only evident for primary school children.

Among the rural northern areas, Engela emerges as an area with greater numbers of children attending secondary school, especially girls. This trend, while positive, reflects the above point of access to school (Engela has an accessible high school) and the demands placed children for household and farm work (especially livestock related activities).

Gender differences in attendances were apparent in the rural and peri-urban north sample. By secondary school, girls are attending school in numbers double that of boys of the same age. This female bias is most evident in the Peri-Urban area and Engela.

Table 27 reports the percentage of eligible children in primary school. The rural North finds almost all eligible children in primary school with slightly lower figures for Engela. The Urban Katutura and Peri-Urban North, the figures drop to between 76 to 78 percent of children. The reasons for the absences are not apparent.

**Table 27: Percentage of Children aged 5 to 15 Years Attending Primary School by Gender of Head of Household**

(Percentage of children aged 5 to 15 years)

| | Male Headed | Female Headed | All | N |
|---|---|---|---|---|
| Katutura | 75 | 83 | 78 | 324 |
| Peri-Urban N | 72 | 83 | 76 | 150 |
| Rural North | 89 | 89 | 89 | 683 |
| -Onyaanya | 94 | 94 | 94 | 213 |
| -Engela | 81 | 80 | 81 | 230 |
| -Tsandi | 92 | 93 | 93 | 240 |
| All Areas | 83 | 87 | 84 | 1157 |

N is the number of households with children attending primary school.

### 5.1.1 School Attendances and Gender of the Household Head

So far we have identified the importance of Engela's high schools in attracting students. Furthermore, the gender differences have favoured the female student especially in the higher grades. Another aspect is the loss of male students, especially in secondary school, to farm and other work related activities. If labour is a constraint and female headed households are typically with less labour (if for no other reason than the lack of an extra adult), then the data would show more male secondary student absentees among female headed households. This was not the case. In fact, female headed households in the rural north were less likely to have female children in secondary school (0.4 male secondary students compared with 0.1 female students). The differences in the peri-urban North were in the same direction but with a three-fold difference favouring male students. The impediment for female secondary students in female headed households could reflect the need for child care and other related work activities for female children.

The education bias towards females is not at issue. Rather it is the failure of the males in attending schooling that is of concern. Seasonal demands for stock care and the tradition of males seeking employment outside of rural areas (in the mines and farms) combine to reduce the educational achievement of the children and the lack of labour at critical seasonal period. It is worthwhile noting that while only one per cent of the sample from the North were attending secondary school, there was no bias due to gender.

Furthermore, there was no gender of head of household bias when the percentage of children in the household attending school is examined. Table 27 reports the results of the comparison. Only in Katutura and Peri-Urban North are children of female headed households more likely to be in school. In the rural areas, no differences were found.

### 5.1.2 School Attendances and Returnees

Returnee households were found to be larger in number (approximately 2 people more) compared with non-returnee households. Does this trend appear in school children attendances? Yes, especially for the Northern locations where on average, one extra child was attending from a household with a returnee living there. For the Rural North, the household with a returnee had 3.6 children attending school compared with 2.7 for non-returnee households. This significant difference was found in the Peri-Urban area but not Katutura. Returnee households have the additional burden of greater numbers of children attending school. While additional resources are needed to send these children to school, the higher numbers may reflect the importance place on education by this group.

## 5.2 Water and Sanitation

The importance of water and sanitation in determining well-being is well recognized. The recent outbreak of diarrhoea and malaria in the North has once again drawn attention to this critical aspect (Mbomena and Mundia, 1990). The report of the outbreak makes some important recommendations regarding both the treatment and prevention of illness with a major focus on water and sanitation.

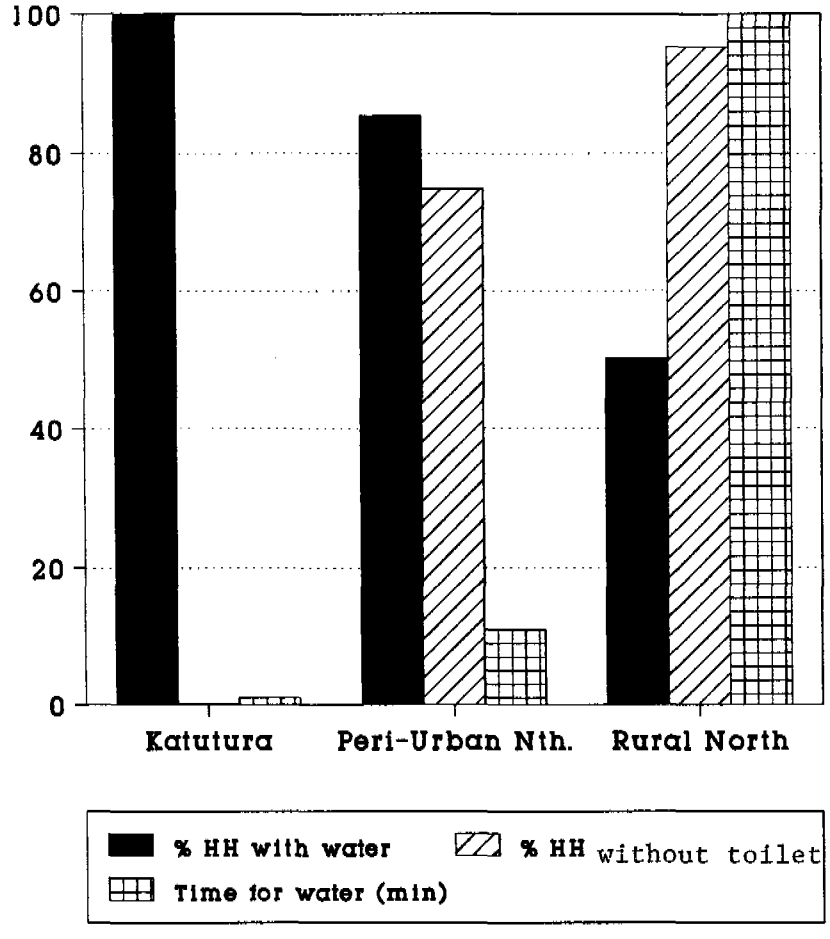
This survey collected basic information to reflect the situation. A more comprehensive study of the quality and quantity of water is required.

The time to collect water in the dry season reflects the time burden placed on households especially in rural areas. Typically this burden falls to women and children. Tsandi households have significantly the greatest distances to fetch water compared with other rural areas and the urban locations. Over three hours is spent in this task during the dry season.

Sanitation is critical and the safe disposal of faeces and other waste is essential. With the exception of Katutura, all locations have unacceptable high percentages of no toilet (Table 28 and Figure 14). For the high density peri-urban locations in the North, three in four households did not have any toilet facility. This proportion increases to 95 per cent for the rural areas. Similar results were found in Mbomena and Mundia's survey (1990) where only 3.5 percent of households had a pit latrine (from their 1990 study of 172 households in an area close to Tsandi -- Ombalantu and Oshikuku).

The Peri-Urban region of the north had 20 per cent of households with a pit latrine, but the lack of suitable toilet facilities must be considered a priority for improved health and sanitation. The DHNW 1988 study of other areas in Namibia found a lower figure of 52.7 percentage of households with no toilet and over 68 per cent of households received their water from a closed source.

**Figure 14: Percentage of Households with a Toilet, Easy Access to Water and the Time Required to Get Water During the Dry Season**




Source: Unicef Namibia Survey 1990

### 5.2.1 Access to Water and Income

A comparison of the distance to a water source in the dry season between income quintiles (determined by Rural North income level) indicated a significant trend. For the rural north, and especially for Tsandi, the poorest households have to spend twice as much time to get water (2.5 hours vs. 1.1 hour) than the wealthiest households. This trend of increasing time to fetch water with decreasing income was significant at the P<.001 level (F=11.2).

**Table 28: Water and Sanitation Characteristics of Survey Households**

| | Water in or Outside House (%) | No Toilet (%) | Minutes to Dry Season Water Source |
|---|---|---|---|
| Katutura | 100 | 0 | 1 |
| Peri-Urban Nth | 85 | 75 | 11 |
| Rural North | 50 | 95 | 102 |
| -Onyaanya | 60 | 94 | 64 |
| -Engela | 47 | 94 | 58 |
| -Tsandi | 44 | 97 | 173 |
| All regions | 72 | 62 | 53 |

Statistical comparisons of time to get water show that Katutura is significantly better off than all other locations. Peri-Urban North is significantly less than all the rural areas (P<.001). Onyaanya and Engela are significant closer to water than Tsandi (P<.001).

### 5.2.2 Access to Water and Gender of the Household Head

Female headed households in the rural areas of the North are significantly further away by 20 minutes from water sources in the dry season. Most striking are the distances faced by households in the Tsandi area. The three hour time to get water is three times longer than in Engela and Onyaanya and 16 times longer than the peri-urban households. Distance to dry season water is a major time and resource constraint. The access by the peri-urban households must rank as an important incentive to relocate.

## 5.3 Child Illness and Treatment

Information was collected on a limited set of symptoms for all children under five-years of age. The focus on young children makes sense as this age group is vulnerable to illness and malnutrition. Data collated by Mbomena and Mundia (1990) during March to May 1990 indicate that under-five year-old children accounted for 16 per cent of admissions to Oshikati, Engela, Tsandi and Kamhaku Hospitals. This percentage of admissions is equal to the expected percentage of under-fives for the region but what it indicates is the mortality risk experienced at this vulnerable age and the time and emotional burden this must place on the guardians of the children.

Guardians were asked to report the presence of a set of symptoms (Cough, Fever, Measles and Diarrhoea) and the overall duration of the illness. The period of recall was fourteen days. In addition, the action taken to treat the condition was collected. Attitude related questions on child diarrhoea were asked to understand the current response to this important condition.

**Table 29: Percentage of Children with Specific Symptoms Within past Fourteen Days by Location**

(Percentage of children)

| | Sickness | Cough | Fever | Measles | Diarrhoea |
|---|---|---|---|---|---|
| Katutura (n=434) | 66 | 47 | 29 | 1 | 31 |
| Peri-Urban N (n=476) | 68 | 47 | 32 | 2 | 36 |
| Onyaanya (n=269) | 68 | 40 | 42 | 0 | 37 |
| Engela (n=318) | 67 | 33 | 36 | 6 | 31 |
| Tsandi (n=249) | 70 | 46 | 61 | 1 | 29 |
| RURAL NORTH (n=836) | 68 | 39 | 45 | 3 | 32 |
| ALL REGIONS (N=1746) | 68 | 43 | 38 | 2 | 33 |

Numbers in parentheses are sample sizes

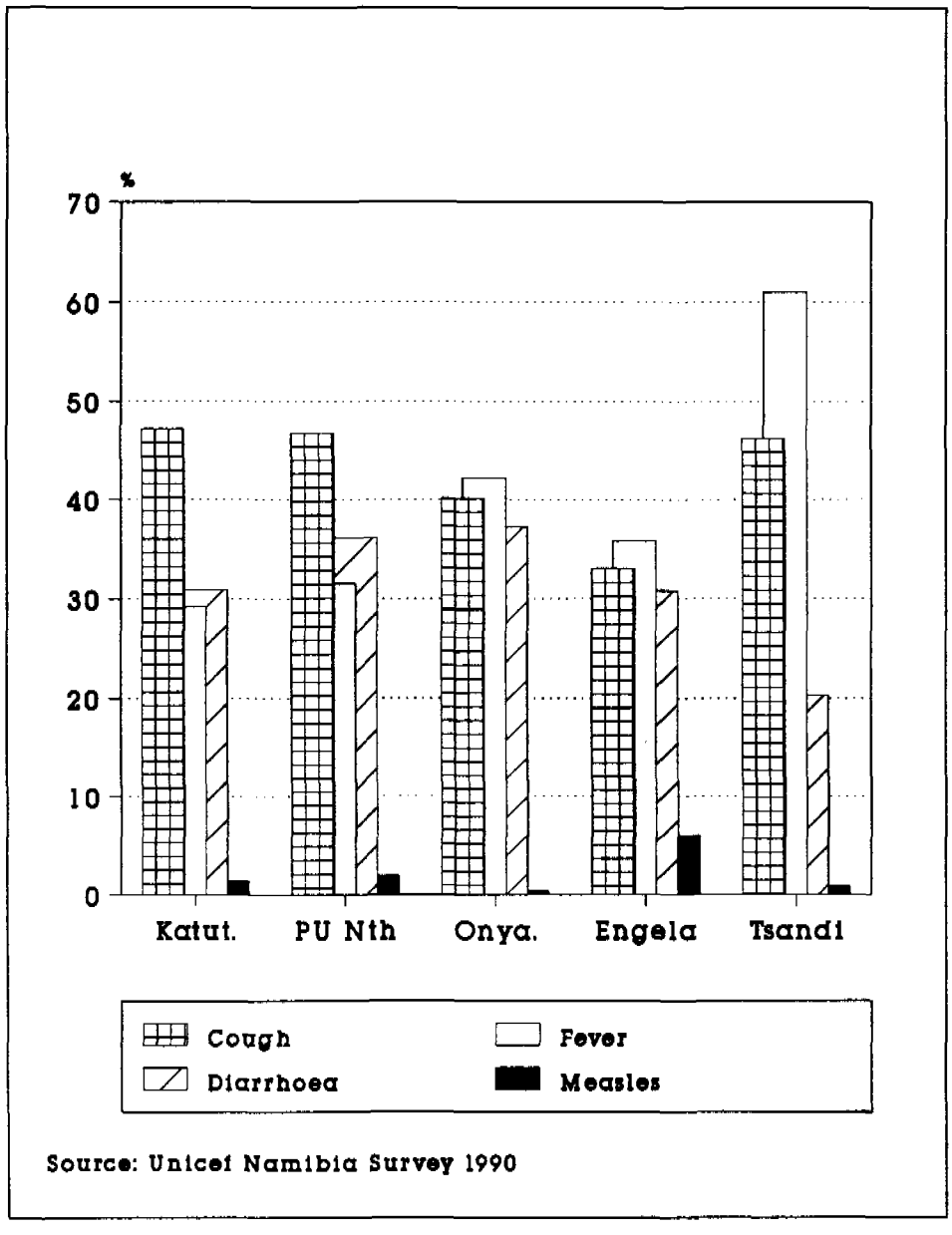
Disease conditions are highly seasonal. Data were collected at the time of year when diarrhoea and malaria are commonplace. The seasonal pattern is malaria following the rains in November and diarrhoea peaking during this period but with unacceptable high levels throughout the year. In the northern regions, the combination of poor water and sanitation and the high rains during the November to March period result in high morbidity. Measles typically occurs during the hotter months with reports peaking in the September to November months. In addition, the first quarter of 1990 reports of an outbreak of a killer illness prompted a great deal of discussion and was subsequently investigated (Mbomena and Mundia 1990).

Table 29 presents the data indicating that two in three children were ill in the previous fourteen days to the survey. There were little differences among the locations including the better-off area of Katutura.

When specific illness are studied (Table 29), some regional patterns emerge. The Peri-Urban North is similar to the rural locations but with two main exceptions. The high level of reported fever in Tsandi region and the higher level of measles in Engela. These figures are consistent with the survey of Mbomena and Mundia (1990) which found headache and fever a common symptom both in the small community survey and in the patients of the region's hospitals. Admissions to Tsandi Hospital in the March to May period in 1990 for malaria increased eight-fold over the same period for 1989. Other hospitals in the region (Oshikuku,

Oshikati hospital) saw a doubling of admissions during the same period. In addition, the incidence of diarrhoea saw a marked increase in 1990.

**Figure 15: Specific Symptoms for Survey Children by Age for Selected Locations**




Source: Unicef Namibia Survey 1990

**Table 30: Percentage of Children with Specific Symptoms by Location and Gender of Head of Household**

| | | Sick | Cough | Fever | Diarrhoea | N |
|---|---|---|---|---|---|---|
| Katutura | Male | 69* | 51* | 30 | 32 | 270 |
| | Female | 62 | 41 | 27 | 29 | 164 |
| PUN | Male | 68 | 47 | 34* | 36 | 290 |
| | Female | 67 | 47 | 27 | 37 | 186 |
| Onyaanya | Male | 69 | 39 | 46* | 40* | 150 |
| | Female | 66 | 41 | 37 | 34 | 119 |
| Engela | Male | 61* | 27* | 31* | 30 | 178 |
| | Female | 75 | 41 | 42 | 32 | 140 |
| Tsandi | Male | 66* | 47 | 56* | 30 | 143 |
| | Female | 76 | 45 | 68 | 28 | 106 |
| RURAL N | Male | 65* | 37* | 43* | 33 | 471 |
| | Female | 72 | 42 | 48 | 32 | 365 |
| ALL | Male | 67 | 43 | 37 | 34 | 1031 |
| | Female | 68 | 43 | 38 | 32 | 715 |

* Designates statistically significant difference between female and male headed households

The Mbomena and Mundia report supports the data collected in the current study. Malaria (as seen in the fever data) was a major cause of morbidity in the North. Diarrhoea is also a common problem and can be directly related to the water and sanitation situation. Tsandi appears to be especially vulnerable to the seasonal affects of malaria. Diarrhoea are common with over one in three children experiencing the condition, which is similar to the results of the Mbomena and Mundia community study (1990).

Hughson reports from her Oxfam 1986 study of Katutura and southern Namibia, levels of report of diarrhoea for the preceding two weeks in the range similar to the current study. She found the diarrhoea most common in the 7 to 24 month age category further supporting this study in targeting this age group. The slightly higher frequency of diarrhoea in the Peri-Urban area of the north is also of concern. As population increases in the area, further stress is likely on the already inadequate water and sanitation situation.

A Lutheran Hospital report quoted in Ofosu-Amaah et al. (1989) for nine hospitals and health centres in the Owambo and Kavango areas reported diarrhoea as the most common reason for admission to the general infectious ward. These are in-patient data and not reflective of the disease pattern of the general community. Nevertheless, the data provide a relative account of the types of illnesses and with the exception of the outbreak of malaria support the findings of this study.

### 5.3.1 Illness Patterns and Gender of Head of Household

The data suggest that illness in under-fives is common. Are certain household characteristic such as gender of the head likely to affect the percentage of children reporting the symptoms? Table 30 presents the data that suggest that children from female headed households are more likely to have reported an illness especially in the rural north.

Several explanations for greater illness in female headed households can be found by referring to the conceptual framework depicted in Figure 2. Caretakers with small children who are ill are having to balance demands on their time including agricultural activities which are considerable during the planting and weeding necessary. Female headed households have less adult labour to care for the children as well as less income to have the child treated for the illness when it occurs. Finally, female headed households are generally poorer and as seen in the previous section, have poorer water and sanitation situations.

### 5.3.2 Returnee Children and Illness Patterns

The data on the 79 returnee under-five year old children when compared with the other children do not suggest any different morbidity experience despite their slightly better nutritional status.

### 5.3.3 Illness Patterns and Child Age

The type and severity of illness in small children depends on its age. As the protective effects of breastmilk decreases and the toddler is exposed to more pathogens, the child experiences debilitating illnesses such as diarrhoea. Table 31 and Figure 15 present the data for selected locations. The data clearly show the age-specific nature of common illnesses. By the second half of the first year, infants are suffering from diarrhoea, fevers and coughs that will accompany them for the next few years. As can be seen, diarrhoea reporting peaks in the second year of life while fever begins as early as the second six months. As noted above, Hughson (1986) found the prevalence of diarrhoea increases from six months to two years of age. Coughs increase over the first five years.

The results suggest that for diarrhoea, the most critical period of intervention is the second year of life while fever (and its related malaria) it is earlier. These patterns are similar in all locations. When these age trends are compared with the prevalence of malnutrition (Chapter 8), the data points to the need to intervene in the first year of life before the child is further weakened by increasing malnutrition.

It should be noted that the data reported in Table 31 will be subject to considerable levels of sampling error. While the trends reported in the table may be indicative, they should not necessarily be taken as being representative of the whole study area.

**Table 31: Illness Reported by Age Category and by Location**

| | Sickness | Cough | Fever | Diarrhoea |
|---|---|---|---|---|
| Katutura | | | | |
| 0- 5.9 | 52 | 39 | 27 | 16 |
| 6-11.9 | 82 | 59 | 37 | 37 |
| 12-23.9 | 76 | 54 | 33 | 45 |
| 24-35.9 | 69 | 46 | 28 | 37 |
| 36-47.9 | 59 | 41 | 25 | 27 |
| 48-60 | 60 | 47 | 27 | 19 |
| Rural North | | | | |
| 0- 5.9 | 47 | 33 | 30 | 15 |
| 6-11.9 | 76 | 39 | 53 | 10 |
| 12-23.9 | 79 | 48 | 50 | 45 |
| 24-35.9 | 73 | 36 | 46 | 39 |
| 36-47.9 | 65 | 40 | 43 | 26 |
| 48-60 | 58 | 36 | 46 | 19 |
| Peri-Urban North | | | | |
| 0- 5.9 | 49 | 32 | 31 | 15 |
| 6-11.9 | 74 | 56 | 43 | 40 |
| 12-23.9 | 77 | 52 | 34 | 45 |
| 24-35.9 | 68 | 41 | 22 | 39 |
| 36-47.9 | 70 | 53 | 27 | 26 |
| 48-60 | 62 | 44 | 23 | 19 |
| Tsandi | | | | |
| 0- 5.9 | 33 | 26 | 22 | 15 |
| 6-11.9 | 76 | 67 | 57 | 48 |
| 12-23.9 | 78 | 62 | 58 | 32 |
| 24-35.9 | 77 | 71 | 48 | 31 |
| 36-47.9 | 71 | 64 | 45 | 28 |
| 48-60 | 72 | 64 | 41 | 26 |
| All regions | | | | |
| 0- 5.9 | 49 | 34 | 30 | 15 |
| 6-11.9 | 77 | 50 | 46 | 39 |
| 12-23.9 | 78 | 51 | 41 | 49 |
| 24-35.9 | 71 | 39 | 37 | 38 |
| 36-47.9 | 65 | 43 | 36 | 26 |
| 48-60 | 59 | 59 | 35 | 20 |

### 5.3.4 Attitudes to Diarrhoea

Respondents were asked about specific actions that they carry out in the event their child experiences diarrhoea. While not reflecting what they actually do, the data in Table 32 give a reflection of action which has important preventative implications.

The answers from the respondents indicate that in some area there is a poor understanding of appropriate action to child diarrhoea. One in three Peri-Urban respondents do not treat

children with diarrhoea while Health Centre Oral Rehydration Salts (ORS) are only used sparingly. In general, the use of ORS is limited and is an area of intervention. These findings are similar to the community study of Mbomena and Mundia (1990). They found only 52.3 percent of respondents were familiar with Sugar/Salt Solutions and 14.5 percent with ORS. Over 65 percent of respondents did nothing when confronted with diarrhoea. While their data are more alarming, both studies point to the need for greater awareness and better treatment of diarrhoea.

**Table 32: Actions Taken in Response to Diarrhoea in Pre-schoolers by Location**
(Percentage of households)

| | No Treat-ment | Health Centre | Home ORS | Health Centre ORS | Tea & Drinks | Porridge | Stop Breast Milk | Traditional Medicine |
|---|---|---|---|---|---|---|---|---|
| Katutura | 0 | 64 | 16 | 9 | 8 | 4 | 0 | 2 |
| Peri-urban North | 36 | 94 | 44 | 2 | 3 | 4 | 0 | 7 |
| Rural North | 11 | 82 | 62 | 4 | 2 | 23 | 1 | 6 |
| -Onyaanya | 21 | 81 | 54 | 7 | 1 | 9 | 3 | 2 |
| -Engela | 11 | 79 | 73 | 2 | 3 | 22 | 0 | 5 |
| -Tsandi | 3 | 87 | 58 | 4 | 0 | 35 | 0 | 10 |
| All regions | 12 | 79 | 44 | 5 | 4 | 13 | 0 | 5 |

Potentially harmful practices like stopping breast milk is not widely practices but some forms of traditional medicine are used, especially in the north. Most respondents appear to rely on the health centre for treatment but given the common occurrence of diarrhoea at certain times of the year, this practice, while positive, should be supported by more home treatment with ORS. The study did not establish the type of treatment obtained at the Health Centre but the use of the Centres is interesting in terms of health education.

**Table 33: Responses to Diarrhoea in Children for Selected Locations for Female and Male Headed Households**

| | Female Headed Households | Male Headed Households | |
|---|---|---|---|
| All regions: | | | |
| No treatment | 14 | 11 | Chi-sq.=3.6 P=.05 |
| Stop breast milk | 1 | 0 | Chi-sq.=3.7 P=.05 |
| Onyaanya: | | | |
| No treatment | 27 | 15 | Chi-sq.=4.9 P=.02 |
| Stop breast milk | 43 | 64 | Chi-sq=10.2 P<.001 |
| Engela: | | | |
| No treatment | 14 | 7 | Chi-sq.=3.8 P=.05 |
| Peri-Urban North: | | | |
| Health Centre | 89 | 97 | Chi-sq.=7.1 P=.01 |

Female headed households (Table 33) are more likely to adopt negative behaviour towards diarrhoea. In some areas, female headed households are significantly more likely to stop breast milk, not treat at all or not take the child to the health centre. These reason for these practices are not obvious but point to the general concern about the welfare of children in these households.

Returnee households gave responses for diarrhoea treatment reflective of familiarity with Oral Rehydration therapy. In Katutura, returnee households were almost twice more likely to give home prepared ORS solution to their child with diarrhoea. The results support the contention that returnee households are better informed and educated.

### 5.3.5 Multivariate Analysis of Determinants of Child Illness

The analysis presented so far has examined the data in terms of means and proportions broken down by location, gender of head of household, returnee status and age grouping. Such static comparisons often raise more questions than is answered by the analysis. For example, were the differences in illness rates between the locations explained in terms of different income levels? The data from the survey lend themselves to multivariate analysis in which key variables are used to build a model to explain the patterns of nutritional status found in the static analysis.

Many different models can be chosen, but certain statistical and subject matter criteria are used in selecting the best model. The model should encompass the following explanatory variables.

Percent time ill= f (Income, education level, recent nutritional status, gender of head of household, health knowledge, water quality, location, age, sex of child, farming, age solid introduction, immunization status, returnee status)

The models were run for the whole sample, the North and for Katutura households. The distinction between Katutura and the North was made due to the different environments. The reader is referred to Appendix G for the models and statistical results.

A cautionary note must be made about interpreting results from multiple regressions analyses. The model enables some of the variance in the dependent variable (e.g. percent time ill) to be explained by a number of independent variables. The relationships between the dependent variable and the outcome variable is not necessarily causal. Later introduction of solid food is only associated with more time ill, for example, it cannot be said to necessarily cause it.

Furthermore, the variables chosen were not comprehensive in determining illness. The child's genetic potential, psychological environment, illness history, crowding, utilization of food, birth weight, and quality and quantity of food intake are key variables that are not reflected in the models. As a result of incomplete model building, the variance explained by the models is quite low. For the models (see Appendix G), the best models could only explain 6 percent of the variance in percent of time ill (referred to as the R square). Less than 2 percent was explained in the Katutura model. The remaining 98 percent can be accounted for by measurement error and the lack of other explanatory variables as noted above.

While the explanatory power of the models is low, it is well within the range found for these types of models. The main focus is not the overall R square value but the significance of the T statistic on the individual variables or coefficients. Table 34 presents only those variables that were significant in their relationship with the dependent variable. The non-significant variables are presented in the model in Appendix G. The lack of significance in these variables (Appendix G) could be due to a lack of any relationship with the dependent variable or that measurement error was too great for the relationship to be found, or the variable was poorly specified. For example, the variable NONE1 refers to the action taken by the guardian to a child with diarrhoea. If no action was taken (NONE1=1), this was assumed to reflect poor attitudes to better health for the child, a proxy for poor health knowledge. If the question was asked poorly (measurement error) or the answers reflected factors other than health knowledge or respondents were too busy and just gave any answer) than the explanatory power of the variable will be reduced.

**Table 34: Regression Results for Survey Children for Percentage of Time Ill With Any Symptom**

| | KATUTURA | | NORTH | | ALL REGIONS | |
|---|---|---|---|---|---|---|
| Variable | Better | Worse | Better | Worse | Better | Worse |
| Age child | X | | X | | X | |
| Education head | | X | | | | |
| Returnee vs NR | | X | | | | |
| Male head vs female head | | | | X | | X |
| Age solid introduced | | | | | | X |

For full models refer to Appendix G. Table should be read as an increase in predictor variable (e.g. age child) results in Better or Worse of Percent Time Ill.

Table 34 presents a summary of the results from Appendix G. The information should be read in a directional manner relative to the dependent variable. For example, as age increases there is an associated reduction in time ill. Comparison of differences for Returnee versus Non-Returnee or Male headed households versus female headed households are read as Returnee is worse than Non-Returnee child in Katutura.

Several points should be made about Table 34. First, the models show very low explanatory power. The data did not reveal much differentiation among the variables. This is most likely due to the imprecision of the dependent variable (Percent Time Ill).

Table 29 shows very little difference among the locations and the result are consistent with the regression results. That is:

- No significant differences among the locations were found when comparing percent of time ill.

- o Only in the North were male headed households weakly significantly worse than female headed households Katutura. This finding is contrary to other trends observed in the data.

- o As the child ages, the level of illness decreases demonstrating immunocompetence.

- o Household income, size, immunization status, access to water, and child gender were not related to the percentage of time ill.

Analyzed, but not presented here, were a series of models predicting the likelihood of diarrhoea, cough, measles, and fever. The models were characterized by low explanatory power any very few significant variables. One interesting result was the location comparisons which relate to some of the earlier results. The outbreak of fever in Tsandi was demonstrated by the significant difference in fever for Tsandi compared with the Peri-Urban North. Onyaanya also had significantly more fever and cough. Engela was worse than Peri-Urban North for cough and measles.

# Chapter 6 Child Immunization

## 6.1 Introduction

Immunization against common childhood diseases forms the basis for preventative health programmes everywhere. Complete immunization coverage of all children is a stated goal of Unicef and the Ministry of Health has entered into a new phase of aggressively pursuing this goal for Namibia.

It was with the realization of the importance of immunization, that the questionnaire was expanded to include detailed information on four antigens currently given to young children. The antigens covered were BCG, DPT, Polio and Measles. The frequency and date of the injection was recorded and if possible, the information was directly taken from the vaccination book.

This book was held by the caretaker of the child in 66 per cent of cases (Table 35). This means that two in three children have a vaccination record. Older children are just as likely to have a book as younger children (Table 35). It can be assumed that the issuing of books was as common four years ago as it was in the second half of 1989. The Rossouw and Tonder 1988 study of areas of Namibia other than the North found 74 percent of children with booklets or clinic cards indicating a higher level of immunization in areas outside of the North.

**Table 35: Possession of Vaccination Booklets by Age Category and Location**

| | 0-11 Mths | 12-23 Mths | 24-35 Mths | 36-47 Mths | 48-60 Mths | All Ages |
|---|---|---|---|---|---|---|
| Katutura | 83 | 75 | 61 | 58 | 55 | 68 |
| Peri-Urban N | 69 | 70 | 60 | 53 | 44 | 64 |
| Rural North | 79 | 74 | 62 | 59 | 58 | 66 |
| -Onyaanya | 86 | 75 | 74 | 69 | 72 | 78 |
| -Engela | 79 | 74 | 58 | 55 | 53 | 64 |
| -Tsandi | 71 | 73 | 54 | 55 | 50 | 60 |
| All Areas | 76 | 73 | 62 | 57 | 55 | 66 |

The books enabled a linkage of the date of immunization with the age of the child based on his or her birth date. It is worthwhile noting that the in about 10 to 20 percent of immunizations it was not possible to determine the month and year of the immunization. In some areas this figure was much larger. Engela consistently had high percentages of immunization in which the month and year were not recorded (approximately 25 per cent of immunizations).

The data in Table 36 are based on the reporting in the books of 66 per cent of respondents under five years of age. Assuming the remaining 34 per cent of children have lower levels of immunization, the data overstate the coverage of immunization by up to 30 percent. Furthermore, the reporting of an immunization does not necessarily mean an effective shot was given due to the sensitivity of vaccines to heat. Data are presented for the children in different formats to provide the best use of available cross-sectional information.

**Table 36: Average Age of Children (in months) at Immunization with Four Antigens by Location**

| | BCG | DPT1 | DPT2 | DPT3 | Polio1 | Polio2 | Polio3 | Measles1 | Measles2 |
|---|---|---|---|---|---|---|---|---|---|
| Katutura | 1.0 | 5.5 | 7.5 | 9.5 | 6.6 | 7.6 | 10.7 | 11.7 | 13.3 |
| Peri-Urban N | 1.8 | 5.3 | 6.8 | 8.4 | 5.3 | 6.7 | 8.4 | 10.3 | 18.8 |
| Rural North | 1.5 | 5.1 | 6.9 | 8.8 | 5.3 | 7.1 | 8.9 | 11.4 | 18.5 |
| -Onyaanya | 1.5 | 5.8 | 7.4 | 9.6 | 6.0 | 7.9 | 9.9 | 11.7 | 17.7 |
| -Engela | 1.3 | 4.6 | 6.7 | 8.4 | 4.7 | 6.8 | 8.5 | 11.5 | 19.4 |
| -Tsandi | 1.8 | 4.7 | 6.5 | 8.4 | 5.0 | 6.4 | 8.3 | 10.7 | 18.2 |
| All Areas | 1.5 | 5.2 | 7.0 | 8.8 | 5.5 | 7.2 | 9.0 | 11.2 | 18.3 |
| No of children | 1392 | 961 | 814 | 651 | 908 | 773 | 629 | 690 | 213 |

Statistical comparisons show Katutura significantly earlier than the northern locations for BCG and Measles only (P<.001). Peri-Urban North significantly later than Onyaanya for DPT3. While Onyaanya is typically later than other rural locations for DPT and Polio.

## 6.2 Patterns of Immunization

The data in Table 36 are only part of the information collected. They have been summarized to provide an overall picture of the level of immunization coverage in the study area. We begin with the mean age at immunization for the antigens (Table 36 and Figure 16). There are not any obvious patterns across locations in these times. The Katutura children get their last Polio and DPT shots later than the northern children but the last Measles shot earlier (by five months). The average age of the shot given provides only part of the useful information. The coverage of the shots is provided by age category in Tables 37 to 40.

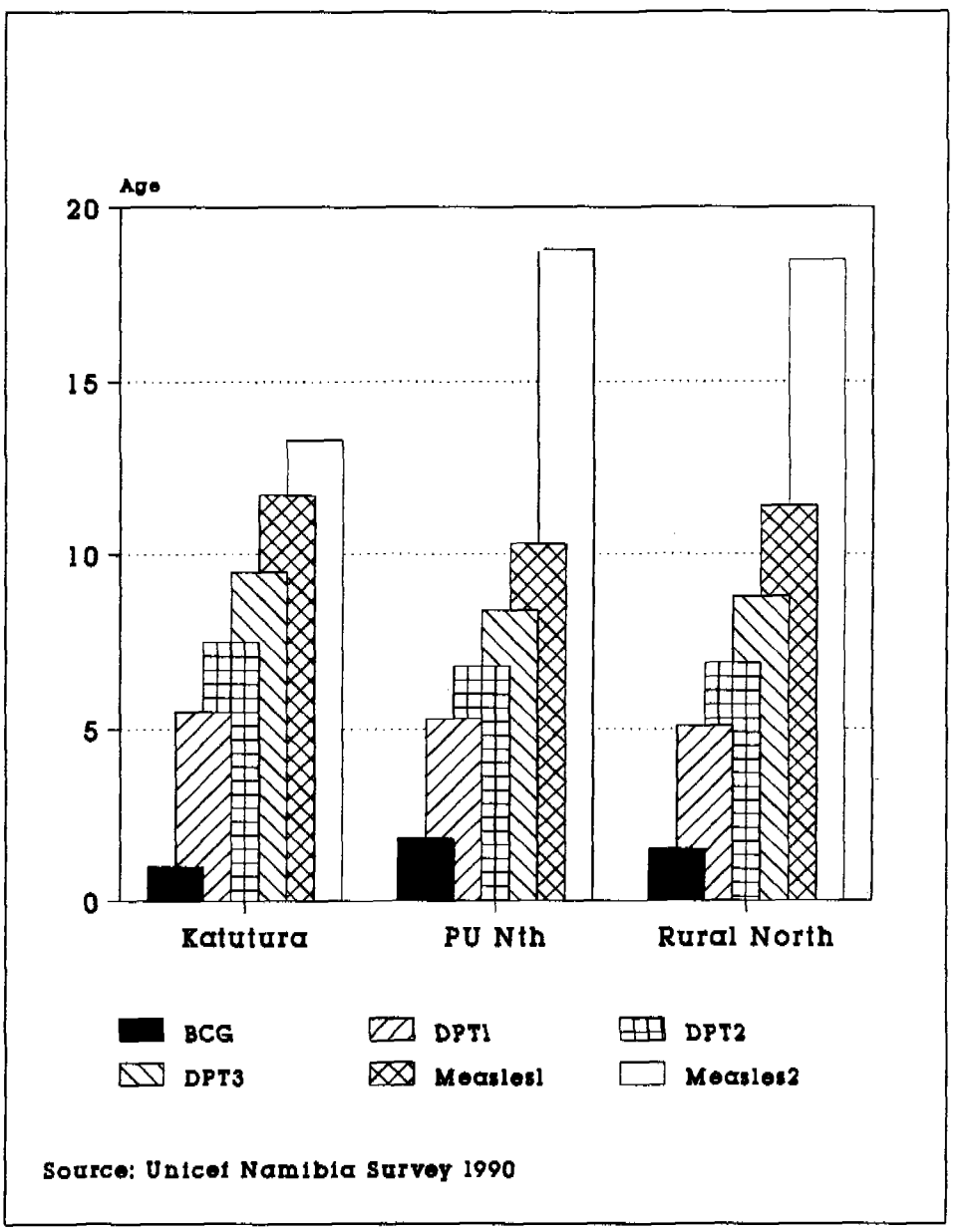
### 6.2.1 BCG Status

BCG coverage is by far the best coverage of the antigens (Figure 16 and Table 37). In excess of 85 percent of survey children (Table 37) received their BCG shots on average 1.5 months after birth (Table 36). Tsandi and Katutura have the best coverage with over 90 percent immunized. These high levels correspond with the high frequency of deliveries at health centres in these locations (see Table 58) where over 90 percent of deliveries take place in a health centre or hospital. The results are encouraging for BCG coverage even in rural areas.

If the data for the study area can be taken as being representative of other parts of the country, then Table 41 places Namibia among the better countries for coverage of BCG. Botswana, Kenya, Zambia and Lesotho have similar levels of BCG coverage. Only Zaire and Angola has worse coverage. The DHNW study (Rossouw and Tonder 1989) found that 98

percent of infants had received at least one BCG shot by the age of five months. These are encouraging results against reports of increasing tuberculosis.

**Figure 16: Average Age at Immunization for Specific Locations**



Engela consistently shows up as having poor health facilities. It also has the poorest BCG coverage along with the Peri-Urban region. The poor BCG coverage is consistent with the high level of home births and the lateness of the BCG shot.

Coverage of BCG appears consistent across age groups. Older children have had the same coverage as younger children. This result indicates the lack of change over the past five years of BCG coverage.

BCG is the only antigen given at an early age and in one shot. The other antigens require a more careful analysis to ensure the range of regimens is recorded. Table 41 reports the percentage of survey children who have received the shots at various ages.

**Table 37: Percentage of Children with Completed BCG Shots by Age Category and Location**

| | 0-11 | 12-23 | 24-35 | 36-47 | 48-59 | All Ages |
|---|---|---|---|---|---|---|
| Katutura | 94 | 94 | 90 | 86 | 88 | 91 |
| Peri-Urban N | 76 | 80 | 71 | 76 | 64 | 75 |
| Rural North | 87 | 88 | 83 | 85 | 85 | 85 |
| -Onyaanya | 88 | 88 | 83 | 79 | 83 | 83 |
| -Engela | 84 | 87 | 81 | 81 | 77 | 82 |
| -Tsandi | 90 | 92 | 87 | 95 | 93 | 91 |
| All Areas | 84 | 87 | 82 | 83 | 83 | 84 |

### 6.2.2 DPT Status

On average, the coverage of DPT is not as good as BCG (see Table 38 and Figure 16). Over one-third of the children had not received any DPT shots at any age and only half of the children had completed the course by the time they were one year old. The situation in the north is considerable worse than Katutura. Whereas Tsandi had a number of favourable health related statistics including excellent BCG coverage, the DPT coverage is among the worst for the locations especially in the older age groups. The immunization outreach is quite poor despite the clinic based activities of the region.

In Katutura, with quite good access and facilities, the complete DPT coverage did not climb beyond 55 per cent. At least 70 per cent of Katutura children have received at least one DPT shot. The Peri-Urban North coverage is quite close to that of Katutura. Both statistics suggest considerable room for improvement.

As noted above, coverage does not necessarily mean immunization. Maintaining the cold chain and administering the shots in a staggered sequence is essential to ensure a technically correct immunization. Less than a month between DPT booster shots renders the effort faulty. On average 24 per cent of the DPT2 shots were technically faulty while 21.4 percent of the DPT3 shots were less than a month from DPT2.

Determining the exact time between shots was not easy as only the month of the shot was recorded and not the day. The percentages of technically faulty shots must be considered with some caution. Katutura DPT shots were considerable less faulty than shot given in Tsandi (32 per cent faulty) or the Peri-urban North. In fact, the northern locations record faulty percentage of between 21 and 32 per cent (compared with 14 per cent for Katutura). Fewer faults were observed with DPT3 but the pattern remains.

DPT coverage as reported by Rossouw and Tonder (1989) was slightly higher with 60 per cent having received at least three shots by their second year of life (compared with 56 per cent in Table 41). The WHO guideline is for all children to have three vaccinations by their first birthday. Other countries in the region (Table 41) fall short of the guideline. Botswana is among the best with 89 percent covered by age one. War-torn Angola has only 32 percent of one year old children immunized.

**Table 38: Percentage of Children with Four Stages of DPT Shots by Age Category and Location**

| | No. shots[1] | 0-11 | 12-23 | 24-35 | 36-47 | 48-59 | All Ages |
|---|---|---|---|---|---|---|---|
| Katutura | 3 | 4 | 42 | 47 | 55 | 48 | 39 |
| | 2 | 13 | 19 | 10 | 7 | 9 | 12 |
| | 1 | 25 | 7 | 12 | 7 | 4 | 12 |
| | 0 | 58 | 23 | 31 | 31 | 39 | 37 |
| Peri-Urban North | 3 | 20 | 61 | 52 | 53 | 46 | 42 |
| | 2 | 13 | 9 | 6 | 8 | 5 | 10 |
| | 1 | 12 | 4 | 6 | 9 | 3 | 8 |
| | 0 | 55 | 25 | 37 | 30 | 46 | 40 |
| Rural North | 3 | 27 | 54 | 56 | 50 | 47 | 47 |
| | 2 | 12 | 9 | 10 | 8 | 10 | 10 |
| | 1 | 18 | 7 | 4 | 5 | 2 | 7 |
| | 0 | 43 | 30 | 31 | 38 | 41 | 36 |
| -Onyaanya | 3 | 35 | 40 | 54 | 42 | 36 | 42 |
| | 2 | 14 | 16 | 15 | 10 | 25 | 16 |
| | 1 | 16 | 9 | 3 | 8 | 6 | 8 |
| | 0 | 35 | 35 | 29 | 40 | 33 | 34 |
| -Engela | 3 | 27 | 72 | 71 | 60 | 65 | 58 |
| | 2 | 10 | 4 | 5 | 5 | 0 | 5 |
| | 1 | 22 | 7 | 3 | 3 | 0 | 7 |
| | 0 | 40 | 17 | 22 | 32 | 35 | 29 |
| -Tsandi | 3 | 19 | 49 | 39 | 41 | 43 | 38 |
| | 2 | 13 | 8 | 9 | 9 | 5 | 9 |
| | 1 | 13 | 6 | 6 | 5 | 0 | 6 |
| | 0 | 56 | 37 | 46 | 45 | 53 | 47 |
| All Areas | 3 | 19 | 56 | 53 | 51 | 47 | 44 |
| | 2 | 13 | 12 | 9 | 8 | 9 | 10 |
| | 1 | 17 | 6 | 6 | 6 | 3 | 8 |
| | 0 | 51 | 26 | 32 | 35 | 41 | 37 |
| N | | 455 | 378 | 350 | 321 | 224 | 1752 |

N is the number of children

[1] No. of shots refers to the percentage of children who have received that number of shots.

### 6.2.3 Polio Status

Immunization against polio was far less frequent than BCG or DPT. Table 39 and Figure 16 summarizes the coverage for the three shot Polio vaccine. What is striking and reassuring is the similar coverage between Polio and DPT. These drops are supposed to administered at the same time and the similarity gives confidence in the diligence of data collection as the enumerators were not coaxed or prepared to expect the same schedule.

**Table 39: Percentage of Children with Four Stages of Polio Drops by Age Category and Location**

| | No. shots[1] | 0-11 | 12-23 | 24-35 | 36-47 | 48-59 | All Ages |
|---|---|---|---|---|---|---|---|
| Katutura | 3 | 4 | 37 | 42 | 43 | 36 | 30 |
| | 2 | 3 | 16 | 9 | 6 | 13 | 9 |
| | 1 | 14 | 12 | 10 | 13 | 11 | 8 |
| | 0 | 80 | 35 | 40 | 39 | 40 | 41 |
| Peri-Urban North | 3 | 20 | 61 | 52 | 53 | 46 | 42 |
| | 2 | 13 | 10 | 4 | 8 | 5 | 9 |
| | 1 | 11 | 3 | 6 | 8 | 3 | 7 |
| | 0 | 57 | 26 | 38 | 32 | 46 | 42 |
| Rural North | 3 | 27 | 56 | 56 | 51 | 46 | 48 |
| | 2 | 13 | 7 | 10 | 7 | 10 | 9 |
| | 1 | 16 | 7 | 4 | 4 | 5 | 7 |
| | 0 | 45 | 30 | 30 | 38 | 40 | 36 |
| -Onyaanya | 3 | 33 | 46 | 57 | 42 | 36 | 44 |
| | 2 | 18 | 12 | 13 | 13 | 22 | 16 |
| | 1 | 16 | 9 | 3 | 8 | 8 | 8 |
| | 0 | 33 | 33 | 28 | 38 | 33 | 32 |
| -Engela | 3 | 25 | 72 | 69 | 60 | 59 | 57 |
| | 2 | 12 | 4 | 5 | 5 | 3 | 6 |
| | 1 | 18 | 7 | 4 | 3 | 0 | 6 |
| | 0 | 45 | 17 | 22 | 33 | 38 | 30 |
| -Tsandi | 3 | 19 | 49 | 37 | 47 | 43 | 39 |
| | 2 | 10 | 6 | 11 | 3 | 5 | 7 |
| | 1 | 13 | 4 | 6 | 5 | 5 | 6 |
| | 0 | 58 | 41 | 46 | 45 | 48 | 47 |
| All Areas | 3 | 18 | 52 | 52 | 50 | 42 | 42 |
| | 2 | 10 | 10 | 8 | 7 | 10 | 9 |
| | 1 | 13 | 7 | 6 | 7 | 6 | 8 |
| | 0 | 58 | 30 | 34 | 37 | 41 | 41 |
| N | | 455 | 378 | 350 | 320 | 224 | 1751 |

N is the number of children

1 No. of shots refers to the percentage of children who had received that number of shots.

By the child's first birthday, approximately 52 percent of the children had not received any polio drops (Table 41). Namibia falls behind its neighbours in its coverage of Polio. As noted with DPT, Katutura is not much better than more isolated areas of the country (Table 38). This unacceptable situation in Katutura is also found in Tsandi and Onyaanya where

only half the children have obtained the full course by their first birthday. Interestingly, Engela has a polio and DPT coverage better than Katutura.

The DHNW study found the same pattern as with DPT. More than 60 percent of children have received three shots or more by their first birthday which is greater than the current study.

The fault estimates based on the time between Polio1 and Polio2 or Polio2 and Polio3 show the same trends as noted above for DPT. Katutura ranks better while Tsandi and other rural areas are the most faulty.

**Table 40: Percentage of Children with Three Stages of Measles Shots by Age Category and Location**

| | No. shots[1] | 0-11 | 12-23 | 24-35 | 36-47 | 48-59 | All Ages |
|---|---|---|---|---|---|---|---|
| Katutura | 2 | 1 | 6 | 11 | 9 | 16 | 8 |
| | 1 | 7 | 54 | 40 | 48 | 41 | 36 |
| | 0 | 92 | 40 | 49 | 43 | 43 | 56 |
| Peri-Urban North | 2 | 0 | 18 | 29 | 27 | 39 | 18 |
| | 1 | 16 | 40 | 32 | 30 | 31 | 30 |
| | 0 | 84 | 42 | 44 | 49 | 51 | 60 |
| Rural North | 2 | 2 | 16 | 29 | 22 | 22 | 18 |
| | 1 | 19 | 40 | 32 | 30 | 31 | 30 |
| | 0 | 79 | 44 | 39 | 48 | 47 | 51 |
| -Onyaanya | 2 | 6 | 9 | 23 | 8 | 14 | 12 |
| | 1 | 35 | 46 | 47 | 44 | 53 | 45 |
| | 0 | 59 | 46 | 30 | 48 | 33 | 42 |
| -Engela | 2 | 0 | 15 | 32 | 22 | 24 | 20 |
| | 1 | 8 | 46 | 32 | 35 | 27 | 30 |
| | 0 | 92 | 39 | 36 | 44 | 50 | 51 |
| -Tsandi | 2 | 1 | 26 | 32 | 33 | 28 | 24 |
| | 1 | 7 | 26 | 13 | 14 | 15 | 15 |
| | 0 | 92 | 49 | 56 | 53 | 58 | 41 |
| All regions | 2 | 1 | 14 | 25 | 20 | 23 | 15 |
| | 1 | 15 | 43 | 33 | 33 | 41 | 30 |
| | 0 | 84 | 40 | 43 | 47 | 43 | 55 |
| N | | 455 | 378 | 350 | 321 | 224 | 1752 |

N is the number of children

[1] No. of shots refers to the percentage of children who have received that number of shots.

### 6.2.4 Measles Status

Measles vaccine is administered in two shots with the a much later timing at around 11 months (Table 36). The coverage for measles vaccine was the poorest reflecting the lack of maternal and child health services especially in the north (Table 40 and Figure 16). Even in Katutura only 6 percent had received the complete course by age two years and 18 percent

by age three years. Coverage was much better in the Peri-Urban North than Katutura with 47 percent with full immunization by age two years.

Comparing the survey results with coverage in neighbouring countries places measles vaccination at levels below even Angola (Table 41). The DHNW study found that 78 per cent of children had received at least one shot by their first birthday compared with 56 per cent for the rural North and 58 percent for the Peri-Urban North (Table 40).

Across all the ages, of the 1,752 pre-schoolers, only 15 per cent had completed their measles course. This low figure compares with about 42 percent having completed their Polio and DPT (Table 41). BCG remains as the most successful at over 84 per cent of children. Tsandi again emerges as the location with the poorest coverage followed by the Peri-Urban north. Interestingly, both Engela and Onyaanya have poor but still better coverage.

**Table 41: Percentage of Children Fully Immunized by Age of One Year for Survey Children in Selected Locations and for Children in Neighbouring Countries**

| | BCG | DPT | Polio | Measles |
|---|---|---|---|---|
| Katutura | 94 | 52 | 37 | 6 |
| Rural North | 88 | 54 | 56 | 16 |
| All Areas | 87 | 56 | 52 | 14 |
| Botswana | 99 | 89 | 89 | 83 |
| Lesotho | 90 | 77 | 77 | 79 |
| Zambia | 92 | 83 | 81 | 80 |
| Zaire | 59 | 41 | 41 | 44 |
| Angola | 32 | 12 | 13 | 56 |
| Kenya | 87 | 74 | 75 | 60 |

Country figures for 1987-88 period from Unicef (1990)

### 6.3 Gender of Head of Household and Immunization

Women of female headed households were significantly less likely to have an immunization book for their child especially for children older than 24 months. This could be a reflection of the movements and poverty of females in female headed households. Female headed households tend to have lived in their locations for a shorter period than households headed by men.

### 6.4 Returnee Children and Immunization

An analysis of the patterns for immunizations for returnee households compared with non-returnee households and a comparison of female and male headed households resulted in no significant differences in percentages or means for the different indicators.

The immunization patterns of children from returnee households or the poorer female headed households did not differ from the other households. This is encouraging as the economic disadvantages of these groups has not translated into worsening immunization coverage. BCG shots, however, tend to be given significantly later in households with returnees ($P<.05$).

# Chapter 7 Child Feeding Patterns

## 7.1 Introduction

The benefits of breastfeeding for the child and the mother is well recognized. The child gains essential nutrients and immunological properties from the milk while the risk of exposure to pathogens in contaminated water and food is reduced. The mother gains in several areas mainly through suppression of ovulation and economically. Nevertheless, as countries become more urbanized, the proportion of mothers who breastfeed tends to decline as does the duration of breast feeding. Several questions were asked on the mothers of the practices applied to their children.

Data were collected for all under-fives. Of these, 1,557 children under-fives had received some form of solid food other than breast milk while 1,033 of these children had been completely weaned from breast milk.

## 7.2 Breast Feeding

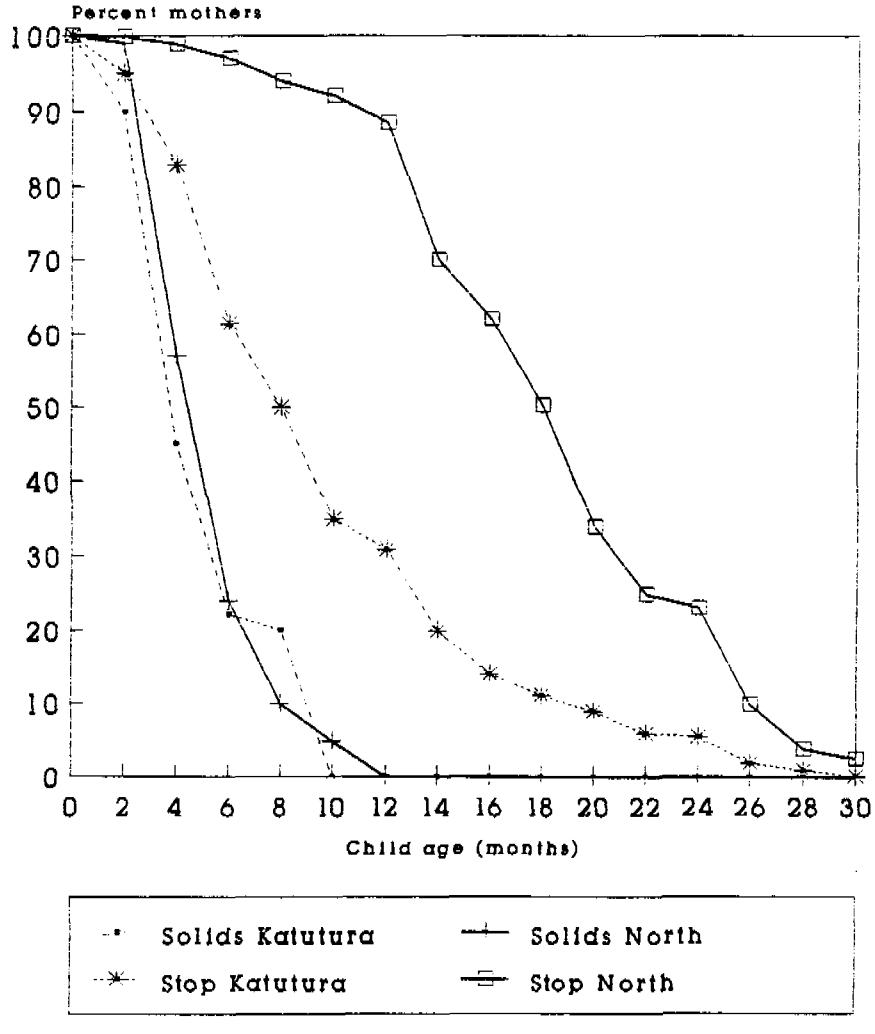
The practice of breastfeeding in the study was universal at least for the first month of life. As the child ages, the percentage of women who choose to breast feed declines rapidly (Figure 17). The mean age of introduction of food other than breast milk is presented in Table 42. The average of four months is the suggested time of introduction. The women of Katutura and Onyaanya introduced solid foods two to three weeks earlier than in other areas (Table 42).

The earlier introduction of solid foods in Katutura reflects the more urbanized nature of the community including the availability of alternative infant food. The low figure for Onyaanya is more difficult to explain in this Northern rural community. Earlier solid food introduction in Onyaanya is repeated when the duration of breast feeding is examined. Onyaanya women, therefore, are reflecting a more urbanized pattern of breast feeding than other rural women.

Later in this report the age of introduction of solid food will be regressed on child nutritional status (Table 57). The result show that in Katutura only, earlier introduction of solid foods is associated with better levels of wasting and undernutrition. In Katutura, earlier introduction of solid foods in addition to breastmilk is not related to poor child nutrition.

The duration of breast feeding statistic in Table 42 is interesting as it indicates the time that the mother must be there to provide milk for the child. The Katutura mother only breast feeds 8.7 months on average, at least eight months shorter than women of the rural north. This additional eight months in the north is significant and reflects the choice open to Katutura women both in time and work demands outside the home and the choice of suitable weaning foods. In Chapter VIII, the data will show clearly that while breast feeding duration is shorter in Katutura, it is not associated with worsening malnutrition.

**Figure 17: Percent of Children Experiencing a Specified Feeding Practice: Age of Introduction of Solid Foods: Age of Complete Weaning**




Source: Unicef Survey 1990

**Table 42: Comparison of Age of Introduction of Solid Foods and Stopping of Breastmilk by Age of the Child and Location**

| | Solids introduction | | | Stopped breastfeeding | | |
|---|---|---|---|---|---|---|
| | Mean | (sd) | Number | Mean | (sd) | Number |
| Katutura | 3.5[1,3] | (1.6) | 354 | 8.7[4] | (6.5) | 233 |
| Peri-Urban North | 4.2[1] | (1.3) | 416 | 14.5[6] | (5.5) | 212 |
| RURAL NORTH | 4.1[3] | (1.5) | 787 | 16.9[6] | (5.9) | 788 |
| -Onyaanya | 3.9[2,3] | (1.5) | 260 | 15.7[5] | (6.0) | 191 |
| -Engela | 4.2[3] | (1.3) | 293 | 16.4[5] | (5.4) | 218 |
| -Tsandi | 4.2[2,3] | (1.5) | 234 | 18.7[5] | (6.0) | 179 |
| ALL REGIONS | 4.0 | (1.5) | 1557 | 14.5 | (6.8) | 1033 |

Source: Unicef Namibia Health and Nutrition Survey 1990

[1] Katutura significantly less than Peri-urban North (P<.001)
[2] Onyaanya significantly less than Tsandi (P<.05)
[3] Katutura significantly less than Rural North, Engela and Tsandi (P<.001)
[4] Katutura significantly less than all other ages for stopped breastfeeding (P<.001)
[5] Onyaanya and Engela significantly less than Tsandi (P<.001)
[6] Peri-urban North significantly less than Rural north (P<.001)

Roussow and Tonder's 1988 study of rural women found an average duration of 14 months which suggests that women of the North are breast feeding slightly longer than other Namibian rural women. This could be interpreted as reflecting the more isolated and less urbanized north.

The decline in duration and prevalence of breast feeding with urbanization is apparent in Namibia. There appears three main groups. The first is the more urbanized Katutura women followed by the less urbanized but changing Peri-Urban North women. The third group is the Northern rural women who breast feed the longest period. The only exception is Onyaanya women who appear to be approaching the characteristics of the Peri-Urban women. The Peri-Urban North women duration of breast feeding is significantly shorter than Rural women (Table 42) while the percent of women completely weaning their child drops at twice the rate of northern rural women (Table 44).

The percentage of women introducing solid food at different ages and completely weaning the child is presented in Tables 43 and 44. The same information is summarized in Figure 17 for the Katutura and North sample only. The Figure shows the different pattern found in weaning in Katutura compared to the north. By the time the child is 10 months old, half of the Katutura mothers have completely weaned their children while in the north only 10 percent of women have stopped. (Note that the Peri-Urban North women are weaning at a much higher rate than rural women.)

**Table 43: Percentage of Children who Have Received Foods Other than Breastmilk by the Age of Introduction and Location**

| | Age of Child in Months | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 9 | 12 |
| Katutura | 0 | 0 | 10 | 21 | 55 | 74 | 78 | 91 | 100 |
| Peri-Urban North | 0 | 0 | 1 | 4 | 37 | 59 | 73 | 90 | 100 |
| RURAL NORTH | 0 | 0 | 1 | 8 | 43 | 61 | 74 | 95 | 100 |
| -Onyaanya | 0 | 0 | 1 | 14 | 52 | 70 | 76 | 98 | 100 |
| -Engela | 0 | 0 | 1 | 6 | 55 | 60 | 76 | 94 | 100 |
| -Tsandi | 0 | 0 | 1 | 6 | 44 | 54 | 70 | 94 | 100 |
| ALL REGIONS | 0 | 0 | 3 | 10 | 44 | 64 | 75 | 93 | 100 |

**Table 44: Percentage of Children who Have Been Completely Weaned by Age and Location**

| | Age of Child in Months | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 36 |
| Kat. | 0 | 7 | 39 | 59 | 69 | 84 | 89 | 94 | 94 | 98 | 99 | 100 |
| PUN | 0 | 0 | 6 | 15 | 24 | 49 | 66 | 90 | 91 | 99 | 100 | 100 |
| RN | 0 | 0 | 3 | 7 | 11 | 38 | 50 | 74 | 77 | 97 | 98 | 99 |
| -On. | 0 | 0 | 6 | 9 | 16 | 39 | 53 | 86 | 90 | 96 | 98 | 98 |
| -En. | 0 | 0 | 2 | 7 | 11 | 42 | 57 | 79 | 84 | 96 | 98 | 100 |
| -Ts. | 0 | 0 | 1 | 4 | 7 | 32 | 38 | 55 | 65 | 98 | 99 | 99 |
| ALL | 0 | 2 | 12 | 20 | 27 | 51 | 62 | 82 | 84 | 98 | 99 | 99 |

Kat. - Katutura; PUN - Peri-urban North; On. - Onyaanya; En. - Engela; Ts. - Tsandi; RN - Rural North; ALL - All locations

Other studies conducted in Namibia have found almost universal breast feeding (97 per cent in Roussow and Tonder (1989) and Hughson's 1986 study in Katutura and two rural areas in Southern Namibia found that at age three months, 54 percent of infants were breast fed declining to just 15 percent by age 12 months. Hughson's data suggest far less breast feeding and rapid weaning in the first three months. It is worthy to note that Hughson failed to associate duration of breast feeding with nutritional status so that despite the early weaning, nutrition was not adversely affected.

The type of food first used to supplement breast milk is presented in Table 45. The familiar pattern is repeated with the three main groups. Katutura women are more reliant on commercially available foods followed by the Peri-Urban North. Once again, the Onyaanya results are enigmatic. These data suggest that Onyaanya is less rural than would be apparent from the location.

A comparison with other countries has been carried out. The breast feeding patterns are fairly close to Botswana and Zambia. The difficulty in comparing quite different situations such as Katutura and the North as a national average is illustrated when the country rates are compared with the location results.

### 7.3 Gender of Head of Household and Breast Feeding

Explanations as to why women wean earlier in Katutura and the Peri-Urban North has been reduced to urbanization. Many factors relate to urbanization such as employment, alternative child care including commercial, sibling and family, choice of weaning foods, and education levels of the mother. The head of household and his spouse have lower education levels in the North. Formal work opportunities are greater in Katutura but seasonal demand (e.g. agriculture) for women's time can be great in North. If labour is in demand for activities such as agriculture and mothers are facing more demands on their time thereby reducing duration of breast feeding, then this will be felt most acutely in resource-poor households headed by women.

The pattern of weaning and solid food introduction is found in Tables 43 and 44. Women in female-headed households tend to completely wean their children later than women of male headed households (Table 46). No discernable pattern was found when the distribution according to age of introduction of solid foods were compared (Table 47).

The later pattern among women of female headed households likely reflects the greater poverty of these households rather than any progressive behaviour of women of male headed households.

The patterns of breast feeding in the study are suggestive of rapid changes taking place. While no associations with worsening malnutrition can be found, the declines in the urban and Peri-Urban areas must be viewed with some concern. Women should be encouraged to breast feed as long as they find it possible given their activities and preferences.

**Table 45: Percentage of Children who Have Received their First Solid Food by Source and Location**

| | Home-based | Purchased |
|---|---|---|
| Katutura | 48 | 52 |
| Peri-Urban North | 45 | 55 |
| RURAL NORTH | 71 | 29 |
| -Onyaanya | 59 | 41 |
| -Engela | 77 | 23 |
| -Tsandi | 76 | 24 |
| ALL REGIONS | 59 | 41 |

The women of Katutura have a wide range of choices in food stuffs (admittedly only if they can afford the prices) and a cleaner environment in which to prepare food. Early weaning and earlier introduction of solid foods probably does not adversely affect the health of the child. The women of the north, however, do not have the cash or water and sanitation suitable for further declines in breast feeding. The practice of the Peri-Urban women placing her young child in the rural areas (with relatives) is likely to be putting pressure on the child. Development and education should be directed to encouraging:

- o the current positive behaviour of breast feeding from birth,
- o the development and promotion of appropriate weaning foods, and
- o the promotion of breast feeding as long as possible.

**Table 46: Gender of Head of Household and Percentage of Children who Have Been Completely Weaned by Age and Location**

| | | Age of Child in Months | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 30 |
| Katutura | M | 8 | 45 | 64 | 72 | 84 | 88 | 92 | 94 | 99 |
| Katutura | F | 7 | 31 | 53 | 66 | 85 | 89 | 95 | 95 | 99 |
| PUN | M | 0 | 8 | 16 | 24 | 49 | 68 | 90 | 91 | 100 |
| PUN | F | 0 | 4 | 11 | 24 | 48 | 65 | 89 | 90 | 100 |
| RN | M | 0 | 4 | 8 | 12 | 39 | 49 | 75 | 77 | 98 |
| RN | F | 0 | 2 | 6 | 11 | 36 | 50 | 73 | 76 | 98 |

Kat. - Katutura; PUN - Peri-urban North; RN - Rural North

Table 47: Gender of Head of Household and Percentage of Children who Have Received Foods Other than Breastmilk by Age and Location

| | | Age of Child in Months | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 9 |
| Katutura | Male | 0 | 0 | 10 | 20 | 56 | 75 | 80 | 90 |
| Katutura | Female | 0 | 0 | 11 | 23 | 54 | 71 | 74 | 92 |
| NORTH | | | | | | | | | |
| Peri-Urban | Male | 0 | 0 | 1 | 3 | 37 | 61 | 74 | 90 |
| Peri-Urban | Female | 0 | 0 | 1 | 5 | 35 | 56 | 71 | 90 |
| Rural | Male | 0 | 0 | 1 | 9 | 42 | 60 | 75 | 90 |
| Rural | Female | 0 | 0 | 1 | 8 | 44 | 63 | 72 | 95 |

# Chapter 8 Child Nutritional Status

## 8.1 Introduction

Measures of child nutritional status using attained weight and height are commonly used to assess the overall nutritional and health status of children. These anthropometric measures are important proxies for the assessing the overall well-being of the most vulnerable of groups in the population, pre-schoolers (see Carlson and Wardlaw, 1990).

The factors that influence nutritional status are many. Most important is poverty or poor environmental conditions. Over time, these factors can gradually impair growth in children resulting in reduced height. Factors combine to reduce food intake, increase illness and reduce growth in children. The reduction in height is often referred to as stunting and is a reflection of long-term or chronic malnutrition. A recent illness or sudden lack of appetite can result in muscle and fat loss in a child and this short-term effect can result in wasting, also termed current or acute malnutrition.

Figure 18 illustrates the point that a child (girl A) can be the same age but shorter than a healthy reference child (girl B). Girl A is stunted and if she is also lighter or underweight she is said to be underweight.

> Girl A has low Height-for-Age and low Weight-for-Age and low Weight-for-Height compared with the reference child.

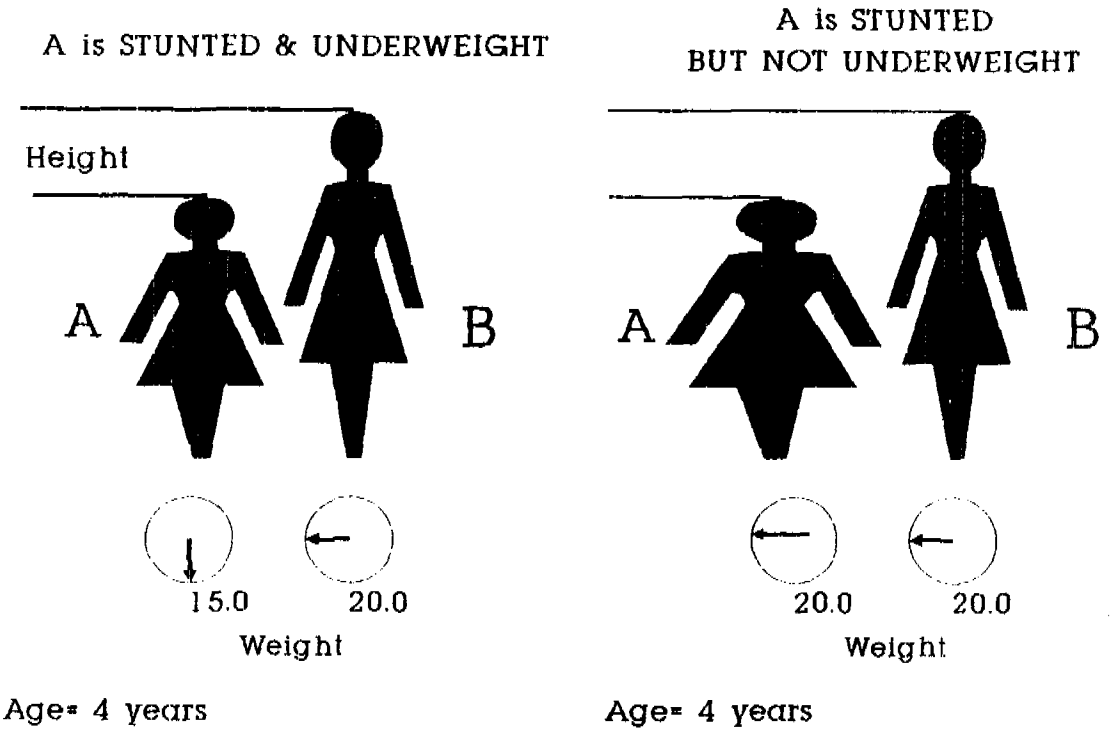
The second diagram shows a heavier but shorter girl (A) who is still stunted but is the same level of undernutrition or wasting relative to girl B.. She is stunted but not wasted or undernourished.

> Girl A in the second diagram has a low Height-for-Age but the same Weight-for-Age and Weight-for-Height compared with the reference child.

A number of indicators have been developed to express the various types of malnutrition. Chosen for this study were the most commonly used indicators:

| | | |
|---|---|---|
| Chronic malnutrition | | |
| Height-for-age (Ht/A) | -- | Stunting |
| Chronic and current malnutrition | | |
| Weight-for-age (Wt/A) | -- | Undernutrition |
| Current malnutrition | | |
| Weight-for-height (Wt/Ht) | -- | Wasting |

**Figure 18: Comparison of Indicators of Malnutrition with Subjects of the Same Age but Different Heights and Weights**




It is important to recognize that Weight-for-Age reflects both recent and long-term malnutrition especially in children older than 2 to 3 years of age.

For weight and height[2] indicators to be meaningful, it is necessary to standardize the child's measurement using reference curves usually taken from healthy children. The WHO/NCHS curves allow the determination of the extent and severity of abnormal nutritional status.

---

[2] Weights were measured using Salter sprint hanging scales with a 25 kilogram maximum and 100 gram increments. Unicef length/height measuring boards were used to measure recumbent length on all ages to the nearest 0.1 cm. It is recommended to measure standing height or stature on children over 24 months of age and recumbent length on children under 24 months. The reference standards of NCHS/WHO have this distinction. Under the survey conditions, it was decided not to have the enumerators determining which child was 24 months or older. Only recumbent length was measured. An adjustment was made to the recumbent length using the formula developed by Alnwick and reported by Stephenson et al. (1983) -- *Height (cm) = Length (cm) - (3 - 0.03864*Age (months))*.

Earlier reference curves (e.g. Harvard standards) were used to express weight and height as a percent of reference median. The weight of the child was divided by the weight of the same age reference child and expressed as a percentage. Cutoffs were applied and the percent of children below the cutoff were classified as having protein-energy malnutrition (e.g. Gomez classification).

Limitations exist with the percentage of median method. For a specific indicator, as age increases, the same percentage of the median does not reflect the same severity of malnutrition. Furthermore, the same cutoff is interpreted differently when other indicators are used. An alternative approach gaining acceptance is the use of Z-scores which measures a standardized deviation of the measurement from the reference median. The Z-score reflects the reference distribution and most importantly is comparable across ages and across indicators. The cutoff most commonly used is -2.0 standard deviations. For reference purposes it is useful to note that the third percentile approximately corresponds to -1.88 Z-score and is roughly equivalent to 77 per cent of the reference median.

To enable comparison with earlier studies, it was necessary to use both Z-score presentations and the percent of median. The formulas are:

$$\text{Z-score} = \frac{\text{(actual measurement - median reference value)}}{\text{standard deviation}}$$

$$\text{Percent of median} = \frac{\text{actual measurement}}{\text{median reference value}} * 100$$

### 8.2 Height and Weights for Survey Children

The three indicators (Ht/A, Wt/A, Wt/Ht) were calculated using the CASP software programme from CDC Atlanta and expressed as either a Z-score or a percentage of the median. Extreme anthropometric values of greater then plus or minus 6.0 Z-scores were excluded from the analysis, except in the case of low weight-for-height where -4.0 Z-score was used as a cutoff. The mean weight and heights for the survey sample is presented in Table 48 and 49. The coefficient of variation (the measure of the relative width of the distribution using the formula of: Standard deviation/mean) is not presented but can be determined from the information in the Tables.

Several points can be made about the results. First, the coefficient of variation is quite acceptable low and indicates sound data coming from the survey. The coefficient is approximately the same for the children from the north as from Katutura indicating similar levels of data quality. The CV is higher for weight than for height indicating higher variability across ages for weight measures. This is a familiar finding when weight for age is compared with height for age. Another observation from the data is that there is little differences when males and females are compared except that girls tend to be slightly smaller. These differences disappear when comparisons are made using the age and sex standardized measures of Weight-for-age, Height-for-age and Weight-for-Height (see later sections).

The sample sizes for the age categories are found in Table 48. The numbers are adequate for the North and All regions sample but are quite small for the Katutura sample. Inferences

from the growth curves for the individual locations are not possible due to the small sample sizes.

**Table 48: Height (in Centimetres) for Survey Children by Age Category for Selected Locations**

| | Males | | | Females | | |
|---|---|---|---|---|---|---|
| | N | Mean | (sd) | N | Mean | (sd) |
| All Regions | | | | | | |
| 6-11.9 | 116 | 69.6 | (3.6) | 118 | 67.4 | (3.2) |
| 12-23.9 | 197 | 77.8 | (4.2) | 177 | 75.5 | (4.2) |
| 24-35.9 | 167 | 83.9 | (4.8) | 178 | 84.0 | (4.3) |
| 36-47.9 | 123 | 94.0 | (5.7) | 198 | 91.2 | (5.2) |
| 48-59.9 | 116 | 99.9 | (4.6) | 107 | 99.7 | (4.7) |
| Average | 719 | 84.2 | (11.1) | 788 | 83.5 | (11.2) |
| Katutura | | | | | | |
| 6-11.9 | 22 | 70.3 | (3.6) | 24 | 67.1 | (3.2) |
| 12-23.9 | 54 | 79.4 | (4.1) | 42 | 76.9 | (4.2) |
| 24-35.9 | 37 | 85.8 | (4.4) | 43 | 84.7 | (4.3) |
| 36-47.9 | 25 | 95.9 | (5.0) | 46 | 91.8 | (5.2) |
| 48-59.9 | 41 | 100.3 | (4.6) | 33 | 102.2 | (4.7) |
| Average | 179 | 83.1 | (11.1) | 188 | 83.5 | (11.2) |
| Peri-urban North | | | | | | |
| 6-11.9 | 48 | 69.9 | (3.6) | 48 | 66.9 | (3.2) |
| 12-23.9 | 48 | 76.2 | (4.1) | 59 | 75.0 | (4.2) |
| 24-35.9 | 59 | 83.3 | (4.4) | 26 | 84.0 | (4.3) |
| 36-47.9 | 39 | 92.9 | (5.0) | 46 | 91.0 | (5.2) |
| 48-59.9 | 20 | 100.3 | (4.5) | 22 | 98.8 | (4.7) |
| Average | 166 | 84.2 | (11.1) | 201 | 102.9 | (11.2) |
| Rural North | | | | | | |
| 6-11.9 | 46 | 68.9 | (3.8) | 46 | 68.2 | (3.3) |
| 12-23.9 | 84 | 77.8 | (4.1) | 76 | 75.0 | (4.3) |
| 24-35.9 | 91 | 83.5 | (4.7) | 109 | 83.7 | (4.4) |
| 36-47.9 | 78 | 93.7 | (5.9) | 106 | 91.0 | (4.7) |
| 48-59.9 | 59 | 99.4 | (4.4) | 52 | 98.4 | (4.8) |
| Average | 358 | 83.3 | (11.1) | 389 | 82.3 | (11.2) |

Note that children over 24 months were measured using reclining length. An adjustment to the length measure was made using the formula: Height = Length - (3 - 0.03864*Age in months). (Measures in centimetres).

**Table 49: Weight (in Kilograms) for Survey Children by Age for Selected Locations**

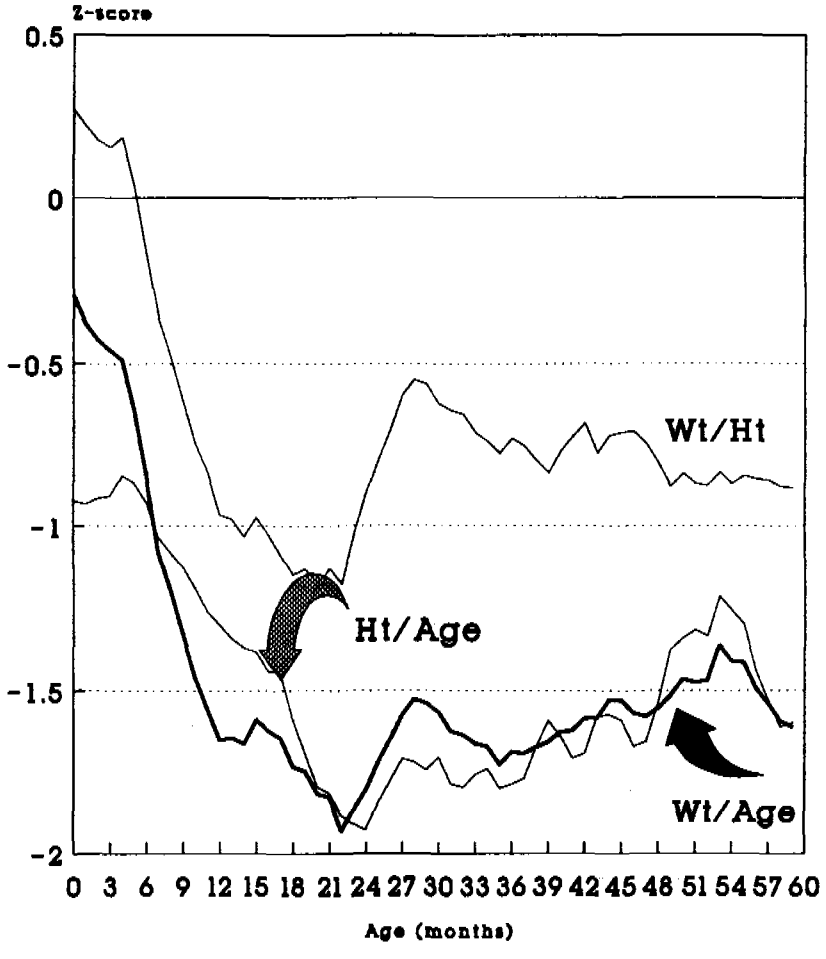
| | Males | | Females | |
|---|---|---|---|---|
| | Mean | (sd) | Mean | (sd) |
| All Regions | | | | |
| 6-11.9 | 8.0 | (1.1) | 7.3 | (1.1) |
| 12-23.9 | 9.5 | (1.4) | 8.9 | (1.3) |
| 24-35.9 | 11.5 | (1.6) | 11.0 | (1.4) |
| 36-47.9 | 13.4 | (1.7) | 12.5 | (1.5) |
| 48-59.9 | 14.9 | (1.6) | 14.4 | (1.7) |
| Average | 11.3 | (2.8) | 10.8 | (2.7) |
| Katutura | | | | |
| 6-11.9 | 8.1 | (1.0) | 7.4 | (1.0) |
| 12-23.9 | 10.4 | (1.3) | 9.5 | (1.2) |
| 24-35.9 | 12.4 | (1.3) | 11.4 | (1.1) |
| 36-47.9 | 14.5 | (1.7) | 13.1 | (1.5) |
| 48-59.9 | 15.4 | (1.5) | 15.5 | (1.7) |
| Average | 11.4 | (2.8) | 10.7 | (2.7) |
| Peri-urban North | | | | |
| 6-11.9 | 7.9 | (1.1) | 7.1 | (1.1) |
| 12-23.9 | 9.0 | (1.1) | 8.8 | (1.4) |
| 24-35.9 | 11.3 | (1.7) | 10.8 | (1.4) |
| 36-47.9 | 13.3 | (1.5) | 12.5 | (1.6) |
| 48-59.9 | 15.4 | (1.7) | 14.2 | (1.3) |
| Average | 9.3 | (2.8) | 9.5 | (2.7) |
| Rural North | | | | |
| 6-11.9 | 7.9 | (1.2) | 7.4 | (1.1) |
| 12-23.9 | 9.3 | (1.3) | 8.7 | (1.2) |
| 24-35.9 | 11.2 | (1.5) | 10.8 | (1.4) |
| 36-47.9 | 13.1 | (1.6) | 12.3 | (1.5) |
| 48-59.9 | 14.3 | (1.5) | 13.4 | (1.6) |
| Average | 16.1 | (2.8) | 10.4 | (2.9) |

### 8.3 Malnutrition by Age

Figure 19 displays the same data for heights and weights expressed as Z-scores and graphed over the age of the sample for children from the North. To reduce month to month variation, a three-month moving average is used. Undernutrition reflected by Weight-for-Age shows an early and precipitous fall so that between 15 and 24 months of age, northern Namibians have dropped as low as they get during their first five years. The preventative implication of these data is that growth monitoring activities at clinic have to be alert to the early declines in child nutritional status. It is suggested by the data that the decline has begun before six months of age. The first year of life, therefore, is critical to the prevention of child malnutrition. By age 21 months, both wasting and undernutrition begin to decrease. The decrease is due to the immunological and dietary adaptation to the prevailing adverse

environmental conditions and the removal of malnourished children from the population due to death.

**Figure 19: Changes in Malnutrition Across Age**




Source: Unicef Namabia Survey 1990

Wasting (Weight-for-Height) shows a similar pattern to undernutrition (Figure 19) but a slightly lagged or delayed fall. The delay is likely due to the longer period for stunting to manifest due to the reduction in height. Nevertheless, wasting is already evident by 9-12 months of age long before the second year of life that is typically the focus for action programmes. Curative services need to be targeted to the 9 to 24 month age group but the prevention of child wasting must begin earlier and no later than the second six months of life.

Stunting patterns in Figure 19 shows an expected delayed onset due to the longer time it takes for deprivation to affect growth in height. By age 27 months, children do not decline further and stunting improvement is likely due to adaptation and attrition due to death.

Comparison of the growth curves in Figure 19 with similar data taken at the same time in rural Zambia (Cogill and Zaza, 1990) suggests that Northern Namibians are must less stunted than rural Zambian children (approximately by 0.5 sd). The age of maximum stunting is slightly earlier in northern Namibia (by three months). The Namibian data shows slightly higher levels of undernutrition (Wt/Age -- 0.25 sd) but the same onset of lowest levels for undernutrition (second year of life). Wasting is much more pronounced in Namibia, but the age of onset is similar. The higher levels of short-term malnutrition reflect the likelihood of a significant impact of seasonal stress on rural Namibians[3]

### 8.4 Prevalence of malnutrition

The percentage of children below the cutoff of -2 standard deviations are presented in Table 50 and Figure 20. The percentage is a prevalence of malnutrition and it is clear that the sample has high and unacceptable levels of malnutrition. The prevalences are presented only for children over six months of age and under 60 months. This is done because infants under 6 months are difficult to measure and their lengths are prone to error. The sample had a total of 220 infants under 6 months (50 per cent were male) out of a total sample size of 1,727 children under 5 years (or 13 per cent). Only 1,507 children are used for the following analyses.

The children of the north are three times more likely to be undernourished than those from Katutura. More alarming is the eight-fold difference in severe malnutrition in northern children. Children suffering from severe undernutrition are at high risk of mortality and the data for the north are reflective of a high risk of child mortality.

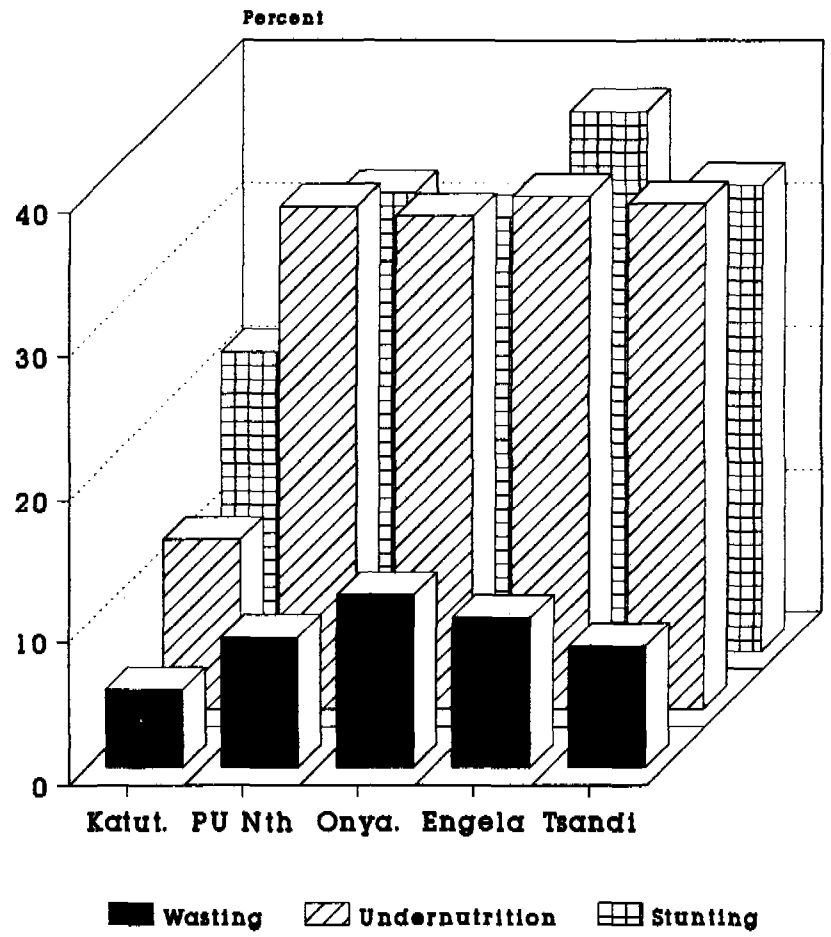
In an unpublished study of a measles outbreak in Oshakati in the North in 1986 carried out on 445 in-patients under five years of age, 85 per cent of the children were below the third percentile (or -2 standard deviations of weight-for-age) (Dr. T. Tueumuna, personal communication). The malnutrition picture was so severe that 21 per cent of the children were below the cutoff of 60 per cent of the median for weight for age. Of the total sample, 15 per cent of children died.

Expressed in another way, the death rate for the total sample of 445 children was 7 percent and for children falling below the 60 percent of median cutoff, the death rate was 16 percent. These data support studies done elsewhere that severely malnourished children are more than twice as likely to die during the outbreak as better nourished children. The interaction of infection and malnutrition can kill.

---

[3] One explanation for the lower levels of stunting and higher wasting or similar patterns for Weight-for-Age and Height-for-Age over the age of the sample is that there was a systematic bias in the measurement of child length. It is possible that enumerators consistently over-measured the lengths. The higher measurement of lengths would reduce the level of stunting but increase the level of wasting (and not affect undernutrition). It is difficult to consider that all enumerators would overstate the lengths but the unusual pattern is suggestive of either measurement problems or serious short-term malnutrition. Unfortunately, no standardization of measurements were taken.

**Figure 20: Prevalence of Malnutrition Among Survey Children by Location**




Source: Unicef Namibia Survey 1990

**Table 50: Prevalence of Malnutrition in Pre-schoolers Aged Between 6 and 60 Months**

| | Undernutrition | | Wasting | Stunting |
|---|---|---|---|---|
| | Moderate[1] | Severe[2] | Combined[3] | Combined[4] |
| KATUTURA (n=367) | 11 | 1 | 5 | 21 |
| NORTH | | | | |
| Peri-urban (n=385) | 26 | 9 | 9 | 32 |
| Rural North (n=749) | 28 | 7 | 10 | 34 |
| -Onyaanya | 28 | 7 | 12 | 30 |
| -Engela | 26 | 10 | 10 | 38 |
| -Tsandi | 31 | 4 | 8 | 33 |
| All locations (N=1501) | 23 | 6 | 9 | 30 |

The number of children are in parentheses.

[1] Moderate undernutrition refers to the percent of pre-schoolers between minus two and minus three standard deviations from median weight for age of NCHS reference population.

[2] Severe undernutrition refers to the percent below minus three standard deviations from median weight for age of NCHS reference population.

[3] Moderate and severe wasting is the percent below minus two standard deviations from median weight for height of NCHS reference population.

[4] Moderate and severe stunting is the percent below minus two standard deviations from median height for age of NCHS reference population.

Northern children experience twice the level of wasting (low Weight-for-height) and 50 per cent more stunting than children of Katutura. As wasting and undernutrition are reflective of short-term malnutrition, these patterns indicate that Katutura children while suffering less short-term malnutrition are still experiencing chronic malnutrition at a high and unacceptable level. Poverty and long-term deprivations still exist in Katutura.

What is interesting to note in Table 50 is the lack of difference in prevalence among the children of the three rural locations and between the children of the rural areas and the children of the Peri-urban North. The only exception is the slightly higher prevalence of wasting and stunting in Engela children. Later, data are presented to show that Engela is significantly worse than Tsandi or Onyaanya for stunting (Table 50). Engela emerges as having more serious long-term or chronic malnutrition. Tsandi reflects a lower level of short-term malnutrition. The better health of Tsandi children will be further exhibited by lower mortality in children and the fewer miscarriages in the mothers (Chapter 10).

The Peri-Urban children, unlike their urban counterparts in Katutura, have the same high levels of malnutrition as the rural children. Urbanization does not appear to have conferred advantages onto these children of better water and sanitation and access to services. Water

and sanitation levels in the Peri-Urban area must be an important explanation for these discouraging levels of malnutrition.

Table 51 presents the data in the same format as Table 50 but percent of reference median is used instead of Z-scores. While Table 51 shows the same pattern as observed in Table 50 it is useful as a means of comparison with previous studies.

Earlier Department of Health and Welfare reports (e.g. Rossouw and Tonder, 1988, 1989) state that

> *"... Malnutrition does not appear to be a major health problem amongst the under 5's cared for by the Department of National Health and Welfare." (Rossouw and Tonder 1989:7).*

This rather surprising assertion is neither supported by the current survey nor the data from the government reports of the time.

The figures for clinically diagnosed malnutrition were reported for 1988 as 529 cases or 9 under-fives per 1,000 target population. (Note these data do not include the Owambo area and are for blacks.) The annual reports from the Department have been supplemented by the 1988/89 demographic and health survey (Rossouw and Tonder, 1989). The Rossouw and Tonder survey covered those districts under the jurisdiction of the department. Notable exclusions include over 55 percent of the population in Owambo, Caprivi, Okavango as well as coloureds and whites.

The Rossouw and Tonder survey presents a great deal of data by district but it must be interpreted with caution. The sampling was derived from identifying approximately 300 households in the district with at least one woman of reproductive age. Largely a fertility study, a number of problems were encountered with non-compliance from respondents, absentees and errors of data collection and quality control. Furthermore, of the sample of 3,067 women, 42 per cent were urban compared with a national figure of 26 per cent. Absence of women from the household due to work was common and resulted in a biased sample of women remaining at home or respondents being older children. It is difficult to interpret data such as prevalence at the district level due to the small sample size and biased sampling. Nevertheless, the guarded interpretation of the data is useful as a baseline for understanding the health and nutrition situation in selected regions of Namibia as a means of comparison with the current study.

Comparing the same indicators and cutoffs with the current study, the Rossouw and Tonder figures (Table 52) are similar for the North of Namibia. The major difference lies in the slightly higher prevalence of stunting found in the 1988/89 study. Rural areas of Namibia, therefore, experience high levels of malnutrition.

Comparison of the Rossouw and Tonder data for 1988 with a small study carried out in three communities in Namibia during the first quarter of 1986 by OXFAM (Hughson, 1986) is difficult due to the different cutoffs used in the surveys. Another problem with the data is the unacceptable high variances for the height and weight data collected in one of the three regions (Berseba). The erratic data for this sub-sample has cast doubt on the means and

prevalence for the whole data set. Nevertheless, it is possible to compare the Oxfam study with the current data set.

**Table 51: Prevalence of Malnutrition Using Cutoffs of Percentage of the Median in Pre-schoolers Aged Between 6 and 60 months**

| | Undernutrition | | Wasting | Stunting |
|---|---|---|---|---|
| | Moderate[1] | Severe[2] | Combined[3] | Combined[4] |
| KATUTURA (n=367) | 16 | 0 | 7 | 9 |
| NORTH | | | | |
| Peri-urban (n=385) | 36 | 1 | 18 | 17 |
| Rural (n=749) | 38 | 1 | 18 | 18 |
| -Onyaanya | 38 | 0 | 20 | 13 |
| -Engela | 38 | 1 | 16 | 22 |
| -Tsandi | 38 | 0 | 18 | 19 |
| All locations (N=1501) | 32 | 1 | 15 | 16 |
| Katutura 1986[5] | 18 | -- | 10 | 17 |
| Otjimbingwe 1986[5] | 26 | -- | 11 | 11 |
| Berseba 1986[5] | 37 | -- | 14* | 16* |

The number of children are in parentheses.

[1] Moderate undernutrition refers to the percent of pre-schoolers between 60 and 80 percent of median weight for age of NCHS reference population.

[2] Severe undernutrition refers to the percent below 60 percent of median weight for age of NCHS reference population.

[3] Moderate and severe wasting is the percent below 85 percent of median weight for height of NCHS reference population.

[4] Moderate and severe stunting is the percent below 90 percent of median height for age of NCHS reference population.

[5] Taken from the March-April 1986 Hughson's Oxfam Katutura survey of 320 pre-schoolers, Otjimbingwe of 159 pre-schoolers and 235 pre-schoolers from Berseba (see below).

* Note: the Berseba data are included for comparison but the Weight-for-Height and Height-for-Age must be interpreted with extreme caution due to high variances in height measurements.

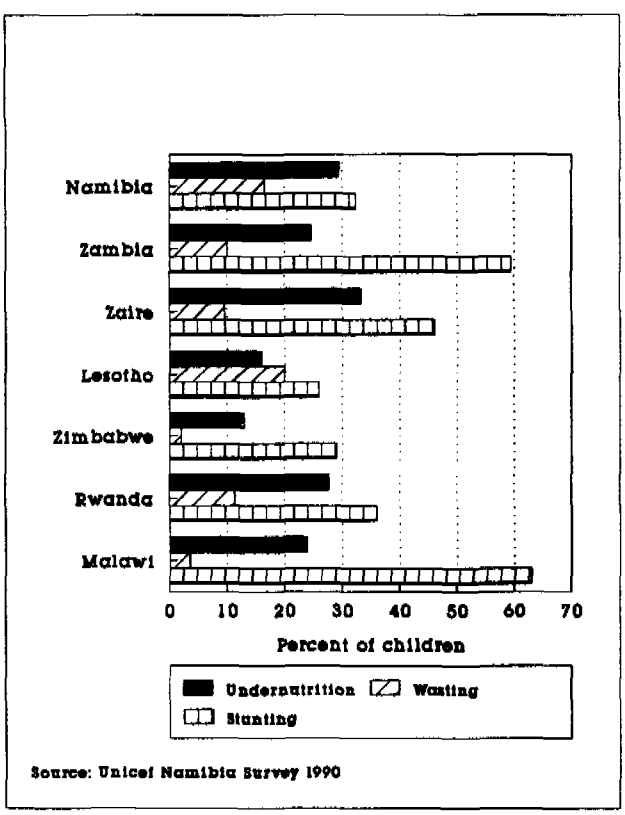
The OXFAM study is especially useful for an analysis of the more sound data for 320 pre-schoolers from Katutura and 159 pre-schoolers from Otjimbingwe, a rural area close to Windhoek. The poor urban community of Katutura was also the site of another study (Garnier, 1986) of conditions during the same period. The data from the OXFAM study found the situation for undernutrition, wasting and stunting worse in 1988 compared with

1990. Hughson found the prevalence of stunting in Katutura to be 17 percent which is over fifty per cent greater than the current study.

Similarly, the cutoff for wasting for the Hughson study (85 per cent of median for Wt/Ht) resulted in a prevalence of 9.7 percent for Katutura compared with the Rossouw and Tonder cutoff of -2SD resulting in a prevalence of 12 percent wasted. The cutoffs for undernutrition (80 per cent of median for Wt/A and -2 sd) are closer, however, and a comparison of the national figure with Katutura indicates less undernutrition in Katutura than nationally. The Hughson figure for undernutrition was quite close to the current study (Table 52).

In the rural Otjimbwingwe and Berseba, the level of undernutrition, wasting and stunting was slightly less than the North but worse than Katutura. The current study and the OXFAM data are suggestive of unacceptable malnutrition levels in Katutura. This situation does appear to have improved slightly since 1988 but the sampling of the 1986 study was biased to poorer households. The nutrition situation, therefore, has remained static or slightly improved. No comparisons are possible for the North but the situation is considerable worse for Northern Namibians.

**Figure 21: Comparison of Undernutrition and Stunting of Namibia and its Neighbours**



## 8.5 Regional comparisons

The comparison of the data on malnutrition from parts of Namibia with similar information for its neighbours provides some idea of the relative prevalence of malnutrition. Table 52 presents these data using the same cutoffs and indicators as other studies (Figure 21 for North Namibia). For the study areas in the North of Namibia, levels of undernutrition are similar to other countries in the region as is wasting. Stunting is slightly less especially when compared with the recent survey in rural Zambia (Cogill and Zaza, 1990). Katutura is similar to Lesotho and Botswana and shows much lower levels of malnutrition (the exception is wasting in Lesotho which is unusually high). The data for Katutura are quite close to the results found from the 1990 survey of urban Luanda (Hunt and Bender 1990). For the northern regions of Namibia, the high levels of wasting and severe undernutrition are grounds for concern.

**Table 52: Prevalence of Malnutrition in Survey Pre-schoolers Compared with Levels Elsewhere in the Region**

| | Undernutrition | | Wasting | Stunting |
|---|---|---|---|---|
| | Moderate[1] | Severe[2] | Combined[3] | Combined[4] |
| KATUTURA (n=367) | 11 | 1 | 10 | 21 |
| NORTH | | | | |
| Peri-urban (n=385) | 28 | 9 | 18 | 32 |
| Rural (n=749) | 28 | 7 | 19 | 34 |
| All locations (N=1501) | 23 | 6 | 17 | 32 |
| NAMIBIA[6] | 27 | - | 12 | 38 |
| Zambia[7] | 20 | 5 | 10 | 59 |
| Zaire[5] | 28 | 5 | 10 | 46 |
| Rwanda[5] | 21 | 6 | 11 | 37 |
| Malawi[5] | 24 | - | 4 | 63 |
| Botswana[5] | 15 | - | - | 44 |
| Lesotho[5] | 14 | 2 | 20 | 26 |
| Zimbabwe[5] | 12 | 2 | 2 | 29 |
| Angola[8] | 12 | 2 | 8 | 25 |

The number of children are in parentheses.

[1] Moderate undernutrition refers to the percent of children between 6 and 60 months between minus two and three standard deviations from median weight for age of NCHS reference population.

[2] Severe undernutrition refers to the percent below minus three standard deviations from median weight for age of NCHS reference population.

[3] Moderate and severe wasting is the percent of children between 12 and 23.9 months of age below minus two standard deviations from median weight for height of NCHS reference population.
[4] Moderate and severe stunting is the percent of children aged 24 to 59.9 months below minus two standard deviations from median height for age of NCHS reference population.
[5] Country data taken from Carlson and Wardlaw (1990) and Unicef "State of the World's Children 1990'.
[6] Rossouw and Tonder (1989) -- excludes Ovambo region.
[7] Cogill and Zaza (1990) survey of Rural Zambia
[8] Hunt and Bender (1990) survey of Urban Luanda only.

### 8.6 Malnutrition and Returnee Children

A repeated concern has been expressed over the condition of children who were among the 44,000 returnees repatriated as part of the UN sponsored transition to independence. It is encouraging to read that compared with non-returnee children, the 79 returnee children are generally better off (Table 53) but this difference is not statistically significant.

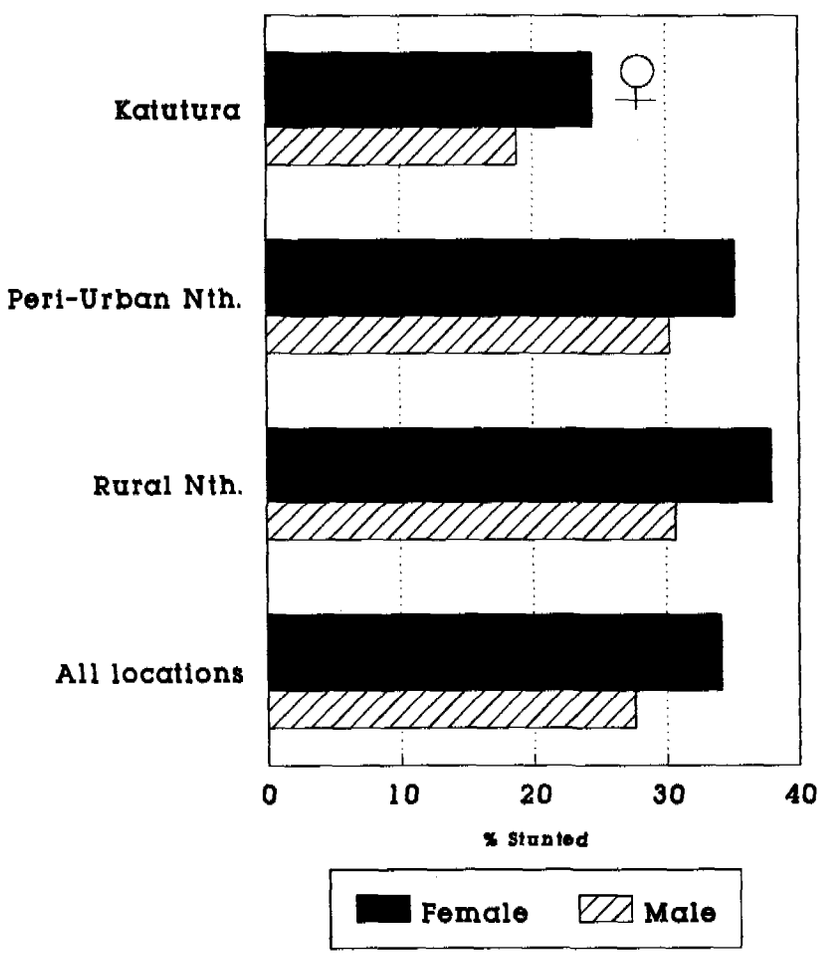
**Table 53: Returnee Children - Prevalence of Malnutrition in Returnee and Non-returnee Pre-schoolers Aged Between 6 and 60 Months by Location**

| | Undernutrition[1] | | Wasting[2] | | Stunting[3] | |
|---|---|---|---|---|---|---|
| | Yes | No | Yes | No | Yes | No |
| KATUTURA (n=11:356) | 0 | 12 | 0 | 6 | 9 | 21 |
| NORTH | | | | | | |
| Peri-urban (n=14:371) | 7 | 36 | 0 | 10 | 7 | 33 |
| Rural (n=55:695) | 29 | 36 | 11 | 10 | 28 | 36 |
| -Onyaanya | 29 | 35 | 29 | 12 | 29 | 30 |
| -Engela | 35 | 36 | 12 | 10 | 24 | 39 |
| -Tsandi | 27 | 37 | 7 | 9 | 30 | 33 |
| All Locations (N=79:1422) | 22 | 30 | 8 | 9 | 22 | 31 |

The number of returnee children, and non-returnee children are in parentheses. Note: There were no significant differences between returnee nutritional status and non-returnee nutritional status.
1 Undernutrition refers to the percent of pre-schoolers below minus two standard deviations from median weight for age of NCHS reference population.
[2] Wasting is the percent below minus two standard deviations from median weight for height of NCHS reference population.
[3] Stunting is the percent below minus two standard deviations from median height for age of NCHS reference population.

The differences between the returnee and non-returnee children are more marked when a comparison is made with long-term indicators of malnutrition. As a cautionary indication of future problems, wasting among returnees shows levels very similar to the other children in the north. In other words, the better nutrition status gained in exile may be weakened by the difficulty of life in the rural north. Evidence of such short-term hardships is provided by the data showing reliance on food and income transfers and the lack of employment among the returnee households.

**Figure 22: Household Gender and Child Stunting**




Source: Unicef Namibia Survey 1990

**Table 54: Female Headed Households - Prevalence of Malnutrition in Female and Male Headed Households by Location**

| | Undernutrition[1] | | Wasting[2] | | Stunting[3] | |
|---|---|---|---|---|---|---|
| | Fmle | Male | Fmle | Male | Fmle | Male |
| KATUTURA (n=143:224) | 9 | 14 | 4 | 7 | 24 | 19 |
| NORTH | | | | | | |
| Peri-urban (n=145:240) | 38 | 34 | 7 | 10 | 35 | 30 |
| Rural (n=329:420) | 38 | 34 | 11 | 10 | 38 | 31 |
| -Onyaanya | 41* | 29* | 14* | 10* | 36* | 26* |
| -Engela | 37 | 35 | 9 | 12 | 43 | 34 |
| -Tsandi | 35 | 36 | 10 | 7 | 34 | 32 |
| All locations (N=617:884) | 31 | 28 | 8 | 9 | 34* | 28* |

The number of children in female-headed households and male-headed households are in parentheses

[1] Undernutrition refers to the percent of pre-schoolers below minus two standard deviations from median weight for age of NCHS reference population.

[2] Wasting is the percent below minus two standard deviations from median weight for height of NCHS reference population.

[3] Stunting is the percent below minus two standard deviations from median height for age of NCHS reference population.

* Statistical comparisons of Z-score and percent of median within locations show only Onyaanya having significant different means with Female headed households worse at the P<.01, P<.05 and P<.05 level for Wt/Age, Wt/Ht and Ht/Age respectively.

### 8.7 Malnutrition and Head of Household Gender

Earlier in this report, the income and asset characteristics of female-headed households were compared with male household heads. Female-headed households were poorer and more isolated than their male counterparts. Figure 22 and Table 54 supports this conclusion by revealing that stunting, an indicator of long-term deprivation, is significantly worse in female-headed households for all locations and for rural Onyaanya. Furthermore, the Onyaanya female headed households have worse wasting and undernutrition. The higher rates of malnutrition in these households is both an indication of hardship and a signal for further action.

**Table 55: Average Weight for Age, Weight for Height and Height for Age Z-scores for the Survey Children Aged 6 to 60 Months**

| | Undernutrition | | Wasting | | Stunting | |
|---|---|---|---|---|---|---|
| | Weight/Age | | Weight/Height | | Height/Age | |
| KATUTURA (n=367) | -1.0[2] | (0.94) | -0.4[2] | (0.95) | -1.1[2] | (1.11) |
| NORTH | | | | | | |
| Peri-urban (n=385) | -1.6 | (1.03) | -0.8[1,4] | (0.98) | -1.6 | (1.20) |
| Rural (n=749) | -1.6 | (0.97) | -0.8[4] | (0.94) | -1.5 | (1.16) |
| -Onyaanya | -1.5 | (1.00) | -0.8 | (0.98) | -1.4[3] | (1.14) |
| -Engela | -1.6 | (0.99) | -0.8 | (0.95) | -1.7[3] | (1.09) |
| -Tsandi | -1.6 | (0.89) | -0.9[1] | (0.86) | -1.5[3] | (1.24) |
| All locations (N=1501) | -1.4 | (1.00) | -0.7 | (0.97) | -1.4 | (1.17) |

Note: No statistical differences were found when male and female Z-scores were compared for all regions and for each location.

[1] Comparison of Peri-urban and Tsandi for wasting significant at P<.05 (T-test)

[2] Comparison of Katutura with all others for undernutrition, wasting and stunting significant at P<.001 (T-test)

[3] Comparison of Onyaanya and Engela (and Tsandi and Engela) for stunting significant at P<.05 (T-test)

[4] Comparison of Peri-urban and rural north for wasting significant at P<.05 (T-test)

### 8.8 Malnutrition by Location

Tables 50 to 54 present data for the locations for the prevalence of malnutrition according to different criteria. The presentation of average Z-scores enables a statistical comparison of the results. Table 55 provides a comparison of the mean Z-scores. The results follow the pattern established in the earlier tables. Not surprisingly Katutura is significantly better than all other locations for the three indicators. Comparison among the rural locations result in a differentiation of long-term malnutrition. Engela emerges as the worst location and is significant. The regional comparisons will be explored later using regression techniques to control for confounding due to different income levels and other key factors.

### 8.9 Malnutrition and Income

The data indicate that long-term malnutrition is more serious in households from rural areas, the north, with female heads and from specific locations such as Engela. Income in its broadest sense was identified in the conceptual framework as an important determinant of household food security and nutrition. This section examines the data for household income and nutrition with the assumption that low income is associated with worse nutrition.

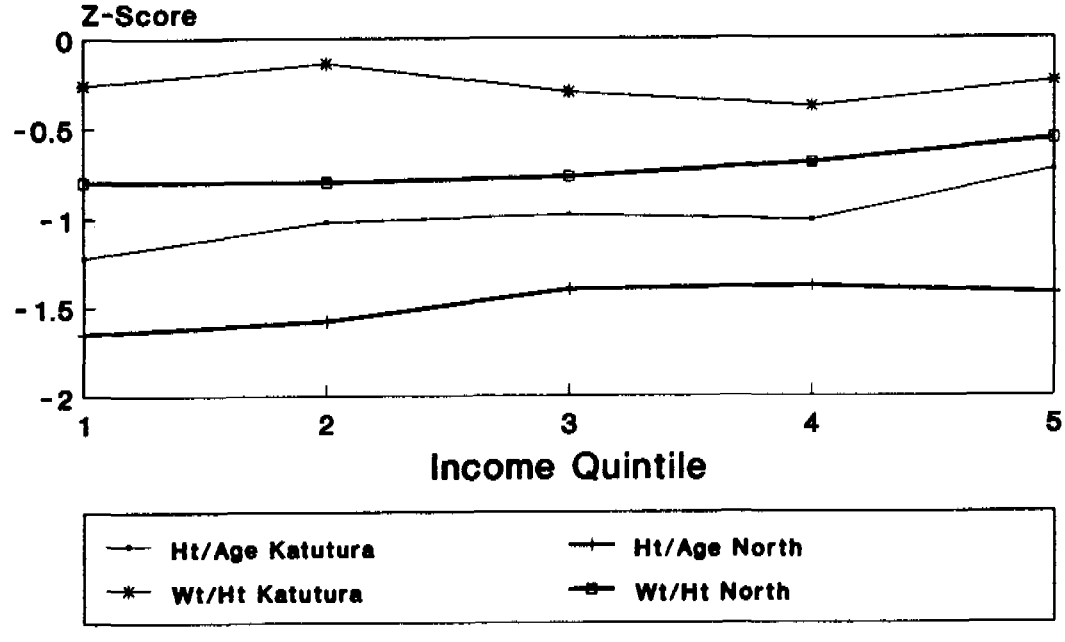
Figure 23 and Table 56 present the findings for specific groupings of the rural and peri-urban north and Katutura. The households were grouped into quintiles by annual household income for the location. This grouping was necessary due to the very different levels of income in Katutura compared with the north.

The results clearly show that as income increases, stunting levels drop in a roughly linear manner. This pattern is repeated for undernutrition (weight-for-age) but is not evident for wasting (weight-for-height).

Two statistical tests were applied. The first compared the best and poorest income quintile using the powerful T-test. Differences between quintiles for Katutura and the rural north were significant (Table 56) for stunting while wasting and undernutrition were significant for the North only. Analysis of variance across quintiles (Table 56) shows the trend more pronounced for the rural north which influences the results for the North.

Both weight-for-age and height-for-age are significant in their trend with increasing income and better nutritional status. Wasting is also significant but at a weaker level ($P<.05$). Note that the relationship is not necessarily causal. Increased income is only associated with improved nutrition. Higher income households may have better food security, better access to services, better child care, and better water and sanitation. Improving income without improved environmental conditions including health, water and sanitation will not necessarily translate into improved nutrition (Kennedy and Cogill, 1987).

**Figure 23: Household Income (Grouped by Income Quintile) and Child Nutrition**




**Source: Unicef Namibia Survey 1990**

**Table 56: Comparison of Pre-schooler Nutritional Status by Income Quintiles by Location**

(Mean Z scores for each quintile)

| | Height/Age | Weight/Age | Weight/Height |
|---|---|---|---|
| Katutura[1] | | | |
| 1 | -1.2** | -0.9 | -0.3 |
| 2 | -1.0 | -0.8 | -0.1 |
| 3 | -1.0 | -0.9 | -0.3 |
| 4 | -1.0 | -0.9 | -0.4 |
| 5 | -0.7** | -0.6 | -0.2 |
| All | -1.0 | -0.8 | -0.3 |
| N=396 | NS | NS | NS |
| North[1] | | | |
| 1 | -1.6* | -1.7*** | -0.8** |
| 2 | -1.6 | -1.6 | -0.8 |
| 3 | -1.4 | -1.5 | -0.8 |
| 4 | -1.4 | -1.4 | -0.7 |
| 5 | -1.4* | -1.3*** | -0.6** |
| All | -1.5 | -1.5 | -0.7 |
| N=1,234 | F=2.4 P<.05 | F=4.2 P<.01 | F=2.5 P<.05 |
| Peri-Urban North[1] | | | |
| 1 | -1.6 | -1.6 | -0.7 |
| 2 | -1.6 | -1.6 | -0.7 |
| 3 | -1.3 | -1.4 | -0.8 |
| 4 | -1.5 | -1.5 | -0.7 |
| 5 | -1.5 | -1.3 | -0.5 |
| All | -1.5 | -1.4 | -0.6 |
| N=434 | NS | NS | NS |
| Rural North[1] | | | |
| 1 | -1.6*** | -1.6*** | -0.8 |
| 2 | -1.6 | -1.6 | -0.9 |
| 3 | -1.6 | -1.6 | -0.8 |
| 4 | -1.3 | -1.4 | -0.7 |
| 5 | -1.2*** | -1.3*** | -0.7 |
| All | -1.5 | -1.5 | -0.8 |
| N=800 | F=3.9 P<.01 | F=4.9 P<.01 | NS |

*** Comparison of lowest (1) and highest (5) quintile means are significant: * P<.05; ** P<.01; *** P<.001 (T-test).

[1] Households were ranked in ascending order and assigned to equal quintile based on: Katutura -- annual reported household income for Katutura sample only; North -- annual reported household income for all northern households excluding Katutura; Peri-urban north -- annual reported household income for all northern households excluding Katutura; Rural north -- annual reported household income for peri-urban northern households excluding Katutura and rural north. Analysis of variance results within indicators (eg Wt/Age) and across quintiles are presented. NS -- no significant difference.

[2] Comparison of means for lowest (1) and highest (5) quintile is significant at P<.01 (T-test).

Note: Households were also ranked by livestock and cattle ownership and the nutritional status compared across quintiles. The results show that while magnitudes of malnutrition were similar for the North, the statistical tests (Analysis of variance and T-test) indicated slight significance for stunting (Height for age) and undernutrition (Weight for age).

## 8.10 Multivariate analysis of malnutrition

The analysis presented so far has examined the data in terms of means and proportions disaggregated by location, gender of head of household, returnee status and age grouping. Such static comparisons often raise more questions than is answered by the analysis. For example, were the differences in malnutrition rates between the North and Katutura explained by different income levels? The data from the survey lend themselves to multivariate analysis in which key variables are used to build a model to explain the patterns of nutritional status found in the static analysis.

The models that can be chosen are many but certain statistical and subject matter criteria are used in selecting the best model. The model should encompass the following explanatory variables.

Nutrition status= f (Income, education level, illness, gender of head of household, health knowledge, water quality, location, age, sex of child, farming, age solid introduction, immunization status, returnee status, household size)

The models were run for the whole sample, the North and for Katutura households. The distinction between Katutura and the North was made to take account of the different environments. The reader is referred to Appendix G for the models and statistical results.

Table 57 presents a summary of the results in Appendix G. The information should be read in a directional manner relative to the dependent variable. For example, an increase in the education level of the household is associated with an improvement in stunting, or better height-for-age (similarly for Wt/Age and Wt/Ht). Comparison of difference locations are read as Onyaanya is better for Ht/Age than Peri-Urban North. The comparison for the North is between the rural locations and the Peri-Urban North while in the All Regions analysis it is between all the North locations and Katutura.

A cautionary note must be made about interpreting results from multiple regressions analyses. The model enables the variance in the dependent variable (e.g. stunting) to be explained by a number of dependent variables. The relationships between the dependent variable and the outcome variable is not necessarily causal. Improving education is only associated with improved nutrition, it cannot be proved that it actually causes a lowering in malnutrition.

Furthermore, the variables chosen were not comprehensive in determining nutritional status. The child's genetic potential, psychological environment, illness history, utilization of food, birth weight, and quality and quantity of food intake are key variables that are not reflected in the models. As a result of incomplete model building, the variance explained by the models is quite low. For the All Regions model (see Appendix G), the best models could only explain 10 percent of the variance in weight for age and weight for height (referred to as the R square). Less than 4 percent was explained in the height-for-age models. The remaining 90 percent can be accounted for by measurement error and the lack of other explanatory variables as noted above.

**Table 57: Regression Results for Significant Coefficients for Variables Used to Predict Nutritional Status in Survey Children**

| | KATUTURA | | NORTH | | ALL REGIONS | |
|---|---|---|---|---|---|---|
| Variable | Better | Worse | Better | Worse | Better | Worse |
| **Ht/Age** | | | | | | |
| Education of head | X | | X | | X | |
| Income | | | X | | X | |
| Girl vs Boy | | | X | | X | |
| Time ill | | | | X | | |
| Age | | | | | | X |
| Fever | | | | | | X |
| Ony. vs PUN | | | X | | | |
| Eng vs. Kat | | | | | X | |
| Tsi vs. Kat | | | | | X | |
| PUN vs. Kat | | | | | X | |
| **Wt/Age** | | | | | | |
| Education of Head | X | | X | | X | |
| Income | | | X | | X | |
| Age child | | X | | X | | X |
| Age solid intro. | | X | | | | |
| Time ill | | | | X | | X |
| Ony. vs PUN | | | X | | | |
| Eng vs. Kat | | | | | X | |
| Tsi vs. Kat | | | | | X | |
| Ony vs. Kat | | | | | X | |
| PUN vs. Kat | | | | | X | |
| **Wt/Ht** | | | | | | |
| Education of Head | X | | X | | X | |
| Age child | | X | | X | | X |
| Age solid intro. | | X | | | | |
| Time ill | | | | X | | X |
| Fever | | | | X | | X |
| No treatment | | | | X | | X |
| Eng vs. Kat | | | | | X | |
| Tsi vs. Kat | | | | | X | |
| Ony vs. Kat | | | | | X | |
| PUN vs. Kat | | | | | X | |

For a full description of variables and models refer to Appendix G. Note that location comparisons compare nutritional status of the location with Peri-Urban North in NORTH, and with Katutura in ALL REGIONS. All variables significant at P<.05. The Better and Worse designations should be read as an increase in the level of variable x will result in a bettering or worsening of the dependent variable. Ony is Onyaanya, Eng is Engela, Tsi is Tsandi, PUN is Peri-Urban North and Kat is Katutura.

While the explanatory power of the models is low, it is well within the range found for these types of models. The main focus is not the overall R square value but the significance of the T statistic on the individual variables or coefficients. Table 57 presents only those variables that were significant in its relationship with the dependent variable. The non-significant variables are presented in the model in Appendix G. The lack of significance in these variables (Appendix G) could be due to a lack of any relationship with the dependent variable or that measurement error was too great for the relationship to be found, or the variable was poorly specified. For example, the variable NONE1 refers to the action taken by the guardian

to a child with diarrhoea. If no action was taken (NONE1=1), this was assumed to reflect poor attitudes to better health for the child, a proxy for poor health knowledge. If the question was asked poorly (measurement error) or the answers reflected factors other than health knowledge (e.g. respondents were too busy and just gave any answer) than the explanatory power of the variable will be reduced.

The regressions yielded some very interesting results.

**a. The differences found in the earlier Tables in nutritional status between Katutura and the North for all variables are maintained.**

- Katutura has less stunting, undernutrition and wasting even after controlling for differences in income, education of head, illness patterns, and access to water, etc.

This finding is important as the 8-fold difference in household income between the North and the South could have been the main reason for the difference in nutritional status. The differences in nutritional status are partly income but must also be explained in terms of the environmental factors such as health status, water and sanitation, and food quality, quantity and utilization. The only exception found in the results was Onyaanya which was not worse for stunting when compared with Katutura. This differs from the result of Table 55 where Katutura was significantly better for height-for-age than Onyaanya. This could mean that the differences found in the static comparison (Table 55) were diminished after controlling for income.

**b. The comparison among the locations confirms some of the earlier results (Table 55) that:**

- No differences were found when comparing the Peri-Urban North with Engela or Tsandi except that Onyaanya has less long-term malnutrition (stunting and wasting) than the Peri-Urban North.

The differences between northern locations that were found in wasting (Table 55) were diminished after controlling for income, education, etc.

**c. The comparison of gender of head of household and child nutrition adds to the results found in Table 54 that:**

- Female headed households are not different nutritionally from male headed households for all locations.

The results of Table 54 clearly show a significant difference in stunting between female and male headed households. The regressions results indicate that this difference is no longer significant after controlling for income, education, etc.
In other words, when children from female-headed households are placed on equal footing with children from male-headed households, the differences found in stunting no longer appear.

**d. The comparison of children who are returnees with non-returnees confirms the results of Table 53 that:**

- Returnee children are not better nourished than non-returnees children, but neither are they worse nourished.

**e. An analysis of education of the head of household which reflects the overall education level of the household, found that:**

- More education was highly significant and positively related to better nutrition in all locations.

The consistency of the finding in the regressions supports that assertion of improvements to education for all Namibians. The analysis is not able to demonstrate whether or not the influence is directly related to education (that is, literacy and education in promoting child health through use of health and nutrition information and improved child care) or acting through intermediary variables such as wealth. Better educated households have more income, better housing, water and sanitation and so on. In Katutura where measured income was a better reflection of household wealth, the positive relationship of education was found supporting the contention that education independent of income was the major determinant of improved nutrition.

**f. Comparison of boys with girls found that only in the North and the All regions analysis that:**

- Girls in the North experienced less stunting when compared with boys and controlling for age.

The explanation as to why boys are more stunted is unclear. The greater mobility of boys and their requirements for looking after small animals, even at early ages, has been suggested as one explanation.

**g. The regression models used various expressions for income and wealth before the models in Appendix G were used. The results for long-term malnutrition (height-for-age and weight-for-age) show that:**

- Increasing income is positively associated with better long-term nutrition in the North.

The results partly confirm the trends in Table 56. The quintile analysis showed less wasting associated with increasing income. The regression analysis did not find a relationship for wasting. The positive relationship for stunting and undernutrition (Table 57) was not strong and as discussed earlier, doubling or increasing income ten-fold will only have a small change in levels of stunting or undernutrition. Nevertheless, within the possibility of measuring household income, a significant and positive relationship was found to nutrition. Clearly, other factors than income play a role. Increasing income, independently of attention to other

factors, will not improve long-term nutrition. Indeed, short-term wasting does not appear to be related to income levels at all.

**h. Illness would be expected to be an important determinant of nutritional status. Relying on a few carefully selected symptoms, the survey recorded the percentage of time ill for the past 14 days. The regression results indicate:**

- Increasing time spent ill is associated with higher levels of malnutrition, especially in the north and especially for wasting.

The results were consistent for all forms of malnutrition and highly significant for wasting. The result for stunting likely reflects that the illness variable is a proxy for overall household welfare. A poorer environment measured in the time the child is ill is related to the cumulative effect on growth reflected in stunting. Short-term wasting is directly related to illness events in the past two weeks and this was reflected in the data (Table 57 and Appendix G). In Chapter V, the regression results for the models to explain illness are presented. The results show that reducing illness will be strongly associated with improved nutrition, especially short-term malnutrition.

**i. Examining illness further found that:**

- Fever was strongly associated with more wasting in children from the North.

This highly significant finding confirmed earlier results that fever affected the North. The negative relationship to a short-term measure, as is wasting, points to the need for interventions to improve child health (see Mbomena and Mundia, 1990). Note that this relationship of fever and wasting existed after controlling for household education, income etc.

**j. The variable reflecting health awareness (NONE1) was used to determine a relationship with nutrition (referred to as "No treatment" in Table 57).**

- The more familiar a guardian was with more positive health behaviour, the more likely the child was to be less wasted, especially in the North.

In other words, failure by guardians to seek treatment for diarrhoea in general situations was related to more wasting in the child. Health education, therefore, is an area for special consideration in the North.

**k. The age of introduction of solid food to infants was studied to determine any relationship to nutrition.**

- Later introduction of solid food in Katutura infants was associated with poorer wasting and undernutrition.

This weakly significant relationship was found after controlling for household income etc. The finding is difficult to explain. Furthermore, the result should not be interpreted that solid

foods should be introduced earlier than the mean of four months. Katutura parents usually have access to good quality weaning foods, fuel and clean water.

**l. The age of the child was introduced even though the indicator used as a dependent variable has already been standardized.**

- Older children experience more malnutrition (especially wasting) than younger children.

This pattern of worse malnutrition was shown earlier and confirms the need to present nutrition disaggregated by age of child. Another point is that the relationship of older children and worse malnutrition may not be linear. In other words, wasting may be low in the first six months of age, then increase for the next 18 months but then decrease as the child grows older. The relationship is described as U-shaped. The regression model represents the U-shape as a linear one with older children and worse wasting.

**m. Access to services and protection afforded by immunization was difficult to test. The level of immunization by DPT or polio was introduced into the model (DPTSTAT1) to reflect the above.**

The analysis found that the level or completeness of immunization was not related to nutrition other than a weakly significant relationship for stunting in the All Regions analysis (Appendix G). In other words, full immunization or utilization of services is not associated with better nutrition.

**n. Household size can have either a positive or negative relationship with nutritional status.**

- The numbers of people in the household or the percent under 15 years of age were not related to nutrition in all locations.

Within the range of household size found in the survey and after controlling for education of head, income, etc no additional benefit was found in small numbers of household members. When the models were ran with the percent of household members under 15 years, the results were the same.

# Chapter 9 Child Mortality

## 9.1 Introduction

Estimates of basic demographic information such as infant and child mortality as well as maternal mortality are either taken directly from the vital registration system or derived from comprehensive fertility surveys. Very little information exists in Namibia on survival in women or children especially for the north. Estimates of infant mortality for the rural areas range from an improbable DHNW figure of 26 per thousand (Rossouw and Tonder, 1989) to 162 per thousand suggested by SWAPO/WHO prior to independence. More recently figures have been suggested to be between 105 (Unicef, 1990) and 116 per thousand (Anon, 1988).

The UNICEF report "Children on the Front Line" (1989) gives figures for the infant mortality for blacks in Windhoek in 1986 as 175 to 200 per thousand live births. Child mortality was reported at 235 to 300 per thousand. These very high figures were supposedly based on "official Windhoek data" but is in contradiction to the reports of the Department of National Health and Welfare of the period. In an UN Institute for Namibia publication, an infant mortality rate of 155 per thousand was reported for the black population. Whites were reported as having a mortality rate of 21 per thousand. Fortunately, this study was able to study this important issue and the findings are presented below.

As part of the survey, questions were included to estimate mortality statistics using indirect methods developed in situations of limited or incomplete data. The techniques, sometimes referred to as the Brass method[1], are standard tools of the demographer and have found

---

1 The Brass method relies on information collected on women in the child bearing years (15-50 years) who have ever given birth to a child. The ratio of the number still living to the children ever born yields the proportion of children surviving. The complement, proportion of children dying, can be used to give and index of child mortality for the recall period. There are some biases, however. These biases are several fold. The number of children dying may be under-reported due to memory loss or cultural factors affecting the willingness to recall especially in older women. Maternal mortality will reduce available respondents who themselves may have had children who died. The biases exist but are minimal and by comparing the index of mortality with conventional mortality indexes, a minimal estimate of mortality can be derived.

The method yields the probability of dying from birth to age x for each of the five-year age groups of the women. For women aged 15 to 19 years, the probability of dying before the child is one year can be estimated; from women aged 20 to 25 years, the probability of dying before age two; and for women 30 to 35 years, the probability of dying before age five. Women at age 49 years, therefore, yield the probability of dying between birth and 20 years.

In using conventional mortality indexes to "correct" the survey data, various assumptions have to be made regarding the reference population or model life table. The reference model life tables have been developed on the assumption that the population is stable. Migration and deviations from constant fertility and mortality (e.g. war or epidemics) are two factors that weaken the stable model. The situation in the north of Namibia must be considered to be a

widespread use in Africa (Shyrock and Siegel, 1976).

### 9.2 Indirect Estimation of Child Mortality

The method is based on a limited number of questions asked of each woman of reproductive age. The total sample of 1,739 women were interviewed and information gathered on her age, the number of live births and the number of children surviving at the time of interview.

The information was collated by age category (see Appendix C) and the indirect method applied. Various model life tables were tested and included North, South, East, West and the UN General Model. To facilitate the analysis, two approaches were taken. The first was to work through the data using the West Model. The second used the Q-Five software of the UN Software Programme for Child Mortality Measurement in which the five models were tested (see Appendix C).

Limitations of the method are many and are described in the footnote on the previous page. Inadequate sample sizes and the assumptions of a stable population are two of the most serious limitations in the current survey. To reduce the errors, only the results for the larger locations are presented.

### 9.3 Sample Characteristics

The lack of vital registration of deaths and births can be partly attributed to the number of births taking place in the home. In Table 58, the frequency of home birth is recorded. The rural areas are consistently poorly serviced by health and education facilities. Over one-third of children of Onyaanya and Engela are born at home.

Tsandi residents again reflect a different pattern by over 90 percent of children born at the health centre or hospital. The high utilization of the Tsandi health facilities is an excellent opportunity for reaching the local population and reinforcing positive health behaviour.

Katutura children, reflecting the better services, are born in health facilities. Roussow and Tonder's (1989) survey of rural Namibians other than the Ovambo area found the one-third of women giving delivery at home which is comparable to the rural areas of the study.

When the data were examined for a trend with child age, no trend was seen. In other words, mothers of the survey are no more inclined to give birth in a health centre in 1989 compared with 1988 or 1985.

---

population undergoing change. Chosen for the current study were the "West" model life stables based on the experiences in other countries (Shyrock and Siegel 1976). From these models, it is possible to estimate other variables such as life expectancy, crude death rate and birth rate. It should be stressed that these data are only the beginning of the investigation. More work needs to be done. Sample sizes are critical as at least 1,000 women are necessary for an estimate.

**Table 58: Percentage of Pre-schoolers Born at Home**

| | Births in the Home |
|---|---|
| Katutura | 12 |
| Peri-Urban North | 17 |
| Rural North | 26 |
| -Onyaanya | 40 |
| -Engela | 31 |
| -Tsandi | 10 |
| All Areas (N=1,739) | 21 |

## 9.4 Child Mortality

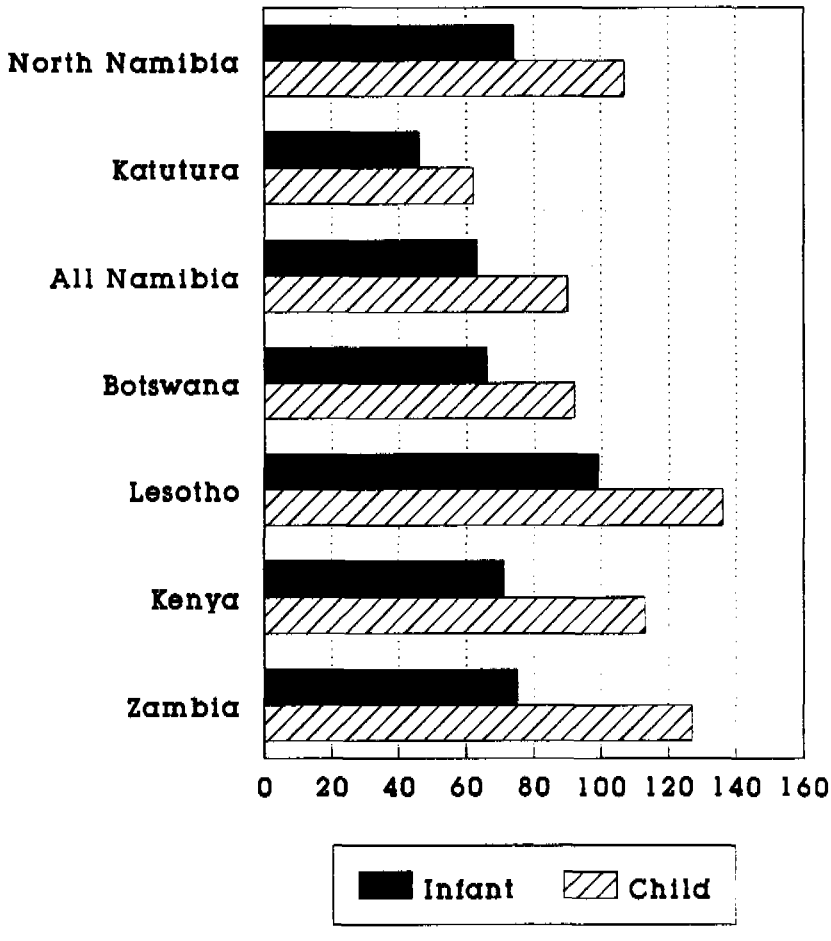
Estimates of mortality are presented in Table 59 and in Appendix C. The estimates for the infant mortality are extrapolated while the figures for early childhood and child mortality are taken directly from the data from the survey.

The results show that the relative differences observed in malnutrition rates between the North and Katutura are maintained. Children of the North are 50 to 60 per cent more likely to die before their first, second or fifth birthdays than the better-off Katutura children. For every 1,000 live births in the north, over 106 or ten percent of these children will die before their fifth birthday. Most of these deaths are preventable.

While the level of mortality is lower than some of the neighbours, the Namibia data illustrate the need for aggressive programmes to address the unacceptable levels of mortality. In addition, further work is necessary to establish more reliable estimates of infant and child mortality. These figures must be considered as tentative only.

From the patterns of infant and child mortality, it is possible to extrapolate these results and determine a number of related statistics. Table 60 presents the summary from selected locations while comparing the results from neighbouring countries.

**Figure 24: Infant and Child Mortality in Selected Regions in Namibia and in Neighbouring Countries**




Source: Unicef Namibia Survey 1990

**Table 59: Infant, Early Childhood and Child Mortality Rates (deaths per 1,000 live births) for Survey Children and Neighbouring Countries**

| | Infant Mortality (Under 1 yr) (Projected[2]) | Early Childhood mortality (Under 2 yrs) (Estimated[1]) | Child Mortality (Under 5 yrs) (Estimated[1]) |
|---|---|---|---|
| All regions (N=1739) | 65 | 59 | 92 |
| Ovambo region (n=1082) | 74 | 61 | 107 |
| Rural North (n=662) | 73 | 69 | 106 |
| Peri-Urban N (n=411) | 70 | 53 | 100 |
| Katutura (n=655) | 47 | 33 | 64 |
| Namibia | 105 | na | 176 |
| Zambia | 75 | na | 127 |
| Botswana | 66 | na | 92 |
| Angola | 116 | na | na |
| Lesotho | 99 | na | 136 |
| Kenya | 71 | na | 113 |

See Appendix C for data and results for various models. na is not available. Country mortality rates from Unicef (1990) except for Angola (calculated from data from Calaco 1989 by Cogill). Note: Onyaanya, Engela and Tsandi not presented due to small sample size.

[1] Estimated -- Refers to the survey data using the West Model and Brass method and the Coale-Demeny Models using the Trussel equations(data in Appendix C). Note the under one mortality is not to be used as sample sizes were too small.

[2] Projected -- Refers to the rates derived from the estimated Level of Mortality that is exhibited by the data and interpreted from the "West Model".

### 9.5 Some Selected Demographic Statistics

The high level of fertility (see Chapter 10) and the in-migration into the Peri-Urban North is reflected by the high rate of population increase (Table 60). Katutura is low, but this figure is distorted due to the large percentage of women and children absent or at home in the rural areas. The national figure of 3.2 per cent is similar to earlier reports for Namibia. It is the North that reflects the patterns exhibited by the rapidly growing countries of Kenya and Zambia.

The rapid growth in numbers is due to a young population with high birth and a low and declining death rate. This relationship is apparent in Table 60 when the birth rate is divided by the death rate. The North has a 5:1 ratio while Katutura and some Namibia's neighbours, it is approximately 3:1. The data reflect the short and long-term issue facing planners for a food and economically secure North.

The relatively low mortality rate and high birth rate results in estimated life expectancies in the study areas comparable to Namibia's better-off neighbours. These data, it must be stressed, are tentative and likely over state the situation. In other words, the situation is likely to be slightly worse than presented here.

**Table 60: Population Annual Growth Rate, Crude Birth and Death Rates for Survey Locations and for Neighbouring Countries**

| | Rate of Increase (% pa) | Crude Birth Rate | Crude Death Rate | Life Expectancy (yrs) |
|---|---|---|---|---|
| All regions | 3.2 | 41 | 9 | 60 |
| Ovambo region | 4.0 | 50 | 10 | 60 |
| Rural North | 3.8 | 48 | 10 | 60 |
| Peri-urban N | 4.2 | 47 | 9 | 60 |
| Katutura | 2.5 | 33 | 8 | 65 |
| Namibia | 3.1 | 44 | 10 | 56 |
| Zambia | 3.9 | 51 | 14 | 54 |
| Botswana | 3.5 | 47 | 11 | 59 |
| Angola | 2.8 | 47 | 20 | 45 |
| Lesotho | 2.8 | 41 | 12 | 56 |
| Kenya | 4.1 | 54 | 22 | 59 |

Country rates from Unicef (1990). Values projected from the Levels of Mortality experienced by survey children as reported from the mother (method in Shryock and Siegel 1976) (See Appendix C for data). Crude Birth rate is the number of births per thousand population. Crude Death rate is the number of deaths per thousand population.

## 9.6 Child Mortality, Returnee Households and Gender of Head of Household

Children of returnee households were equally likely to be born at home as were children of female headed households in the whole sample. Women of female headed households in Onyaanya and Engela, however, were significantly more likely to have given birth at home at least for the past two years, but not before 1988. The disruption of the war in the north may well have been a factor in affecting utilization of delivery facilities in Engela and Onyaanya.

# Chapter 10 Maternal Fertility, Mortality and Contraception

## 10.1 Introduction

The level of maternal mortality in a country is an indicator of the level of welfare of a population. High maternal mortality tends to indicate problems for the child as some of the factors that influence maternal mortality also influence infant and child mortality. Most importantly, an understanding of maternal morality guides planners to improve and target programmes to reduce maternal deaths. The data are necessary for advocacy, targeting and monitoring purposes. It was with the view of reducing maternal mortality that a series of questions were included into the survey to provide an estimate of maternal mortality rates.

Existing information on maternal mortality in Namibia is virtually non-existent. Other countries have used crude data based on hospital records which often provide biased estimates. The long-term solution lies in the improvement of on-going information systems, but this is unlikely to produce immediate results. Of the three sources of information (vital registration, health service statistics and surveys), only surveys will be feasible in the short-term. Critical to the success of survey based maternal mortality statistics is a large sample size. This is simply the result of the need to have large numbers of respondents to reduce the errors arising from the difficulty of recalling events in the past.

Fortunately, Graham and her colleagues have developed a method based on interviews with sisters to give reliable estimates of maternal mortality (Graham, Brass and Snow (1989). Referred to as the "Sisterhood Method", the approach is similar to the Brass techniques applied using census or survey data to estimate child mortality in the common situation of incomplete data.

## 10.2 The Sisterhood Method

The Sisterhood method is an indirect technique and uses the proportions of adult sisters dying during pregnancy, childbirth, or in puerperium (pre- and ante-natal) The method is simple and relies on the recall of unrelated adults of the number of sisters who reached the age of exposure to the risk of pregnancy related death and who are either alive or have died during the pre- and ante-natal period.

The method is based on the relationship of the proportion of sisters dying to the probability of dying from maternal causes by a specified age. After correcting for those sisters who have not yet entered the reproductive years it is possible to come up with the corrected estimate (see Graham et al. 1989). Appendix D provides the basis on which the calculations were carried out. Women in the reproductive years included all women over the age of 15 years, whether married or not. No distinction was made in the survey between those women who were legally married and those who were divorced, widowed or never married.

The definition of maternal death is death while pregnant or within 42 days of a termination of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (e.g. a traffic accident). For the purposes of the current study, a distinction was not made on the cause of death due to the difficulty in

respondents making the distinction and the fact that very few deaths during the pregnancy period are due to causes other than pregnancy related. Note that the current study relies on a time-of-death definition and not a cause-of-death definition and will therefore overstate the level of maternal death slightly.

### 10.3 The Sample Characteristics -- Age, Parity, Miscarriages

The data were collected for all adult women in the sample households. If two women were biological sisters, only one woman was interviewed. The level of infant and child mortality for the regions was presented in Chapter 9 and suggests that while not exceedingly high, Namibia displays levels of child mortality above many of its neighbours. What are evident are the distinct regional differences with northern areas experiencing higher child mortality and malnutrition. The analysis of maternal mortality, therefore, was conducted by location with the view to improving the utility of the information, but also with the view to maximising the sample sizes.

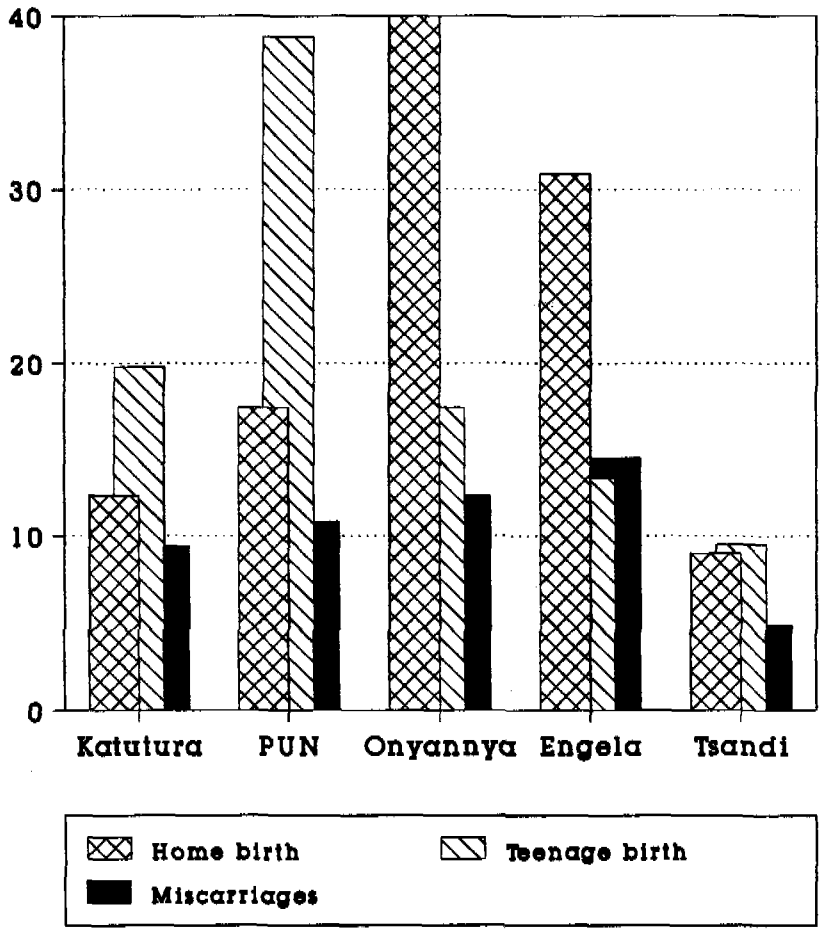
Of the 2,872 women aged 15 years and above responding to the questions on the experience with pregnancy and child survival, 19 per cent (534) had never given birth (Table 61). Women who had given birth were significantly older (39 years) than women with no children (age 22 years). Comparison among locations shows a consistent pattern of one in five women having given birth before the age of 20 years. The peri-urban woman contrasts with her rural counterparts. The women from the Peri-Urban region in the North are starting to have children at a much earlier age than the others. Almost forty per cent of these women were mothers by their twentieth year, four times the level of the women of Tsandi and three times that of the other rural areas. Tsandi lies at the other extreme with the lowest level of child births.

The average number of children born (or parity) to the survey women is presented in Table 62. The pattern over the age of the women provides an interesting comparison especially when the low parity women are compared with the women of the North. On average, the women of the north have over one child extra than women of Katutura. This high level of fertility is not as evident in the women of the Peri-Urban areas, despite the high levels of teenage deliveries found in Table 61 and Figure 24. This due to the younger age of the Peri-Urban women (almost four years on average -- Appendix D).

Over the ages of the women in the sample, the maximum level of child births approximates the Total Fertility Rate (Table 65). The high fertility rate for the Peri-Urban North is cause for concern.

The data are further analyzed to present the reproductive histories of the survey women. The data are presented by the age of the respondent (Table 64) for the average number of pregnancies ending in a miscarriage or stillbirth and the proportion of the children who were born alive and who subsequently died. The former statistic reflects the environmental, economic and health situation as it affects the mother especially during pregnancy. The child death statistic reflects much the same influences.

**Figure 25: Some Characteristics of Sample Women who Have Ever Given Birth**




Source: Unicef Namibia Survey 1990

**Table 61: Percentage of Women Aged 15 Years and Above Who Have Given Birth**

| | Percent Ever Given Birth | Number of Women | Percent Given Birth | |
|---|---|---|---|---|
| | | | By Age 20 | By Age 25 |
| Katutura | 78 | 917 | 20 | 72 |
| Peri-Urban N | 89 | 536 | 39 | 85 |
| Onyaanya | 84 | 450 | 17 | 66 |
| Engela | 82 | 457 | 13 | 74 |
| Tsandi | 72 | 477 | 10 | 43 |
| RURAL NORTH | 81 | 1784 | 13 | 61 |
| ALL AREAS | 81 | 2837 | 19 | 72 |

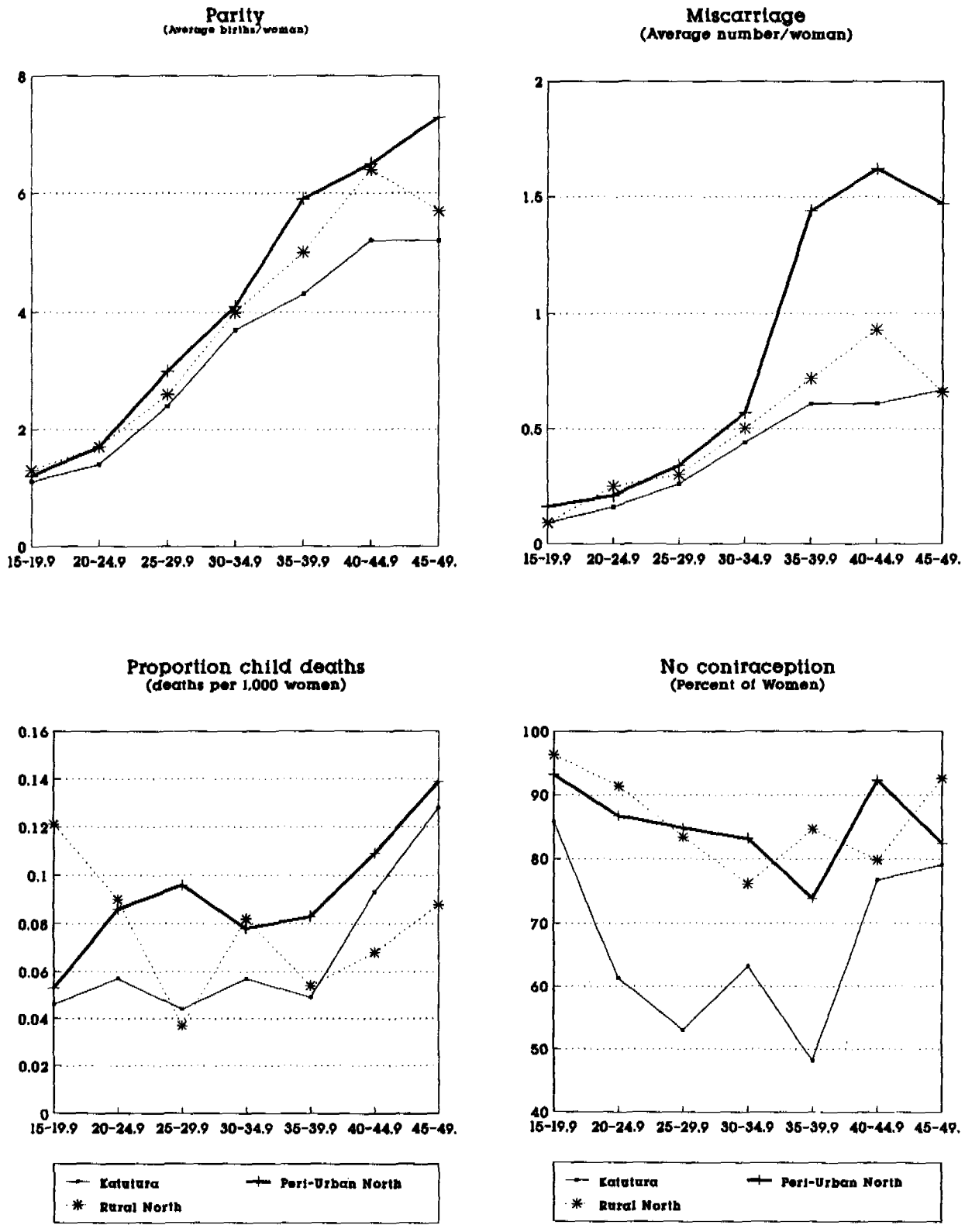
The women of Katutura have fewer children, are less likely to die in pregnancy and have a lower mortality rate later in life. It should be noted that as the Katatura sample ages, the patterns of fertility are quite close to those of the North. This may, in part, be due to the origins of the women of Katutura. Many of them are recent immigrants to the township. They bring with them the reproductive histories of rural areas.

On average, for survey women with seven babies born alive, one pregnancy ends in a stillbirth. This ratio increases for women of Onyaanya and Engela where for every ten live births, almost two pregnancies resulted in a dead foetus. The high figures for these two areas needs to be studied with the view of reducing the level of still-births. Interestingly, Tsandi has the lowest level of terminated pregnancies while the parity is similar to other rural areas. Note that only ten per cent of children are born at home in Tsandi (compared with 31 to 40 percent for Engela and Onyaanya) reflecting the higher levels of pre- and post-natal care in the region. The stronger survival of pregnancies in Tsandi continues as the child ages. The proportion of child deaths is at least half that of the other rural areas and the Peri-Urban North.

Comparison of the three important characteristics of child survival and health of the mother (Table 62 and Figure 26) can be summarized in two indicators (Table 63). The first is the percentage of pregnancies ending in miscarriage and the second is the proportion of children who die.

The results display several distinct patterns. The first is the significantly worse situation in Engela, Onyaanya and the Peri-Urban North, compared with Katatura and Tsandi, for the proportion of children who died and the incidence of miscarriages. The pattern remains when comparisons are made within the age categories covering the 20 to 35 year age group. Perhaps the most important aspect is the low level of miscarriages and child deaths in Tsandi. The rate of child deaths in Tsandi was even less than the better off areas of Katutura.

**Figure 26: Selected Pregnancy Related Characteristics of Sample Women who Have Given Birth by Age Group**




Source: Unicef Namibia Survey 1990

**Table 62: Average Number of Children Born Alive (parity); Average Number of Miscarriages and Stillbirths; and Proportion of Children Dying per 1,000 Women by Location and Age Group**

| | Parity | Miscarriages & Stillbirths | Proportion of Child Deaths |
|---|---|---|---|
| Katutura | | | |
| 15-19.9 | 1.1 | 0.09 | 0.045 |
| 20-24.9 | 1.4 | 0.16 | 0.057 |
| 25-29.9 | 2.4 | 0.26 | 0.044 |
| 30-34.9 | 3.7 | 0.44 | 0.057 |
| 35-39.9 | 4.3 | 0.61 | 0.049 |
| 40-44.9 | 5.2 | 0.61 | 0.093 |
| 45-49.9 | 5.2 | 0.67 | 0.128 |
| 50+ | 6.1 | 0.78 | 0.238 |
| All ages | 3.5 | 0.43 | 0.081 |
| Peri-Urban North | | | |
| 15-19.9 | 1.2 | 0.16 | 0.053 |
| 20-24.9 | 1.7 | 0.21 | 0.086 |
| 25-29.9 | 3.0 | 0.34 | 0.096 |
| 30-34.9 | 4.1 | 0.57 | 0.078 |
| 35-39.9 | 5.9 | 1.44 | 0.083 |
| 40-44.9 | 6.5 | 1.62 | 0.109 |
| 45-49.9 | 7.3 | 1.47 | 0.139 |
| 50+ | 6.2 | 1.12 | 0.213 |
| All ages | 3.7 | 0.56 | 0.106 |
| Rural North | | | |
| 15-19.9 | 1.3 | 0.09 | 0.121 |
| 20-24.9 | 1.7 | 0.25 | 0.090 |
| 25-29.9 | 2.6 | 0.30 | 0.037 |
| 30-34.9 | 4.0 | 0.50 | 0.082 |
| 35-39.9 | 5.0 | 0.72 | 0.054 |
| 40-44.9 | 6.4 | 0.93 | 0.068 |
| 45-49.9 | 5.7 | 0.66 | 0.088 |
| 50+ | 6.5 | 1.04 | 0.166 |
| All ages | 4.9 | 0.71 | 0.106 |
| Onyaanya | | | |
| 15-19.9 | 1.6 | 0.25 | 0.208 |
| 20-24.9 | 1.8 | 0.25 | 0.130 |
| 25-29.9 | 2.4 | 0.37 | 0.027 |
| 30-39.9 | 3.7 | 0.48 | 0.043 |
| 40-44.9 | 5.3 | 1.00 | 0.056 |
| 45-49.9 | 6.9 | 0.90 | 0.078 |
| 50-54.9 | 5.9 | 1.19 | 0.097 |
| 55+ | 7.1 | 1.50 | 0.215 |
| All ages | 5.0 | 0.92 | 0.121 |

/continued...

**Table 62: Average Number of Children Born Alive (parity); Average Number of Miscarriages and Stillbirths; and Proportion of Children Dying per 1,000 Women by Location and Age Group (Continued)**

| | Parity | Miscarriages & Stillbirths | Proportion of Child Deaths |
|---|---|---|---|
| Engela | | | |
| 15-19.9 | 1.1 | 0.00 | 0 |
| 20-24.9 | 1.7 | 0.41 | 0.094 |
| 25-29.9 | 3.1 | 0.36 | 0.052 |
| 30-34.9 | 4.5 | 0.73 | 0.152 |
| 35-39.9 | 5.6 | 0.50 | 0.102 |
| 40-44.9 | 6.1 | 1.25 | 0.111 |
| 45-49.9 | 5.9 | 0.73 | 0.156 |
| 50+ | 6.2 | 1.38 | 0.191 |
| All ages | 5.0 | 0.90 | 0.138 |
| Tsandi | | | |
| 15-19.9 | 1.0 | 0.00 | 0.167 |
| 20-24.9 | 1.5 | 0.00 | 0.015 |
| 25-29.9 | 2.2 | 0.10 | 0.036 |
| 30-34.9 | 3.4 | 0.17 | 0.029 |
| 35-39.9 | 4.2 | 0.56 | 0.011 |
| 40-44.9 | 6.1 | 0.63 | 0.011 |
| 45-49.9 | 5.4 | 0.35 | 0.022 |
| 50+ | 6.3 | 0.28 | 0.096 |
| All ages | 4.8 | 0.29 | 0.056 |
| All Areas | | | |
| 15-19.9 | 1.2 | 0.11 | 0.074 |
| 20-24.9 | 1.6 | 0.20 | 0.076 |
| 25-29.9 | 2.6 | 0.30 | 0.058 |
| 30-34.9 | 3.9 | 0.49 | 0.072 |
| 35-39.9 | 4.8 | 0.75 | 0.055 |
| 40-44.9 | 5.9 | 0.76 | 0.083 |
| 45-49.9 | 5.8 | 0.77 | 0.107 |
| 50+ | 6.4 | 1.01 | 0.182 |
| All ages | 3.4 | 0.59 | 0.098 |

Explanations for the superior survival and pregnancy situation in Tsandi cannot be easily explained especially given Tsandi's low levels of sanitation and income. One explanation may be the good medical facilities available and the high level of utilization (as noted above with deliveries at the Hospital). This finding needs to be studied further particularly to eliminate the possibility of cultural biases in the region which may impair the full reporting of child and pregnancy related deaths.

A special comment should be made about the Peri-Urban North women. These women are significantly younger than their northern rural counterparts (by between 10 and 12 years, $P<.001$) and have had approximately one extra child by their mid-thirties when compared within age groups with rural women ($P<.01$). Women in the Peri-Urban North in the 25 to

30 age group have also experienced significantly greater child deaths than the same aged women in Tsandi, Onyaanya and Katutura (P<.0.1). These results raise the question of whether it is the environment of the Oshikati/Oluno region that causes these deaths in children or is it that poverty and social turmoil forces the women to move the Peri-Urban area bringing with them the health and survival problems of the rural areas

**Table 63: Proportion of Child Deaths and Percentage of Pregnancies Ending in Either a Stillbirth or Miscarriage by Selected Locations**

| | Proportion of Child Deaths | Percentage of Miscarriages |
|---|---|---|
| Engela | 0.140 | 15 |
| Onyaanya | 0.120 | 12 |
| Peri-Urban North | 0.100 | 11 |
| Tsandi | 0.060 | 5 |
| Katutura | 0.080 | 9 |

Statistical comparisons of means (T-tests): Engela, Onyaanya and Peri-Urban area not significantly different for both indicators. Tsandi has significantly less dead children and miscarriages compared with all other locations including Katutura (P<.05). Katutura significantly less than Peri-Urban North (P<.05), Engela and Onyaanya for Proportion of dead children. Katutura significantly less for miscarriages when compared with Engela and Onyaanya (P<.01).

### 10.4 Gender of Head of Household and Mortality

Women from female headed households display different maternal characteristics than those living in male headed households. The women of female headed households are significantly younger (P<.001) by almost six years and surprisingly do not have a lower parity than the older women of male headed households (parity is 4.2 for these households).

The equal parity despite the younger ages of women of female headed households indicates that these women have a higher fertility rate or have more children at an earlier age. When parity is examined by age category and compared by gender of head of household, women in the 20 to 30 year old age groups have significantly higher parity (P<.01) in female headed households. This further supports the contention that the women of the poorer female headed household are having more children at an earlier age. This has important welfare considerations for these women and their children.

But are these younger and more parous mothers in female headed households experiencing greater losses due to miscarriage or deaths in their children? We could find no significant difference between the percentage of pregnancies ending in a miscarriage (10 per cent end in miscarriage) and the proportion of live births that end in death between women of female and male headed households.

## 10.5 Returnee Women and Mortality

Returnee women make up 5 per cent (138) of the sample of adult women and are significantly younger than non-returnee women (average age 31.5 years versus 39.7 years). The returnee women come from all the locations but Onyaanya and Engela have the largest share (Engela has 9 per cent of returnee women). As with the whole sample, 20 per cent of the returnee women had not experienced pregnancy and delivery. Because they were younger, returnee women had had fewer children (or lower parity).

Returnee women while younger also experienced significantly fewer miscarriages (P<.05 - returnees = 0.26, non-returnees = 0.61) but not fewer child deaths (returnees = 88 per 1000 women, non-returnees = 98 per 1000). The comparison of fertility and child survival of returnees and non-returnees is confounded by the significant differences in age. It is necessary, therefore, to compare women of comparable ages. Table 64 provides two statistics disaggregated by respondent age. Returnee women were significantly less likely to have had a child death but had double the level miscarriages for the 25-29.9 age group.

**Table 64: Pregnancy and Child Survival Characteristics of Returnee and Non-returnee Women who had Ever Given Birth by Age Group**

| | Proportion of Child Deaths per 1,000 Women | | Average Number of Miscarriages and Still Births per 1,000 Women | |
|---|---|---|---|---|
| | Returnee | Non-returnee | Returnee | Non-returnee |
| Age category | | | | |
| 20-24.9 | 0.000*** | 0.220*** | 67 | 77 |
| 25-29.9 | 0.200 | 0.305 | 108* | 53* |
| 30-34.9 | 0.310 | 0.509 | 88 | 71 |

Sample sizes are 20-24.9: 20,318; 25-29.9: 39,402; 30-34.9: 26,507 for returnee and non-returnee women respectively.

*** Comparison of means of returnee and non-returnee women by the number of Miscarriages or stillbirth and number of dead children per 1000 women (* P<.05; ** P<.01; *** P<.001 -- T-test).

## 10.6 Maternal Mortality

The previous analysis was undertaken to enable the reproductive histories of women in the survey areas to be studied. The results of the Sisterhood Method to estimate maternal mortality from these data can be found in Appendix D. Table 65 summarizes the results. The method indicates a lifetime risk of maternal mortality of 0.022 for the whole sample, or about 1 in 46. This figures increases to 0.027 (or 1 in 37) for the Ovambo region and 0.040 for the Peri-Urban North (or 1 in 25).

The lifetime risk of pregnancy related deaths approximates a maternal mortality ratio per 100,000 live births of 371 (Table 65) using the formula:

$$\textit{Maternal mortality ratio} = 1 - [(\textit{Probability of survival})^{1/TFR}]$$

Where TFR is the Total Fertility Rate

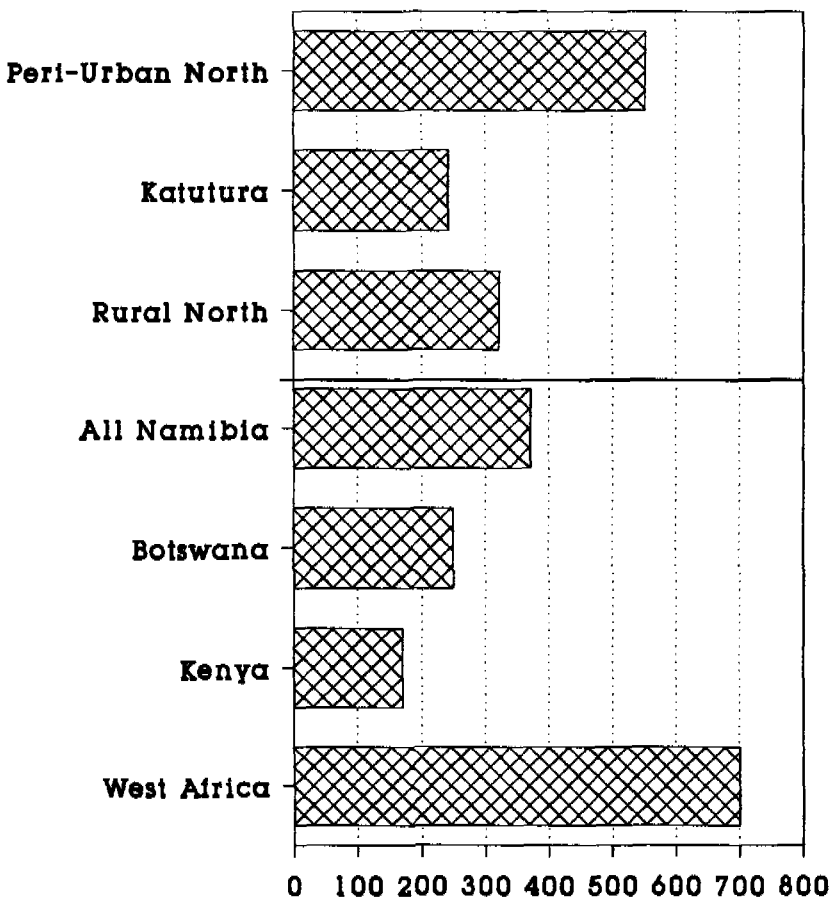
The figure for maternal mortality was highest for the women of the North, particularity the Peri-urban North where the figure was double that of Katutura. The figure for Katutura was similar to that of neighbouring Botswana while the North approached those found in West Africa. The data point to the problems of maternal mortality in the North especially among the young and fecund women of the Peri-Urban North.

**Table 65: Maternal Mortality and Fertility Rates for Survey Women for Selected Locations and for Other Countries**

| | Maternal Mortality Rate | Total Fertility Rate |
|---|---|---|
| ALL REGIONS (N=2276) | 371 | 5.9 |
| Ovambo Region (n=1560) | 432 | 6.4 |
| Rural North (n=1147) | 322 | 6.5 |
| Peri-Urban North (n=413) | 552 | 7.3 |
| Katutura (n=716) | 242 | 5.2 |
| Namibia | na | 6.1 |
| Zambia | 151 | 7.2 |
| Botswana | 250 | 6.2 |
| Angola | na | 6.4 |
| Lesotho | na | 5.8 |
| Kenya | 170 | 8.1 |
| West Africa | 700 | - |
| The Gambia | 1005 | 6.0 |

Country rates from Unicef (1990) except for West Africa based on 1983 data (WHO, 1986) and the Gambia (Graham et al. 1989). na is not available. The numbers in parentheses are number of survey women. Note: Onyaanya, Engela and Tsandi not presented due to small sample size. Maternal mortality rate - pregnancy related deaths per 100,000 live births estimated using sisterhood method (Graham et al. 1989). Total Fertility Rate (births per 1,000 women) was taken from the stable and maximum average of live births number women over their child bearing years.

**Figure 27: Maternal Mortality for Selected Survey Areas and for Neighbouring Countries**




Source: Unicef Namibia Survey 1990

## 10.7 Contraceptive Use

If pregnancy carries with it increase risk of mortality especially in areas with poor health facilities and significant environmental problems, the higher use of contraception will be associated with a reduced risk. Data were collected on the current form of contraception used by women in the survey areas.

Table 66 presents the percentage of women aged 15 to 50 years using the listed forms of contraception. The most significant statistic is the percentage using no contraception. Nine out of ten women in the North did not use any form of contraception with little difference between the locations. The theoretically better served Peri-Urban women with high fertility

and teenage pregnancies were only slightly more likely to use contraception. Two in three Katutura women use some form of contraception.

The most popular form of contraception among the Katutura women was by injection which provides protection for up to six months. Only the Peri-Urban North women came close to this frequency of use of the injection method. The pill was the most common method used in the North while the Tsandi preferred the injection. The virtual non-use of the condom must be a cause for concern given recent increases in the incidence of the HIV virus.

**Table 66: Contraceptive Use among Survey Women by Location**

| | None | Pill | Injection | IUD | Sterilisation | Condom | Other | N |
|---|---|---|---|---|---|---|---|---|
| Katutura | 67 | 10 | 13 | 4 | 4 | 0 | 4 | 914 |
| Peri-Urban North | 87 | 4 | 5 | 4 | 4 | 0 | 2 | 514 |
| Rural North | 90 | 2 | 0 | 1 | 0 | 0 | 7 | 1355 |
| -Onyaanya | 90 | 3 | 0 | 0 | 1 | 0 | 6 | 444 |
| -Engela | 88 | 3 | 1 | 1 | 0 | 0 | 7 | 441 |
| -Tsandi | 91 | 1 | 2 | 0 | 0 | 0 | 7 | 470 |
| ALL AREAS | 82 | 5 | 5 | 2 | 2 | 0 | 5 | 2783 |

N is the number of respondents.

The use of contraception by women of different ages has been analyzed to give a picture of what the more productive younger women are using (Table 67). The data suggest that access to and familiarity with methods is much greater for the women of Katutura. The frequency of use of the pill and injections in the 20 to 40 year age groups is encouraging. Women of the north are far more likely to use no form of contraception at any age. It is interesting to note that rural women use the pill in fairly consistent numbers after age 20, but, unlike the Peri-Urban women, do not use the injection method which is more popular in the Peri-Urban areas. Sterilization is an option more readily available to the Katutura women.

The data clearly show that contraception use is limited and in many cases non-existent. The high level of fertility evident in the North, and especially in the rapidly growing Peri-urban North, must be a high priority for targeted programmes to support family planning.

### 10.8 Multivariate Regression Results

The analysis presented so far has examined the data in terms of means and proportions broken down by location, gender of head of household, returnee status and age grouping. Such static comparisons often raise more questions than is answered by the analysis. For example, can the differences in rates of miscarriage between the North and Katutura (Table 63) be explained in terms of different income levels? The data from the survey lend themselves to multivariate analysis in which key variables are used to build a model to explain the patterns of proportion of child deaths and miscarriages found in the static analysis.

**Table 67: Contraceptive Use among Survey Women by Age and Location**
(Percentage of women in age group)

| | None | Pill | Injection | Sterilized |
|---|---|---|---|---|
| Katutura | | | | |
| 15-19.9 | 86 | 2 | 10 | 0 |
| 20-24.9 | 61 | 13 | 18 | 0 |
| 25-29.9 | 53 | 15 | 18 | 0 |
| 30-34.9 | 63 | 15 | 13 | 1 |
| 35-39.9 | 48 | 13 | 15 | 13 |
| 40-44.9 | 77 | 3 | 8 | 8 |
| 45-49.9 | 79 | 0 | 0 | 21 |
| Peri-Urban North | | | | |
| 15-19.9 | 93 | 2 | 0 | 0 |
| 20-24.9 | 87 | 5 | 6 | 0 |
| 25-29.9 | 85 | 5 | 6 | 1 |
| 30-34.9 | 83 | 4 | 7 | 0 |
| 35-39.9 | 74 | 4 | 13 | 4 |
| 40-44.9 | 92 | 0 | 4 | 4 |
| 45-49.9 | 82 | 0 | 0 | 12 |
| Rural North | | | | |
| 15-19.9 | 96 | 1 | 0 | 0 |
| 20-24.9 | 91 | 4 | 0 | 0 |
| 25-29.9 | 83 | 5 | 0 | 0 |
| 30-34.9 | 76 | 5 | 1 | 1 |
| 35-39.9 | 85 | 3 | 1 | 1 |
| 40-44.9 | 80 | 2 | 1 | 1 |
| 45-49.9 | 93 | 0 | 0 | 1 |
| All Areas | | | | |
| 15-19.9 | 92 | 1 | 4 | 0 |
| 20-24.9 | 78 | 8 | 8 | 0 |
| 25-29.9 | 73 | 8 | 3 | 0 |
| 30-34.9 | 73 | 8 | 6 | 1 |
| 35-39.9 | 67 | 8 | 4 | 7 |
| 40-44.9 | 80 | 2 | 4 | 4 |
| 45-49.9 | 87 | 0 | 0 | 8 |

The models that can be chosen are many but certain statistical and subject matter criteria are used in selecting the best model. The model should encompass the following explanatory variables for each woman:

Child deaths/Miscarriage= f (Income, woman's education level, gender of head of household, farm area, distance to dry season water, location, age, household size, farming, parity, returnee status)

The models were run for the whole sample, the North and for Katutura households. The distinction between Katutura and the North was made to allow for the different environments. The reader is referred to Appendix G for details about the models and the full statistical results.

Table 68 presents a summary of the results from Appendix G. The table should be read in a directional manner relative to the dependent variable. For example, an increase in the number of live births (parity) of women in northern households is associated with a worsening in the proportion of their children dying. Comparison of different locations are read as Tsandi is better off than the Peri-Urban North for proportion of children dying. The comparison for the North is between the rural locations and the peri-urban areas while in the All Regions analysis it is between all the northern locations and Katutura.

A cautionary note must be made about interpreting results from multiple regressions analyses. The model enables the variance in the dependent variable (e.g. percent of pregnancies that resulted in a miscarriage) to be explained by a number of independent variables. The relationships between an independent variable and the outcome variable is not necessarily causal. Improving education is only associated with improved child survival for the All Regions model, the model has not proved that it causes it.

Furthermore, the variables chosen were not comprehensive in determining miscarriages or the proportion of child deaths. The woman's genetic potential, psychological environment, illness history, utilization of food, availability of pre- and ante-natal care, and quality and quantity of food intake are key variables that are not reflected in the models. As a result of incomplete model specification, the variance explained by the models is quite low. For the All Regions models (see Appendix G), the best equations could only explain 8 per cent of the variance in proportion dead and 5 per cent for miscarriages (referred to as the R square). Less than 3 percent was explained in the miscarriage models for Katutura. The remaining 97 per cent of the variation can be accounted for by measurement error and the omission of other explanatory variables as noted above.

While the explanatory power of the models is low, it is well within the range found for these types of models. The main focus is not the overall R square value but the significance of the T statistics for the coefficients of the individual variables. Table 68 presents only those variables that were significant in the model. The non-significant variables are presented in the model in Appendix G. The lack of significance in these variables (Appendix G) could be due to a lack of any relationship with the dependent variable, to the fact that measurement error was too great for the relationship to be found, or that the variable was poorly specified. For example, the variable HRSPLGH refers to time it takes to plough the fields which is a proxy for farm area. If the question was asked poorly (measurement error) or the answers reflected factors other than agricultural knowledge (e.g. respondents were too busy and just gave any answer) than the explanatory power of the variable will be reduced.

The choice of the dependent variables of Miscarriage and Proportion dead was done to reflect the pregnancy history and child survival of the women in the survey. The models were only run for those women who had had at least one pregnancy. Non-gravid women were excluded from the analysis.

**Table 68: Regression Results for Proportion of Children Dying and Percentage of Pregnancies that End in a Miscarriage for Survey Women**

| | KATUTURA | | NORTH | | ALL REGIONS | |
|---|---|---|---|---|---|---|
| Variable | Better | Worse | Better | Worse | Better | Worse |
| **Proportion of children dead** | | | | | | |
| Household size | X | | X | | X | |
| Woman's education | | | | | | X |
| Age of woman | | X | | X | | X |
| Time to get water | | X | | | | |
| Parity | | | | X | | X |
| Returnee vs. Non-ret | | | | X | | X |
| Farming vs Non-Farm HH | | | | X | | |
| Tsandi. vs PUN | | | X | | | |
| Engela vs PUN | | | | X | | |
| Tsandi vs Kat. | | | | | X | |
| PUN vs Kat. | | | | | | X |
| **Percentage of Miscarriages** | | | | | | |
| Time to get water | | X | | | | |
| Age of woman | | X | | X | | X |
| Parity | X | | X | | X | |
| Male Head vs Female | | X | | | | X |
| Tsandi. vs PUN | | | X | | | |
| Engela vs PUN | | | | X | | |
| Tsandi vs Kat. | | | | | X | |
| PUN vs Kat. | | | | | | X |
| Engela vs Kat. | | | | | | X |
| Ony. vs Kat. | | | | | | X |

For a full description of variables and models refer to Appendix G. Note that location comparisons compare nutritional status of the location with Peri-Urban North in NORTH, and with Katutura in ALL REGIONS. All variables significant at P<.05. The Better and Worse designations should be read as an increase in the level of variable x will result in a bettering or worsening of the dependent variable. Ony is Onyaanya, Eng is Engela, Tsi is Tsandi, PUN is Peri-Urban North and Kat is Katutura.

The results of the regression analysis support the bivariate analysis found in earlier tables in this Chapter. Dealing first with the Proportion Dead variable the models indicate the following.

### 10.8.1 Child Survival

- Tsandi emerges as having significantly better child survival than other locations including Katutura even after controlling for household income, women's age etc.
- Engela is significantly worse for child survival than the Peri-Urban North which is significantly worse than Katutura.
- Women from female headed households have the same level of child death as women of male headed households.
- Household income was not related to child survival for the models tested.

- As women age, the numbers of children dying increases reflecting the deaths due to many other factors as well maternal health.

- As size of household increases, the numbers of children dying decreases even after controlling for the age of the woman. This may reflect that large household sizes are not associated with reduced survival in children.

- As the number of live births per woman increases (Parity) so does the risk of death in her children. This variable is correlated with the age of the woman so it is not surprising that the results are similar, at least for the North.

- Coming from a farming household and having a better educated mother is associated with reduced risk of death in children.

- While in the North, Returnee women have hade worse survival in their children possibly reflecting past hardship experienced by these exiled women.

There was a weakly significant result for the Katutura sample which showed there was an increased risk of death for children of mothers who have to spend more time getting water. Given the almost universal access to water in Katutura, those women who do not have ready access show worse survival characteristics for their children. The poor water access may be directly related to child survival but may also reflect the poverty in these households.

The models examining the outcome of pregnancy reflected in the percent of miscarriages resulted in the following ways.

### 10.8.2 Miscarriages

- The North is overall worse than Katutura, reflecting the poor level of health and other services. *The only exception* is Tsandi.

- Tsandi emerges as having significantly better pregnancy outcomes than other locations including Katutura even after controlling for household income, women's age, etc.

- Engela is significantly worse for miscarriages than the Peri-Urban North which is significantly worse than Katutura.

- Women from female headed households have fewer miscarriages than women of male headed households only in Katutura.

- As the number of live births per woman increases (Parity) the percentage of miscarriages declines. This result is in the opposite direction than was found for Proportion of children who die. This reflects the higher risk of miscarriage among younger women.

- Household income, woman's education, time to get water and farm area were not related to child survival for the models tested.

In general, the regression results point to the marked location differences found in the static analysis earlier in the chapter. With the exception of Tsandi, the women with low parity are at risk of miscarriage. The survival of their children is associated with where they live (North is worse except for Tsandi) and the age and parity of the mother.

## REFERENCES


Anon. Statistisches Bundesamt Wiesbaden. Laenderbericht Namibia. Verlag W. Kohlham mer GMBH Stuttgart und Mainz. 1988.

Anon. Resultate van Bevolkingsopname: Mei 1985. Stadsbeplanningsafdeling. Dept. Stadsingenieur Munisipaliteit Windhoek. (Study of Katutura in Afrikaans). Mimeo. Windhoek, May 1985.

Abdallah Ahmed, Berthoud Paul. Report of the Reconnaissance Mission to Namibia. Mimeo UNDP, New York. 8 June 1989.

Carlson BA. and Wardlaw T. A global, regional and country assessment of child malnutrition. Unicef Staff Working Papers No. 7. Unicef New York. 1990.

Claassen PE, Page D. Ontwikkelingsplan vir Owambo (Development plan for Owambo). Instituut vir Beplanningsnavorsing, Universiteit van Stellenbosch. CABO Stellenbosch. 1978.

Cogill B. Unicef Namibia Health and Nutrition Survey -- QUESTIONNAIRE: Revision 8. Unicef Namibia. February 1990

Cogill B. Unicef Namibia Health and Nutrition Survey -- MANUAL to Questionnaire: Revision 8. Unicef Namibia. February 1990

Cogill B, Zaza M. Report of the nutrition module as part of the Crop Forecasting Survey -- Rural Zambia 1990. Report to Central Statistic Office by Unicef Zambia. Lusaka Zambia 1990.

Colaco L.F. Sousa. (personal communication). Estimated by Cogill from the 1984 census as average for age groups 20-24, 25-29 and 30-34. 1989

Cross Sholto, Kinsey Bill. Food supplies and nutrition in Namibia: An assessment of food needs, distribution requirements and policy options for food security planning. Report from FAO (NAM/79/022). FAO Rome Italy 1987.

DNHW. Health status report for S.W.A./Namibia 1987/88 (1/4/1987 - 31/3/1988). Mimeo, Windhoek Department of National Health and Welfare, Windhoek. 1988.

DNHW. Annual report on the health services for the financial year 1987/88 National health and Welfare. Mimeo. Dept. of National Health and Welfare. Windhoek, 13 Feb. 1989.

Garnier C von (ed.). Katutura revisited 1986: Essays on a black apartheid suburb. Series: Social Research No. 1. Roman Catholic Church of the Vicariate of Windhoek. Angelus Printing, Windhoek. 1986.

Graham W, Brass W, Snow RW. Estimating maternal mortality: The sisterhood method. Studies in Family Planning. Vol 20, No 3. May/June 1989.

Hay R, Pell, Tanner C. Household food security in Namibia. A report for Unicef Namibia by Food Studies Group, University of Oxford, November 1989.

Hughson H.C. Survey of nutritional status and related factors in selected areas of Namibia. March-April 1986. OXFAM report. Oxford, UK. August 1986.

Hunt S, Bender W. The Luanda household budget and nutrition survey. Preliminary Results. Report for Ministry of Planning, Govt. of Angola by Unicef Luanda. Mimeo Luanda 6 June 1990.

Immink Maarten DC. Household food supplies and food intake patterns in Namibia, and Food Distribution Programme Options upon Independence. Report for FAO Food Policy and Nutrition Division. Project NAM/79/022. FAO Rome, Italy. January 1983.

Kennedy EK, Cogill B. Income and nutritional effects of the commercialization of agricult ure in Southwestern Kenya. IFPRI Research Report No. 63. Washington DC: IFPRI, 1987.

Kitoko, Pedro M. Prevalencia da ma-nutricao proteico-calorica nos menores de 5 anos das Comunas de Bom Jesus e Calumbo. Programa conjunto de apoio a nutricao (Procan/JNSP). Mimeo, Unicef Luanda, 1988.

Mbomena J, Mundia G. Unicef/WHO report into the investigation of the March - May, 1990 Diarrhoeal Disease Outberak in Northern Namibia. 23 May - 23 July 1990. Mimeo report. Unicef/WHO Windhoek. 24 July 1990.

Merwe JH van der (editor). National atlas of South-West Africa (Namibia). Institute for Cartographic Analysis, University of Stellenbosch. National Book Printers, Cape Town. 1983.

Morgan, RG. Report on a visit to Northern Namibia as part of a UN Interagency Mission to assess the needs of returnees (3-11 August 1989). Mimeo, Unicef Namibia. 12 August 1989.

Ofosu-Amaah S, Martin G. Glisser M. Report on health mission to Namibia July 2 - 7 1989. Mimeo Unicef Namibia (Draft/NYHQ/89-0268/final) 20 July 1989.

Pendleton Wade C. Katutura: a place where we do not stay. San Diego State University 1974.

Pendleton Wade C. Questionnaire for 1989 Katutura study (from the Academy) in Afrika ans and English. Mimeo, Windhoek 1989.

Pendleton WC, Du Bois BC, Goodman JD. Health and daily living survey of Windhoek, Namibia. Draft copy. Mimeo. Univ. San Diego. Calif. 1990

Rossouw JPH, Tonder JL van. (editors). Southern Africa Demographic and Health Survey : Namibia, 1989: Infant Mortality and Child Health. Memorandum from the Sociological and Demographic Research Institute of the Centre for Demographic Analysis and Prognosis. The Secretary for National Health and Welfare, Namibia. Human Services Research Council, Pretoria, 1989.

Shryock H, Siegel JS. The methods and materials of demography. Condensed Edition. Academic Press London. 1976.

Du Toit, E. Resultate van bevolkingsopname: Mei 1985. Stadsbeplanningsafdeling. Dept. Stadsingenieur. Munisipaliteit Windhoek. Report of May 1987.

Stephenson LS, Latham MC, Jansen A. A comparison of growth standards: similarities between NCHS, Harvard, Denver and priveledged African children and differences with rural Kenyan children. Ithaca NY, Cornell University, Cornell International Nutrition Monograph Ser. No. 12. 1983.

UNICEF. State of the world's children 1989. UNICEF. Oxford University Press. Oxford UK 1989.

UNICEF. State of the world's children 1990. UNICEF. Oxford University Press. Oxford UK 1990.

UNICEF. Children on the front line. UNICEF. New York 1989.

UN Institute for Namibia. Namibia: A direct United Nations responsibility. UNIN Lusaka Zambia 1987.

Wood Brian (Ed.) Namibia 1884-1984: Readings on Namibia's history and society. Namibia Support Committee and UN Inst. for Namibia Publications, London, 1988.

World Health Organization. Maternal Mortality Rates: A tabulation of available information. Second edition, WHO Division of Family Health, Geneva 1986.

# APPENDIX A

## POPULATION ESTIMATES

**Table A.1: Estimated 1989 Population Distribution**

| Region | Area (km) | Percent of Population | Estimated Population | Population Density |
|---|---|---|---|---|
| Damaraland | 46560 | 2.2 | 29238 | 0.63 |
| Hereroland | 51949 | 3.6 | 47844 | 0.92 |
| Kakaoland | 23924 | 1.8 | 23922 | 1.00 |
| Owamboland | 51800 | 44.0 | 584762 | 11.29 |
| Okavango | 136898 | 10.3 | 136887 | 1.00 |
| Caprivi | 11533 | 3.4 | 45186 | 3.92 |
| Rehoboth | 14182 | 2.8 | 37212 | 2.62 |
| Namaland | 21120 | 1.3 | 17277 | 0.82 |
| Windhoek | 33489 | 10.8 | 143532 | 4.29 |
| Other | 431690 | 19.8 | 263143 | 0.61 |
| TOTAL | 823144 | 100.0 | 1329004 | 1.61 |

Source: The estimated 1981 Population was 1,025,000; Growth rate 3.3%. Note that the percentages of the total population are estimated from a graph Van Der Merwe (1983:45)

Note that the 1981 population totals are now thought to be seriously under-estimated. Estimated of the total population prepared since the report was written suggest that the figure may well be closer to 1.7 million.

# APPENDIX B

## SAMPLING PROCEDURES

Specific sampling demands

The survey used a cluster sampling method for the North and list sampling for Katutura.

### ENGELA TSANDI AND ONYAANYA SAMPLING FRAME

#### Stage 1 - Ward Enumeration

The household enumeration list was difficult to prepare and therefore cluster sampling was used in this survey area. The boundaries of each ward are known by the wardmen and it was easy to mark them and determine the ward sizes for enumeration. A list of these wards for each area was made for random sampling.

#### Stage 2 - Household Enumeration

All households and homesteads in the selected survey wards were counted by the supervisors with help of the ward headmen and the pastors.

A household pilot survey was done to determine the household composition. It showed that 80per cent of the households had a child under five years of age, an average of two adult women above fifteen years, and a household size of approximately 6 people.

#### Stage 3 - Enumeration Block Formation

The initial sample sizes estimated for households in Engela, Onyaanya and Tsandi which have almost similar population sizes were the same (150 households). To increase the probability of finding a child under five, the sample sizes were increased by a factor of 100/80. This was based on the results of the pilot survey in which 80 per cent of the households had a child under five years. Hence the sample sizes for Engela, Tsandi and Onyaanya were estimated to be over 200 households (150 x 100/80=220).

#### Stage four- Determination of the cluster size (enumaration block size)

For the purpose of increasing representativeness of the population in the sample, bigger wards (bigger than 25 households), were divided into smaller ones called enumeration blocks comprising of 20-25 households each (out of every 25 households, there are an estimated number of 20 households with a child under five (see stage 3 above)).

Boundaries of each enumeration block were outlined again using all possible assistance namely dividing the wards from north to south and east to west grid boundaries and by use of other geographical landmarks and by names of known households heads. Lists of these enumeration blocks were then made and a sketch maps drawn to indicate their relative boundaries to each other and where possible their distances from the centre of the wards.

Stage 4 - Determination of the Number of Enumeration Blocks

The average cluster size is (20+25)/2 = 22 households. Therefore the number of Enumeration Blocks to be surveyed are equal to sample size/cluster size = 220/22 = 10 clusters (enumeration blocks).

Stage 5 - Random sampling of Enumeration Blocks (clusters)

From the list of x clusters (enumeration blocks in each study location), random selection was made by use of the table of random numbers. Ten (10) enumeration blocks were selected for the survey for each of the locations.

All the households in the selected enumeration blocks (clusters) were then to be surveyed.

KATUTURA SAMPLING FRAME

1. Understanding of the structure of Katutura is important in order to grasp the sampling frame employed in the randomisation of the study units.

> Katutura has two (2) parts, the old Katutura and the new Katutura. The whole of Katutura is then allocated to five (5) superintendents, which are referred to as Supt. A,B,C,E and F. Each superintendent, except Supt F, has under him an area composed of the old and new sections in Katutura. The new sections are generally referred to as ERFS. The old Katutura sections are then divided into different ethnic sections which we shall refer to as Section D,H,N,O and G. The new sections in Katutura are divided up into ERFS. However, old Katutura Sections have the Erfs as well. The erfs also appear in Electricity and Service bills.

2. Katutura is divided under five superintendents.

Table B.1 Distribution of Houses by Superintendents
(as at March 1990)

| Superintendent | Number of Houses |
|---|---|
| SUPT A | 2350 |
| SUPT B | 2056 |
| SUPT C | 1693 |
| SUPT E | 2504 |
| SUPT F | 2670 |
| TOTAL | 11273 |

3. Old KATUTURA is then divided into different sections. These are Section D, Section N, Section H, Section O, and Section G.

Table B.2: Distribution of Houses in Katutura according to Sections

| Sections | Number of Houses | Percentage of Total |
|---|---|---|
| Section D | 2259 | 36.00 |
| Section N | 401 | 6.00 |
| Section H | 1687 | 27.00 |
| Section O | 1443 | 23.00 |
| Section G | 491 | 8.00 |
| | 6281 | 100.00 |

4. New KATUTURA is divided into different ERFS.

Table B.3: Distribution of House according to ERFS

| Superintendent | Number of ERFS | Percent of Total |
|---|---|---|
| SUPT A | 86 | 2.00 |
| SUPT B | 451 | 9.00 |
| SUPT C | 379 | 7.00 |
| SUPT E | 1518 | 30.00 |
| SUPT F | 2670 | 53.00 |
| Total | 4992 | 100.00 |

5. Household Selection was done by List Sampling. Household lists were available from various sources especially Katutura Municipal Superintendents.

6. The Sample Size calculated was 400. To increase the probability of including households with a child under five, a final minimum Sample Size of 500 was considered adequate. A pilot of Household composition showed that 70 per cent to 80 per cent of Households have a child under five. The sample size was based on 400 * 100/75 = 533.

The sample of 500 households was then divided proportionately between old and new Katutura. The old sections of Katutura took 56 per cent of total number of houses in Katutura and therefore 280 houses out of the total sample size. The remaining 220 houses in the sample were allocated to the new Katutura. Table B.1 shows the sections and household distribution.

The 280 houses were then proportionately allocated to the D,H,N,O & G sections in old Katutura and the 220 were similarly allocated to the different superintendents with erfs in new Katutura. The proportionate allocation and percentage distribution in the sections out of total in all the sections is shown on Table B.2.

The second stage of the sampling frame was to randomly select all the 280 old Katutura households and the 220 houses from the list of the households in the in the old and new Katutura.

All households were selected using a Table of random numbers. (Note the serial number of all households in Katutura was done by allocating all sections to a Serial sequence in the listing of Superintendent A to F.)

A complete Sample per section was then compiled and followed for questionnaire application.

7. Tables showing distribution of sample households to the different sections of Katutura. The sample size taken by old KATUTURA has been distributed to the section proportionately.

Table B.4 Distribution of sample size according to old Katutura sections

| Section | Percentage | No. of Houses in Sample |
|---|---|---|
| D | 36.00 | 101 |
| N | 6.00 | 17 |
| H | 27.00 | 76 |
| O | 23.00 | 22 |
| G | 8.00 | 22 |
| | 100.00 | 280 |

8. The sample size taken by new Katutura (or ERFS) is (500-280 = 220). Houses were then distributed proportionately to the SUPT A,B,C,E and F.(See Table B.2 above).

SAMPLING FRAME FOR OSHAKATI-OLUNO LOCATION.

The Oshakati-Ondangwa-Oluno survey area is unique in its population distribution pattern. Households and business (cuca-shops and other) buildings are distributed in a haphazard manner and especially on the squatter camps. However, geographical landmarks have enabled a sample design to be applied for the survey.

Stage 1 - Three main locations were identified depending on their characteristics (household densities, population estimates etc).

1. Oshakati Town up to Kandjengedhi - is urban and has a high household density.

2. The Kandjengedhi to Ondangwa strip (a 30 km long strip) has a similar households numbers and was considered as Peri-Urban.

3. The Ondangwa/Oluno area including Oluno Town (4 Km from army barracks towards Tsumeb) has similar characteristics (Oluno Urban) to Oshakati Urban.
(i) Proportionate allocation of the total sample size of 300 households was made to the locations depending on estimated households densities. (For household density estimates see the cluster numbers and the estimated household numbers in Table B.2).

Oshakati-Ondangwa-Oluno total sample size = 300.
Oshakati location was 116 households.
Kandjengedhi be Ondangwa allocation was 116 household.
Oluno location allocation was 68 households.

Note - For the Peri-Urban locations (Kandjengedhi to Ondangwa strip) households along a strip of only 0.5 Km on the either side of the Oshakati-Tsumeb tarmac road were considered. This strip has some typical rural households.

Stage 2. Proportionate distribution of sample size to the three study areas. The sample of 300 households was distributed in the ratio of 2:2:1 among Oshakati urban, the strip Peri-urban, and Ondangwa-Oluno urban.

Determination of the number of clusters to be included in the survey. Sample size was equal to 300, estimated number of households with a child under five per cluster. Therefore the number of clusters required was 300/20 = 15 clusters. These clusters were then allocated in the ratio of 2:2:1.

Oshakati urban = 6 clusters(minimum of 120 households)
Peri-urban = 6 clusters (minimum of 120 households)
Oluno/Ondangwa = 3 clusters (minimum of 60 households).

Stage 3 Random selection of the study Clusters.

From the list of 53 clusters, 15 Clusters were randomly selected for the study (see Table 2 of randomly sampled clusters).

Stage 4 Movement from house to house

Note 1: Take all households that have child under five, start by random selection of the first household. Do this by rotating a bottle while at the centre of the cluster. Move to the house that the bottle opening is pointing, and take the second house in that direction.
Note 2: Move from the last interviewed house and go to the next one on your right-hand side as you move from the door of the last one you finished.
Note 3: Try as much as possible to estimate the distances from the last finished house to the next one on your right hand side. Remember only to include households with a child under five years (under 60 months).

## APPENDIX C

## TABLES USED TO ESTIMATE THE LEVEL OF CHILD MORTALITY

Table C.1: Indirect Estimates of Early Childhood (<2) and Child (<5) Mortality Rates for Selected Regions

| | NORTH | SOUTH | EAST | WEST | GENERAL[2] UN MODEL | |
|---|---|---|---|---|---|---|
| **ALL REGIONS** | | | | | | |
| [Infant][1] | 59 | 71 | 72 | 65 | 63 | (21)[2] |
| Under 2 | 41 | 47 | 57 | 51 | 59 | |
| Under 5 | 93 | 95 | 92 | 92 | 90 | |
| **OVAMBO** | | | | | | |
| [Infant] | 76 | 80 | 81 | 74 | 71 | (30) |
| Under 2 | 49 | 56 | 67 | 61 | 70 | |
| Under 5 | 107 | 110 | 106 | 107 | 105 | |
| **RURAL NORTH** | | | | | | |
| [Infant] | 66 | 79 | 81 | 73 | 72 | (49) |
| Under 2 | 55 | 63 | 76 | 69 | 79 | |
| Under 5 | 105 | 108 | 105 | 106 | 106 | |
| **PERI-URBAN NORTH** | | | | | | |
| [Infant] | 63 | 76 | 77 | 70 | 66 | (13) |
| Under 2 | 44 | 50 | 58 | 53 | 61 | |
| Under 5 | 101 | 103 | 99 | 100 | 95 | |
| **KATUTURA** | | | | | | |
| [Infant] | 43 | 53 | 52 | 47 | 46 | (7) |
| Under 2 | 26 | 30 | 37 | 33 | 39 | |
| Under 5 | 64 | 65 | 63 | 64 | 62 | |

Calculations based on survey data and the application of the UN Software programme for Child Mortality Measurement. North, South, East and West models use the Coale-Demeny Models using the Trussel Equations.

[1] Infant (under one) mortality based on estimates on projected infant mortality as sample sizes were too small to estimate directly.

[2] General UN model uses the Palloni-Heligman Equations. Number in parenthesis is the figure for under-one mortality taken from the table.

# Summary statistics on reproductive history of survey women who have ever given birth

*Unicef Namibia Health and Nutrition Survey 1990*

*Cogill July 1990*

| Age (years) | Number births | Number surviving | Proportion dead | Factor | | Corrected deaths | Proportion surviving |
|---|---|---|---|---|---|---|---|

## All regions N=1739

| | Pi | Si | 1-(Si/Pi) | Mult | Age x | Lx | Nos. Age x |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 1.203 | 1.109 | 0.0781 | 1.3 | 1 | 0.102 | 89842 |
| 20-24.9 | 1.602 | 1.484 | 0.0737 | 1.15 | 2 | **0.085** | 91529 |
| 25-29.9 | 2.634 | 2.438 | 0.0744 | 1.055 | 3 | **0.079** | 92150 |
| 30-34.5 | 3.892 | 3.562 | 0.0848 | 1.046 | 5 | **0.089** | 91131 |
| 35-39.9 | 4.780 | 4.412 | 0.0770 | 1.054 | 10 | 0.081 | 91886 |
| 40-44.9 | 5.913 | 5.377 | 0.0906 | 1.037 | 15 | 0.094 | 90600 |
| 45-49.9 | 5.763 | 5.158 | 0.1050 | 1.039 | 20 | 0.109 | 89093 |

| P1/P2= | Age: | | Rate of | | Level (L2) | 17 |
|---|---|---|---|---|---|---|
| 0.750936 | Xbar= | 31.200 | Increase= | 0.032 | e0= | 60 |
| 0.608200 | Xmedian= | 30.000 | | | e5= | 63 |
| | | | Birth rate= | 0.041 | Est. IMR= | 78.63 |
| | | | Death rate: | 0.009 | Est. U2MR | 94.16 |
| | | | | | Est. U5MR | 110.01 |

## OVAMBO regio N=1082

| | Pi | Si | 1-(Si/Pi) | Mult | Age x | Lx | Nos. Age x |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 1.244 | 1.122 | 0.0981 | 1.254 | 1 | 0.123 | 87702 |
| 20-24.9 | 1.711 | 1.564 | 0.0859 | 1.129 | 2 | **0.097** | 90300 |
| 25-29.9 | 2.799 | 2.559 | 0.0857 | 1.055 | 3 | **0.090** | 90954 |
| 30-34.5 | 3.990 | 3.596 | 0.0987 | 1.046 | 5 | **0.103** | 89671 |
| 35-39.9 | 5.196 | 4.767 | 0.0826 | 1.054 | 10 | 0.087 | 91298 |
| 40-44.9 | 6.396 | 5.883 | 0.0802 | 1.037 | 15 | 0.083 | 91683 |
| 45-49.9 | 6.000 | 5.371 | 0.1048 | 1.039 | 20 | 0.109 | 89108 |

| P1/P2= | Age: | | | | | |
|---|---|---|---|---|---|---|
| 0.727060 | Xbar= | 31.200 | Rate of | | Level (L2) | 16 |
| 0.611289 | Xmedian= | 30.000 | increase= | 0.04 | e0 | 57 |
| | | | | | e5 | 62 |
| | | | Birth rate= | 0.05 | Est. IMR= | 90.61 |
| | | | Death rate: | 0.01 | Est. U2MR | 110 |
| | | | | | Est. U5MR | 128.98 |

## Rural North N=662

| | Pi | Si | 1-(Si/Pi) | Mult | Age x | Lx | Nos. Age x |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 1.300 | 1.091 | 0.1608 | 1.62 | 1 | 0.260 | 73955 |
| 20-24.9 | 1.690 | 1.520 | 0.1006 | 1.23 | 2 | **0.124** | 87627 |
| 25-29.9 | 2.606 | 2.457 | 0.0572 | 1.11 | 3 | **0.063** | 93653 |
| 30-34.5 | 3.931 | 3.542 | 0.0990 | 1.08 | 5 | **0.107** | 89313 |
| 35-39.9 | 5.057 | 4.660 | 0.0785 | 1.07 | 10 | 0.084 | 91600 |
| 40-44.9 | 6.447 | 5.941 | 0.0785 | 1.06 | 15 | 0.083 | 91680 |
| 45-49.9 | 5.650 | 5.225 | 0.0752 | 1.07 | 20 | 0.080 | 91951 |

| P1/P2= | Age: | | | | | |
|---|---|---|---|---|---|---|
| 0.769230 | Xbar= | 32.860 | Rate of | | Level (L2) | 17 |
| 0.648503 | Xmedian= | 32.000 | increase= | 0.038 | e0 | 60 |
| | | | | | e5 | 63 |
| | | | Birth rate= | 0.048 | Est. IMR= | 78.63 |
| | | | Death rate= | 0.01 | Est. U2MR | 94.16 |
| | | | | | Est. U5MR | 110.01 |

## Katutura N=655

| | Pi | Si | 1-(Si/Pi) | Mult | Age x | Lx | Nos. Age x |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 1.130 | 1.087 | 0.0381 | 1.254 | 1 | 0.048 | 95228 |
| 20-24.9 | 1.422 | 1.352 | 0.0492 | 1.129 | 2 | **0.056** | 94442 |
| 25-29.9 | 2.349 | 2.229 | 0.0511 | 1.055 | 3 | **0.054** | 94610 |
| 30-34.5 | 3.714 | 3.500 | 0.0576 | 1.046 | 5 | **0.060** | 93973 |
| 35-39.9 | 4.286 | 3.991 | 0.0688 | 1.054 | 10 | 0.073 | 92745 |
| 40-44.9 | 5.167 | 4.597 | 0.1103 | 1.037 | 15 | 0.114 | 88560 |
| 45-49.9 | 5.214 | 4.667 | 0.1049 | 1.039 | 20 | 0.109 | 89100 |

| P1/P2= | Age: | | | | | |
|---|---|---|---|---|---|---|
| 0.794655 | Xbar= | 31.240 | Rate of | | Level (L2) | 19 |
| 0.605363 | Xmedian= | 30.000 | increase= | 0.025 | e0 | 65 |
| | | | | | e5 | 68 |
| | | | Birth rate= | 0.0333 | Est. IMR= | 58.56 |
| | | | Death rate= | 0.0083 | Est. U2MR | 65.5 |
| | | | | | Est. U5MR | 75.45 |

## Peri-urban Nth N=411

| | Pi | Si | 1-(Si/Pi) | Mult | Age x | Lx | Nos. Age x |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 1.211 | 1.158 | 0.0438 | 1 | 1 | 0.044 | 95623 |
| 20-24.9 | 1.730 | 1.604 | 0.0728 | 1.02 | 2 | 0.074 | 92571 |
| 25-29.9 | 3.022 | 2.669 | 0.1168 | 1 | 3 | 0.117 | 88319 |
| 30-34.5 | 4.069 | 3.694 | 0.0922 | 1.02 | 5 | 0.094 | 90600 |
| 35-39.9 | 5.852 | 5.185 | 0.1140 | 1.01 | 10 | 0.115 | 88488 |
| 40-44.9 | 6.462 | 5.692 | 0.1192 | 1 | 15 | 0.119 | 88084 |
| 45-49.9 | 7.294 | 6.059 | 0.1693 | 1 | 20 | 0.169 | 83068 |

| P1/P2= | Age: | | | | | |
|---|---|---|---|---|---|---|
| 0.7 | Xbar= | 28.400 | Rate of | | Level (L2) | 17 |
| 0.572468 | Xmedian= | 27.000 | increase= | 0.042 | e0 | 60 |
| | | | | | e5 | 63 |
| | | | Birth rate= | 0.047 | Est. IMR= | 78.63 |
| | | | Death rate= | 0.0093 | Est. U2MR | 94.16 |
| | | | | | Est. U5MR | 110.01 |

## Onyaanya N=242

| | Pi | Si | 1-(Si/Pi) | Mult | Age x | Lx | Nos. Age x |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 1.625 | 1.250 | 0.2308 | 1.425 | 1 | 0.329 | 67115 |
| 20-24.9 | 1.800 | 1.550 | 0.1389 | 1.188 | 2 | 0.165 | 83500 |
| 25-29.9 | 2.436 | 2.339 | 0.0398 | 1.081 | 3 | 0.043 | 95696 |
| 30-34.5 | 3.705 | 3.523 | 0.0491 | 1.063 | 5 | 0.052 | 94778 |
| 35-39.9 | 5.310 | 4.905 | 0.0763 | 1.069 | 10 | 0.082 | 91847 |
| 40-44.9 | 6.900 | 6.267 | 0.0917 | 1.052 | 15 | 0.097 | 90349 |
| 45-49.9 | 5.938 | 5.649 | 0.0487 | 1.057 | 20 | 0.051 | 94856 |

| P1/P2= | Age: | | | | | |
|---|---|---|---|---|---|---|
| 0.902777 | Xbar= | 31.720 | Rate of | | Level (L2) | 17 |
| 0.738916 | Xmedian= | 31.000 | increase= | 0.035 | eo= | 60 |
| | | | | | e5= | 63 |
| | | | Birth rate= | 0.0445 | Est. IMR= | 78.63 |
| | | | Death rate= | 0.0095 | Est. U2MR | 94.16 |
| | | | | | Est. U5MR | 110.01 |

## Engela N=232

| | Pi | Si | 1-(Si/Pi) | Mult | Age x | Lx | Nos. Age x |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 1.125 | 1.125 | 0.0000 | 1.62 | 1 | 0.000 | 100000 |
| 20-24.9 | 1.676 | 1.514 | 0.0967 | 1.23 | 2 | **0.119** | 88111 |
| 25-29.9 | 3.128 | 2.957 | 0.0547 | 1.11 | 3 | **0.061** | 93932 |
| 30-34.5 | 4.519 | 3.750 | 0.1702 | 1.08 | 5 | **0.184** | 81622 |
| 35-39.9 | 5.600 | 4.967 | 0.1130 | 1.07 | 10 | 0.121 | 87905 |
| 40-44.9 | 6.071 | 5.500 | 0.0941 | 1.06 | 15 | 0.100 | 90030 |
| 45-49.9 | 5.933 | 5.067 | 0.1460 | 1.07 | 20 | 0.156 | 84382 |

| P1/P2= | Age: | | | | | |
|---|---|---|---|---|---|---|
| 0.671241 | Xbar= | 33.000 | Rate of | | Level (L2) | 14 |
| 0.535805 | Xmedian= | 32.000 | increase= | 0.035 | e0= | 52 |
| | | | | | e5= | 57 |
| | | | Birth rate= | 0.049 | Est. IMR= | 117.64 |
| | | | Death rate= | 0.014 | Est. U2MR | 143.39 |
| | | | | | Est. U5MR | 169.6 |

## Tsandi N=199

| | Pi | Si | 1-(Si/Pi) | Mult | Age x | Lx | Nos. Age x |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 1.000 | 0.833 | 0.1670 | 1.75 | 1 | 0.292 | 70775 |
| 20-24.9 | 1.522 | 1.478 | 0.0289 | 1.24 | 2 | **0.036** | 96415 |
| 25-29.9 | 2.200 | 2.050 | 0.0682 | 1.171 | 3 | **0.080** | 92016 |
| 30-34.5 | 3.400 | 3.257 | 0.0421 | 1.12 | 5 | **0.047** | 95289 |
| 35-39.9 | 4.177 | 4.088 | 0.0213 | 1.1 | 10 | 0.023 | 97656 |
| 40-44.9 | 6.111 | 6.037 | 0.0121 | 1.08 | 15 | 0.013 | 98692 |
| 45-49.9 | 5.441 | 5.324 | 0.0215 | 1.09 | 20 | 0.023 | 97656 |

| P1/P2= | Age: | | | | | |
|---|---|---|---|---|---|---|
| 0.657030 | Xbar= | 34.110 | Rate of | | Level (L2) | 17 |
| 0.691818 | Xmedian= | 34.000 | Increase= | 0.032 | e0= | 60 |
| | | | | | e5= | 63 |
| | | | Birth rate= | 0.042 | Est. IMR= | 78.63 |
| | | | Death rate= | 0.0096 | Est. U2MR | 94.16 |
| | | | | | Est. U5MR | 110.01 |

NOTE: Level and e0, e5 and mortality rates based on WEST MODEL

# Description of sample of women who have ever given birth

*Unicef Namibia Survey 1990*

*Cogill July 1990*

## All regions

| | No. women | No. births | Age | Birth/woman |
|---|---|---|---|---|
| 15–19.9 | 64 | 77 | 18.2 | 1.20 |
| 20–24.9 | 339 | 543 | 22.3 | 1.60 |
| 25–29.9 | 454 | 1196 | 27.0 | 2.63 |
| 30–34.5 | 315 | 1226 | 31.8 | 3.89 |
| 35–39.9 | 245 | 1171 | 37.0 | 4.78 |
| 40–44.9 | 183 | 1082 | 41.6 | 5.91 |
| 45–49.9 | 139 | 801 | 47.0 | 5.76 |
| Total | 1739 | 6096 | 31.2 | 3.51 |

## Ovambo

| | No. women | No. births | Age | Birth/woman |
|---|---|---|---|---|
| 15–19.9 | 41 | 51 | 18.1 | 1.24 |
| 20–24.9 | 211 | 361 | 22.3 | 1.71 |
| 25–29.9 | 288 | 806 | 26.9 | 2.80 |
| 30–34.5 | 203 | 810 | 31.7 | 3.99 |
| 35–39.9 | 133 | 691 | 36.9 | 5.20 |
| 40–44.9 | 111 | 710 | 41.5 | 6.40 |
| 45–49.9 | 97 | 582 | 47.1 | 6.00 |
| Total | 1084 | 4011 | 31.2 | 3.70 |

## ural north

| | No. women | No. births | Age | Birth/woman |
|---|---|---|---|---|
| 15–19.9 | 22 | 28 | 18.2 | 1.27 |
| 20–24.9 | 100 | 169 | 22.3 | 1.69 |
| 25–29.9 | 149 | 386 | 27.0 | 2.59 |
| 30–34.5 | 131 | 517 | 31.8 | 3.95 |
| 35–39.9 | 106 | 533 | 36.9 | 5.03 |
| 40–44.9 | 85 | 542 | 41.6 | 6.38 |
| 45–49.9 | 80 | 458 | 47.2 | 5.73 |
| Total | 673 | 2633 | 32.9 | 3.91 |

## -urban north

| | No. women | No. births | Age | Birth/woman |
|---|---|---|---|---|
| 15–19.9 | 19 | 23 | 18.1 | 1.21 |
| 20–24.9 | 111 | 192 | 22.3 | 1.73 |
| 25–29.9 | 139 | 420 | 26.8 | 3.02 |
| 30–34.5 | 72 | 293 | 31.5 | 4.07 |
| 35–39.9 | 27 | 158 | 36.8 | 5.85 |
| 40–44.9 | 26 | 168 | 41.2 | 6.46 |
| 45–49.9 | 17 | 124 | 46.6 | 7.29 |
| Total | 411 | 1378 | 28.4 | 3.35 |

## )nyaanya

| | No. women | No. births | Age | Birth/woman |
|---|---|---|---|---|
| 15–19.9 | 8 | 13 | 18.1 | 1.63 |
| 20–24.9 | 40 | 72 | 22.1 | 1.80 |
| 25–29.9 | 62 | 151 | 27.0 | 2.44 |
| 30–34.5 | 44 | 163 | 31.9 | 3.70 |
| 35–39.9 | 42 | 223 | 37.0 | 5.31 |
| 40–44.9 | 30 | 207 | 41.3 | 6.90 |
| 45–49.9 | 16 | 95 | 47.6 | 5.94 |
| Total | 242 | 924 | 31.7 | 3.82 |

## Engela

| | No. women | No. births | Age | Birth/woman |
|---|---|---|---|---|
| 15–19.9 | 8 | 9 | 18.3 | 1.13 |
| 20–24.9 | 37 | 62 | 22.4 | 1.68 |
| 25–29.9 | 47 | 147 | 26.9 | 3.13 |
| 30–34.5 | 52 | 235 | 31.8 | 4.52 |
| 35–39.9 | 30 | 168 | 36.8 | 5.60 |
| 40–44.9 | 28 | 170 | 41.9 | 6.07 |
| 45–49.9 | 30 | 178 | 47.3 | 5.93 |
| Total | 232 | 969 | 33.0 | 4.18 |

## Tsandi

| | No. women | No. births | Age | Birth/woman |
|---|---|---|---|---|
| 15–19.9 | 6 | 6 | 18.2 | 1.00 |
| 20–24.9 | 23 | 35 | 22.4 | 1.52 |
| 25–29.9 | 40 | 88 | 27.1 | 2.20 |
| 30–34.5 | 35 | 119 | 31.8 | 3.40 |
| 35–39.9 | 34 | 142 | 36.9 | 4.18 |
| 40–44.9 | 27 | 165 | 41.7 | 6.11 |
| 45–49.9 | 34 | 185 | 46.9 | 5.44 |
| Total | 199 | 740 | 34.1 | 3.72 |

## Katutura

| | No. women | No. births | Age | Birth/woman |
|---|---|---|---|---|
| 15–19.9 | 23 | 26 | 18.2 | 1.13 |
| 20–24.9 | 129 | 183 | 22.3 | 1.42 |
| 25–29.9 | 166 | 390 | 27.2 | 2.35 |
| 30–34.5 | 112 | 416 | 31.8 | 3.71 |
| 35–39.9 | 111 | 474 | 37.1 | 4.27 |
| 40–44.9 | 72 | 372 | 41.8 | 5.17 |
| 45–49.9 | 41 | 214 | 46.9 | 5.22 |
| Total | 654 | 2075 | 31.2 | 3.17 |

# APPENDIX D

# MATERNAL MORTALITY

# Summary statistics on survival of sisters of survey women --- Maternal Mortality

*Unicef Namibia Health and Nutrition Survey 1990*

*Cogill July 1990*

| Age (years) | Number spondents | Number sisters | Maternal deaths | djustment Factor | Sister units of risk exposure Bi | Life time risk of maternal death | Proportion of dead sisters maternally |
|---|---|---|---|---|---|---|---|
| All regions | | | | *Ai* | *Bi* | *q(w)* | dying |
| | (b) | (c)** | (d) | (e) | (f=ce) | (g=d/f) | (h) |
| 15-19.9 | 192 | 632 | 2 | 0.107 | 68 | 0.030 | 0.111 |
| 20-24.9 | 364 | 1198 | 6 | 0.201 | 241 | 0.025 | 0.103 |
| 25-29.9 | 429 | 1439 | 7 | 0.329 | 473 | 0.015 | 0.080 |
| 30-34.5 | 284 | 975 | 9 | 0.478 | 466 | 0.019 | 0.143 |
| 35-39.9 | 223 | 762 | 12 | 0.648 | 494 | 0.024 | 0.150 |
| 40-44.9 | 159 | 513 | 12 | 0.776 | 398 | 0.030 | 0.203 |
| 45-49.9 | 125 | 387 | 6 | 0.889 | 344 | 0.017 | 0.125 |
| 50+ | 500 | 1575 | 40 | 0.997 | 1570 | 0.025 | 0.100 |
| Total | 2276 | 7253 | 94 | --- | 4054 | 0.023 | --- |

To 50 yrs= 0.0217

Total Fertility Rate= 5.9

**Maternal Mortality Ratio 371**

** Number of sisters for 15-24.9 derived from multiplying the number of respondents by the average number of sisters for women older than 25 years: (15-19.9 yrs = 192*3.29 = ; 20-24.9 =364*3.29)
Actual no. sisters for 15-19.9 yrs: 548; 20-24.9:1054.

## Peri-Urban North

| | (b) | (c)** | (d) | Ai (e) | Bi (f=ce) | q(w) (g=d/f) | (h) |
|---|---|---|---|---|---|---|---|
| 15–19.9 | 32 | 115 | 0 | 0.116 | 13 | 0.000 | 0.000 |
| 20–24.9 | 98 | 486 | 5 | 0.195 | 95 | 0.053 | 0.172 |
| 25–29.9 | 117 | 434 | 7 | 0.318 | 138 | 0.051 | 0.179 |
| 30–34.5 | 60 | 207 | 4 | 0.457 | 95 | 0.042 | 0.308 |
| 35–39.9 | 23 | 91 | 3 | 0.632 | 58 | 0.052 | 0.214 |
| 40–44.9 | 20 | 89 | 0 | 0.755 | 67 | 0.000 | 0.000 |
| 45–49.9 | 14 | 44 | 1 | 0.891 | 39 | 0.026 | 0.250 |
| 50+ | 49 | 153 | 4 | 0.997 | 153 | 0.026 | 0.087 |
| Total | 413 | 1619 | 24 | -- | 657 | 0.037 | --- |

To 50 yrs= 0.0396

Total Fertility Rate= 7.3

**Maternal Mortality Ratio 552**

** Number of sisters for 15–24.9 derived from multiplying the number of respondents by the average number of sisters for women older than 25 years: (15–19.9 yrs = 32*3.6 = ; 20–24.9 =98*3.6)
Actual no. sisters for 15–19.9 yrs: 114; 20–24.9:311.

## Rural North

| | (b) | (c)** | (d) | Ai (e) | Bi (f=ce) | q(w) (g=d/f) | (h) |
|---|---|---|---|---|---|---|---|
| 15–19.9 | 101 | 327 | 2 | 0.106 | 35 | 0.029 | 0.143 |
| 20–24.9 | 131 | 424 | 1 | 0.201 | 85 | 0.000 | 0.000 |
| 25–29.9 | 157 | 484 | 0 | 0.328 | 159 | 0.025 | 0.114 |
| 30–34.5 | 123 | 418 | 4 | 0.470 | 196 | 0.031 | 0.136 |
| 35–39.9 | 106 | 364 | 6 | 0.632 | 230 | 0.039 | 0.237 |
| 40–44.9 | 79 | 263 | 9 | 0.776 | 204 | 0.005 | 0.029 |
| 45–49.9 | 72 | 225 | 1 | 0.891 | 200 | 0.005 | 0.037 |
| 50+ | 378 | 1206 | 28 | 0.997 | 1202 | 0.023 | 0.093 |
| Total | 1147 | 3711 | 51 | -- | 2312 | 0.022 | --- |

To 50 yrs= 0.0207

Total Fertility Rate= 6.5

**Maternal Mortality Ratio 322**

** Number of sisters for 15–24.9 derived from multiplying the number of respondents by the average number of sisters for women older than 25 years: (15–19.9 yrs = 101*3.24 = ; 20–24.9 =131*3.24)
Actual no. sisters for 15–19.9 yrs: 289; 20–24.9:381.

## Ovambo region

| | | | | Al | Bl | q(w) | |
|---|---|---|---|---|---|---|---|
| | (b) | (c)** | (d) | (e) | (f=ce) | (g=d/f) | (h) |
| 15–19.9 | 133 | 439 | 2 | 0.105 | 46 | 0.043 | 0.133 |
| 20–24.9 | 229 | 756 | 6 | 0.201 | 152 | 0.040 | 0.128 |
| 25–29.9 | 274 | 918 | 7 | 0.329 | 302 | 0.023 | 0.095 |
| 30–34.5 | 183 | 625 | 8 | 0.462 | 289 | 0.028 | 0.140 |
| 35–39.9 | 129 | 455 | 9 | 0.648 | 295 | 0.031 | 0.173 |
| 40–44.9 | 99 | 352 | 9 | 0.776 | 273 | 0.033 | 0.166 |
| 45–49.9 | 86 | 269 | 2 | 0.892 | 240 | 0.008 | 0.065 |
| 50+ | 427 | 1359 | 32 | 0.991 | 1347 | 0.024 | 0.092 |
| Total | 1560 | 5173 | 75 | -- | 2943 | 0.025 | --- |

To 50 yrs= 0.0269

Total Fertility Rate= 6.4

**Maternal Mortality-Ratio 432**

** Number of sisters for 15–24.9 derived from multiplying the number of respondents by the average number of sisters for women older than 25 years: (15–19.9 yrs = 133*3.3 = ; 20–24.9 =229*3.3)
Actual no. sisters for 15–19.9 yrs: 403; 20–24.9:692.

## Onyaanya

| | | | | Al | Bi | q(w) | |
|---|---|---|---|---|---|---|---|
| | (b) | (c)** | (d) | (e) | (f=ce) | (g=d/f) | (h) |
| 15–19.9 | 24 | 70 | 1 | 0.103 | 7 | 0.139 | 0.200 |
| 20–24.9 | 52 | 151 | 0 | 0.203 | 31 | 0.000 | 0.000 |
| 25–29.9 | 64 | 161 | 0 | 0.329 | 53 | 0.000 | 0.000 |
| 30–34.5 | 41 | 104 | 1 | 0.487 | 51 | 0.020 | 0.053 |
| 35–39.9 | 44 | 116 | 2 | 0.648 | 75 | 0.027 | 0.105 |
| 40–44.9 | 30 | 75 | 0 | 0.789 | 59 | 0.000 | 0.000 |
| 45–49.9 | 15 | 37 | 0 | 0.900 | 33 | 0.000 | 0.000 |
| 50+ | 118 | 240 | 7 | 0.997 | 239 | 0.029 | 0.069 |
| Total | 388 | 953 | 11 | -- | 548 | 0.020 | --- |

To 50 yrs= 0.0129

Total Fertility Rate= 7

**Maternal Mortality Ratio 185**

** Number of sisters for 15–24.9 derived from multiplying the number of respondents by the average number of sisters for women older than 25 years: (15–19.9 yrs = 24*2.9 = ; 20–24.9 =52*2.9)
Actual no. sisters for 15–19.9 yrs: 48; 20–24.9:132.

## Engela

| | (b) | (c)** | (d) | Ai (e) | Bi (f=ce) | q(w) (g=d/f) | (h) |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 37 | 126 | 1 | 0.100 | 13 | 0.079 | 0.500 |
| 20-24.9 | 43 | 146 | 1 | 0.195 | 29 | 0.035 | 0.125 |
| 25-29.9 | 42 | 135 | 0 | 0.321 | 43 | 0.000 | 0.000 |
| 30-34.5 | 46 | 168 | 1 | 0.478 | 80 | 0.012 | 0.059 |
| 35-39.9 | 27 | 105 | 4 | 0.648 | 68 | 0.059 | 0.333 |
| 40-44.9 | 23 | 85 | 6 | 0.789 | 67 | 0.089 | 0.375 |
| 45-49.9 | 25 | 76 | 1 | 0.900 | 68 | 0.015 | 0.100 |
| 50+ | 125 | 417 | 19 | 0.999 | 417 | 0.046 | 0.154 |
| Total | 368 | 1258 | 33 | -- | 785 | 0.042 | --- |

To 50 yrs= 0.0380

Total Fertility Rate= 6.3

**Maternal Mortality Ratio 613**

** Number of sisters for 15-24.9 derived from multiplying the number of respondents by the average number of sisters for women older than 25 years: (15-19.9 yrs = 24*3.4 = ; 20-24.9 =52*3.4)
Actual no. sisters for 15-19.9 yrs: 103; 20-24.9:119.

## Tsandi

| | (b) | (c)** | (d) | Ai (e) | Bi (f=ce) | q(w) (g=d/f) | (h) |
|---|---|---|---|---|---|---|---|
| 15-19.9 | 40 | 136 | 0 | 0.106 | 14 | 0.000 | ERR |
| 20-24.9 | 36 | 122 | 0 | 0.195 | 24 | 0.000 | 0.000 |
| 25-29.9 | 51 | 177 | 0 | 0.328 | 58 | 0.000 | 0.000 |
| 30-34.5 | 36 | 127 | 0 | 0.487 | 62 | 0.000 | 0.000 |
| 35-39.9 | 35 | 125 | 2 | 0.648 | 81 | 0.025 | 0.286 |
| 40-44.9 | 26 | 97 | 0 | 0.782 | 76 | 0.000 | 0.000 |
| 45-49.9 | 32 | 106 | 3 | 0.891 | 94 | 0.032 | 0.231 |
| 50+ | 135 | 437 | 2 | 0.997 | 436 | 0.005 | 0.027 |
| Total | 391 | 1327 | 7 | -- | 845 | 0.008 | --- |

To 50 yrs= 0.0122

Total Fertility Rate= 6.1

**Maternal Mortality Ratio 201**

** Number of sisters for 15-24.9 derived from multiplying the number of respondents by the average number of sisters for women older than 25 years: (15-19.9 yrs = 40*3.4 = ; 20-24.9 =36*3.4)
Actual no. sisters for 15-19.9 yrs: 128; 20-24.9:121.

| Katutura | | | | AI | BI | q(w) | |
|---|---|---|---|---|---|---|---|
| | (b) | (c)** | (d) | (e) | (f=ce) | (g=d/f) | (h) |
| 15-19.9 | 59 | 189 | 0 | 0.108 | 20 | 0.000 | 0.000 |
| 20-24.9 | 135 | 433 | 0 | 0.201 | 87 | 0.000 | 0.000 |
| 25-29.9 | 155 | 521 | 0 | 0.328 | 171 | 0.000 | 0.000 |
| 30-34.5 | 101 | 350 | 1 | 0.483 | 169 | 0.006 | 0.010 |
| 35-39.9 | 94 | 307 | 3 | 0.648 | 199 | 0.015 | 0.032 |
| 40-44.9 | 60 | 161 | 3 | 0.786 | 127 | 0.024 | 0.050 |
| 45-49.9 | 39 | 118 | 4 | 0.891 | 105 | 0.038 | 0.103 |
| 50+ | 73 | 216 | 8 | 0.99 | 214 | 0.037 | 0.110 |
| Total | 716 | 2180 | 19 | --- | 1092 | 0.017 | --- |

To 50 yrs= 0.0125

Total Fertility Rate= 5.2

**Maternal Mortality Ratio 242**

** Number of sisters for 15-24.9 derived from multiplying the number of respondents by the average number of sisters for women older than 25 years: (15-19.9 yrs = 59*3.21 = ; 20-24.9 =135*3.21)
Actual no. sisters for 15-19.9 yrs: 145; 20-24.9:362.

# APPENDIX E

## MEASUREMENT PROCEDURES

### Weights

Weighing of the children was done with a hanging spring balance (25 kg Salter scale). Children were gently placed in weighing pants and slowly pulled up the hanging salter scale. All weighing was done after adjusting the scale to read 0 (zero). The weights read up to the nearest 0.1 kg and noted on the questionnaire straight after weighing to avoid errors.

### Lengths

For all children, (0-60 months), crown-heel length was measured using graduated wooden length boards. The child was laid on the board with the legs extended by firm pressure applied by an assistant, and the feet are flexed at right angles to the lower legs. The head is held comfortably erect and the headpiece making the contact with the top of the head. The upright sliding foot piece is then moved to obtain firm contact with the heels and the length is read to the nearest 0.1 cm. Unicef length measuring boards were used for all measurements.

Only length measurements were taken on all children. Supine lengths for children older than 24 months converted to height using Alnwick's formula (Stephenson et al. 1983):

*Height (in cms) = Length - (3-0.03864*Age (in months))*

This was necessary to adjust the lengths on older children as the reference standard (NCHS/WHO reference standards) are based on measurements of children over 24 months standing height.

Weight, height, age and child's sex were used to estimate the following three measures:

Weight for age (a measure of undernutrition which combines both SHORT and LONG-TERM malnutrition,

Weight for height (a measure of wasting or SHORT-TERM or ACUTE malnutrition,

Height for age (a measure of stunting or LONG-TERM malnutrition.

The above measures were calculated using the CASP Anthropometric Software provided by CDC Atlanta. These measures were standardized using the NCHS/WHO reference standards. The three indices of nutritional status were expressed in two forms. The first and more familiar is PERCENT OF MEDIAN and the second is the Z-SCORE. Z-scores are gaining wider acceptance because of its statistical soundness. In this report, both measures are presented but with an emphasis on Z-scores..

## APPENDIX F

## SPECIAL ACKNOWLEDGEMENTS

Supplementary list of some of the people and organizations that assisted in the Survey.

A. Katutura Superintendents (Assisted in Households Listing,supply of maps and community outreach activities).

| | | Section |
|---|---|---|
| 1. | Philip van Staden | (A) |
| 2. | H S Haztog | (B) |
| 3. | R Steynberg | (C) |
| 4. | S Engelbrecht | (E) |
| 5. | A Muller | (F) |

B. Council of Churches in Namibia (CCN) -- For continuous support in administration,coordination and execution of the survey.

1. Dr. A Shejavali, General Secretary Council of Churches in Namibia(CCN)
2. Dr. Immanuel Dumeni, Director, RRR Committee of the CCN.

C. Vocational Training Institutions.

1. Mr Venter, Principal of Vocational Training Centre Katutura(offer of survey field office)
2. Principal, Otto Benecke Foundation, Windhoek (offer of supervisors training workshop venue)

D. Principals of the schools below for allowing the school pupils to act as pretest subjects during training, and assisting in the community outreach activities.

1. Principal of van der Byl School
2. Principal of St Banabas School
3. Principal of Auas School

E Pastors of the Church congregations below for Coordination of community outreach messages.

1. Roman Catholic Church - Katutura
2. Evangelical Church - Khomasdal University of Namibia (Academy)

The North

F. Oshakati

1. Dr Shivute - then Oshakati Hospital Medical Superintendent (Authority and Collaboration in Survey)

2. Mr I Ashipala - Chief Laboratory Technologist Oshakati Hospital for giving support in Fax & Telephone communication.
3. Mr J S Udjombala - Principal Gabriel Taapopi Secondary School For Offering Enumerator Training Venue at the School
4. Mr A C Koegelenberg - Alpine Caterers
District Manager Oshakati for Catering Services during Enumerator Training Workshop
5.. Mr S Kaukungue - Oshakati SWAPO Office for support in carrying out community outreach
6. Bishop Dumeni - For Giving support in many ways including support in carrying out community outreach activities before the Survey.
7. The UNHCR office in Oluno For the identification of the enumerators.
8. Mr B A Taylor Manager -- Rural Development Centre, Oshakati

G. Tsandi

1. All the administrative headmen for giving support in creating community awareness and cooperation during the survey,and among them we greatly acknowledge the following:-
2. Mr Josia S Taapopi -- King of Ukwaludhi for support in furthering community cooperation,offer of field office and identification of field enumarator assistants.
3. Pastor Alpo Enkono -- Pastor in charge of Tsandi for creating community awareness, support and cooperation during the survey.

H. Onyaanya

All the administrative headmen for giving support in creating community awareness and cooperation during the survey, and among them we greatly acknowledge the following:-

1. Mr Niikoti -- Headman-Onatyatya.
2. Mr Fillipus Uukule -- Headman-Uulewanambwa.
3. Mr Fillipus L Nandjala -- Headman-Onandjamba.

I. Onyaanya location.

4. Director -- SWAPO Office Onyaanya

J. Engela

All the administrative headmen for giving support in creating community awareness and cooperation during the survey,among them we greatly acknowledge the following:-

1. Mr Gabriel Kautima -- Chief-Omhedi.
2. Mr Gotlieb Dan -- Chief-Engela
3. Rev Jason Haufiku -- Pastor in charge of Engela

## APPENDIX G

## A. CHILD NUTRITION AND ILLNESS REGRESSIONS

### 1. Nutrition

Dependent Variables:

| | | |
|---|---|---|
| 1.. | HAZ | Height for age (Z-score) -- Stunting |
| 2.. | WAZ | Weight for age (Z-score) -- Undernutrition |
| 3.. | WHZ | Weight for Height (Z-score) -- Wasting |

Predictor Variables:

| | | |
|---|---|---|
| 1.. | AGESOL | Age solid food months |
| 2.. | FEVER1 | Presence of fever (1=yes, 0=no) |
| 3.. | KIDRET1 | Returnee child (1=yes, 0=no) |
| 4.. | SEX1 | Child gender (1=Male, 0=Female) |
| 5.. | DPTSTAT1 | DPT status (1=complete, 0=incomplete or none) |
| 6.. | HOH2 | Gender of Head (1=female, 0=male) |
| 7.. | HOHED1 | Education of Head (1=more 4 years, 0=less 4 years) |
| 8.. | NONE1 | Health Education -- Attidute to treatment (1=no action, 0=action) |
| 9.. | AGEC | Age calculated in months |
| 10.. | HHSIZE | HH size |
| 11.. | WAGEYRPC | Household annual per capita income in Rand |
| 12.. | PCTILL | Percent time ill with any illness |
| 13.. | FARM1 | Farming household (1=yes, 0=no) |
| 14.. | ENG | Engela location (1=yes, 0=no) |
| 15.. | TSI | Tsandi location (1=yes, 0=no) |
| 16.. | ONY | Onyaanya location (1=yes, 0=no) |
| 17.. | KAT | Katutura location (1=yes, 0=no) |
| 18.. | PUN | Peri-Urban North location (1=yes, 0=no) |

### 2. Illness

| | |
|---|---|
| DIAR1 | Presence of diarrhoea (1=yes, 0=no) |
| COUGH1 | Presence of cough (1=yes, 0=no) |
| MEASLES1 | Presence of measles (1=yes, 0=no) |
| FEVER1 | Presence of fever (1=yes, 0=no) |
| SICK1 | Presence of any illness (1=yes, 0=no) |
| PCTILL | Percent time ill in past 14 days |
| MEASTAT1 | Measles status (1=complete, 0=incomplete or none) |

Location comparisons for Northern analysis is with Peri-Urban North and for All Regions with Katutura.

Methodological Note: Several models were examined and the following are a the most useful in examining the determinants of child nutrition and illness. Variables such as the percent of children under 15 years in the household, time to get dry season water, farm area approximated by hours to plough, percent of children in primary school and the source of income from transfers (pension, food aid and remittances) were tested but excluded from the final models.

1. KATUTURA:

1.1 Ht/Age Katutura

Multiple R .20 R Square .04372
Adjusted R Square .00438 Standard Error 1.13417

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 13 | 18.58556 | 1.42966 |
| Residual | 316 | 406.48543 | 1.28635 |

F = 1.11141 Signif F = .3482

Variables in the Equation

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| NONE1 | .14865 | 1.15861 | .00719 | .128 | .8980 |
| HHSIZE | -.01960 | .01906 | -.06309 | -1.029 | .3044 |
| PCTILL | .00059 | .00216 | .01667 | .275 | .7837 |
| AGESOL | -.03754 | .04092 | -.05136 | -.917 | .3597 |
| KIDRET1 | .61397 | .41123 | .08320 | 1.493 | .1364 |
| HOH2 | -.05733 | .13832 | -.02421 | -.414 | .6788 |
| SEX1 | -.02410 | .12690 | -.01061 | -.190 | .8495 |
| DPTSTAT1 | -.10202 | .13153 | -.04473 | -.776 | .4386 |
| HOHED1* | .22729 | .13283 | .09907 | 1.711 | .0880 |
| FARM1 | .15992 | .14439 | .06318 | 1.108 | .2689 |
| AGEC | -.00547 | .00382 | -.08244 | -1.432 | .1532 |
| FEVER1 | .00889 | .14850 | .00357 | .060 | .9523 |
| WAGEYRPC | .00006 | .00007 | .05686 | .877 | .3814 |
| (Constant) | -.53716 | .30700 | | -1.750 | .0811 |

1.2 Wt/Age Katutura

Multiple R .28883 R Square .08342
Adjusted R Square .04572 Standard Error .99638

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 13 | 28.55332 | 2.19641 |
| Residual | 316 | 313.71575 | .99277 |

F = 2.21240 Signif F = .0090

Variables in the Equation

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| NONE1 | .49439 | 1.01785 | .02668 | .486 | .6275 |
| HHSIZE | -.02303 | .01674 | -.08262 | -1.376 | .1698 |
| PCTILL | -.00120 | .00190 | -.03746 | -.630 | .5288 |
| AGESOL* | -.07871 | .03595 | -.12001 | -2.189 | .0293 |
| KIDRET1 | -.01702 | .36127 | -.00250 | -.047 | .9625 |
| HOH2 | -.14671 | .12152 | -.06904 | -1.207 | .2282 |
| SEX1 | -.01984 | .11148 | -.00970 | -.178 | .8589 |
| DPTSTAT1 | .05000 | .11555 | .02443 | .433 | .6655 |
| HOHED1* | .30173 | .11669 | .14656 | 2.586 | .0102 |
| FARM1 | .05752 | .12685 | .02533 | .453 | .6505 |
| AGEC*** | -.01074 | .00336 | -.18052 | -3.202 | .0015 |
| FEVER1 | -.08761 | .13046 | -.03931 | -.672 | .5023 |
| WAGEYRPC | .00005 | .00006 | .05017 | .790 | .4301 |
| (Constant) | -.23946 | .26970 | | -.888 | .3753 |

1.3 Wt/Ht Katutura

Multiple R .26619 R Square .07086
djusted R Square .03263 Standard Error .97946
Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 13 | 23.11824 | 1.77833 |
| Residual | 316 | 303.15145 | .95934 |

F = 1.85370 Signif F = .0348

Variables in the Equation

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| NONE1 | .52298 | 1.00056 | .02891 | .523 | .6016 |
| HHSIZE | -.01756 | .01646 | -.06452 | -1.067 | .2867 |
| PCTILL | -.00250 | .00187 | -.08018 | -1.340 | .1811 |
| AGESOL* | -.05951 | .03534 | -.09292 | -1.684 | .0932 |
| KIDRET1 | -.41409 | .35514 | -.06405 | -1.166 | .2445 |
| HOH2 | -.09120 | .11945 | -.04396 | -.763 | .4458 |
| SEX1 | -.05566 | .10959 | -.02797 | -.508 | .6119 |
| DPTSTAT1 | .14084 | .11359 | .07049 | 1.240 | .2159 |
| HOHED1* | .22049 | .11471 | .10970 | 1.922 | .0555 |
| FARM1 | -.06666 | .12470 | -.03006 | -.535 | .5933 |
| AGEC*** | -.00950 | -.00330 | -.16354 | -2.881 | .0042 |
| FEVER1 | -.10439 | .12824 | -.04797 | -.814 | .4163 |
| WAGEYRPC | .00001 | .00006 | .00353 | .055 | .9560 |
| (Constant) | .16284 | .26512 | | .614 | .5395 |

2. NORTH -- OVAMBO

2.1 Ht/Age -- North

Multiple R .17711 R Square .03137
Adjusted R Square .01729 Standard Error 1.13823
Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 16 | 46.19286 | 2.88705 |
| Residual | 1101 | 1426.41863 | 1.29557 |

F = 2.22841 Signif F = .0036

Variables in the Equation

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| AGESOL | -.01564 | .02412 | -.01966 | -.649 | .5167 |
| FEVER1** | .18607 | .07709 | .07981 | 2.414 | .0160 |
| KIDRET1 | .15891 | .16196 | .02969 | .981 | .3267 |
| SEX1* | -.12744 | .06837 | -.05547 | -1.864 | .0626 |
| DPTSTAT1 | -.09033 | .07046 | -.03853 | -1.282 | .2001 |
| HOH2 | .01973 | .07247 | .00848 | .272 | .7855 |
| HOHED1* | .15241 | .07815 | .06014 | 1.950 | .0514 |
| ONY** | .31582 | .11216 | .11366 | 2.816 | .0050 |
| NONE1 | -.06882 | .09667 | -.02257 | -.712 | .4767 |
| AGEC | -.00307 | .00221 | -.04325 | -1.394 | .1635 |
| HHSIZE | .00306 | .01034 | .00951 | .296 | .7673 |
| WAGEYRPC* | .00010 | .00005 | .06067 | 1.850 | .0645 |
| PCTILL* | -.00247 | .00118 | -.06725 | -2.090 | .0368 |
| ENG | .10307 | .10924 | .03900 | .943 | .3457 |
| FARM1 | -.14965 | .12087 | -.04636 | -1.238 | .2160 |
| TSI | .19832 | .12345 | .06761 | 1.607 | .1084 |
| (Constant) | -1.12500 | .17561 | | -6.406 | .0000 |

2.2 Wt/Age North

| | | | |
|---|---|---|---|
| Multiple R | .20681 | R Square | .04277 |
| Adjusted R Square | .02886 | Standard Error | .98237 |

| An. of Variance | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 16 | 47.47499 | 2.96719 |
| Residual | 1101 | 1062.52076 | .96505 |

F = 3.07464 Signif F = .0000

Variables in the Equation

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| AGESOL | -.00920 | .02082 | -.01332 | -.442 | .6585 |
| FEVER1 | -.05190 | .06653 | -.02564 | -.780 | .4355 |
| KIDRET1 | .07755 | .13978 | .01669 | .555 | .5791 |
| SEX1 | -.00300 | .05901 | -.00150 | -.051 | .9596 |
| DPTSTAT1 | -.09118 | .06081 | -.04479 | -1.500 | .1340 |
| HOH2 | -.00068 | .06255 | -.00330 | -.109 | .9134 |
| HOHED1 ** | .18117 | .06745 | .08234 | 2.686 | .0073 |
| ONY* | .19392 | .09680 | .08039 | 2.003 | .0454 |
| NONE1 | .12819 | .08343 | .04842 | 1.537 | .1247 |
| AGEC*** | -.00654 | .00190 | -.10609 | -3.440 | .0006 |
| HHSIZE | .00679 | .00892 | .02431 | .761 | .4469 |
| WAGEYRPC* | .00011 | .00005 | .07545 | 2.314 | .0208 |
| PCTILL** | -.00318 | .00102 | -.09969 | -3.117 | .0019 |
| ENG | .12011 | .09428 | .05235 | 1.274 | .2030 |
| FARM1 | -.09979 | .10432 | -.03561 | -.957 | .3390 |
| TSI | .15367 | .10654 | .06035 | 1.442 | .1495 |
| (Constant) | -1.32790 | .15156 | | -8.761 | .0000 |

2.3 Wt/Ht North

| | | | |
|---|---|---|---|
| Multiple R | .24793 | R Square | .06147 |
| Adjusted R Square | .04783 | Standard Error | .96280 |

| AOV | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 16 | 66.84626 | 4.17789 |
| Residual | 1101 | 1020.61080 | .92699 |

F = 4.50697 Signif F = .0000

Variables in the Equation

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| AGESOL | -.00883 | .02040 | -.01292 | -.433 | .6652 |
| FEVER1*** | -.21018 | .06521 | -.10490 | -3.223 | .0013 |
| KIDRET1 | -.01077 | .13700 | -.00230 | -.079 | .9373 |
| SEX1 | -.00357 | .05783 | -.00181 | -.062 | .9508 |
| DPTSTAT1 | -.04525 | .05960 | -.02246 | -.759 | .4478 |
| HOH2 | -.01003 | .06130 | -.00501 | -.164 | .8701 |
| HOHED1* | .12899 | .06611 | .05923 | 1.951 | .0513 |
| ONY | .02283 | .09487 | .00955 | .241 | .8099 |
| NONE1*** | .26718 | .08177 | .10196 | 3.268 | .0011 |
| AGEC*** | -.00881 | .00187 | -.14429 | -4.725 | .0000 |
| HHSIZE | .00514 | .00875 | .01860 | .588 | .5567 |
| WAGEYRPC | .00006 | .00004 | .04505 | 1.396 | .1631 |
| PCTILL** | -.00259 | .00100 | -.08225 | -2.597 | .0095 |
| ENG | .06622 | .09241 | .02916 | .717 | .4737 |
| FARM1 | -.03377 | .10224 | -.01218 | -.330 | .7412 |
| TSI | .08226 | .10442 | .03264 | .788 | .4310 |
| (Constant) | -.59055 | .14854 | | -3.976 | .0001 |

3. ALL REGIONS

3.1 Ht/Age All Regions

| | | | |
|---|---|---|---|
| Multiple R | .23347 | R Square | .05451 |
| Adjusted R Square | .04327 | Standard Error | 1.13558 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 17 | 106.31325 | 6.25372 |
| Residual | 1430 | 1844.04453 | 1.28954 |

F = 4.84957 Signif F = .0000

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| WAGEYRPC* | .00008 | .00004 | .05734 | 1.923 | .0547 |
| KIDRET1 | .22656 | .14994 | .03952 | 1.511 | .1310 |
| SEX1* | -.10209 | .05989 | -.04430 | -1.718 | .0860 |
| DPTSTAT1 | -.10362 | .06159 | -.04392 | -1.682 | .0927 |
| PCTILL | .00163 | .00103 | -.04420 | -1.589 | .1122 |
| NONE1 | -.05847 | .09554 | -.01709 | -.612 | .5406 |
| AGEC* | -.00364 | .00189 | -.05134 | -1.924 | .0546 |
| HOH2 | .02801 | .06304 | .01185 | .444 | .6569 |
| AGESOL | -.01913 | .02069 | -.02463 | -.924 | .3555 |
| ONY | -.17592 | .12573 | -.05674 | -1.399 | .1620 |
| HHSIZE | -.00306 | .00892 | -.00953 | -.343 | .7315 |
| HOHED1** | .17990 | .06680 | .07408 | 2.693 | .0072 |
| ENG*** | -.38876 | .12027 | -.13265 | -3.232 | .0013 |
| FEVER1* | .14574 | .06795 | .06114 | 2.145 | .0321 |
| FARM1 | -.01232 | .09148 | -.00476 | -.135 | .8929 |
| PUN*** | -.43974 | .09787 | -.16684 | -4.493 | .0000 |
| TSI* | -.29455 | .13207 | -.08942 | -2.227 | .0261 |
| (Constant) | -.71416 | .15570 | | -4.587 | .0000 |

3.2 Wt/Age All Regions

| | | | |
|---|---|---|---|
| Multiple R | .32632 | R Square | .10648 |
| Adjusted R Square | .09586 | Standard Error | .98483 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 17 | 165.28684 | 9.72276 |
| Residual | 1430 | 1386.95335 | .96990 |

F = 10.02452 Signif F = .0000

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| WAGEYRPC** | .00009 | .00004 | .07301 | 2.518 | .0119 |
| KIDRET1 | .05883 | .13004 | .01150 | .452 | .6510 |
| SEX1 | -.00646 | .05194 | -.00312 | -.124 | .9010 |
| DPTSTAT1 | -.06955 | .05341 | -.03304 | -1.302 | .1931 |
| PCTILL** | -.00272 | .00089 | -.08253 | -3.052 | .0023 |
| NONE1 | .14595 | .08286 | .04781 | 1.761 | .0784 |
| AGEC*** | -.00738 | .00164 | -.11672 | -4.500 | .0000 |
| HOH2 | -.02485 | .05467 | -.01179 | -.455 | .6495 |
| AGESOL | -.02509 | .01795 | -.03621 | -1.398 | .1623 |
| ONY*** | -.40402 | .10904 | -.14607 | -3.705 | .0002 |
| HHSIZE | .00174 | .00774 | .00606 | .225 | .8221 |
| HOHED1*** | .21755 | .05793 | .10041 | 3.755 | .0002 |
| ENG*** | -.47169 | .10430 | -.18041 | -4.522 | .0000 |
| FEVER1 | -.06025 | .05893 | -.02833 | -1.022 | .3067 |
| FARM1 | -.03954 | .07934 | -.01713 | -.498 | .6183 |
| PUN*** | -.57473 | .08488 | -.24442 | -6.771 | .0000 |
| TSI*** | -.43212 | .11454 | -.14725 | -3.773 | .0002 |
| (Constant) | -.68318 | .13504 | | -5.059 | .0000 |

3.3 Wt/Ht All regions

| | |
|---|---|
| Multiple R | .29935 |
| R Square | .08961 |
| Adjusted R Square | .07879 |
| Standard Error | .96513 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 17 | 131.10857 | 7.71227 |
| Residual | 1430 | 1332.01430 | .93148 |

F = 8.27960 Signif F = .0000

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| WAGEYRPC | .00005 | .00004 | .04435 | 1.515 | .1299 |
| KIDRET1 | -.07241 | .12744 | -.01458 | -.568 | .5700 |
| SEX1 | -.01419 | .05090 | -.00705 | -.279 | .7804 |
| DPTSTAT1 | -.00640 | .05235 | -.00314 | -.122 | .9026 |
| PCTILL** | -.00265 | .00087 | -.08286 | -3.036 | .0024 |
| NONE1 *** | .28082 | .08120 | .09474 | 3.458 | .0006 |
| AGEC*** | -.00874 | .00161 | -.14242 | -5.439 | .0000 |
| HOH2 | -.03208 | .05358 | -.01567 | -.599 | .5495 |
| AGESOL | -.02155 | .01759 | -.03204 | -1.225 | .2207 |
| ONY*** | -.35659 | .10686 | -.13279 | -3.337 | .0009 |
| HHSIZE | .00250 | .00758 | .00897 | .330 | .7415 |
| HOHED1** | .15240 | .05677 | .07245 | 2.684 | .0074 |
| ENG ** | -.30706 | .10222 | -.12097 | -3.004 | .0027 |
| FEVER1*** | -.18855 | .05775 | -.09132 | -3.265 | .0011 |
| FARM1 | -.06010 | .07775 | -.02681 | -.773 | .4397 |
| PUN *** | -.38385 | .08318 | -.16814 | -4.615 | .0000 |
| TSI** | -.28616 | .11225 | -.10044 | -2.549 | .0109 |
| (Constant) | -.13474 | .13233 | | -1.018 | .3088 |

4. MORBIDITY EQUATIONS

4.1 Percent time ill -- Katutura

| | |
|---|---|
| Multiple R | .30854 |
| R Square | .09520 |
| Adjusted R Square | .05786 |
| Standard Error | 30.98238 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 13 | 31814.19894 | 2447.24607 |
| Residual | 315 | 302371.02530 | 959.90802 |

F = 2.54946 Signif F = .0024

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| MEASTAT1 | -10.98522 | 6.94505 | -.09133 | -1.582 | .1147 |
| FARM1 | 1.71597 | 3.94450 | .02416 | .435 | .6638 |
| KIDRET1* | 19.36474 | 11.21611 | .09359 | 1.727 | .0852 |
| SEX1 | 4.11175 | 3.47884 | .06447 | 1.182 | .2381 |
| HOHED1** | 11.54091 | 3.59926 | .17904 | 3.206 | .0015 |
| AGESOL | .81923 | 1.12014 | .03981 | .731 | .4651 |
| HOH2 | -1.55977 | 3.79374 | -.02347 | -.411 | .6812 |
| WHZ | -2.83769 | 1.77381 | -.08866 | -1.600 | .1107 |
| NONE1 | 31.66241 | 32.02204 | .05469 | .989 | .3235 |
| HHSIZE | .29206 | .52352 | .03337 | .558 | .5773 |
| AGEC** | -.28249 | .10508 | -.15190 | -2.688 | .0076 |
| DPTSTAT1 | -4.43613 | 3.68854 | -.06924 | -1.203 | .2300 |
| WAGEYRPC | -.00181 | .00196 | -.05800 | -.923 | .3567 |
| (Constant) | 30.19257 | 8.20906 | | 3.678 | .0003 |

4.2 Percent time ill -- North

| | |
|---|---|
| Multiple R | .16504 |
| R Square | .02724 |
| Adjusted R Square | .01410 |
| Standard Error | 31.14961 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 15 | 30183.87149 | 2012.25810 |
| Residual | 1111 | 1078001.21444 | 970.29812 |

F = 2.07386 Signif F = .0092

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| MEASTAT1 | -2.10652 | 2.64748 | -.02649 | -.796 | .4264 |
| WAGEYRPC | -.00124 | .00145 | -.02801 | -.858 | .3912 |
| SEX1 | -.33188 | 1.86395 | -.00529 | -.178 | .8587 |
| KIDRET1 | -3.26525 | 4.43656 | -.02224 | -.736 | .461 |
| AGESOL | .93053 | .65649 | .04285 | 1.417 | .1566 |
| HOH2* | -4.80562 | 1.96547 | -.07565 | -2.445 | .0146 |
| ENG | -1.36601 | 2.97799 | -.01889 | -.459 | .6465 |
| HOHED1 | -2.08084 | 2.12458 | -.03006 | -.979 | .3276 |
| NONE1 | -2.74435 | 2.63039 | -.03290 | -1.043 | .2970 |
| AGEC*** | -.20882 | .06095 | -.10735 | -3.426 | .0006 |
| HHSIZE | .04214 | .28171 | .00479 | .150 | .8811 |
| ONY | -3.51985 | 3.04278 | -.04643 | -1.157 | .2476 |
| DPTSTAT1 | 1.18495 | 2.08510 | .01850 | .568 | .5699 |
| FARM1 | 1.05391 | 3.28835 | .01197 | .320 | .7487 |
| TSI | 3.21671 | 3.28280 | .04009 | .980 | .3274 |
| (Constant) | 38.50601 | 4.63996 | | 8.299 | .0000 |

4.3 Percent time ill -- All regions

| | |
|---|---|
| Multiple R | .16320 |
| R Square | .02663 |
| Adjusted R Square | .01583 |
| Standard Error | 31.27544 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 16 | 38596.54031 | 2412.28377 |
| Residual | 1442 | 1410496.77214 | 978.15310 |

F = 2.46616 Signif F = .0011

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| WAGEYRPC | -.00135 | .00123 | -.03599 | -1.194 | .2328 |
| KIDRET1 | -.13222 | 4.13147 | -.00085 | -.032 | .9745 |
| SEX1 | .81924 | 1.64342 | .01299 | .498 | .6182 |
| DPTSTAT1 | -.58307 | 1.80931 | -.00910 | -.322 | .7473 |
| NONE1 | -2.23153 | 2.61813 | -.02399 | -.852 | .3942 |
| AGEC*** | -.22836 | .05232 | -.11853 | -4.364 | .0000 |
| HOH2* | -3.74386 | 1.72196 | -.05838 | -2.174 | .0299 |
| AGESOL* | .95121 | .56707 | .04515 | 1.677 | .0937 |
| ONY | -4.24688 | 3.42655 | -.05054 | -1.239 | .2154 |
| HHSIZE | .07932 | .24504 | .00906 | .324 | .7462 |
| HOHED1 | 1.35116 | 1.83023 | .02051 | .738 | .4605 |
| ENG | -2.21277 | 3.30218 | -.02776 | -.670 | .5029 |
| MEASTAT1 | -2.39586 | 2.45292 | -.02828 | -.977 | .3289 |
| TSI | 2.35302 | 3.57742 | .02631 | .658 | .5108 |
| FARM1 | 1.95239 | 2.50554 | .02778 | .779 | .4360 |
| PUN | -.96423 | 2.69834 | -.01348 | -.357 | .7209 |
| (Constant) | 37.54663 | 4.16603 | | 9.013 | .0000 |

## B. MATERNAL REGESSIONS

Dependent variable = f(Age (WOMAGE), income (WAGEYRPC), hhsize, gender of Head (HOH2), returnee status (WOMRET1), location, education (SPED1), farm area (Hrsplgh), water quality (WATTIME), parity (BALIVE))

Predictor Variables

| | | |
|---|---|---|
| 1.. | WATTIME | Minutes to get dry season water |
| 2.. | BALIVE | Children born alive to woman |
| 3.. | FARM1 | Farm (1=yes, 0=no) |
| 4.. | WOMRET1 | Woman returnee (1=yes, 0=no) |
| 5.. | HOH2 | Gender head (1=female, 0=male) |
| 6.. | HHSIZE | HH size |
| 7.. | SPED1 | Head woman's education (1=4+years, 0=less than 4 years) |
| 8.. | WAGEYRPC | Household annual per capita income (Rand) |
| 9.. | WOMAGE | Womans age (years) |
| 10. | HRSPLGH | Hours to plough fields |
| 11. | PUN | Peri-Urban North (1=yes, 0=no) |
| 13. | ONY | Onyaanya (1=yes, 0=no) |
| 14. | ENG | Engela (1=yes, 0=no) |
| 15. | TSI | Tsandi (1=yes, 0=no) |
| 16. | KAT | Katutura (1=yes, 0=no) |

Dependent variables:

| | | |
|---|---|---|
| 1. | PRODED | Proportion children who died |
| 2. | PCTMISC | Percent miscarriage |
| 3. | GRAVITY | Number conceptions |

Location comparisons for Northern analysis is with Peri-Urban North and for All Regions with Katutura.

1. KATUTURA

1.1 Proportion Dead -- Katutura

| | |
|---|---|
| Multiple R | .29828 |
| R Square | .08897 |
| Adjusted R Square | .07651 |
| Standard Error | .20539 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 9 | 2.71087 | .30121 |
| Residual | 658 | 27.75747 | .04218 |

F = 7.14024 Signif F = .0000

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| WATTIME* | .02324 | .01367 | .06484 | 1.701 | .0895 |
| BALIVE | .00229 | .00389 | .02690 | .588 | .5567 |
| FARM1 | -.02442 | .01791 | -.05159 | -1.363 | .1732 |
| WOMRET1 | .01372 | .05413 | .00952 | .253 | .8000 |
| HOH2 | .02256 | .01723 | .05199 | 1.309 | .1910 |
| HHSIZE* | -.00377 | .00266 | -.06861 | -1.668 | .0958 |
| SPED1 | -.02183 | .01820 | -.04787 | -1.200 | .2308 |
| WAGEYRPC | -.00001 | .00001 | -.05115 | -1.220 | .2230 |
| WOMAGE* | .00440 | .00083 | .24304 | 5.329 | .0000 |
| (Constant) | -.05775 | .04141 | | -1.394 | .1637 |

1.2 Percent Miscarriage -- Katutura

| | |
|---|---|
| Multiple R | .16998 |
| R Square | .02889 |
| Adjusted R Square | .01561 |
| Standard Error | 15.79461 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 9 | 4884.24626 | 542.69403 |
| Residual | 658 | 164151.11113 | 249.46977 |

F = 2.17539 Signif F = .0220

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| WATTIME* | 1.88964 | 1.05088 | .07078 | 1.798 | .0726 |
| BALIVE* | -.68851 | .29896 | -.10874 | -2.303 | .0216 |
| FARM1 | -1.80625 | 1.37750 | -.05123 | -1.311 | .1902 |
| WOMRET1 | 3.34884 | 4.16259 | .03119 | .805 | .4214 |
| HOH2* | 3.25126 | 1.32530 | .10059 | 2.453 | .0144 |
| HHSIZE | -.04625 | .17396 | -.01129 | -.266 | .7904 |
| SPED1 | -.12453 | 1.39943 | -.00367 | -.089 | .9291 |
| WAGEYRPC | -.00013 | .00053 | -.01080 | -.249 | .8032 |
| WOMAGE* | .18236 | .06353 | .13515 | 2.870 | .0042 |
| (Constant) | .91446 | 3.18471 | | .289 | .7729 |

2.1 Proportion Dead -- North

| | |
|---|---|
| Multiple R | .30119 |
| R Square | .09072 |
| Adjusted R Square | .08262 |
| Standard Error | .19450 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 13 | 5.51022 | .42386 |
| Residual | 1460 | 55.23160 | .03783 |

F = 11.20446 Signif F = .0000

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| HRSPLGH | .00005 | .00004 | .03693 | 1.216 | .2242 |
| TSI*** | -.07266 | .02072 | -.14756 | -3.507 | .0005 |
| HOH2 | -.00470 | .01205 | -.01100 | -.371 | .7105 |
| BALIVE*** | .00904 | .00203 | .13370 | 4.455 | .0000 |
| WOMRET1* | .04595 | .02410 | .04911 | 1.906 | .0568 |
| WAGEYRPC | .00000 | .00000 | .00067 | .025 | .9802 |
| HHSIZE* | -.00344 | .00152 | -.06134 | -2.267 | .0235 |
| ENG* | .00644 | .01702 | .01359 | .378 | .7052 |
| SPED1 | -.02817 | .01206 | -.06934 | -2.336 | .0196 |
| FARM1 | -.01529 | .01989 | -.02501 | -.769 | .4421 |
| WOMAGE*** | .00182 | .00036 | .16234 | 5.109 | .0000 |
| WATTIME | -.00008 | .00007 | -.03826 | -1.177 | .2395 |
| ONY | -.01259 | .01811 | -.02674 | -.695 | .4872 |
| (Constant) | .05809 | .02173 | | 2.673 | .0076 |

2.2 Percent Miscarriage -- North

| | |
|---|---|
| Multiple R | .26481 |
| R Square | .07013 |
| Adjusted R Square | .06185 |
| Standard Error | 15.34850 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 13 | 25938.27355 | 1995.25181 |
| Residual | 1460 | 343941.44246 | 235.57633 |

F = 8.46966 Signif F = .0000

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| HRSPLGH | .00930 | .02900 | .00951 | .310 | .7569 |
| TSI*** | -5.72245 | 1.63518 | -.14893 | -3.500 | .0005 |
| HOH2 | .60103 | .95101 | .01894 | .632 | .5275 |
| BALIVE*** | -.64138 | .16012 | -.12156 | -4.005 | .0001 |
| WOMRET1 | -2.61382 | 1.90218 | -.03580 | -1.374 | .1696 |
| WAGEYRPC | -.00030 | .00064 | -.01256 | -.463 | .6435 |
| HHSIZE | -.09921 | .11956 | -.02271 | -.830 | .4068 |
| ENG** | 3.21684 | 1.34282 | .08700 | 2.396 | .0167 |
| SPED1 | .76419 | .95154 | .02411 | .803 | .4220 |
| FARM1 | .45309 | 1.56926 | .00950 | .289 | .7728 |
| WOMAGE*** | .17180 | .02816 | .19604 | 6.101 | .0000 |
| WATTIME | -.00371 | .00564 | -.02165 | -.658 | .5104 |
| ONY | 1.74264 | 1.42920 | .04744 | 1.219 | .2229 |
| (Constant) | 5.63607 | 1.71501 | | 3.286 | .0010 |

3.1 Proportion Dead -- All Regions

| | |
|---|---|
| Multiple R | .29533 |
| R Square | .08722 |
| Adjusted R Square | .08121 |
| Standard Error | .19819 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 14 | 7.98328 | .57023 |
| Residual | 2127 | 83.54428 | .03928 |

F = 14.51791 Signif F = .0000

---------- Variables in the Equation ----------

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| HRSPLGH | .00004 | .00003 | .03226 | 1.299 | .1942 |
| HOH2 | .00279 | .00974 | .00672 | .287 | .7744 |
| WOMRET1* | .04121 | .02218 | .03957 | 1.858 | .0633 |
| PUN* | .02296 | .01309 | .04461 | 1.754 | .0797 |
| HHSIZE** | -.00363 | .00124 | -.06521 | -2.928 | .0035 |
| BALIVE*** | .00782 | .00181 | .10989 | 4.332 | .0000 |
| TSI** | -.05213 | .02125 | -.08989 | 2.453 | .0142 |
| WAGEYRPC | -.00000 | .00000 | -.02233 | -.943 | .3458 |
| ENG | .02762 | .01718 | .04979 | 1.608 | .1081 |
| SPED1** | -.02857 | .00995 | -.06883 | -2.871 | .0041 |
| WOMAGE*** | .00229 | .00033 | .18531 | 6.960 | .0000 |
| FARM1* | -.02327 | .01327 | -.05207 | -1.754 | .0796 |
| WATTIME | -.00009 | .00007 | -.03653 | -1.248 | .2123 |
| ONY | .01028 | .01793 | .01868 | .574 | .5663 |
| (Constant) | .03054 | .01881 | | 1.624 | .1046 |

3.2 Percent Miscarriage -- All locations

| | |
|---|---|
| Multiple R | .23333 |
| R Square | .05633 |
| Adjusted R Square | .05011 |
| Standard Error | 15.48912 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 14 | 30458.10758 | 2175.57911 |
| Residual | 2127 | 510294.64091 | 239.91285 |

F = 9.06821 Signif F = .0000

Variables in the Equation

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| HRSPLGH | .00111 | .00234 | .01199 | .475 | .6351 |
| HOH2* | 1.45100 | .76100 | .04546 | 1.907 | .0567 |
| WOMRET1 | -1.67977 | 1.73330 | -.02098 | -.969 | .3326 |
| PUN* | 1.73794 | 1.02342 | .04393 | 1.698 | .0896 |
| HHSIZE | -.07622 | .09677 | -.01784 | -.788 | .4310 |
| BALIVE*** | -.64922 | .14098 | -.11876 | -4.605 | .0000 |
| TSI* | -3.68390 | 1.66043 | -.08265 | -2.219 | .0266 |
| WAGEYRPC | .00016 | .00039 | -.00974 | -.405 | .6859 |
| ENG*** | 5.42221 | 1.34257 | .12718 | 4.039 | .0001 |
| SPED1 | .15220 | .77770 | .00477 | .196 | .8449 |
| WOMAGE*** | .17649 | .02571 | .18586 | 6.866 | .0000 |
| FARM1 | -.77082 | 1.03719 | -.02244 | -.743 | .4575 |
| WATTIME | -.00313 | .00567 | -.01642 | -.552 | .5813 |
| ONY** | 3.92169 | 1.40101 | .09270 | 2.799 | .0052 |
| (Constant) | 4.03309 | 1.46997 | | 2.744 | .0061 |

3.3 Gravity -- All regions

| | |
|---|---|
| Multiple R | .95495 |
| R Square | .91193 |
| Adjusted R Square | .91135 |
| Standard Error | 1.00610 |

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 14 | 22293.32528 | 1592.38038 |
| Residual | 2127 | 2153.00758 | 1.01223 |

F = 1573.14498 Signif F = .0000

Variables in the Equation

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| HRSPLGH | .00013 | .00015 | .00671 | .871 | .3841 |
| HOH2 | .07375 | .04943 | .01087 | 1.492 | .1358 |
| WOMRET1 | -.02363 | .11259 | .00139 | -.210 | .8338 |
| PUN | .09603 | .06648 | .01142 | 1.445 | .1487 |
| HHSIZE | -.00411 | .00629 | -.00453 | -.654 | .5130 |
| BALIVE*** | 1.06926 | .00916 | .91995 | 116.764 | .0000 |
| TSI*** | -.34912 | .10785 | -.03684 | -3.237 | .0012 |
| WAGEYRPC | -.00002 | .00003 | -.00541 | -.736 | .4621 |
| ENG*** | .29475 | .08721 | .03252 | 3.380 | .0007 |
| SPED1 | .03461 | .05052 | .00510 | .685 | .4934 |
| WOMAGE*** | .01073 | .00167 | .05316 | 6.428 | .0000 |
| FARM1 | -.03745 | .06737 | -.00513 | -.556 | .5783 |
| WATTIME | -.00000 | .00037 | -.00007 | -.008 | .9935 |
| ONY** | .28165 | .09100 | .03131 | 3.095 | .0020 |
| (Constant) | -.20797 | .09548 | | -2.178 | .0295 |