

**PAEDIATRIC PROBLEMS ADMITTED TO A RURAL
KWAZULU-NATAL HOSPITAL:
HOW COULD THEY HAVE BEEN PREVENTED?**

A J HAWKRIDGE

A research report submitted to the Faculty of Medicine, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Medicine in the field of Community Paediatrics

Johannesburg, 1998

DECLARATION

I, Anthony John Hawkrige, declare that this research report is my own work. It is being submitted for the degree of *Master of Science in Medicine in the branch of Community Paediatrics* in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

 Dr. A. J. Hawkrige

14th day of February, 1999.

Ethics approval for this research was obtained from the Committee for Research on Human Subjects (Medical) of the University of the Witwatersrand. Ref R14/49 Hawkrige. Protocol number M 950705.

Abstract

The sex, age, area of origin, nutritional status, immunisation status, discharge diagnosis/-es, length of stay in the ward and outcome of 1261 children admitted to the paediatric ward at Manguzi Hospital between 1.2.93 and 31.1.94 were analysed to yield a list of common paediatric problems in the health ward, which was then looked at in terms of the existing paediatric primary care structure during that period and possible modifications which need to be made to combat these problems more effectively. The disease profile produced was found to be typical of third world findings and the problem could therefore best be tackled by upgrading paediatric primary health care facilities and paediatric skills of primary health care workers responsible for caring for the health ward's children. Some examples are given.

Acknowledgements

I should like to acknowledge the encouragement and guidance throughout the preparation of this report that I received from Professor L Wagstaff, and to thank Dr. ID Couper, Medical Superintendent, Manguzi Hospital, for permission to publish, and my wife, Erica, for valuable assistance with extraction and collation of data. Also, thank you to the Birth to Ten office for their help with formatting the thesis.

TABLE OF CONTENTS

	Page
DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	vii
LIST OF TABLES	viii
1.0 INTRODUCTION	1
1.0.1 Overall aims of the study	1
1.0.2 Background	1
1.0.3 Existing child health services	1
1.1 LITERATURE REVIEW	6
1.1.1 Causes of infant and child mortality in developing countries	6
1.1.2 Rural clinic services	9
1.1.3 Health services utilisation	11
1.1.4 Preventive health and curative measures at clinic level	13
2.0 MATERIALS AND METHODS	28
2.0.1 Study sample	28
2.0.2 Statistical analysis	28
2.0.3 Costs	29
3.0 RESULTS	30
3.0.1 Explanatory note regarding diagnoses	30
3.0.2 Number of patient admitted and distributed by month	31
3.0.3 Length of stay in the ward	31
3.0.4 Sex	31
3.0.5 Age of patients	31
3.0.6 Immunisation status	31
3.0.7 Outcome of admission	31
3.0.8 Nutrition	32
3.0.9 Common discharge diagnoses	35
4.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS	52
4.0.1 Limitations of this study	52
4.0.2 Age	52
4.0.3 Immunisation status	52
4.0.4 Nutrition	53
4.0.5 Area of origin of patients	55
4.0.6 Malaria	56
4.0.7 Pneumonia	57
4.0.8 Diarrhoeal disease	59
4.0.9 Anaemia	60
4.0.10 Bilharzia	61
4.0.11 Intestinal parasites	62
4.0.12 Tuberculosis	63

4.0.13	Burns	64
4.0.14	Conclusions and recommendations	64
APPENDIX 1: FIGURES		67
REFERENCES		76

LIST OF FIGURES

	Page
Figure 3.1: Number of children admitted by month	67
Figure 3.2: Admissions with malaria by month	67
Figure 3.3: Length of stay in the ward	68
Figure 3.4: Age of patients admitted	68
Figure 3.5: Outcome of admissions	69
Figure 3.6: Nutritional status of children admitted	69
Figure 3.7: Outcome for each nutritional category	70
Figure 3.8: Area of origin	70
Figure 3.9: Area of origin of children with malaria	71
Figure 3.10: Frequency by month of children admitted with pneumonia	71
Figure 3.11: Outcome of children with pneumonia	72
Figure 3.12: Frequency by month of children admitted with diarrhoeal disease	72
Figure 3.13: Fatality rates by month of children with diarrhoeal disease	73
Figure 3.14: Frequency by month of children with anaemia	73
Figure 3.15: Frequency of bilharzia by month	74
Figure 3.16: Frequency of diagnosis of worm infection by month	74
Figure 3.17: Incidence of pulmonary tuberculosis	75
Figure 3.18: Incidence of burns by month	75

LIST OF TABLES

	Page
Table 1.1: Comparison of demographic characteristics of three rural hospitals	5
Table 3.1: Number of children admitted by month	30
Table 3.2: Nutritional status of children admitted	32
Table 3.3: Outcome for each nutritional category	33
Table 3.4: Area of origin of children admitted	35
Table 3.5: Children admitted with malaria by month	36
Table 3.6: Outcome of children admitted with malaria	38
Table 3.7: Frequency by month of children admitted with pneumonia	38
Table 3.8: Outcome of children with pneumonia	40
Table 3.9: Frequency by month of children admitted with diarrhoeal disease	41
Table 3.10: Outcome of children with and without diarrhoeal disease	42
Table 3.11: Fatality rates by month of children with diarrhoeal disease	43
Table 3.12: Frequency by month of children with anaemia	44
Table 3.13: Frequency of bilharzia by month	46
Table 3.14: Frequency of diagnosis of worm infection by month	47
Table 3.15: Incidence of pulmonary tuberculosis	48
Table 3.16: Incidence of burns by month	50

1.0 INTRODUCTION

1.0.1 Overall aims of the study

To describe the situation as it was in a rural kwaZulu Hospital (Manguzi) in 1993 in terms of:
 diagnoses
 demographic data
 length of stay in the ward
 outcome

of children admitted to the hospital's paediatric ward, and then to select those diagnoses which were common and might have been preventable through primary health care measures, and then to make recommendations regarding possible changes to the existing primary health care set-up in the health ward.

1.0.2 Background

Manguzi hospital is a 250-bed community hospital in Maputaland, the far north of Natal kwaZulu. The health ward measures about 80 by 80km and stretches from the Indian Ocean in the East to the Pongola River in the West, and the Mozambican border in the North to the shores of Lake Sibaya in the South. At the time of the study the estimated population of the ward was 100 000 people living in scattered homesteads mostly in the coastal strip and the Pongola River flood plain. There was very little formal employment, even in the village of kwaNgwanase where the hospital is, and most families were reliant on small scale agriculture and stock farming to survive.

The hospital, its 4 residential clinics and 12 mobile stopping points were virtually the only Western medical facility in the health ward. There were one or two private general practitioners who had "day clinics" in rented rooms near the major shops in kwaNgwanase, but they offered little in the way of comprehensive child health services, being primarily curative and somewhat expensive. The area abounds in traditional healers, who are well patronised by the population: most children seen at the clinics or hospital would have been seen recently by a traditional healer for the same or similar complaint(s).

1.0.3 Existing child health services in the health ward at the time of the study (1993)

1. Community Health Workers (CHW's): The Manguzi Health Ward is fortunate to be well supplied with CHW's in most of its districts (*isigodi*). They are responsible for reporting all births and deaths, checking on growth, referring malnourished or sick children to the nearest clinic and following up children discharged from hospital. The CHW programme dates back to the

1970's when Dr. Det Prozesky, currently Professor of Family Medicine at the University of Pretoria, was Medical Superintendent at Manguzi Hospital. It was he who started the programme, and subsequently expanded it to cover other parts of kwaZulu through the Amatikhulu Primary Health Care Training Centre, of which he became Medical Director.

2. Mobile clinic: At the time of this study Manguzi had one mobile team which went out daily, visiting each stopping point once or twice a month. Most stopping points consist of rudimentary one- or two-room wattle and daub structures, many only accessible by fourwheel drive vehicle. The team typically consists of a professional nurse (PN) with experience, but not necessarily training, in primary health care (PHC), and a number of enrolled nurses (EN's) and nursing assistants (NA's). The team generally manages to diagnose and treat common ailments such as scabies, Upper Respiratory Tract Infections (URTI's) etc. and refers the rest to a residential clinic or the hospital. Mobile points were seldom visited by a medical officer (MO), because of the shortage of MO's at the hospital. (There exist seven posts of which four to five are usually filled.)

3. Residential clinics: Staffing of these is similar to the mobile clinic, except that the PN is more likely to have PHC training. The residential clinics are visited once a week by an MO for review of "problem cases" and those requiring drugs not on clinic code (e.g. Praziquantel). An ambulance service exists between the various clinics and the hospital and this is generally reliable, if somewhat slow. Each residential clinic has a telephone and radiophone.

4. Outpatient department and paediatric ward at the Hospital: The hospital has a busy outpatient department, with between 100 and 150 patients visiting on the average weekday. There is no separate paediatric outpatient facility. All patients are "screened" by primary care staff, most of whom are professional and enrolled nurses with screening experience but no formal primary health care training. About half the patients are managed by these staff as well, the remainder being referred to one of the MO's. Patients who need more than outpatient treatment can be:

- (a) "boarded" for observation for up to 48 hours in Paediatric Ward.
- (b) admitted to the Paediatric Ward. This facility can accommodate up to 50 children reasonably comfortably, and 80 at a push. It is staffed by one PN and a number of EN's and NA's as well as one MO, none of whom, for the most part, have had any postgraduate training

in paediatrics. A consultant paediatrician visited the hospital for one day every 2 months at the time that the study was done (this has since stopped).

(c) referred to either Ngwelezana Hospital near Empangeni (280km) or Durban (450km), hopefully to be seen by a consultant.

The hospital and residential clinics offer a combination of curative/ diagnostic (every day) and preventive (once day a week) paediatric services. The preventive service takes the form of a "wellbaby" clinic which comprises some health education (group), growth monitoring, immunisation and referral if necessary. The mobile clinic offers both services every day.

5. "Zamimpilo": the malnutrition rehabilitation programme. Children with any degree of malnutrition, from simple failure to gain weight to marasmic kwashiorkor, are admitted to the Paediatric ward where they undergo a standard battery of tests and receive standard treatment. Their caretakers are admitted to the *Zamimpilo* unit which lies just outside the hospital gates and comprises a sleeping area, cooking area, ablutions and a demonstration garden. During the time that the children are in the ward, the caretakers attend talks, demonstrations and group activities concerning the fundamentals of nutrition, causes, symptoms and signs of malnutrition, and the practicalities of growing their own crops, supervised by an experienced ENA. Before the children are discharged, the caretaker must pass (50%) an oral examination given by the ENA in her home language.

6. The school health team: This consists of a PN and a number of EN's and ENA's. It has its own transport, goes out every day (Monday to Friday) to visit the more than 50 schools in the area and offers a largely preventive service (screening, immunisation): children found to have problems are referred to their nearest clinic. Once a year an essay competition on a health related topic is held for high school pupils.

7. Dental prophylaxis and treatment: An EN, trained to do tooth extractions, is available at the hospital on weekdays, and visits the residential clinics as well. For restorative dentistry children have to be referred to Ngwelezana Hospital (280km).

8. Child abuse prevention and management: No specific service exists, and the local police station has no Child Protection Unit or staff with special training or interest in the area. Cases

are seen by the medical or nursing staff, and might be referred to the social worker or psychiatric nurse, and the magistrate informed.

9. Tuberculosis: 2 enrolled nurses, based at the hospital, but able to make use of the "Ambulatory Team" transport (with psychiatry, AIDS and leprosy), form the "TB team". They, with the help of the CHW's, are active in contact- and defaulter-tracing and bring children to the hospital for reading of skin tests and chest Xrays.

10. Child psychiatry: The psychiatry team consists of a PN with psychiatric training and an EN, with an MO available in an advisory capacity. The team is responsible for screening outpatients with suspected psychopathology at an MO's request, recommending treatment or admission, following up admissions in the wards, following up discharges and defaulters, and running the weekly psychiatric clinic. There is no one with a specific interest in child psychiatry. Problem cases can be referred to Madadeni Hospital (500km) or Durban (480km).

11. Handicapped children: The hospital was fortunate to have two occupational therapists, one of whom had a specific interest in neurodevelopmental problems. A monthly cerebral palsy ("CP") clinic is held at the hospital, as well as a monthly clinic for follow-up of "highrisk babies". Single care grants are arranged through the social worker.

12. HIV and AIDS: The "AIDS team" consists of a PN who has been trained as a counsellor and as a counsellor trainer, several EN's and NA's and an MO in an advisory role. At the time of the study the numbers of AIDS patients were still small. The team is mobile and tried to offer "homebased" services and care. Most of its work is naturally with adults, but children affected by AIDS are also seen as the need arises.

13. Related services: Antenatal and family planning services are available at the hospital and all the clinics, but not necessarily on the same day as the "wellbaby" clinics.

14. Areas not covered: There are no specific genetic services available at the hospital, the nearest genetic clinic being in Durban. No services exist specifically for adolescents, and there are no clinics for children with specific diseases e.g. asthma, malnutrition, epilepsy: the children simply have to be seen with the rest of the patients in the Outpatient Department.

The table below shows a comparison of the demographic characteristics and the health care facilities of two other rural areas in South Africa and those of Manguzi.

Table 1.1. Comparison of demographic characteristics of 3 hospitals.

	MHALA	ELIM	MANGUZI
SIZE OF POPN.	NOT GIVEN	NOT GIVEN	CA. 100 000
REFUGEES	30000	0	?5000
AREA IN KM ²	1500	500	650
VILLAGES	IRREGULAR	REGULAR	SPREAD OUT HOMESTEADS - NO REAL VILLAGES
ROADS	BAD DIRT	GOOD DIRT	THICK SAND
CLINICS	13	6	3
HEALTH CENTRES	2	2	0
MOBILE POINTS	10	19	12
MOBILE TEAMS	1	3	1
SISTERS/CLINIC	1	2	2
COMMUNITY HEALTH WORKERS	12	9	50
COMMUNITY MATRON	1	1	0
SENIOR COMMUNITY NURSE	1	2	1
COMMUNITY MEDICAL OFFICER	0	1	1

The table shows that Manguzi was about average compared to similar rural hospitals in terms of primary care infrastructure and staffing except that it had comparatively few residential clinics. Without population figures valid service comparisons cannot be made.

1.1. LITERATURE REVIEW

1.1.1. Causes of infant and child mortality in developing countries

1.1.1.1 Mortality rates and their accuracy

Ahmed (1991) makes the point that estimates of child mortality in developing countries are mainly based on reports by mothers on the survival status of their children and that infant mortality estimates from such data should be regarded as suspicious.

Jaffar et al (1997) studied changes in the pattern of infant and childhood mortality in The Gambia from 1989 to 1993. The most frequent cause of death in infants was acute respiratory infection (ARI), whereas in children it was malaria: these two conditions accounted for 41% of the deaths in children under 5 years old. Other leading causes of death were acute gastroenteritis, malnutrition, and septicaemia. Mortality from all causes peaked in the rainy season and was slightly higher in villages which were part of a primary health care program than in those which were not. Despite the introduction of a number of health interventions, there had been no major change in the overall pattern of mortality in children in this rural area of The Gambia. Malaria and ARI remained the main causes of death.

1.1.1.2 Factors contributing to and causes of rural paediatric mortality

Ahmad et al (1991) studied the effects of maternal socio-demographic characteristics and the quality of the environment on child survival through two intervening variables, breast-feeding and prenatal care in a sample of 5180 Liberian children aged 0-5 years. Their findings revealed complex relationships of the role of education, maternal age and breast-feeding in enhancing child survival.

Casterline et al (1992) examined determinants of infant and child mortality in rural Egypt, primarily the effects of household economic status and the availability of health services. Certain features of the health service environment affected survival in the neonatal period. In early childhood, survival chances improved markedly as income increased and if the household depended almost exclusively on employment income. In infancy and in early childhood, mortality was strongly associated with region of residence and maternal demographic characteristics, and was weakly associated with parental schooling.

Amin (1996) studied two rural districts of Sierra Leone in early 1993, and examined the coverage of an Expanded Program on Immunization (EPI), infant and child mortality, and

disease symptoms in children who died under the age of five in the study area. The major symptoms of disease at the time of death of an infant or child were fever, cough, troubled breathing, and diarrhea in that order. Amin felt that while fever and cough could reflect the persistence of malaria and pneumonia - two major causes of infant and child deaths not covered by existing EPI - the study also revealed that many children failed to take full doses of immunization and that similarly, inadequate coverage of domiciliary oral rehydration therapy (ORT) might have been the reason of high incidence of diarrhea-related deaths. The author commented that simple medical technologies to eliminate many of the existing major causes of infant and child mortality in rural Sierra Leone are available and that a strengthened primary health care service, including an extensive rural health care network, aimed at eliminating these diseases, might go a long way in reducing infant and child mortality.

Karungula (1992) found that in Tanzania the major cause of infant mortality could be attributed to preventable diseases such as gastroenteritis, acute respiratory infections and malnutrition and that, in spite of the fact that various efforts had been made to extend primary health care coverage, particularly in rural areas, the scarcity of economic resources impeded the implementation of many health programs. The authors suggested that only by maintaining primary health care as a major part of the country's development strategy could the needs of both rural and urban people be met.

Gorter et al (1995) state that in Nicaragua, the principal cause of infant mortality is diarrhea, which is responsible for 40% of these deaths annually. and that this statistic reflects the low usage of health services and oral rehydration therapy (ORT).

1.1.1.3 Rural/urban differences

Knobel et al (1994) analyzed data from death certificates for all infant deaths in Taiwan from 1981 to 1988. Deaths due to infectious diseases constituted a major fraction of this mortality. This differential rate between urban and rural areas was most prominent for the vaccine-preventable diseases; the aboriginal areas had rates that were 12.9 times those in the cities.

Sastry (1996; 1997) sought to explain rural-urban differentials in child mortality in Brazil. Child mortality rates were found to be significantly lower in urban areas of Brazil. The results suggested, however, that the urban advantage did not simply reflect underlying differences in

socioeconomic and behavioral characteristics at the individual and household levels but that community variables appeared to play an independent and important role. The studies also found that the effects of community characteristics on child survival were moderated by household socioeconomic factors, especially maternal education.

1.1.1.4 Solutions, prevention and programs

Hesketh and Zhu (1997) describe how China has made great progress in improving the health of children over the past two generations. They attribute their success to improved living standards, public health measures, and good access to health services. The Chinese have developed a hierarchical network of child health services, with each level taking a supervisory and teaching role for the level below it.

Sfari et al (1995) described the impact of a combination of PHC intervention activities on child survival, growth, morbidity and mortality in rural communities in Ghana from 1987 to 1990. EPI, provision of basic essential drugs and supplies for the treatment of common childhood diseases, treatment of the sick child, growth monitoring, health education, family planning, training and supervision of Community Health Workers, disease surveillance and special studies were the major PHC strategies used to improve the health of the children in the communities. These activities had a significant impact on morbidity and mortality in children under five over the study period. Although malaria, acute respiratory infections and diarrhoeal diseases continued to be major causes of childhood morbidity, deaths due to these diseases declined dramatically. Measles and other vaccine preventable diseases no longer contributed significantly to childhood morbidity and mortality. Infant and under five mortality was reduced from 114.6/1000 and 155.6/1000 to 40.8/1000 and 61.2/1000 live births respectively.

Greenwood et al (1989) conducted a survey of deaths in children under the age of 7 years over a 1-year period in a rural area of The Gambia with few facilities for curative medicine, but with a good record of infant immunizations. Acute respiratory infections, malaria and chronic diarrhoeal disease with marasmus were the most frequent causes of death after the 1st month of life. Few children died of diseases that could have been prevented by routine immunizations. The authors felt that an effective immunization program had probably had some effect on deaths in infancy and early childhood but that it would be necessary to find ways of preventing deaths from malaria, acute respiratory infections and chronic

diarrhoea/marasmus at the primary health care level if infant and childhood mortality were to be reduced.

O'Rourke et al (1998) conducted an intervention to improve child health in a remote Bolivian area which focused on initiating and strengthening women's organizations, developing women's skills in problem identification and prioritization, and training community members in safe birthing techniques. There was a significant increase in the number of women participating in women's organizations following the intervention, as well as in the number of organizations. The proportion of women receiving prenatal care and initiating breast-feeding on the first day after birth was also significantly larger. The number of infants attended to immediately after delivery likewise increased, but the change was not statistically significant. The study demonstrated that community organization can improve child health in remote areas.

Barzgar et al (1997) describe how women residing in villages in three districts of Pakistan were recruited, trained to deliver primary care and mobilize their communities for health, assigned to limited catchment areas, provided with supervisory and managerial support, and remunerated. According to the authors, the women's comprehensive activities substantially reduced infant and child mortality within a year, generated positive perceptions of family planning in the communities and the program was cost-effective and appeared suitable as a model for reforming the organization and provision of health care services.

1.1.2. Rural clinic services

1.1.2.1 Quality of rural health services in developing countries

Beracochea et al (1995) assessed the quality of case management of malaria, malnutrition, and acute respiratory tract infections in children in rural primary health services in Papua New Guinea. Primary health workers' (PHWs') knowledge of case management was weak, but in all cases better than their actual practice. History taking and examination practices were rudimentary. PHW's tended not to make or record diagnoses. Treatment knowledge was often incorrect, with inappropriate or insufficient drugs prescribed. The authors questioned the effectiveness of providing health services through small, isolated health units and suggested that greater attention be directed to the institutionalization of problem-based training, continuous supportive supervision and maintenance of clinical skills and provision of essential drugs, supplies and equipment to ensure that rural health workers (RHW) provide sound care.

Krause et al (1998) studied the quality of diagnostic practice in rural Burkina Faso. The variation between nurses was immense, but no correlation could be found with regard to their basic training. However, nurses who had received the diagnostic guidelines examined patients more carefully than those who had not. Larger numbers of patients per day were not associated with shorter nurse-patient contact, and neither was sufficiency of patient history associated with duration of the consultation. The authors commented that examination skills were good and that diagnostic guidelines may have had a positive effect on diagnostic quality.

1.1.2.2 Solutions, programs

Maclure (1995) described two non-governmental primary health care assistance programs in Burkina Faso. By emphasizing education and the promotion of new participatory health systems, the programs aimed to enhance the conditions of women as principal community care givers. Although both programs contributed to infant survival, they also induced new ties of donor dependency. The author contended that these may prove to be a positive first stage in the mobilization of women and the development of locally managed health systems and emphasized the need to integrate local participation in assistance programs' planning and management processes, and to augment the professional status of indigenous health workers.

Kolstad et al (1997) tested one component (assess and classify) of an Integrated Management of Childhood Illness (IMCI) algorithm, (developed by the WHO and UNICEF, in an effort to bring together various disease-specific guidelines for sick children), in the outpatient department of a rural district hospital in western Uganda. Children aged 2-59 months were seen first by a Ugandan medical assistant trained in IMCI, and then evaluated by a medical officer. Sensitivity, specificity and positive predictive values were determined by comparing the IMCI classifications with a reference standard based on the medical officers' diagnoses and laboratory tests. Of the 1226 children seen, 69% were classified into more than one symptom category, 7% were not classified in any symptom category, 8% had a danger sign, and 16% were classified into a severe category, for which the IMCI approach recommended urgent hospital referral. Specificity for most classifications was good, though sensitivity and positive predictive values were variable. The authors concluded that the IMCI algorithm was an important advance in the primary care of sick children in developing countries.

1.1.3. Health service utilisation

1.1.3.1 Accessibility

Magnani et al (1996) studied the impact of primary health care services on under-five mortality in rural Niger. Children residing in villages near to health dispensaries were 32% less likely to have died during the study period than children without access to modern health services. Village health teams were not, however, associated with significantly lower mortality probabilities. The authors comment that:

1. the findings are largely supportive of the premise that packages of basic services can be effectively mounted nationally in poor countries and have a significant impact over a short time period and that
2. in Niger, less than optimal implementation of Village Health Teams has reduced the magnitude of the impact achieved.

Kauffman and Myers (1997) studied the Primary Health Care (PHC) system in Thailand, which they state is one of the oldest in the world and is known worldwide for its success. Supporting the concept of community involvement, the Village Health Volunteer (VHV) is the backbone of this health care delivery system. With increasing urbanization of this once rural village, the VHV no longer served as the point of entry into the health care system. The authors foresaw that, while still a vital part of the PHC system, the role of the VHVs would need to adapt to the changing needs of the communities they serve.

1.1.3.2 Alternatives to rural clinics

Rajaratnam et al (1996) concluded that the health-seeking behavior of a population can be changed if efficient services are rendered through government primary health centers. They collected information on the morbidity pattern, pattern of health care utilization and per capita health expenditure in a rural district of Tamil Nadu by interviewing respondents from 300 households. They found that services rendered by private practitioners (registered, non-registered and indigenous) were utilized by 59% of the households and that 79% of the households had used allopathic treatment at some time.

Myaux et al (1996) found that, of 177 children under five with dysentery, detected at home and referred to a sub-center for standard treatment, only 45 per cent were actually taken to the sub-center, 27 per cent went to traditional healers and 23 per cent used private allopathic

services. Less than 40 per cent of the shigellosis cases received the suggested standard treatment.

Ryan (1998) examined sequences of health-related behaviors from a small village in Cameroon. Local residents considered seven health actions, including: delaying initial treatment, using various home remedies or pharmaceuticals, going to a clinic or a hospital, and consulting a private nurse or a traditional healer. Caregivers acted as if they were following three basic tenets. They minimized uncertainty by identifying illness types that require particular health actions and by delaying action. They minimized the cost of care by first resorting to treatments that were less expensive and easier to administer or by reducing the number of treatments tried and they maximized treatment in the hopes of finding at least one treatment that helped stop the illness.

1.1.3.3 Solutions

Loevinsohn and Loevinsohn (1986) advocated that, in order to improve attendance at mobile clinics for children, food incentives be offered to attendees, as had been done in a rural municipality in northern Nicaragua. They found that clinic attendance in villages where food incentives were offered was higher than that in control villages. They suggested that some of the large amounts of non-emergency food aid available could be offered as incentives to increase the use of basic health services in developing countries.

Curtale et al (1995) analysed the effects of a Nutrition Education Intervention (NEI) on skills and utilization of Community Health Volunteers (CHVs) in rural Nepal. The intervention, which included preventive and curative activities, was carried out through the existing Primary Health Care (PHC) structure, utilizing CHVs trained by the Ministry of Health and already working in the villages. At the end of two years implementation, the CHVs associated with the NEI showed an improved ability to detect and treat a range of common diseases (diarrhoeal disease, night blindness, malnutrition and acute respiratory infections) as compared with the CHVs not associated with the intervention program. Community utilization of CHVs increased significantly while the use of traditional healers and consultations at private pharmacies decreased. The utilization of health posts and referral to hospitals remained constant. Coverage for all activities carried out by the CHVs was higher among the population within the NEI area. The intervention did not utilize cash incentives. Its operational input consisted mainly of more frequent training, added supervision and increased and regular drug supply. The

inclusion of curative activities among the CHVs' responsibilities seems to be a key factor, in increasing motivation of volunteers and their acceptance within the community. This study indicated some possible adjustments to improve productivity and utilization of health volunteers in rural communities of Nepal, with a positive return for all PHC activities.

1.1.4. Preventive health at clinic level

1.1.4.1. Immunization

1.1.4.1.1 Immunisation coverage in rural areas

Wilkinson et al (1997) measured child health indicators in the rural Hlabisa health district of KwaZulu Natal by doing a modified Expanded Program of Immunisation cluster sample survey. Overall Immunisation coverage was high (80-98%), as was the proportion receiving an immunogenic dose of each vaccine (78-98%). However, only 76% had received all the vaccines due to a 12-month-old child, and only 88% of these had received all doses by 12 months of age. They concluded that the proportion of children receiving all vaccines could be improved upon, as could the timing of Immunisation.

1.1.4.1.2 Immunisation and child/ infant mortality

Amin (1996), in the study already quoted, surveyed two rural districts of Sierra Leone in early 1993, and examined the coverage of an Expanded Program on Immunization (EPI), infant and child mortality, and disease symptoms in children who died under age five in the study area. The infant and child mortality rate declined from 162 in the mid 1980s to 77 in 1993. This decline was associated with a considerable increase in immunization coverage which reached more than 60% of the eligible children by 1993. Amin felt that while fever and cough could reflect the persistence of malaria and pneumonia - two major causes of infant and child deaths not covered by existing EPI - the study also revealed that many children failed to take full doses of immunization.

1.1.4.1.3 Programs

Kapoor et al (1996) studied the time utilisation pattern of staff of two primary health centers in Ballavgarh, Haryana, India. The authors concluded that the Immunisation program was getting the maximum input from workers, which was reflected in > 90% coverage of all vaccines, but that family welfare and tuberculosis activity were not getting the emphasis which they deserved.

1.1.4.1.4 Reasons for failure of Immunisation programs

Schoub and Cameron (1996) found that in two investigations in South Africa where polio vaccine samples were recalled for potency testing from peripheral clinics, almost a half and almost a third, respectively, of vaccine vials had titres below WHO recommended cutoff limits. Major logistical and organizational difficulties in storage and transport of vaccine under cold chain conditions were present.

1.1.4.1.5 Immunisation campaigns

Dyer et al (1996) did pre- and post- measles campaign vaccination coverage surveys in KwaZulu-Natal using a modified Expanded Program of Immunisation technique, in order to measure the effect of the campaign on vaccination coverage rates for children. The results showed no significant increase in measles vaccination coverage rates for any race after the campaign (as documented by Road-to-Health cards). The authors suggest that the results call into question the effectiveness of immunisation campaigns as a strategy for raising vaccination coverage levels, as well as their having a sustained impact on the incidence of measles. They further suggest that alternative strategies, such as the strengthening and expansion of existing primary health care services, should be considered.

1.1.4.2. Malnutrition

1.1.4.2.1 Factors associated with good nutrition

Amar-Klimesu et al (1991) studied thirty rural Ghanaian infants for 6 months. Variations in growth were found to be related to levels of breast milk intakes, and timely and effective supplementation with the traditional weaning porridge prepared from fermented maize dough. No diarrhoeal disease was recorded before 3 months. The authors suggested that, coupled with true demand breast feeding, the traditional weaning porridge could have adequately supported growth if introduced on time, even when breast milk intakes were less than optimal.

Den Besten et al (1995) studied changes in the anthropometric status of rural African children under five years old during a decade of primary health care. They comment that protein energy malnutrition (PEM) is a major cause of hospital admissions and death in most impoverished Third World countries. In the rural Gelukspan Health District of the North West Province of South Africa, a primary health care (PHC) program, based on the GOBI-FFF strategy, commenced in 1980. Community health surveys on under-five children were regularly undertaken. In 1990, to assess improvements achieved, anthropometric and other data were

obtained on a representative series of 926 children. Low weight-for-age fell from 28 to 19%, low height for age from 33 to 17%, and low weight-for-height from 5 to 1%. The percentage with low arm circumference was unaffected, 3 and 4%, respectively. The improvements described were believed to be due in part to the PHC program.

Melville et al (1995) initiated a community volunteer program in rural Jamaica. The main aim of the program was to monitor the growth of children less than 36 months of age through community health volunteers (CHVs) and improve their nutritional status. The annual cost per child per year for the total program was fairly moderate (US\$14.5) with growth monitoring accounting for nearly half (42.7%). The results suggest that CHVs can play an important role in primary health care programs in developing countries.

1.1.4.2.2 Factors associated with poor nutrition

Cosminsky et al (1993) studied child feeding practices in a rural area of Zimbabwe which still has high child malnutrition rates. Whereas a World Bank study of the same problem had suggested a problem of late introduction of breast milk supplements or solids, the authors found the opposite tendency of early introduction (by 3 months) of supplements.

Davies-Adetugbo (1997) studied local knowledge of and attitudes to breast feeding and the socio-cultural factors that shape its practice in poor rural Yoruba communities of Southwestern Nigeria. The author found that all women in these communities breast fed their infants on demand, and for up to two years, because breast milk was universally accepted as the best food for babies, and breast feeding spaced births. Breast milk was supplemented, from birth, with water and teas. Exclusive breast feeding was considered dangerous to the infant: the baby had an obligatory requirement for supplementary water to quench its thirst and promote its normal development, and for herbal teas which serve as food and medicine. Colostrum was discarded because it was dirty, "like pus", and therefore potentially harmful to the infant, although 24% of the survey sample said they would give it to their babies. Expressed breast milk was suspect as it could get contaminated, poisoned or bewitched. Complementary foods were introduced as early as two months because of perceived lactation insufficiency. The commonest supplement was a watery maize porridge of low nutrient density. Breast feeding could also be seen as being dangerous, as toxins and contaminants could be passed to the infant through breast milk.

Cameron and DeBelle (1986) did a cross-sectional anthropometric study of 297 Aboriginal children aged from 0 to 11 years, from four communities in Victoria and New South Wales, Australia, which revealed significant levels of growth retardation compared with 146 local non-Aboriginal children. Levels of malnutrition varied according to the standards of housing, the degree of community organization and the social pressures that were experienced by each community.

1.1.4.2.3 Breast feeding

Perez-Escamilla et al (1992) summarized data on breast-feeding in Mexico collected between 1958 and 1987 which suggested that about half of all Mexican infants were not breast-fed beyond six months of age. The duration of breast-feeding was shortest in urban areas.

Awate et al (1997) recommended dietary modification, improvement of school sanitation and personal hygiene, strengthening school health services and awareness building, as the key strategies in combating childhood malnutrition. They further asserted that nutritional disorders account for most morbidity, mortality and dropping out among schoolchildren.

Davies-Adetugbo and Adebawa (1997) concluded that appropriate education of health extension workers can contribute significantly to the promotion of breast feeding in rural communities. A multivariate analysis showed that the training program and the study area were the only significant variables that were predictors of breast feeding knowledge ($P < 0.001$).

1.1.4.2.4 Complications

Reed and Wegerhoff (1995) studied 134 children less than 5 years of age admitted with all grades of malnutrition to a rural hospital and investigated them for urinary tract infection. Thirty-five (26.1%) had proven infection. Incidence rates amongst malnutrition categories did not vary significantly. This study emphasized that urinary tract infection in malnutrition is common and should be routinely investigated.

1.1.4.3. Malaria

1.1.4.3.1 Malaria in rural areas

Julvez et al (1995) performed two randomized studies on malaria knowledge and practice in 1992 and 1994 in the Niger river valley where malaria transmission is thought to occur throughout the year but is increased during the rainy season. As perceived by the community

members, the leading cause of malaria was described to be mosquitoes (44.7%), followed by the rainy season, God, and less commonly, dirtiness, parasites, or the sun. The majority of cases were diagnosed by the parents, and were self-treated at home with either medicinal plant infusions or oral drugs. The self-treatment was not common, because Nivaquine (chloroquine) was the only medication known by the people and was often unavailable. The authors suggest that it is necessary to manage a regular drug supply with a public awareness campaign about dosage for self-treatment of malaria. Also, that the public needs to be informed about any new policies of supplying essential drugs under generic names. Despite some confusion, the people studied generally believed that mosquitoes were responsible for the disease. Thus, the use of mosquito netting over the beds was justified and widespread throughout the population. They concluded that the traditional practice could be improved upon with an impregnated net even if the comprehension about the causes of the disease remains limited.

1.1.4.3.2 Treatment

Kimerling et al (1995) undertook a district hospital-based evaluation to identify malaria control issues in a rural malarious region in southern Cambodia. The primary reason found for patient delay (8.9 days) in seeking hospital care was self-treatment at home (91%), with drugs purchased through private sellers. The case fatality rate for the study period was 2.7%. A confirmed malaria diagnosis correlated with prior patient behavior and response to anti-malaria therapy.

1.1.4.3.3 Prevention

Ghebreyesus et al (1996) helped institute a Community-Based Malaria Control Program whose primary objectives were to reduce malaria morbidity and mortality in Tigra, Ethiopia, through early diagnosis and treatment of cases, chemoprophylaxis, and vector control by environmental management. The principal success of the program was that a significant proportion of the rural population at risk for malaria was being treated at the village level. Under-utilization of treatment services by women and children under 5 years and low chemoprophylaxis coverage of pregnant women were documented.

Binka et al (1996) carried out a community-based randomized, controlled trial of permethrin impregnated bed nets in a rural area of northern Ghana, to assess the impact on the mortality of young children in an area of intense transmission of malaria and no tradition of bed net use.

In 48 randomly selected areas households were provided with permethrin impregnated bed nets which were re-impregnated every 6 months. A longitudinal demographic surveillance system was used to record births, deaths and migrations, to evaluate compliance and to measure child mortality. The use of permethrin impregnated bed nets was associated with 17% reduction in all-cause mortality in children aged 6 months to 4 years (RR = 0.83; 95% CI 0.69-1.00; P = 0.05). The reduction in mortality was confined to children aged 2 years of younger, and was greater in July-December, during the wet season and immediately after (RR = 0.79; 95% CI 0.63-1.00), a period when malaria mortality is likely to be increased, than in the dry season (RR = 0.92, 95% CI 0.73-1.14). The authors comment that the ready acceptance of bed nets, the high level of compliance in their use and the subsequent impact on all-cause mortality in their study have important implications for programs to control malaria in sub-Saharan Africa.

Aikins et al (1998) state that clinical trials have indicated that treating mosquito nets with insecticide could be a potentially cost-effective method of preventing malaria and that as malaria is one of the most common causes of death in children under five in developing countries, there has been substantial interest in whether such findings can be replicated for a country's control program in practice. They concluded that insecticide-impregnated mosquito nets are one of the more efficient ways of reducing deaths in children under 10 years in rural Gambia.

Nevill et al (1996) conducted a community randomized, controlled trial of permethrin treated bed nets (0.5 gram per square meter) among a rural population on the Kenyan Coast. The introduction of insecticide treated bed nets (ITBN) led to significant reductions in childhood mortality (PE 33%, CI 7-51%) and severe, life-threatening malaria among children aged 1-59 months (PE 44%, CI 19-62%). The authors comment that these findings confirm the value of ITBN in improving child survival and provide the first evidence of their specific role in reducing severe morbidity from malaria.

1.1.4.4. Schistosomiasis

1.1.4.4.1 Schistosomiasis in rural areas

Chandiwana and Christensen (1988) reviewed the dynamics of transmission of urinary (*Schistosoma haematobium*) and intestinal (*S. mansoni*) human schistosomiasis in the highveld region of Zimbabwe. *S. haematobium* was found to be of high endemicity whereas

the endemicity of *S. mansoni* was moderate. They found peak of prevalence and intensity of infection among children and young adults, and a positive correlation between infection status in population subgroup and the relative transmission potential of water contact sites used. They advocated a community-based strategy within the primary health care system for schistosomiasis morbidity control.

In a study in the Nile delta villages, el Katsha et al (1997) found that most people who used the canals for domestic, recreational or agricultural activities thought that they had little alternative but to do so, even though they knew of the risk of exposure to schistosomiasis. The knowledge and behavior of villagers with regard to schistosomiasis affected their utilization of the local provisions for schistosomiasis diagnosis and treatment. The researchers' monitoring of diagnosis and testing for schistosomiasis at a local health center identified areas which could be upgraded, and they trained health staff to improve their knowledge of schistosomiasis. They identified as essential "the fostering of effective communication between villagers, both women and men, and the local staff in rural health centers."

1.1.4.4.2 Treatment

el Katsha and Watts (1995) state that in Egypt the main effort in the campaign against schistosomiasis involves providing free diagnosis and treatment through primary care facilities, especially rural health units.

Friis et al (1997) showed, in a study assessing the effect of zinc supplementation on susceptibility to *S. mansoni* reinfections among schoolchildren, that the median intensity of *S. mansoni* reinfection, although low in both groups, was significantly lower in the zinc than in the placebo group. They speculated that their finding probably reflected a biological effect of zinc that could be of public health importance in settings with higher transmission.

1.1.4.4.3 Prevention

Santana et al (1997) found a decrease in the prevalence of *S. mansoni* infection in all areas studied in rural Bahia in 1989, where an Information, Education, Communication and Community Mobilization program had been taking place.

Tanner et al (1986) studied aspects of community participation in schistosomiasis control within a primary health care (PHC) program. They saw community participation as a prerequisite for

PHC and asserted that building up community participation cannot be disease- or even symptom- orientated, it must be community problem-orientated, and also that the assessment of village priorities as they are recognized by the community governs any control strategy based on PHC. As schistosomiasis is often not first ranking among community problems, schistosomiasis control must become part of a multisectorial approach to improve community health. This process can initiate and ensure community participation and may lead to cost-effective control measures within PHC.

1.1.4.4.4 Screening

Savioli et al (1989) studied control of morbidity due to *Schistosoma haematobium* on Pemba Island by utilizing a primary health care approach of strengthening the existing health care delivery system and creating a sound basis for future control of other parasitic and communicable diseases. The plan of action included training of rural health assistants to undertake an intervention phase targeted to schools for selective population chemotherapy surveys at six-month intervals during the first two years, using indirect diagnostic techniques (observation of gross haematuria and detection of microscopic haematuria by chemical reagent strips) to identify individuals for treatment with praziquantel at a dose of 40 mg/kg body weight. The evaluation of the indirect techniques indicated that both sensitivity and specificity of the chemical reagent strips to detect infection were greater than 90%. After three selective population chemotherapy surveys, the prevalence of gross haematuria was reduced by 94.2% (15.8% to 0.9%) and both gross and microscopic haematuria were reduced by 76.4% (54.1% to 12.8%) among school children. Community involvement and health education were stressed in this program. The use of dispensary laboratories to maintain control of urinary schistosomiasis is now being evaluated.

Onayade et al (1996) conducted a Knowledge, Attitudes, Practices and Beliefs (KAPB) study among primary schoolchildren (those with more than four years elementary education) in a rural village in Nigeria, from 1990 to 1993, to ascertain their understanding of urinary schistosomiasis. It was established that subjective haematuria is both sensitive and specific for detecting urinary schistosomiasis in endemic areas and offers a valid, easy to recognize target for morbidity control in endemic situation. The authors proposed that with appropriate health education, availability of safe, effective and easy-to-administer drugs, such as praziquantel, morbidity control of urinary schistosomiasis is feasible within the primary health

care system with the lower cadre health worker or even a volunteer village health worker (VVHW) at the center of the control effort.

Slootweg et al (1995) studied schistosomiasis in Northern Cameroon, in an area where *Schistosoma haematobium* and *S. mansoni* were prevalent. The data suggested that the health center was efficacious in 'passively' detecting the heaviest infections. It was also possible to identify villages with large numbers of heavily infected people from the health center's records.

1.1.4.5. Acute Respiratory Infection (ARI)

1.1.4.5.1 Ari's in rural areas

Super et al (1994) reported increased risk of respiratory disease in rural Kenyan children, resulting from increased exposure to unrelated young children. The shift in risk patterns accompanied sociocultural and economic trends during the 1970s, viz. maternal participation in work groups for cash cropping and increased school attendance by other family members.

Teka and Dagnew (1995) studied 132 mothers in rural Ethiopia to determine how they recognized pneumonia and what type of treatment they proposed for pneumonia and mild ARI. Most mothers recognized pneumonia by grunting, fast breathing and high fever, but only 35.6% of them proposed taking these children to the health center. Health damaging traditional practices particularly for mild ARI were widespread. The authors comment that information regarding prevailing beliefs and practices in childhood ARI have a policy implication in the formulation of health education strategy for ARI control.

1.1.4.5.2 Treatment

Amofah et al (1995) interviewed 400 caretakers of preschool children in rural Ghana. Over 46% said they would buy drugs and 33% would use various herbs for mild ARI at home. Food was withheld during ARI episodes and few would attempt to treat perceived severe ARI at home. No association was found between knowledge of signs or causation of ARI and intended practice for mild and severe ARI. Finance and poor attitude of health workers were major concerns expressed by caretakers in seeking help from the orthodox health system,

1.1.4.5.3 Prevention of ARI's and ARI-associated mortality

Pandey et al (1989) studied the impact of a pilot acute respiratory infection (ARI) control program in a rural community in Nepal. Despite a substantial reduction in ARI mortality with the interventions, there was still an unacceptably high mortality from chronic diarrhoea, malnutrition and other factors. This implies that the program to control ARI, diarrhoeal disease, malnutrition and vaccine-preventable diseases should be integrated into one, within the framework of a primary health care strategy.

Vejar et al (1998) examined the activities for the prevention and control of acute respiratory infections (ARI) carried out by a paediatric program in a government health service that provided care to a low-income population in Chile. Specific activities carried out by the ARI program included personnel training as well as control measures at the primary care level and hospitalization of children with severe ARI. In the first 5 years of the program (1990-1994); a reduction in annual mortality from pneumonia from 3.0 to 1.7 per 1,000 was observed among children under the age of one year, which contributed to a decline in infant mortality from 13.5 to 8.9 deaths per 1,000 live births.

Sow et al (1995) conducted a community-based study in Guinea in order to evaluate the frequency, severity of illness, risk factors and the results of planned treatment of acute respiratory infections (ARI) in children under the age of 15 years. The authors commented that this supervised study demonstrated that simple guidelines are valid in order to prevent mortality and complications, and that care appropriate to population requirements in term of infectious diseases can be delivered with low cost and low technology.

1.1.4.6 Ear infections

Villasenor et al (1998) state that otitis media is a prevalent condition which can be diagnosed and treated by primary care providers skilled in otoscopy. A didactic course on otitis media with a practical otoscopy workshop consistently improved short-term knowledge of otitis media and the authors concluded that further teaching efforts and a longer term practice-impact study were warranted.

1.1.4.7. Tuberculosis

1.1.4.7.1 Tuberculosis in rural developing areas

Lee and Price (1995) evaluated the Tuberculosis Control Program (TBCP) of KaNgwane, a rural, previously designated 'homeland' of South Africa, in 1990. Particularly problematic aspects were found to be: the health information collection, case-finding and case-holding, health education and coordination and supervision.

Vecchiato (1997) examined sociocultural aspects of tuberculosis control in a rural Ethiopian community, and recommended that health-education interventions, illustrating the nature and transmission avenues of tuberculosis and the effects of biomedical therapies, precede vaccination campaigns or chemotherapy. They noted the importance of nutritional adequacy in fighting the disease.

1.1.4.7.2 Treatment issues

Chowdhury et al (1997) showed in Bangladesh that by using community health workers to screen villagers for chronic cough and collect sputum samples for acid-fast bacillus (AFB) microscopy, high treatment acceptance rates (3497 (90%) of 3886 cases identified), high cure rates (2833 (81.0%) and 1496 (85.9%)), low death rates (336 (9.6%) and 133 (7.6%)), and low relapse rates and dropout rates (3.1%) were attainable. Where CHW's were used in this fashion, the prevalence of tuberculosis was half of that in the comparison areas, where only government services were available (0.07 vs 0.15 per 1000).

1.1.4.8. Burns

1.1.4.8.1 Incidence

Forjuoh et al (1995) state that the incidence of burns in developing countries is not precisely known due to unavailability or incompleteness of death registration and disease reporting. In their study, they determined prevalence and age-specific incidence of burns in children 0-5 years in the Ashanti region of Ghana using burn scars as proxy. They concluded that childhood burns were a significant health problem in Ghana, especially among rural residents and the very young, and recommended that interventions be developed to control them.

1.1.4.8.2 Causes, prevention and outcome

Mahaluxmivala (1997) from Saudi Arabia concluded from a burns study that the maximization of resources and prevention of burns by education through a national campaign remain the keystones in reducing the incidence of burns, particularly in children..

1.1.4.9. Worm infection

1.1.4.9.1 Prevention

Messou et al (1997) assessed the impact of improvement measures for hygiene and water supply, installation of latrines and health education on the incidence of ascariasis and ankylostomiasis in two- to four- year old children in some villages of southern Cote' d'Ivoire. Their results showed a reduction in the incidence of ascariasis by 75% and ankylostomiasis by 82%. They stressed the importance of appropriate evacuation of excreta, education of mothers and domestic hygiene in the prevention of children parasitosis.

1.1.4.9.2 Treatment

Onadeko and Ladipo (1989) carried out a study in four villages in Nigeria. *Ascaris* was the most common helminth encountered and multiple infestation was also quite common. Schoolchildren and preschool children were the greatest sufferers of *Ascaris*, while students and farmers were the greatest target for hookworm. The authors proposed a community-based distribution program of health services using trained traditional birth attendants and voluntary health workers for data collection and distribution of antihelminth drugs.

1.1.4.10. Diarrhoeal disease

1.1.4.10.1 Factors associated with diarrhoeal disease

Manun'ebo et al (1994) conducted a longitudinal study of diarrhoeal disease morbidity in rural Zaire. The study of children aged 3 to 35 months found an annual incidence rate of 6.3 episodes per child and confirmed that a child's risk of diarrhoeal attack is associated with age, water quality and sanitation, parental education and household size and suggested also that birth interval may be an important risk factor for diarrhoeal morbidity.

Ibrahim et al (1994) found that diarrhoea was the second most common symptom of disease in a study of 431 children under 5 years of age in rural Somalia. Most mothers perceived diarrhoeal disease as a condition in which oral rehydration therapy (ORT) and feeding were logical parts of its management. The under-5 mortality from diarrhoeal disease in children of

literate and illiterate mothers was 43 per 1000 (95% CI 0-84) and 93 per 1000 (95% CI 60-101), respectively.

Chavasse et al (1996) found that rural Pakistani mothers perceived diarrhoeal disease to be the biggest health problem faced by their young children and considered flies to be the principle cause thereof.

Gorter et al (1995) state that in Nicaragua, the principal cause of infant mortality is diarrhoeal disease, which is responsible for 40% of these deaths annually, and that this statistic reflects the low usage of health services and oral rehydration therapy (ORT). In most cases, the mothers had more confidence in folklore treatments that they administered themselves or that the traditional healers (curanderos) applied, than in the services offered at health centres. This attitude limited their use of health services and ORT, although it was observed that in certain cases traditional treatments were used in combination with those of western medicine. They suggested that health service providers should become familiar with traditional nomenclature and beliefs in order to be able to communicate better with mothers and steer them away from harmful practices.

1.1.4.9.2 Treatment

Malik et al (1992) investigated cultural models of diarrhoeal illness which were employed by Pakistani mothers and their emotional responses to children's illnesses. A significantly higher proportion of mothers who feared diarrhoeal disease to be life threatening to their children than mothers with other concerns chose to use NIMKOL, the Pakistan ORS.

Chavasse et al (1996) found that treatment of diarrhoeal disease, in rural Pakistan, was based on a combination of local remedies and commercially produced drugs. They commented that a reduction in diarrhoeal disease incidence as a result of fly control would result in economic gains over and above health gains.

1.1.4.9.3 Prevention

Davies-Adetugbo et al (1997) concluded that focused breast-feeding counseling can increase exclusive breast feeding and reduce the prevalence of diarrhoeal disease in rural communities and that breast-feeding promotion is an important intervention for the control of infant diarrhoeal disease.

Shahid et al (1996) instituted the practice of hand washing with soap and water in a periurban slum of Dhaka city, and did surveillance of diarrhoeal disease for a one-year period. The authors contended that these practices, if implemented as health policy, could reduce the spread of diarrhoeal diseases at low cost in high risk areas since hand washing with soap and water can prevent the spread of diarrhoeal diseases in areas where comparatively costly interventions, such as supply of safe water and improved sanitation, are not possible.

Omotade et al (1995) observed hand washing practices and environmental conditions of 549 mothers and health care-providers of 638 children aged less than 5 years of age in Nigeria. Hand washing in relation to these events occurred more frequently in periurban than in rural villages ($p < 0.001$) and the authors speculated that these differences may have been due to higher education of the periurban women compared to their rural counterparts.

Messou et al (1997) studied the impact of hygiene measures, improved water supply and oral rehydration on diarrhoeal disease in under 5 year olds in four villages of Cote d'Ivoire. The authors commented that their results showed the importance of improved hygiene and accessibility of drinkable water in the prevention of diarrhoeal disease in children.

Chavasse et al (1996) proposed that, if fly control is shown to reduce childhood diarrhoeal disease, then long term community based fly control may be feasible because the community is likely to support efforts resulting in reduced fly density.

Kaltenthaler et al (1996) studied cultural belief systems regarding specific hygiene behaviours and diarrhoeal disease, with emphasis on hand washing in two villages in northeast district of Botswana. Hand washing was said to occur for three main reasons: to remove contamination, for social reasons, and for comfort reasons. Sources of dirt on the hands included human blood and faeces. Many perceived causes of diarrhoeal disease were identified, including pogwana (dehydration associated with sunken anterior fontanel). The authors suggest that beliefs surrounding hygiene behaviour and diarrhoeal disease should be incorporated into health education programs.

Watson et al (1996) pointed out that whereas modern dietary advice emphasizes the importance of freshly preparing food, many African communities leave food to ferment and that

fermentation of cereals is a traditional method of reducing the microbial contamination of porridges. They examined beliefs and consumption patterns of fermented food among mothers of children aged under five and health workers in a rural and urban community in Kenya and found that the majority (83%) of rural mothers' families regularly consumed fermented food and over half (66%) gave their young children this food. In the urban area, fewer mothers (56%) reported that their families ate fermented food and only (40%) gave their children some kind of fermented food. Several reasons for the declining uses of fermented food were given including education by health workers that fermented foods were bad, declining production and availability, and substitution of traditional foods by commercial products such as soft drinks. They comment that health educators need to consider that mothers may be missing out on a useful means of preventing diarrhoeal disease in their children.

Mahfouz et al (1995) provided standard chlorination packages of calcium hypo chloride for the first time to 171 families residing in the catchment area of a Primary Health Care Center in the rural areas of Saudi Arabia. The villagers added the packages to their home storage water tanks each time they added water from the 220 nearby wells. The use of chlorinated water was associated with a 48% reduction in diarrhoeal disease. These results indicate that the chlorination of water can be successfully carried out locally in rural areas to improve the health of the population.

1.1.4.11 Anemia

Luby et al (1995) conducted a study to evaluate the ability of health workers to use clinical findings to identify children with anemia. Health care workers examined a total of 1104 children under 5 years of age at two hospital-based outpatient clinics in rural Malawi. Blood samples were taken to determine haemoglobin concentrations. Pallor of the conjunctiva, tongue, palm or nail beds was 66% sensitive and 68% specific in distinguishing children with moderate anemia (hemoglobin concentration five to eight grams/dl) and 93% sensitive and 57% specific in distinguishing those with severe anemia (hemoglobin concentration less than five grams/dl).

2.0 MATERIALS AND METHODS

2.0.1 Study sample

All children (admission criteria: less than 9 years old) admitted to Manguzi Hospital Paediatric ward between 1.2.93 and 31.1.94. Total number approximately 1200.

2.0.2 Statistical analysis

2.0.2.1 Instruments

On admission, the author (AJH) assessed each child and recorded demographic data (name, age, sex, weight, weight status, immunization status) which were entered into a computer program ('PATs', written specifically for running a paediatric ward by Prof. David Power) by the author's wife. The author was responsible for the patients' management while in the ward, and for each patient's discharge. On discharge, the discharge diagnosis /-es was /were entered, along with the ICD code(s) and outcome (discharged, transferred, died, absconded), and the program calculated the length of stay in the ward. All this information is on the hard drive of the author's personal computer and thus available to him.

2.0.2.2 Data analysis

The following information was extracted from the programme "PATs" for each patient:

Inpatient number (for identification) e.g. 2386/93. This is the hospital's number and allows cross checking by going back to the original file if necessary

month of admission e.g. "6"

length of stay in the ward: This was calculated in days from the admission and discharge dates contained in "PATs". In the case of transfer to another hospital, it was calculated to the date of transfer, even if the child later returned as an inpatient. In the case of death, it was to the date of death, and in the case of absconding, to the date of departure.

sex e.g. "M" (male), "F" (female) or no entry (sex not recorded in the file)

age: "PATs" gives the age in years and months e.g. "6.11", calculated from the birth date. This had to be converted to a decimal age before it could be entered into EPI INFO 5, thus "6.11" became "6.9" and so on.

weight status ("OK" weight for age above the 3rd centile of the kwaZulu child health card, "U" underweight: weight for age below the third centile, but above the 60% of expected weight for age line of the same card, "M" marasmic: weight below the 60% of expected weight for age line of the same card, "K" kwashiorkor: any child with nutritional oedema, with or without other clinical features of kwashiorkor, regardless of weight, "MK" marasmic

kwashiorkor: weight for age below the 60% of expected weight for age line on the same card and nutritional oedema with or without other clinical signs of kwashiorkor and "N" neonate: age < or = 1 month and therefore placement on weight for age chart less meaningful)

immunization status: ("Y" up to date [as shown by child health card: mother's assurance not accepted as proof] or "N" not up to date: 1 or more immunisations not signed for on child health card, or child health card not present and adult accompanying child not sure when questioned)

area of origin: 81 areas were coded and entered. Those within the Manguzi Health ward correspond roughly to the isigodi, that is areas under the jurisdiction of one induna e.g. Thandizwe, Mahlungulu. Others are areas outside the health ward from which patients reported they came e.g. Mozambique, Mkuze.

discharge diagnosis /-es: These were extracted and entered in ICD format. If an appropriate ICD code could not be found e.g. complications arising from administration of herbal enema at home, then a code was made up, usually consisting of 5 letters. Space was made for 5 discharge diagnoses on the capture sheet, but generally the patients only had 2 or 3. An attempt was made to place the most important diagnosis first e.g. pneumonia, and those from the "other problems" list thereafter e.g. worm infection, bilharzia, anaemia, etc.,

outcome of admission: ("DC" discharged, "D" died, "TF" transferred, or "B" absconded: the child's family removed him/her without formal permission from the author)

A questionnaire was compiled using the facility on EPI INFO 5. The programme then automatically constructed a record file proforma into which each patient's data were entered manually.

When all patients' data had been entered, analysis was done using the statistical package which forms part of EPI INFO 5 programme. The graphs were drawn using Microsoft Word software belonging to the kwaZulu-Natal Department of Health, Ngwelezana Hospital, with the permission of the Senior Medical Superintendent. The final draft of the thesis was edited on an Acermate 433s personal computer, using Microsoft Word, and printed with a Epson Stylus 800+ printer. The report was later re-edited and the graphs redrawn, using Lotus Smart Suite and the author's personal Fujitech computer.

2.0.3 Costs

The study cost the subjects nothing. Costs to the author were for printing, computer programmes, stationery and postage.

3.0 RESULTS

3.0.1 Explanatory note regarding diagnoses

All diagnoses included in the discharge diagnoses box of the child's case sheet have been included in the analysis. Thus a child who was admitted with bronchopneumonia and malnutrition (primary diagnoses), but was discovered while in the ward to have tuberculosis (secondary diagnosis), bilharzia and intestinal parasite infection (additional diagnoses) will have all of these diagnoses included. At the time of the study (1993) the possibility that some of these paediatric patients might have had AIDS related illness was not seriously considered. Any HIV testing required blood specimens to be sent to Pietermaritzburg (400 km) and results were long delayed. Thus such investigations were only done in exceptional circumstances particularly bearing in mind that no specific therapy was available.

3.0.2 Number of patients admitted and distribution by month

During the period 1.2.93 to 31.1.94 1261 admissions were recorded. Their distribution by month of admission is summarised in the Table 3.1 below and illustrated in Figure 3.1.

Table 3.1: Number of children admitted by month

MONTH	NUMBER ADMITTED	PERCENT	CUMULATIVE PERCENT
FEB. 1993	112	8.9	8.9
MARCH	129	10.2	19.1
APRIL	192	15.2	34.3
MAY	197	15.6	49.9
JUNE	106	8.4	58.3
JULY	93	7.4	65.7
AUGUST	95	7.5	73.2
SEPTEMBER	85	6.7	79.9
OCTOBER	58	4.6	84.5
NOVEMBER	62	4.9	94.3
DECEMBER	60	4.9	94.3
JAN. 1994	72	5.7	100.0

The average number of admissions per day was 3.5 and the average per month 105. It will be noted that the months February to June were above average, particularly April and May, which between them accounted for 30.8% of the total admissions. This is due to the malaria epidemic which occurred in 1993 during those months (figure 3.2)

3.0.3 Length of stay in the ward

Of the 1216 patients whose length of stay was recorded (96% of the total), the mean length of patients' stay in the ward was 11.45 days and the median length of stay 4 days. The distribution is illustrated in Figure 3.3. The mean has been inflated by the very long stays e.g. 182 days of children with TB for whom it was thought necessary to keep them in hospital for most or all of their 6 month course of treatment.

3.0.4 Sex

Of the 1255 patients whose sex was recorded (99.5% of the total), 612 (48.8%) were female and 643 (51.2%) were male.

3.0.5 Age of patients

Of the 1176 patients whose age was recorded (93.3% of the total), the mean age was 2.83 years, and the standard deviation 2.39 years. (Figure 3.4). The official cut-off age for the paediatric ward was supposed to be 8.0 years, but it will be seen that 2.7% of the patients were older than this.

3.0.6 Immunisation status

Immunisation status (fully immunised or not fully immunised) was recorded for 1257 of the 1261 patients admitted (99.7%). 1117 (88.9%) were recorded as being fully immunised and 140 (11.1%) not. Analysis of which immunisations were not up to date was unfortunately not done.

3.0.7 Outcome of admission

This was recorded in 1259 of the 1261 admissions (99.8%). 1161 patients (92.2%) were discharged, 48 (3.8%) died, 10 (0.8%) were transferred out to other hospitals and 40 (3.2%) absconded i.e. no discharge was recorded. (Figure 3.5)

3.0.8 Nutrition

As described in the Methods section (page 60), all children were weighed and categorised on admission. The results are summarised in Table 3.2 below and illustrated graphically in Figure 3.6.

It will be noted that there seems to be a seasonal variation with highest malnutrition figures in the winter months.

Table 3.2: Nutritional status of children admitted by month

Month	Total	OK	%	UW	%	MAR	%	KW	%	MK	%	NB	%
Feb	112	70	62.5	19	17.0	6	5.4	3	2.7	2	1.8	12	10.7
Mrch	129	75	58.1	35	27.1	5	3.9	2	1.6	1	0.8	11	8.5
Apr	191	167	87.4	11	5.8	2	1.0	4	2.1	0	0.0	7	3.7
May	196	164	83.7	20	10.2	3	1.5	1	0.5	0	0.0	8	4.1
Jun	106	81	76.4	13	12.3	3	2.8	5	4.7	0	0.0	4	3.8
Jul	93	60	64.5	24	25.8	2	2.2	2	2.2	2	2.2	3	3.2
Aug	95	63	66.3	17	17.9	6	6.3	4	4.2	0	0.0	5	5.3
Sept	85	55	64.7	14	16.5	5	5.9	7	8.2	0	0.0	4	4.7
Oct	58	34	58.6	10	17.2	8	13.8	2	3.4	0	0.0	4	6.9
Nov	62	45	72.6	8	12.9	0	0.0	6	9.7	0	0.0	3	4.8
Des	60	38	63.3	10	16.7	3	5.0	3	5.0	2	3.3	4	6.7
Jan	72	51	70.8	8	11.1	4	5.6	1	1.4	0	0.0	8	11.1
Total	1259	898	71.3	189	15.0	47	3.7	40	3.2	7	0.6	73	5.8

If the categories marasmic, kwashiorkor, and marasmic kwashiorkor are taken together (severe malnutrition), they total 94 children out of 1259, or 7.5%, and if the category underweight for age (mild to moderate malnutrition) is added, the total rises to 283, which is 22.4% of the total. Only 77.6% of children had weight for age greater than the 3rd centile, or else were less than 1 month old.

The outcome for each category is shown below in Table 3.3 and in Figure 3.7.

Table 3.3: Outcome for each nutritional category

	OK	UWFA	MARAS	KWASH	M/K	NB	TOTAL
DISCH	848	173	40	34	6	58	1159
(%)	94.0	92.0	85.1	85.0	85.7	79.4	92.2
DIED	20	9	4	4	0	11	48
(%)	2.2	4.8	8.5	10.0	0	15.1	3.8
T/FER	9	0	1	0	0	0	10
(%)	1.0	0	2.1	0	0	0	0.8
ABSC.	25	6	2	2	1	4	40
(%)	2.8	3.2	4.3	5.0	14.3	5.5	3.2
TOTAL	902	188	47	40	7	73	1257

DISCH = DISCHARGED; T/FER = TRANSFERRED OUT TO ANOTHER HEALTH CARE FACILITY; ABSC. = ABSCONDED.

It can be seen that the mortality rate for children classified as having a normal weight for age was 2.2%, less than half that of those classified as being underweight for age (4.8%), which was in turn about half that of children classified as being marasmic or suffering from kwashiorkor (8.5% and 10.0% respectively). Interestingly, none of the 7 children with marasmic kwashiorkor died. Of the 282 children classified as being malnourished, 17 died and 265 survived, as opposed to 31 out of the 975 children classified as adequately nourished who died, and 944 who survived. Relative risk (RR) = 1.62 [95% confidence interval (95%CI) 1.09-2.40, Chi square 4.83, $p = 0.028$]. The death rate for neonates is alarmingly high at 15.1%. It must be remembered that this is not 15.1% of all hospital births, but 15.1% of neonates admitted to paediatric ward with one or other illness. It is still cause for concern, however, and possibly reflects the lack of training of medical and nursing staff alike in this specialised aspect of paediatric practice.

The mean stay of children with malnutrition was 17.24 days (SD 16.27 days; [all children: 11.45 days (SD 15.46 days)]. Put another way, of the 273 and 541 patients with and without malnutrition, 54 and 593 respectively stayed a week or less, and 219 and 348 stayed more than a week. RR = 0.22 [95%CI 0.16-0.28, Chi square 158.93, $p < 0.05$].

52.7% were female and 47.3% male.

The mean age was 2.96 years (SD 2.11 years) [all children: 2.83 years (SD 2.39 years)]. Put differently, of the 271 and 903 patients with and without malnutrition whose age was recorded, 119 and 475 respectively were 2 years or less, and 152 and 428 respectively more than 2 years old. RR = 0.736 [Chi square 6.30, $p=0.11$]. No statistically significant difference was found between the two groups.

84.1% of the children were up to date with their immunisations [88.9% of all children]. Of the 283 and 973 children with and without malnutrition for whom immunisation status was recorded, 238 and 878 respectively were up to date, and 45 and 95 respectively not up to date. RR = 0.66 [95% CI 0.51 - 0.87, Chi square 8.34, $p=0.0039$].

The most frequent areas of origin were Zama Zama (9.0%) [7.6% of all patients], kwaNdaba (8.6%) [9.7%], Phelandaba (4.3%) [3.2%], Bhekabantu (7.2%) [6.2%], Mboza (7.2%) [5.4%], Makane's Drift (3.6%) [3.2%], Engozini (5.0%) [5.8%], Thandizwe (6.5%) [8.7%], Thengane (4.7%) [7.0%], and kwaMshudu (4.0%) [2.4%].

Analysis for outcome shows that 11 children (3.9%) absconded, 17 (6.0%) died, 253 (89.7%) were discharged and 1 (0.4%) was transferred [all children: 3.2%, 3.8%, 92.2% and 0.8% respectively]. Of the 282 and 975 patients with and without malnutrition respectively for whom outcome was recorded, 17 and 31 respectively died, and 265 and 944 respectively were either discharged, transferred or absconded. RR = 1.62 [95% CI 1.09-2.40, Chi square 4.83, $p=0.0279$].

Explanatory note regarding the inclusion of area of origin in the analysis:

It is realised that this information will have little meaning for anybody who has not worked in the Manguzi area and is not familiar with the various *isigodi*. The information has been included in the hope that this report will be of some practical use to the hospital staff.

Analysis of all children for area of origin is shown in the following table and figure. (Only those areas from which more than 5% of the children came are included):

Table 3.4: Area of origin of children admitted

AREA	DIST.	COMMENT	FREQ.	%
ZAMA ZAMA	70	PONGOLA FLOOD PLAIN	94	7.6
KWANDABA	60	" "	120	9.7
BHEKABANTU	80	" "	77	6.2
MBOZA	80	" "	67	5.4
ENGOZINI	5	NEAR HOSPITAL	71	5.8
THANDIZWE	5	" "	107	8.7
THENGANE	5	" "	86	7.0
TOTAL			622	50.4

DIST. = DISTANCE FROM THE HOSPITAL IN KILOMETRES; FREQ. = FREQUENCY, I.E. NUMBER FROM THAT AREA.

The first 4 areas are all in the Pongola River flood plain, and the other 3 are near the hospital and town of kwaNgwanase. They are all fairly populous.

3.0.9 Common discharge diagnoses

3.0.9.1 Malaria

Table 3.5 below includes all children discharged with malaria as one of their diagnoses (ICD Code 084.6). See also Figure 3.2 for a graphic illustration of this. 1993 was the year of a major malaria epidemic in Maputaland, and the hospital policy was that of admitting all patients with smear positive malaria. Standard treatment given included chloroquine, sulphadoxine/methoxazole (Fansidar), and primaquine in the appropriate doses. All patients had a second blood smear done on day 3 or 4. If negative, and the clinical condition better, the patient was discharged. If positive, another smear was done the following day, and quinine sulphate treatment considered. All cases of complicated malaria (cerebral malaria, etc.) were treated with intravenous (IV) or oral quinine.

Table 3.5: Children admitted with malaria by month

MONTH	FREQ.	%	CUMUL. %
FEB	10	4.6	4.6
MAR	30	13.7	18.3
APR	91	41.6	59.9
MAY	64	29.2	89.1
JUN	11	5.0	94.1
JULY	2	0.9	95.0
AUG	2	0.9	95.9
SEPT	0	0.0	95.9
OCT	1	0.5	96.4
NOV	3	1.4	97.8
DEC	2	0.9	98.7
JAN	3	1.3	100.0
TOTAL	219	100.0	100.0

It will be noted that 84.5% of the malaria cases occurred in the months of March, April and May. On further analysis of the malaria patients' data, it was shown that the mean stay in the ward for malaria patients was 7.62 days (Standard deviation 4.89 days, median 6 days), compared to 11.45 +/- 15.46 days, median 4 days, for the general paediatric patient population. Put another way, of the 194 and 1022 patients with and without malaria, 132 and 516 respectively stayed a week or less, and 62 and 506 stayed more than a week. RR = 1.87 [95%CI 1.41-2.47, Chi square 20.18, $p < 0.05$].

The sex of malaria patients was 50.0% male and 50.0% female (109 patients each), which was essentially the same as that for the general paediatric population. (51.2% and 48.8% respectively). The mean age of malaria patients was 3.64 years (standard deviation 2.22 years), which is somewhat older than that for the general paediatric population (mean 2.83 years, standard deviation 2.39 years). Put differently, of the 179 and 997 patients with and without malaria whose age was recorded, 55 and 539 respectively were 2 years or less, and 124 and 458 respectively more than 2 years old. RR = 0.43 [95% CI 0.32-0.58, Chi square 33.06, $p < 0.05$].

A comparison of nutritional status of malaria vs. all patients shows that 87.2% of malaria patients (vs. 68.9% of patients with conditions other than malaria) were adequately nourished, 10.0% were underweight (15.8% of non-malaria patients), 0.9% kwashiorkor (3.7%) and 1.8% new-borns (6.6%). $RR = 0.46$ [95% CI 0.3-0.7, Chi square 14.70, $p < 0.05$]. Thus, it appears that those children admitted with malaria were better nourished and less likely to be neonates than those admitted for other reasons.

Immunisation status for malaria patients was higher than for non-malaria patients. 173 or 88.7% of the 195 malaria patients for whom it was recorded were up to date, and 22 or 11.3% not, compared to 813 or 76.4% and 251 or 25.6% respectively for the 1064 patients admitted for other reasons. $RR = 0.46$ [95% CI 0.3-0.7, Chi square 14.70, $p < 0.05$].

An analysis of the area of origin of those children admitted with malaria shows that many came from areas adjacent to or on the Pongolo river flood plain and few from those areas closer to the coast. 33 cases (15.5%) [7.6% of all cases] came from Zama Zama, 37 (17.4%) [9.7%] from kwaNdaba, 31 (14.6%) [6.2%] from Bhekabantu, 11 (5.2%) [3.2%] from Makane's Drift, and 17 (8.0%) [3.2%] from Lulwane. These are all areas on the flood plain. Together they account for 129 of the 213 cases, or 60.6%. [29.9% of all cases]. On the other hand, populous areas around the hospital, such as Thengani, Thandizwe, Mahlangu and Ekuhluphekeni produced only 6 (2.8%) [7.0% of all cases], 4 (1.9%) [8.7%], 3 (1.4%) [3.7%] and 3 (1.4%) [3.4%] of the cases respectively. (Total for these areas: 16 (7.5%) [22.8% of all cases]). These results are illustrated in Figure 3.9.

Table 3.6, below, shows an analysis of the outcome of children admitted with malaria and shows a overall case fatality rate of 0.9% (2 cases out of 218 patients). Of the 194 patients with malaria for whom outcome was recorded, 2 died and 192 were either discharged, transferred or absconded. Of the 1065 patients without malaria, 46 died, and 1019 were either discharged, transferred or absconded. $RR = 0.26$ [95% CI 0.07-1.03, Chi square 4.84, $p = 0.0278$]. (This is not statistically significant).

Table 3.6: Outcome of children admitted with and without malaria.

	MALARIA	NOT MALARIA	TOTAL
Died	2	46	48
Discharged, transferred or absconded	192	1,019	1,211
Total	194	1,065	1,259

It will be noted that the 2 fatalities occurred in March and May, which were busy months, with average admissions per day of 4.2 and 6.3 patients respectively.

3.0.9.2 Pneumonia

329 children had pneumonia as one of their discharge diagnoses. (For the purposes of this analysis, bronchopneumonia, lobar pneumonia and pneumonia presumed to be of viral or other origin are grouped together). The distribution by month is summarised in Table 3.7 below and Figure 3.10.

Table 3.7: Frequency by month of children admitted with pneumonia

MONTH	PNEUMONIA ADMISSIONS	TOTAL ADMISSIONS	PERCENTAGE WITH PNEUMONIA
FEB	30	112	33.6
MAR	33	129	42.6
APR	30	192	15.6
MAY	36	197	18.3
JUN	24	106	22.6
JUL	23	93	24.7
AUG	31	95	32.6
SEP	39	85	45.9
OCT	25	58	43.1
NOV	17	62	27.4
DEC	13	60	21.7
JAN	28	72	38.9
TOTAL	329	1261	26.1

Table 3.6: Outcome of children admitted with and without malaria.

	MALARIA	NOT MALARIA	TOTAL
Died	2	46	48
Discharged, transferred or absconded	192	1,019	1,211
Total	194	1,065	1,259

It will be noted that the 2 fatalities occurred in March and May, which were busy months, with average admissions per day of 4.2 and 6.3 patients respectively.

3.0.9.2 Pneumonia

329 children had pneumonia as one of their discharge diagnoses. (For the purposes of this analysis, bronchopneumonia, lobar pneumonia and pneumonia presumed to be of viral or other origin are grouped together). The distribution by month is summarised in Table 3.7 below and Figure 3.10.

Table 3.7: Frequency by month of children admitted with pneumonia

MONTH	PNEUMONIA ADMISSIONS	TOTAL ADMISSIONS	PERCENTAGE WITH PNEUMONIA
FEB	30	112	33.6
MAR	33	129	42.6
APR	30	192	15.6
MAY	36	197	18.3
JUN	24	106	22.6
JUL	23	93	24.7
AUG	31	95	32.6
SEP	39	85	45.9
OCT	25	58	43.1
NOV	17	62	27.4
DEC	13	60	21.7
JAN	28	72	38.9
TOTAL	329	1261	26.1

The average stay of patients admitted with a diagnosis of pneumonia was 9.19 days (standard deviation 13.62, median stay 5.8 days). This is slightly shorter than the average stay of 11.45 days for all patients. Alternatively, of the 267 and 949 patients with and without pneumonia, 176 and 472 respectively stayed a week or less, and 91 and 477 stayed more than a week. RR = 1.7 [95%CI 1.35-2.13, Chi square 21.9, $p < 0.05$].

Analysis for sex shows that 164 girls and 165 boys were admitted with pneumonia: 49.8 and 50.2% respectively.

The mean age of children with pneumonia was 1.99 years (standard deviation 1.99 years), which is younger than that of all children (2.83 years). Put differently, of the 259 and 917 patients with and without pneumonia whose age was recorded, 162 and 425 respectively were 2 years or less, and 97 and 492 respectively more than 2 years old. RR = 1.68 [95% CI 1.34-2.10, Chi square 21.20, $p < 0.05$].

86.9% of the children with pneumonia were recorded as being up to date with their immunizations, compared to 88.9% of all patients. Of the 279 and 978 children with and without pneumonia for whom immunization status was recorded, 244 and 873 respectively were up to date, and 35 and 105 respectively not up to date. RR = 0.87 [Chi square 0.72, $p = 0.397$: i.e. the difference was not significant].

Analysis for area of origin shows that most of the pneumonia patients came from the more populous areas along the Pongola River flood plain e.g. Zama Zama (5.3%) [7.6% of all patients], kwaNdaba (5.6%) [9.7%], Bhekabantu (4.3%) [6.2%], Mboza (5.3%) [5.4%], or around the hospital and town of kwaNgwanase e.g. Mahlungulu (5.3%) [3.7%], Phelandaba (3.4%) [3.2%], Mazambane (3.4%) [2.2%], Ekhluphekeni (4.0%) [3.4%], Engozini (9.9%) [5.8%], Thandizwe (12.7%) [8.7%] and Thengane (7.1%) [7.0%].

Analysis for nutritional status shows that 58 (18.1%) of the children with pneumonia were malnourished (Kwashiorkor 1, Marasmic 11, Underweight for age 46), 28 (8.8%) were new-borns, and 233 (72.8%) were adequately nourished. This is similar to the nutritional status of all patients, of whom 71.7% were adequately nourished, 21.9% malnourished and 5.8% new-born. Of the 279 and 980 children admitted with and without pneumonia respectively for whom nutritional status was recorded, 48 and 235 respectively were malnourished, and 231

and 745 respectively adequately nourished or neonates. RR = 1.31 [Chi square 0.71, $p=0.401$; i.e. not statistically significant].

Analysis for outcome is illustrated in Table 3.8 and Figure 3.11. Of the 270 and 949 patients with and without pneumonia respectively for whom outcome was recorded, 13 and 35 respectively died, and 257 and 914 respectively were either discharged, transferred or absconded. RR = 1.31 [Chi square 0.71, $p=0.401$].

Table 3.8: Outcome of children with pneumonia.

OUTCOME	FREQUENCY	PERCENT	CUMUL. %
ABSCONDED	9	2.7	2.7
DIED	16	4.9	7.6
DISCHARGE	301	91.5	99.1
TRANSFERRED	3	0.9	100.0

Of the 16 who died, 15 [93.8%] were recorded as being fully immunised (as opposed to 271 of the 313 [86.6%] who survived). Most of the deaths occurred in the colder months of the year viz. 3 in April, 1 in July, 6 in August and 1 in September; total 11 (68.8%). Absolute numbers of pneumonia cases were not increased during these months, however (see Table 3.7). The average age of children dying with pneumonia was 1.07 years (standard deviation 1.50 years), younger than that for all cases of pneumonia (1.99 years). Of the 16 children who died, 5 (31.3%) were malnourished (kwashiorkor 1, marasmic 2, underweight for age 2), 5 (31.3%) were new-borns and 6 (37.4%) were recorded as being adequately nourished. Only 18.1% of all children with pneumonia were malnourished. The average length of stay in the ward for children who died with pneumonia was 5.29 days (SD 4.05 days).

3.0.9.3 Diarrhoeal disease

Two hundred children were discharged with diarrhoeal disease as one of their diagnoses. Their distribution by month of admission is illustrated in Table 3.9 and Figure 3.12 below:

Table 3.9: Frequency by month of children admitted with diarrhoeal disease:

MONTH	NUMBER WITH GE	TOTAL ADMISSIONS	PERCENTAGE WITH GE
FEB	20	112	17.9
MAR	19	129	24.5
APR	29	192	55.7
MAY	36	197	70.9
JUN	34	106	36.0
JUL	15	93	14.0
AUG	8	95	7.6
SEP	5	85	4.3
OCT	7	58	4.1
NOV	5	62	3.1
DEC	14	60	8.4
JAN	8	72	5.8
TOTAL	200	1261	15.9

It will be noted that there is an autumn (April to June) peak, with less cases occurring from August to February.

The mean stay on the ward of children with diarrhoeal disease was 10.5 days (SD 14.42 days). This is slightly shorter than the mean stay for all patients, i.e. 11.45 days (SD 15.46 days). Put another way, of the 146 and 1070 patients with and without diarrhoeal disease, 83 and 565 respectively stayed a week or less, and 63 and 505 stayed more than a week. RR = 1.15 [Chi square 0.84, $p=0.35$: i.e. not statistically significant.]

50% of the children were male and 50% female.

Their mean age was 1.81 years (SD 1.83 years), as compared to 2.83 years (SD 2.39) for all patients. Put differently, of the 139 and 1037 patients with and without diarrhoeal disease whose age was recorded, 93 and 513 respectively were 2 years or less, and 46 and 524 respectively more than 2 years old. RR = 1.90 [95% CI 1.36-2.66, Chi square 14.92, $p<0.05$].

Only 66.5% were recorded as being adequately nourished, as opposed to 71.7% of all patients. 2.5% of those with diarrhoeal disease also had kwashiorkor, 60% marasmus, and 22% were underweight for age. 3.0% were new-borns. The figures for all patients were 3.2%, 3.7%, 15.0% and 5.8% respectively. Of the 149 and 1110 children admitted with and without diarrhoeal disease respectively for whom nutritional status was recorded, 40 and 243 respectively were malnourished, and 109 and 867 respectively adequately nourished or neonates. RR = 1.27 [Chi square 1.85, $p = 0.69$; i.e. not statistically significant].

88.5% of the children with diarrhoeal disease were recorded as being up to date with their immunisations, as opposed to 88.9% of all children. Of the 149 and 1108 children with and without diarrhoeal disease for whom immunization status was recorded, 131 and 986 respectively were up to date, and 18 and 122 respectively not up to date. RR = 0.91 [Chi square 0.15, $p=0.69$; i.e. not statistically significant].

Analysis of diarrhoeal disease cases for area of origin shows that 8.0% [7.6% of all patients] came from Zama Zama, 14.1% [9.7%] from kwaNdaba, 5.5% [5.4%] from Mboza and 5.5% [3.2%] from Makane's Drift these are all areas on or near the Pongola flood plain. 6.5% [5.8%] came from Engozini, 6.5% [8.7%] from Thandizwe and 8.0% [7.0%] from Thengani these areas being near the hospital and quite populous.

The outcome of the children with and without diarrhoeal disease is shown below in Table 3.10.

Table 3.10: Outcome of children with and without diarrhoeal disease.

	WITH GE	WITHOUT GE	TOTAL
DIED	20 (10.0%)	28 (2.6%)	48 (6.0%)
DISCHARGED, TRANSFERRED OR ABSCONDED	180 (90.0%)	1,031 (97.4%)	1,211 (94.0%)
TOTAL	200	1,059	1,259

The table shows that children with diarrhoeal disease were far more likely to die than those without. RR = 2.8 (95% CI 1.95-4.02, Chi square 24.8, $p<0.05$).

The distribution of diarrhoeal disease deaths and case fatality rates by month is shown below in Table 3.10 and in Figure 3.13.

Table 3.11: Fatality rates by month of children with diarrhoeal disease.

MONTH	NUMBER WITH GE	NUMBER WITH GE WHO DIED	C.F.R. (%)
FEB	20	3	15.0
MAR	19	2	10.5
APR	29	3	10.3
MAY	36	3	8.3
JUN	34	2	5.9
JUL	15	0	0.0
AUG	8	2	25.0
SEP	5	1	20.0
OCT	7	1	14.3
NOV	5	0	0.0
DEC	14	3	21.5
JAN	8	0	0.0
TOTAL	200	20	10.0

C.F.R. = CASE FATALITY RATE.

The mean age of the children dying with diarrhoeal disease as one of their diagnoses was 9.2 months (SD 5.6 months). The oldest child was 2.0 years.

The mean stay of children dying from diarrhoeal disease was 6.84 days (SD 4.62). There were 9 females and 11 males. Their mean age was 0.92 years (SD 0.56 years). 3 (15%) had kwashiorkor, 2 (10%) marasmus, 2 (10%) were new-borns, 4 (20%) were underweight for age and 9 (45%) were adequately nourished. 19 (95%) were recorded as being fully immunised. The areas of Zama Zama, Engozini, Thengane and Mvelabusha were each home to 10% of the children dying from diarrhoeal disease.

3.0.9.4 Anaemia

426 children were discharged during the period under study with anaemia as one of their diagnoses (ICD codes 280.9, 283.1, 285.1, 283.9 or 280.0). Their distribution by month of admission is shown below in Figure 3.14 and Table 3.11.

Comment: The first peak in the incidence of anaemia coincides with the peak in malaria incidence, the second with the end of the dry season when malnutrition is at its worst.

Table 3.12: Frequency by month of children with anaemia

MONTH	NUMBER WITH ANEMIA	TOTAL ADMISSIONS	PERCENT WITH ANEMIA
FEB	35	112	31.2
MAR	38	129	29.5
APR	85	192	44.3
MAY	54	197	27.4
JUN	37	106	34.9
JUL	27	93	29.0
AUG	29	95	30.5
SEP	25	85	21.3
OCT	21	58	36.2
NOV	19	62	30.6
DEC	33	60	19.8
JAN	23	72	16.6
TOTAL	426	1261	

It will be noted that there is an April-May peak, which corresponds to the peak in malaria cases during those months. 44.8% of children with anaemia were male and 55.2% female. The mean age of the 407 children whose age was recorded was 3.15 years, as compared to 2.77 years for all patients without anaemia as a diagnosis. Of the 425 children with anaemia whose weight for age status was recorded, only 290 (68.2%) were recorded as being adequately nourished, [vs. 71.8% for those without anaemia], 27 (6.4%)[2.9%] of those with anaemia also had kwashiorkor,

19 (4.5%)[3.8%] marasmus, 4 (0.9%)[0.4%] marasmic kwashiorkor and 76 (17.9%)[13.8%] were underweight for age. 9 (2.1%)[7.2%] were new-borns. 365 (85.9%) of the children with anaemia whose immunization status was recorded were recorded as being fully immunised, as opposed to 89.0% of all children without anaemia. Analysis of children with anaemia for area of origin shows that of the 417 whose area was recorded, 34 (8.1%) [vs. 7.5% of patients without anaemia] came from Zama Zama, 52 (12.4%) [8.7%] from kwaNdaba, 18 (4.3%) from Mboza, 40 (9.6%) from Bhekabantu, 19 (4.6%) from Makane's Drift, 22 (5.3%) from Lulwane, 23 (5.5%) from Engozini, 23 (5.5%) [9.8%] from Thandizwe and 21 (5.0%) [8.0%] from Thengane the first six are all areas on or near the Pongola flood plain, the others near the hospital. The outcome of children admitted with anaemia was that 4 of the 425 (0.9%) [vs. 4.1% of children without anaemia] absconded, 9 (2.1%) [4.4%] died, 1 (0.2%) [1.0%] was transferred and 411 (96.7%) [90.5%] were discharged.

3.0.9.5 Bilharzia

29 children were diagnosed as having bilharzia ova in their urine during the year. Bilharzia has been included in the analysis because its prevalence in children in the ward was probably much higher, but was only checked for routinely in malnourished children, or if haematuria was specifically complained about.

The incidence of bilharzia by month is shown in Table 3.12 below and Figure 3.15.

62.1% of those with bilharzia were female and 37.9% male. The mean age was 4.81 years (SD 2.17 years) [all children: 2.83 years (SD 2.39 years)]. There were no neonates in the group. 86.2% were fully immunised [88.9% of all children]. The most frequent areas of origin were kwaNdaba (14.3%) [9.7% of all patients], Engozini (17.9%) [5.8%], and Thandizwe (21.4%)[8.7%]. Analysis for outcome shows that all 29 of those with bilharzia were discharged: there were no deaths in this group.

19 (4.5%)[3.8%] marasmus, 4 (0.9%)[0.4%] marasmic kwashiorkor and 76 (17.9%)[13.8%] were underweight for age. 9 (2.1%)[7.2%] were new-borns. 365 (85.9%) of the children with anaemia whose immunization status was recorded were recorded as being fully immunised, as opposed to 89.0% of all children without anaemia. Analysis of children with anaemia for area of origin shows that of the 417 whose area was recorded, 34 (8.1%) [vs. 7.5% of patients without anaemia] came from Zama Zama, 52 (12.4%) [8.7%] from kwaNdaba, 18 (4.3%) from Mboza, 40 (9.6%) from Bhekabantu, 19 (4.6%) from Makane's Drift, 22 (5.3%) from Lulwane, 23 (5.5%) from Engozini, 23 (5.5%) [9.8%] from Thandizwe and 21 (5.0%) [8.0%] from Thengane the first six are all areas on or near the Pongola flood plain, the others near the hospital. The outcome of children admitted with anaemia was that 4 of the 425 (0.9%) [vs. 4.1% of children without anaemia] absconded, 9 (2.1%) [4.4%] died, 1 (0.2%) [1.0%] was transferred and 411 (96.7%) [90.5%] were discharged.

3.0.9.5 Bilharzia

29 children were diagnosed as having bilharzia ova in their urine during the year. Bilharzia has been included in the analysis because it's prevalence in children in the ward was probably much higher, but was only checked for routinely in malnourished children, or if haematuria was specifically complained about.

The incidence of bilharzia by month is shown in Table 3.12 below and Figure 3.15.

62.1% of those with bilharzia were female and 37.9% male. The mean age was 4.81 years (SD 2.17 years) [all children: 2.83 years (SD 2.39 years)]. There were no neonates in the group. 86.2% were fully immunised [88.9% of all children]. The most frequent areas of origin were kwaNdaba (14.3%) [9.7% of all patients], Engozini (17.9%) [5.8%], and Thandizwe (21.4%)[8.7%]. Analysis for outcome shows that all 29 of those with bilharzia were discharged: there were no deaths in this group.

Table 3.13: Frequency of bilharzia by month

MONTH	BILHARZIA	TOTAL ADMISSIONS	PERCENT WITH BILHARZIA
FEB	2	112	2.2
MAR	3	129	2.3
APR	5	192	2.6
MAY	4	197	2.0
JUN	1	106	0.9
JUL	3	93	3.2
AUG	2	95	2.1
SEP	1	85	1.1
OCT	4	58	6.9
NOV	1	62	1.6
DEC	2	60	3.3
JAN	1	72	1.4
TOTAL	29	1261	2.3

Comment: There appears to be an increase in incidence from July to a peak in October and tailing off again after December. This corresponds to the end of the dry season and is in keeping with urine testing consequent or malnutrition rather than a high risk season for acquiring Bilharzia.

3.0.9.6 Worms

There were 137 children diagnosed as having intestinal parasites during their stay in the ward i.e. the prevalence of worm infection amongst the subjects of this study was at least 10.9%. It is a limitation of this study that the worms were not typed. The incidence was undoubtedly higher than this, as only those with malnutrition and those with diarrhoeal disease were routinely screened for intestinal parasites. The frequency by month is shown in Figure 3.16 and Table 3.13 below.

Table 3.14: Frequency of diagnosis of worm infection by month

MONTH	WORMS	%	TOTAL ADMISSIONS	WORMS/TOTAL %
FEB	11	8.0	112	9.8
MAR	22	16.1	129	28.4
APR	15	10.9	192	7.8
MAY	16	11.7	197	8.1
JUN	9	6.6	106	8.4
JUL	14	10.2	93	15.0
AUG	13	9.5	95	13.6
SEP	11	8.0	85	12.9
OCT	4	2.9	58	6.9
NOV	5	3.6	62	8.1
DEC	10	7.3	60	16.7
JAN	7	5.2	72	9.7
TOTAL	137	100.0	1261	10.8

Peaks are seen during the summer months of December and March and again during the winter months of July to September. The latter may be related to the increase in malnutrition during the dry winter months. 49.6% of the children with worms were female and 50.4% male. The mean age was 3.74 years (SD 2.45 years) [all children: 2.83 years (SD 2.39 years)]. There were 2 neonates (1.5%) in the group. 89.7% of the children were fully immunised [88.9% of all children]. The most frequent areas of origin were kwaNdaba (11.4%) [9.7% of all patients], Thengane (7.6%) [7.0%], and Thandizwe (11.4%) [8.7%]. Analysis for outcome shows that 3 children (2.2%) absconded, 2 (1.5%) died, 130 (95.6%) were discharged and 1 (0.7%) was transferred [all children: 3.2%, 3.8%, 92.2% and 0.8% respectively].

Nutritional status in relation to positive findings of bilharzia and worms is not analysed as malnutrition was one of the indications for examining urine and stools.

3.0.9.57 Tuberculosis

There were 50 children diagnosed¹ as having tuberculosis. 48 had pulmonary tuberculosis, 1 tuberculous adenitis and 1 tuberculosis of the spine. The incidence by month of children with pulmonary tuberculosis is illustrated in Table 3.15 below and Figure 3.17.

Table 3.15: Incidence of pulmonary tuberculosis

MONTH	GREQ.	PERCENT	TOTAL ADM.	PERCENT
FEB	4	8.3	112	3.5
MAR	4	8.3	129	3.1
APR	4	8.3	192	2.1
MAY	8	16.7	197	4.1
JUN	3	6.3	106	4.1
JUL	2	4.2	93	2.1
AUG	7	14.6	95	7.4
SEP	5	10.4	85	5.9
OCT	2	4.2	58	3.4
NOV	1	1.6	62	1.6
DEC	3	6.3	60	5.0
JAN	5	10.4	72	6.9
TOTAL	50	100.0	1261	4.0

The mean stay of the 48 children with pulmonary tuberculosis was 41.57 days (SD 34.80 days). Three (6.3%) of the 48 stayed a week or less, and 43 (93.7%) more than a week. This is significantly longer than the 1170 children without TB, of whom 645 (55.0%) stayed a week or less, and 525 (45.0%) stayed longer than a week. RR = 0.06 [95%CI 0.02-0.20, Chi square 42.01, $p < 0.05$].

32 children (66.7%) were female and 16 children (33.3%) male. This is a significant difference,

¹The diagnosis was based on clinical and Xray criteria, history of contact and tuberculin skin tests (Tine).

compared to those without TB: RR = 2.10 [95%CI 1.17-3.79, Chi square 6.4, $p=0.01$].

The mean age was 4.24 years (SD 2.5 years) [all children: 2.83 years (SD 2.39 years)]. Put differently, of the 48 and 1128 patients with and without tuberculosis whose age was recorded, 13 and 581 respectively were 2 years or less, and 35 and 547 respectively more than 2 years old. RR = 0.36 [95% CI 0.19-0.68, Chi square 10.99, $p<0.05$].

Eighty-three percent of the children were up to date with their immunisations [88.9% of all children]. Of the 48 and 1209 children with and without tuberculosis for whom immunization status was recorded, 40 and 1077 respectively were up to date, and 8 and 132 respectively not up to date. RR = 0.63 [Chi square 1.54, $p=0.214$: i.e. the difference was not significant].

Of the 48 and 1211 children admitted with and without tuberculosis respectively for whom nutritional status was recorded, 15 (31.3%) and 268 (22.1%) respectively were malnourished, and 33 (68.7%) and 943 (77.9%) respectively adequately nourished or neonates. RR = 1.57 [Chi square 2.20, $p = 0.138$: i.e. not statistically significant].

The most frequent areas of origin were Zama Zama (4.3%) [7.6% of all patients], kwaNdaba (6.5%) [9.7%], Bhekabantu (8.7%) [6.2%], Thandizwe (21.7%) [8.7%]. Only the difference for Thandizwe was statistically significant (RR = 1.54, 95%CI 1.16-2.03, Chi square 6.45 $p=0.01$). Thandizwe is one of the less remote and economically better off areas of the health ward, so why there should be more children from there with TB is not clear. Analysis for outcome shows that 3 children (6.3%) absconded, 1 (2.1%) died, 44 (91.7%) were discharged and none was transferred [all children: 3.2%, 3.8%, 92.2% and 0.8% respectively]. Of the 48 and 1211 patients with and without tuberculosis respectively for whom outcome was recorded, 1 and 47 respectively died, and 47 and 1164 respectively were either discharged, transferred or absconded. RR = 0.54 [Chi square 0.41, $p=0.5235$: i.e. not statistically significant].

The child with tuberculous adenitis was admitted in September, stayed for 90 days (because it was difficult to arrange treatment supervision as an outpatient), was adequately nourished, but not fully immunised, was 5 years old and female, came from Lulwane, and was discharged. The one with TB of the spine was also admitted in September, stayed for 20 days, was underweight for age but

fully immunised, was 3 years old and male, came from Mvelabusha and was discharged for ambulatory treatment. There were also 84 children who had symptoms and/or signs suspicious of tuberculosis, or who were screened for TB while in the ward because of a history of contact, but in whom a positive diagnosis of tuberculosis was never made. They have not been included in the analysis.

3.0.9.8 Burns

62 children were admitted with a diagnosis of burns (ICD code 941, 945, 946 or E899). Their distribution by month is shown below in Table 3.16 and Figure 3.18.

Table 3.16: Incidence of burns by month

MONTH	BURNS	TOTAL ADMISSIONS	PERCENT WITH BURNS
FEB	9	112	8.0
MAR	6	129	6.2
APR	8	192	4.2
MAY	3	197	5.9
JUN	4	106	4.2
JUL	8	93	7.4
AUG	7	95	7.4
SEP	7	85	6.0
OCT	3	58	1.7
NOV	5	62	6.5
DEC	1	60	1.7
JAN	1	72	0.7
TOTAL	62	1261	

Comment: There appear to be two peaks, one around February and one from July to September. The first corresponds with the hottest (though wettest) time of the year, the second with the dry winter months.

The mean stay of the 62 children with burns was 16.59 days (SD 16.67 days) [all children: 11.45 days (SD 15.46 days)]. Put another way, of the 61 and 1155 patients with and without burns, 10 and 638 respectively stayed a week or less, and 51 and 517 stayed more than a week. RR = 0.7 [95%CI 0.09-0.34, Chi square 35.12, $p < 0.05$].

29 children (48.3%) were female and 31 children (51.7%) male. The sex of 2 children was not recorded.

The mean age was 2.44 years (SD 1.8 years) [all children: 2.83 years (SD 2.39 years)]. Thirty (54.5%) of the fifty children with burns were two years old or less, compared to 564 (50.3%) of the 1121 children without burns. This was not a statistically significant difference. ($p = 0.54$)
85.5% of the children were up to date with their immunisations. [88.9% of all children]. This was likewise not a significant difference. ($p = 0.38$)

Six (9.7%) of the 62 children with burns were classified as malnourished, and 56 (90.3%) as adequately nourished or neonates. This was significantly different to children without burns, of whom 277 out of 1197 (23.1%) were malnourished and 920 (76.9%) not. RR = 0.37 [95%CI 0.16-0.85, Chi square 6.13, $p = 0.0133$]. It would appear therefore that burns children tended to be better nourished than those admitted for other reasons.

The most frequent areas of origin were Zama Zama (8.2%) [7.6% of all patients], Mboza (4.9%) [5.4%], Mazambane (4.9%), Mloli (4.9%), Ndondlweni (4.9%), Engozini (4.9%) [5.8%], Thandizwe (6.6%) [8.7%], Thengane (6.6%) [7.0%] and kwaMshudu (6.6%).

Analysis for outcome shows that 1 child (1.6%) [3.2% of all children] absconded, none died [3.3%], 60 (96.8%) [92.2%] were discharged and one (1.6%) [0.8%] was transferred. Of the 62 and 1197 patients with and without burns respectively for whom outcome was recorded, 0 and 48 respectively died, and 62 and 1149 respectively were either discharged, transferred or absconded. Odds Ratio (OR) = 0.00 [95% CI 0.00-1.92, Chi square 2.58, $p = 0.108$: not significant].

4.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

As mentioned in section 1.2 (Overall aims of the study), the thrust of this study was to identify problems with which children were frequently admitted to the hospital, and determine which, if any, could have been better managed at primary health care level, and then to make recommendations as to what changes should be considered in the Paediatric Primary Health Care services of the health ward, and how they should be implemented. Ultimately, one wishes to answer the question, "Is the hospital being optimally used?"

4.0.1 Limitations of this study

Some of the limitations identified are listed below:

1. No distinction is made between children who were referred to the hospital by a clinic nurse, and those who simply used the hospital as their source of primary health care, i.e. were not referred.
2. Only the overall immunization status i.e. fully immunised or not, was recorded. A more detailed immunization coverage survey is needed.

4.0.2 Age

The average age of children admitted was 2.8 years. It seems reasonable, therefore that primary health care services, including clinics should concentrate their efforts on this age group. In this regard, progress has been made at Manguzi since the time of the study, in that a separate mobile team concentrating on "Under-5's" has been established, and a four wheel drive vehicle donated for it to use.

4.0.3 Immunisation status

1. Nearly 89% of children admitted were recorded as being fully immunised. By comparison, the survey done in 1997 by Wilkinson et al in the Hlabisa area, which is a slightly bigger health ward in a similarly rural area of kwaZulu Natal, (see p28) found an overall immunisation coverage of 80-98%². It would appear, therefore, that the immunisation program in the Manguzi health ward at the time of the study was working well, possibly because it was given high priority for health worker time allocation, and this possibly at the expense of other primary health programs e.g. oral

²This was, however, a community based survey, whereas the figures from Manguzi are hospital based.

rehydration therapy education (personal observation).

2. The Manguzi survey did not find significant numbers of children admitted for vaccine preventable diseases such as measles, polio, diphtheria, pertussis and tetanus probably reflecting the high immunisation coverage. Only tuberculosis figured prominently. However, another possible reason is that children with these diseases were treated at home or at clinic level. This is likely the case with measles, which is well known in the community. Another possibility is that cases did occur but that the diagnoses were missed.

3. High immunisation coverage indicates good clinic attendance (the children must have attended a residential or mobile clinic facility at least 4 or 5 times to be fully immunised), and raises the question of why it was not possible to detect and prevent other disorders such as severe malnutrition (the level of immunization of malnourished children was 84%, only slightly less than that for all children). However, it is noteworthy that primary immunisation is completed in the first 12-18 months and thereafter attendances or "well-baby" clinics generally decline.

4. Since the study, there have been several immunisation campaigns, specifically against measles and polio. In view of points one and two above, and in the light of the findings of Dyer et al (1996) that campaigns do not necessarily raise coverage levels or have a sustained impact on the incidence of disease, it is debatable whether scarce primary health resources should be devoted to these time-, energy- and finance-draining activities.

4.0.4 Nutrition

4.0.4.1 Prevalence

Fifteen percent of children were moderately malnourished (underweight for age) and 7.4% severely malnourished (marasmus, kwashiorkor or marasmic kwashiorkor), giving a total of 22.4% with some degree of malnutrition. This is roughly the same as the prevalence found in the Gelukspan area study of 1980-90, where 28% of children were found to have a low weight-for-age before the PHC program (Den Besten 1995).

The mortality rate for severely malnourished children was roughly twice that of moderately malnourished children, which again was roughly twice that of normally nourished children. This

indicates that by the time these children were referred or brought to hospital, they were already severely compromised, with complications present such as bronchopneumonia. Ideally these children should have been picked up earlier at the clinics, and intervention started.

4.0.4.2 Prevention of malnutrition

For better prevention of malnutrition in young children, it is desirable that:

- (a) The currently widespread custom of mothers breast feeding until well into the second or third year be reinforced and encouraged through such means as posters in clinics, talks to ante natal mothers and positive reinforcement during consultations, particularly with community health workers, as growth of rural African infants has been shown to be related to levels of breast milk intake (Armar-Klimesu et al 1991) and that community health workers can be used effectively to increase breast feeding (Davies-Adetugbo et al 1997). Local, community-based research is needed into cultural beliefs about exclusive breast feeding, initiation and duration of breast feeding and value of colostrum, as these may be in conflict with WHO guidelines, and in need of educational input (Davies-Adetugbo et al 1997).
- (b) Mothers be encouraged by clinic sisters, community health workers and other health workers to introduce effective weaning foods such as maize porridge fortified with oil and ground peanuts at the right time.
- (c) School children be taught the basics of nutrition and agricultural techniques as part of their curriculum. School health services should be active in modifying children's diets, improving sanitation and personal hygiene and building awareness of nutritional problems in children.
- (d) There be investment and job creation in the area so as to provide families with much needed hard cash.

4.0.4.3 Early detection of malnutrition at clinics

For effective early detection of malnutrition at clinics, it is necessary that:

- (a) Children be weighed and their weight plotted on their child health card growth chart at every visit.
- (b) Children visit well-baby or under five clinics regularly - at least monthly for the first 2 years.
- (c) Staff be aware of and sensitive to the presenting clinical signs of malnutrition, and the need to refer cases of severe malnutrition early for admission. In particular, health care workers need to be looking out for children from high risk families or communities, such as those with poor

access to resources, little or no money, little parental education, under extreme social pressures and those from very isolated rural areas.

4.0.4.4 General management of malnutrition

For better management of malnourished children generally, it is necessary that:

- (a) A reliable source of food supplements be present to help destitute parents and their children during times of extreme need e.g. the winter dry period, to "tide them over" while more sustainable solutions are sought.
- (b) That outpatient nutrition rehabilitation units be established at both the hospital and the four residential clinics in order to relieve pressure on the paediatric ward at the hospital, and so that more intensive care can be given to children who are severely malnourished e.g. those with kwashiorkor.
- (c) A reliable system of follow-up for children with malnutrition after discharge from a rehabilitation unit be established. To some extent, the community health workers fulfil this role, but they are not present in all areas. All health workers, including doctors, nurses and community health workers need periodic retraining and updating about malnutrition and its management and complications e.g. urinary tract infections.

Infections and inadequate care, and stimulation as factors contributing to malnutrition deserve attention - the interventions of essential health care and catch up feeding after illness are important primary health care activities.

4.0.5 Area of origin of patients

A seemingly disproportionate number of patients came from the areas along the Pongola River flood plain. Unfortunately this could not be confirmed as actual population figures for the areas are not available and if available are likely to be inaccurate. It does seem though, that more attention needs to be focused on these areas. Since the time of the study, the hospital management and community health department have succeeded in upgrading some of the mobile stopping points in the areas, but more needs to be done.

4.0.6 Malaria

This was obviously a major paediatric health problem in the area, with 216 children admitted and a mortality rate of 0.9%. Since the time of the study, the hospital, in 1995-1996, has experienced another epidemic, worse than that of 1993. The following recommendations are made regarding what can or should be done:

4.0.6.1 Local knowledge of the disease

A study of the local population's knowledge of malaria and its treatment might be useful. If it could be established that the disease is generally known to be spread by mosquito bites, then the introduction of impregnated bed nets might be feasible (Julvez et al 1995).

4.0.6.2 Diagnosis and initiation of malaria treatment

Diagnostic facilities and treatment for positive cases should be available at as many health facilities as possible. To start with they should be established at the four residential clinics - at the time of the study they only existed at kwaNdaba clinic. A microscopist attached to the mobile clinic and under five team would perhaps be impractical as these teams only visit most areas once in two weeks or once a month. However, there is no reason why the mobile teams should not carry stocks of ParaSight tests for rapid diagnosis of suspected cases.

4.0.6.3 Definitive treatment and management of complications

All clinic and primary health care staff need ongoing training in the early recognition, danger signs and management of suspected malaria victims. Treatment of uncomplicated cases should be at clinic level, or even at household level by trained community health workers. This would make the treatment far more acceptable to the population at risk, and alleviate the yearly transport, Outpatient Department and bed crisis at the hospital. The PHC protocols might be changed to state that all children with suspected complicated malaria (i.e. convulsing, unconscious, lethargic, unable to drink or breast feed, or vomiting) should be given intramuscular quinine, sugar water and paracetamol before referral.

4.0.6.4 Malaria prophylaxis for pregnant women

Antenatal clinics should include in their health education talks roster education on malaria prophylaxis.

4.0.6.5 Home treatment

Those families living in remote areas of the health ward where health services are either non-existent or inaccessible could be encouraged to keep supplies of antimalarials (e.g. chloroquine syrup) and educated in the correct dosages of the drugs, the need to bring back expired drugs, and the various generic names of antimalarial drugs. Drugs need to be available at clinics for such families to collect when needed, not just when someone has a fever. It would also be helpful to know whether the local population uses herbal or other remedies for malaria, and if so what, and from whom they obtain them (shops, private vendors, traditional healers, etc.).

4.0.6.6 Mosquito repellents

Mosquito repellents, insecticide-impregnated bed-nets, door and window screening, protective clothing and nets for infants' cots should be available for purchase at shops and health care facilities, at subsidised prices, and the population should be educated regarding the potential benefits of their use. A campaign to educate school children in the matter could be held.

4.0.6.7 Geographical areas to concentrate on

Within the Manguzi Health Ward, it is clear that most effort should be concentrated on the areas along the Pongola River, since 60.6% of the cases in the study came from these areas.

4.0.6.8 Extra nursing and medical staff

As noted in the results section, the 2 malaria fatalities occurred in March and May, which were busy months, with average admissions per day of 4.2 and 6.3 patients respectively. This may have affected the standards of nursing and medical care patients received in the ward.

4.0.7 Pneumonia

Pneumonia was a frequent diagnosis (329 of 1261 children, or 26.1%), and had an appreciable mortality rate (7.6%). The following recommendations are made regarding how these admissions and deaths could have been prevented:

4.0.7.1 Diagnosis and management protocols

Those working in the primary care situation, including all mothers, need to be reminded about how to assess the severity of an acute respiratory infection (ARI) using the respiratory rate, stridor

when calm, and presence of recession as criteria, and what management is appropriate for each category, in particular when to refer to hospital.

4.0.7.2 Backup

Attention must be paid to factors which have been shown to hinder the use of standard ARI case management at clinics, i.e. supervision must be adequate, essential drugs and equipment must be available, patient loads of health workers must be realistic, senior health workers should set a good example, and health workers should be regularly encouraged and motivated. If one accepts that about one in ten children with ARI have severe disease and half of those need urgent referral to hospital (Sow et al 1995), then clearly there must be a reliable, functioning transport system if deaths are to be prevented.

4.0.7.3 Surveys

Hospital management or community health department management may wish to use the WHO survey to find out how well standard ARI management is being put into practice at the various health care facilities in the health ward (including Outpatient Department). It might also be useful to know whether child care patterns in the community are changing and thus exposing young children to more infections and increasing the risk of respiratory disease.

4.0.7.4 Home management of ARI's

It has been found elsewhere that health damaging traditional practices for the management of pneumonia are widespread in rural areas (Teka and Dagnew 1995). Mothers need ongoing education regarding correct supportive home measures for children with ARI's i.e. continuing breast feeding, ensuring adequate hydration, use of antipyretic medication, clearing the air passages and ear discharges, and postural drainage. This could best be given at ante natal clinics and at the health education talks given at well-baby clinics. Valid reasons why mothers delay or fail to take their children with ARI's to a health centre must be sought and addressed e.g. cost involved and attitude of health care workers (Amofah et al 1995).

4.0.7.5 Immunisation

Good immunisation coverage is vital to the control of ARI's, particularly against measles, tuberculosis, diphtheria and pertussis.

4.0.7.6 Other measures

Combating malnutrition, supplementing children with Vitamin A, discouraging cigarette smoking and the use of smoky indoor cooking fires will all help to lower the incidence of ARI's. Deaths from ARI's have been reduced by using community health workers to disseminate health education, immunisation and antibiotics for children with signs suggesting pneumonia (Pandey et al 1989).

4.0.8 Diarrhoeal disease

Diarrhoeal disease was a recorded diagnosis in 200 admissions, i.e. 15.9% of those admitted either had or developed diarrhoeal disease. 10.0% of these died. Could these admissions and deaths have been prevented? The following recommendations are made:

4.0.8.1 Primary health measures

General primary health measures such as encouraging breast feeding (Davies-Adetugbó et al 1997), discouraging bottle feeding, proper weaning practices, provision of clean water in adequate quantities, education concerning personal hygiene, provision and use of latrines, disposal of babies' stools, removal of hazards such as unprotected food, faeces, animals and unprotected pit latrines from the children's environment, improved parental education, limitation of household size, immunization and possibly lengthening of birth intervals are all important. Many of these are currently undertaken by the *onompilo* or community health workers, and they should be encouraged to persevere in their tasks. Again, studies of local beliefs about diarrhoea, its causes and management and such activities as hand washing might be useful in planning education campaigns.

4.0.8.2 Education

Every mother should be educated in the prevention of diarrhoeal disease, and dehydration and malnutrition resulting from diarrhoeal disease. Again this is and can best be done by the *onompilo*. It was shown in Pakistan that mothers who perceived diarrhoeal disease as life threatening were more likely to use ORS (Malik et al 1992). It has also been shown that use of ORS is related to availability of maternal time and mother's position in the household. Changing the parameters would necessitate more fundamental sociological changes.

4.0.8.3 Supply of oral rehydration solution

Every mother should have in her possession 2 packets of Sorol (oral rehydration solution powder) and know how to use it. This task could best be undertaken by the clinics, both residential and mobile, with the help of the *onompilo*.

4.0.8.4 Diagnosis and management protocols

All primary health care workers need regular reminding of the correct way to assess and treat dehydration. Use of a standard chart is encouraged. The hospital and clinics currently use the "green, yellow and red" chart used at King Edward Hospital, Durban. Of particular importance is recognition of the danger signs indicating severe dehydration and the need for urgent attention.

4.0.8.5 Rehydration rooms

Every clinic, and the hospital Outpatient Department, should have an oral/nasogastric rehydration room which is open 24 hours a day.

4.0.8.6 Alternatives to oral rehydration solution

Research into locally available alternatives to Sorol and sugar-salt solution, especially traditional remedies for diarrhoeal disease might be helpful. It would also be useful to know what proprietary remedies are being used so that the vendors could be approached to rather stock ORS.

4.0.9 Anaemia

4.0.9.1 Prevalence and causes

33.8% of children discharged had an (additional) diagnosis of anaemia, making it one of the commonest diagnoses recorded. 2.1% of these died. As mentioned, the high number of children with anaemia was due partly to the malaria epidemic, which has been addressed above. The rest of the cases were due either to nutritional deficiency (see above), or parasite infection (hookworm, *Trichuris trichuria*, and bilharzia), which are addressed below.

4.0.9.2 Prevention

Some of the cases of iron deficiency anaemia could probably have been prevented by supplementation distribution programme, as recommended by the South African Vitamin A Consultative Group (SAVACG): all children aged 6-23 months, all children who have been ill, and

all those between 24 and 71 months with low haemoglobin values should be given iron sulphate. This could be given daily or weekly in the appropriate dose. It has been shown that clinical findings are sensitive but not specific for detecting severe anaemia (haemoglobin less than 5grams/dl): community health workers could be trained to look for pallor and refer suspected children to clinics (Luby et al 1995).

4.0.10 Bilharzia

Only 29, or 2.3% of children admitted had bilharzia ova on urine microscopy, but the figure was undoubtedly higher, as it was only routinely screened for in children with malnutrition or diarrhoeal disease. The following recommendations are made as to how the prevalence of bilharzia in children in the health ward could be reduced:

4.0.10.1 Water protection

Bilharzia infested water in the health ward should, if possible, be fenced to prevent swimming, washing, etc. This is probably not practical, as the pans are numerous and sometimes large, and fencing would in any case not prevent access. Also, the cattle need to get to the water.

4.0.10.2 Safe water and latrines

General primary health measures such as provision of proper latrines, clean water supplies, etc. are important.

4.0.10.3 Mass treatment

Mass treatment with praziquantel would probably not reduce the prevalence of bilharzia, but would reduce morbidity - it has been shown that the incidence of macroscopic haematuria can be reduced by 94.2% (Savioli et al 1989). It is suggested that school children with positive urine "dipstick" test for blood be treated and the programme repeated every 6 months. Treatment should be freely available at all clinics (el Katsha and Watts 1995; el Katsha and Watts 1997), preferably from all community health workers. This obviously raises budgetary issues: at the time of the study, praziquantel was only available on prescription by a medical officer, and even then supplies were limited and frequently ran out. Other countries have been able to obtain much cheaper generic praziquantel.

4.0.10.4 Snail control

Snail control is a possibility, but would require thorough research and adequate funding prior to implementation.

4.0.10.5 Dietary supplements

It has been suggested that zinc supplementation may lower the prevalence of *S. mansoni* (Friis et al 1997), so it seems reasonable that nutritional rehabilitation programs, school feeding schemes and nutritional support programs in areas where *S. mansoni* is endemic should include zinc supplementation.

4.0.11 Intestinal parasites

10.9% of admissions had worms as an additional discharge diagnosis. Again this is undoubtedly an underestimate, as stool microscopy was only done routinely on children suffering from malnutrition or diarrhoeal disease.

The following recommendations are made as to how the prevalence of intestinal parasites in children in the health ward could be reduced:

4.0.11.1 General measures

General primary health measures such as effective waste disposal, safe and sufficient water supplies, improved living conditions, and providing education on the causes, symptoms and signs, and treatment of common parasite infections are important.

4.0.11.2 Mass treatment

Mass administration of appropriate chemotherapy at regular intervals. This can best be done at schools. For example, a single dose of mebendazole 500mg orally given once every 4 months. These drugs could best be distributed by community health workers, as has been the case in Nigeria (Onadeko and Lapido 1989).

4.0.11.3 Foot protection

Children, and indeed all people, need to be encouraged to wear shoes to prevent infection with *strongyloides* and hookworm.

4.0.12 Tuberculosis

49 children, or 4% of admissions were discharged with tuberculosis as one of their diagnoses. 1 died. All of these cases were in theory preventable. The following suggestions are made as to how the incidence of TB in children in the health ward could be reduced:

4.0.12.1 BCG

Attention to BCG vaccination of all new-born babies. This is done routinely at the hospital and clinics, but many children are born at home, and not all are subsequently taken to the clinic for immunization. The *onompilo* are of particular importance in this regard, as they keep registers of all births in their areas.

4.0.12.2 Contact tracing

Contact tracing, particularly children born to smear-positive mothers. A study in another rural area of South Africa has found case-finding, (along with information collection, case-holding, health education and program co-ordination and supervision) to be a particularly problematic area (Lee and Price 1995).

4.0.12.3 Backup

A properly functioning health service is essential for TB control i.e. good management, diagnostic facilities, trained staff, regular drug supplies, adequate funding. Some of these are already in place. The use of community health workers for screening and testing for TB has been associated with high acceptance rates and cure rates, and low death rates, relapse rates and dropout rates in Bangladesh (Chowdury et al 1997).

4.0.12.4 General measures

General primary health measures such as prevention of overcrowding, adequate nutrition, etc. are important.

4.0.12.5 Education

Community education programmes to encourage early presentation and compliance with treatment.

4.0.13 Burns

Burns made up 4.9% of the admissions, and had a mortality rate of 0%, though the morbidity rate was naturally much higher. A study in rural Ghana found that six percent of children aged five or less had burn scars and the authors concluded that childhood burns were a significant health problem in that community (Forjuoh et al 1995). The following recommendations are made regarding how these problems might have been prevented through better primary health care:

4.0.13.1 General measures

General primary health measures such as provision of better housing and electricity, and discouraging overcrowding are important.

4.0.13.2 Education of mothers

All mothers and primary health care workers need to be reminded regularly about correct first aid measures to apply to a burnt child.

4.0.13.3 Education of the public

Education campaigns are necessary to alert people to the dangers of hot household substances, matches and flammable liquids being within reach of children, and of allowing children near open fires. Community health workers could play an important role here, and the mass media could be profitably used.

4.0.14 Conclusions and recommendations

The following general recommendations are made regarding ways in which the provision of primary health care to the paediatric population of the health ward as a whole might be improved:

4.0.14.1 Communication

There needs to be more feedback on children referred in from clinics and admitted in the hospital to the providers of primary health care at the clinics. Doctors are notoriously bad at writing letters of reply, but even a summary on the patient carried card when the child is discharged is useful. During the time of the study, clinic staff came into the hospital on one afternoon every month for in-service training. These sessions need perhaps to be weekly or two-weekly, staff problems notwithstanding.

4.0.14.2 Better availability

Primary health care needs to be made more available. With the exception of those areas close to one of the four residential clinics or the hospital, most children in the health ward have to rely on a mobile service which might visit once in two weeks or once a month. This is clearly inadequate for acute problems such as malaria and ARI's. More clinics need to be built and more posts approved as a matter of urgency.

4.0.14.3 Logistical backup

The supply of functional equipment, drugs and materials to the clinics could be improved. The situation where essential drugs, such as penicillin syrup, are simply "out of stock" at clinics is unacceptable, yet it happens not infrequently.

4.0.14.4 Autonomy of primary care services

It would probably be better if the primary health care service were financially autonomous and independent of the hospital, with its own ambulance service, management structures, maintenance department, etc. However, this is not always practical in smaller hospitals.

4.0.14.5 Accelerated training and improved service incentives for primary care nurse practitioners

There is a dire need for more PHC-trained registered nurses to work in the clinics. In this regard it would greatly help if the province provided some incentive(s), such as extra pay, a shoulder bar, etc. At present less than 25 PHC-nurses are trained annually for the whole province!

4.0.14.6 Improved child health services at clinics

There is room for improvement in the quality of child health services rendered at clinics, e.g.:

- 1) Offer comprehensive services every day, including a 24 hours emergency service.
- 2) Adequate supplies of Road to Health cards, and weighing/charting at every visit.
- 3) Consultation with sister to include check on immunisation status, and brief developmental assessment.
- 4) Availability of subsidised food and/or milk for issue/ sale at clinics.
- 5) Educational talks, discussions and demonstrations could be made more interesting and relevant.

- 6) A system to prioritise children waiting to be seen, to make sure that the seriously ill are seen first. All staff need to be reminded of the danger signs which suggest that a child is severely ill and needs urgent attention, e.g. convulsions, lethargy, inability to drink, vomiting, etc.
- 7) An observation area at each clinic where e.g. oral rehydration could be undertaken while a decision is made whether or not to refer.

It must be added that some of these are already partially in place, or have been improved since the time of the study, largely through the efforts of the present superintendent of Manguzi Hospital, Dr. ID Couper.

The estimated cost of upgrading community primary health care should be compared with the costs of potentially avoidable hospital management. Duration of hospital stay recorded in this study could contribute to such an analysis. In addition, important non-financial factors deserve consideration, for example, family stress and inconvenience, and the impact of hospitalization on young children.

Appendix 1: Figures

Figure 3.1: Number of children admitted by month

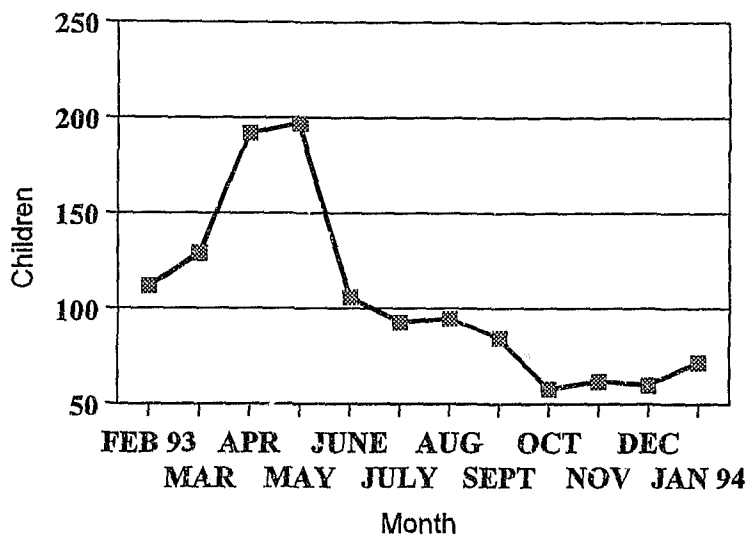


Figure 3.2: Admissions with malaria by month

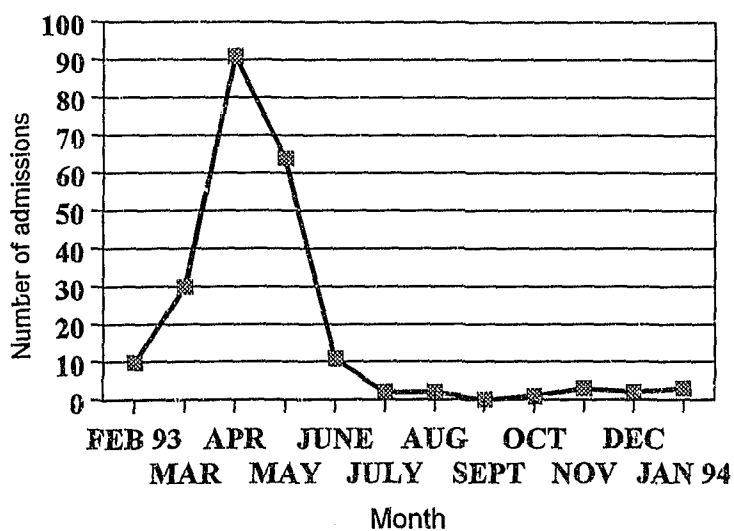


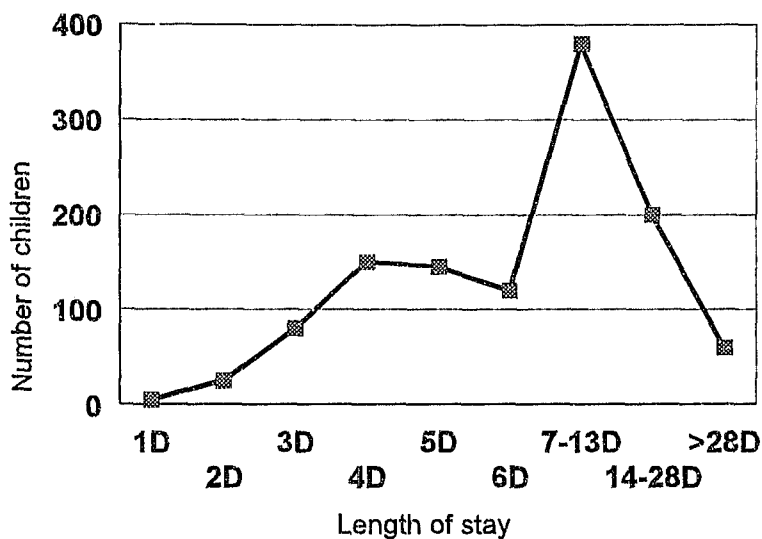
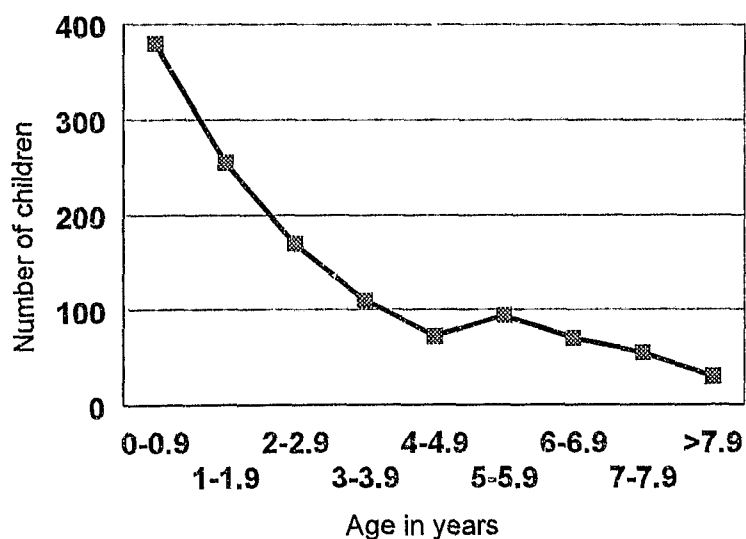
Figure 3.3: Length of stay in the ward**Figure 3.4: Age of patients admitted to paediatric ward**

Figure 3.5: Outcome of admissions

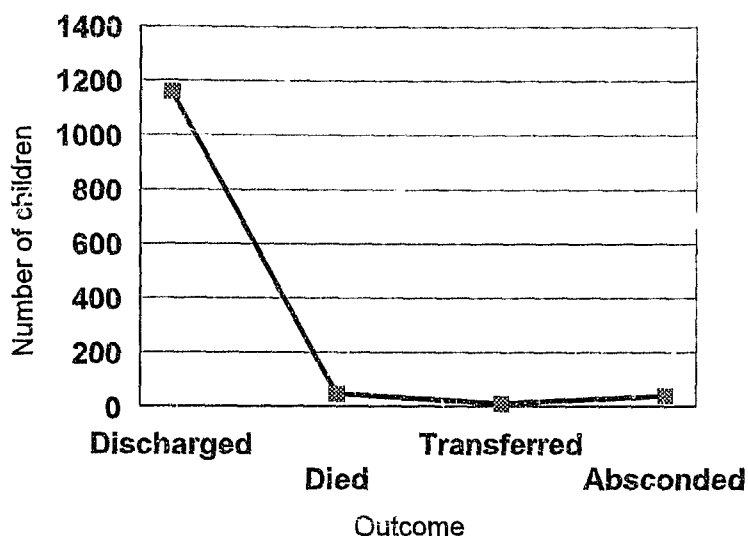


Figure 3.6: Nutritional status of children admitted by month

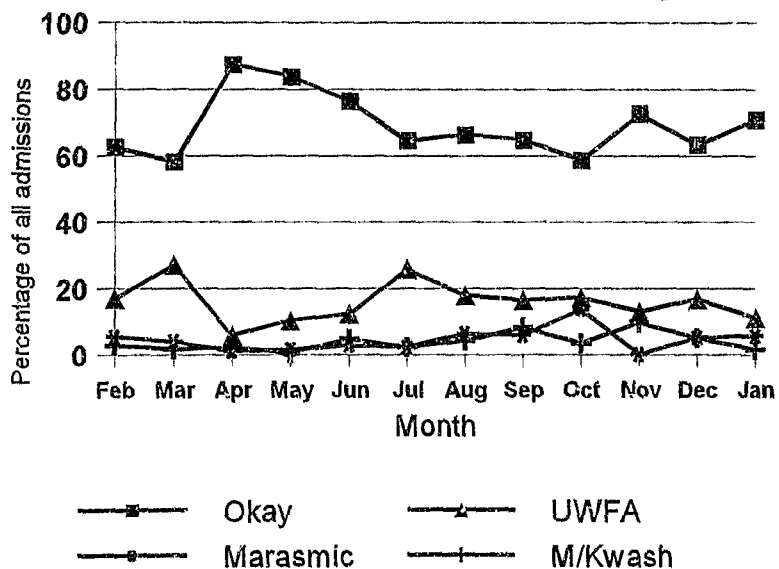


Figure 3.7: Outcome for each nutritional category

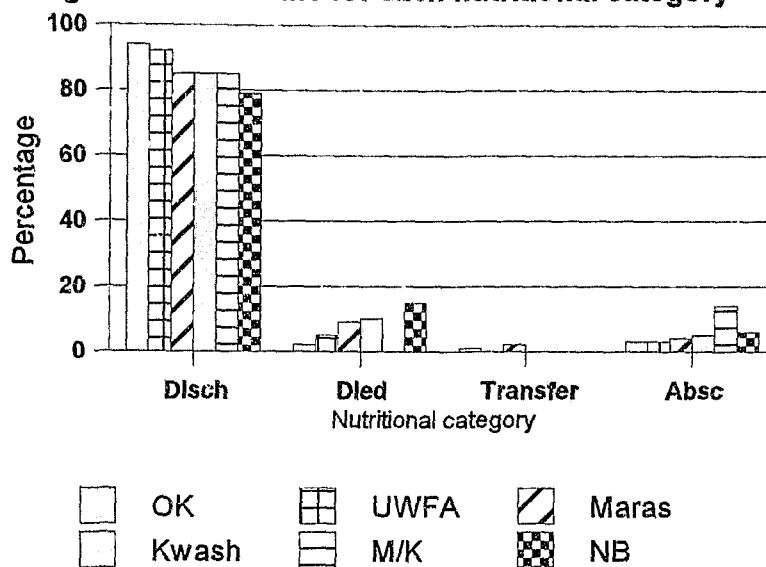


Figure 3.8: Area of origin

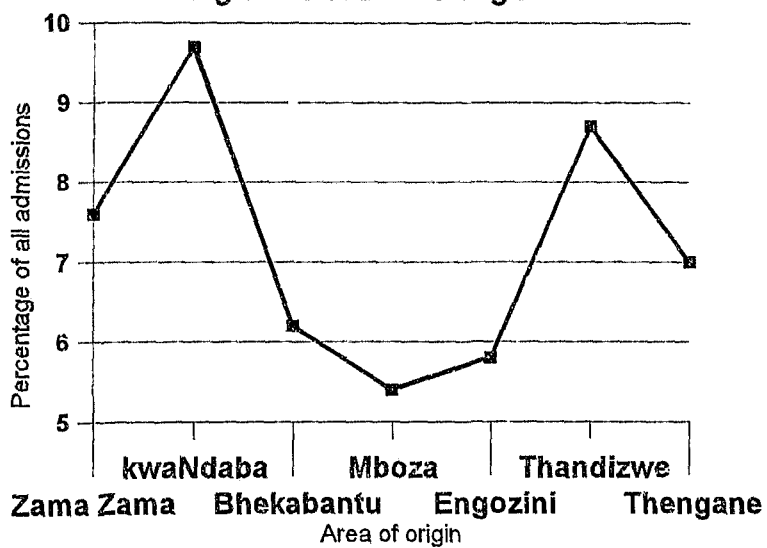


Figure 3.9: Area of origin of children diagnosed with malaria

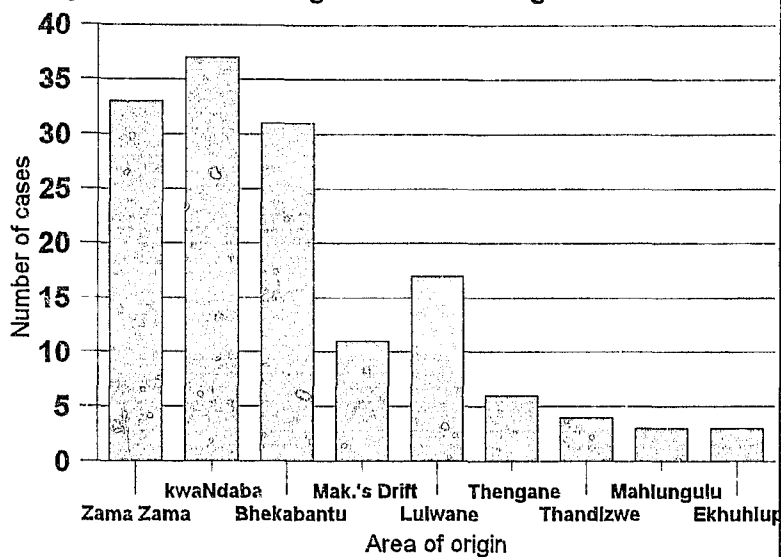


Figure 3.10: Frequency by month of children with pneumonia

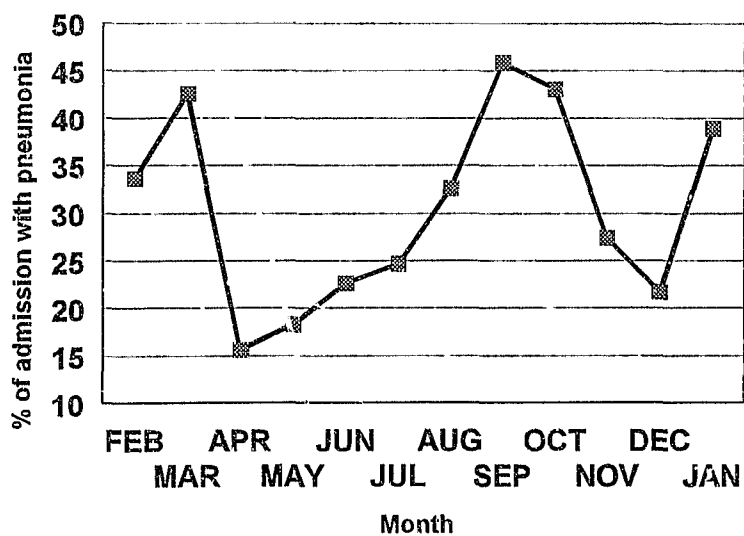


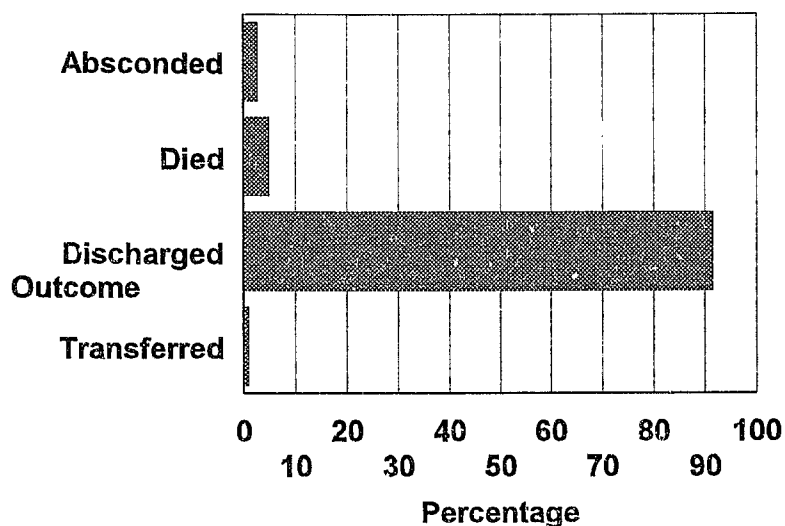
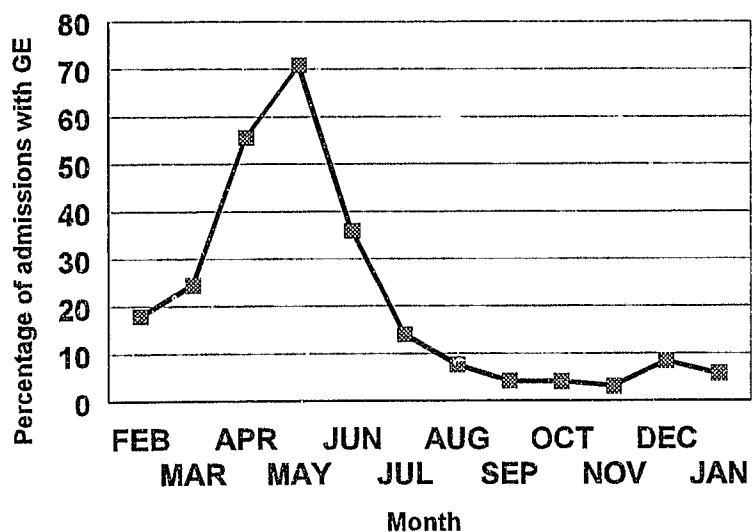
Figure 3.11: Outcome of children with pneumonia**Figure 3.12: Frequency by month of children with GE**

Figure 3.13: Fatality rates by month of children with GE

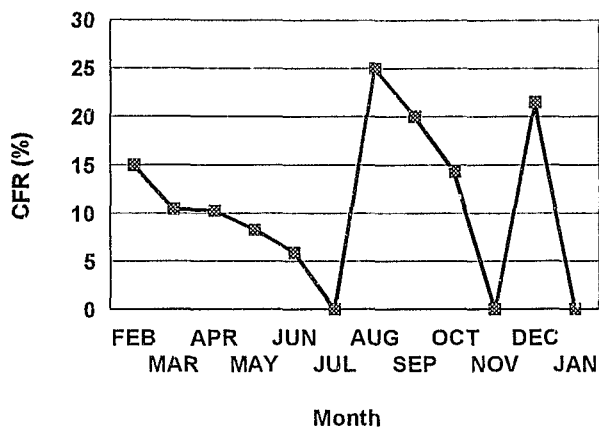


Figure 3.14: Frequency by month of children with anaemia.

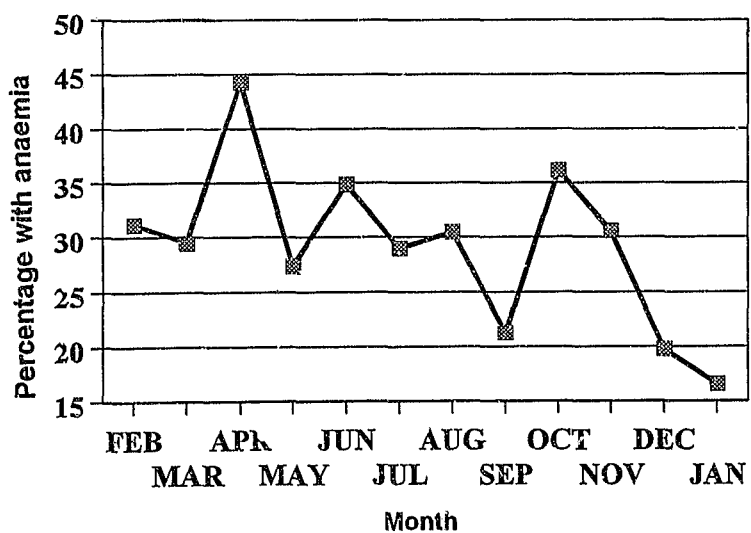


Figure 3.15: Frequency of bilharzia by month

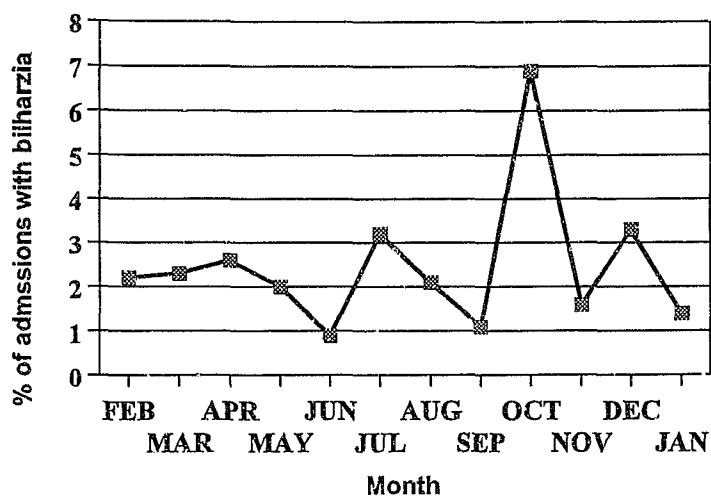


Figure 3.16: Frequency of diagnosis of worm infection by month

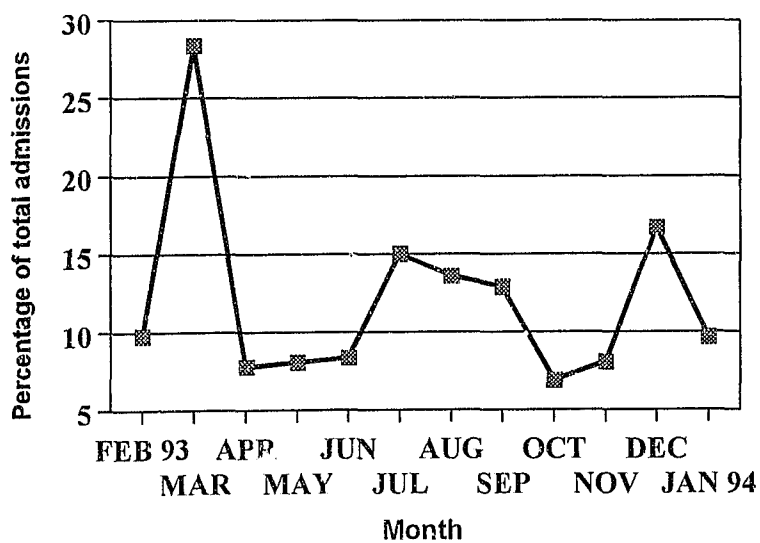
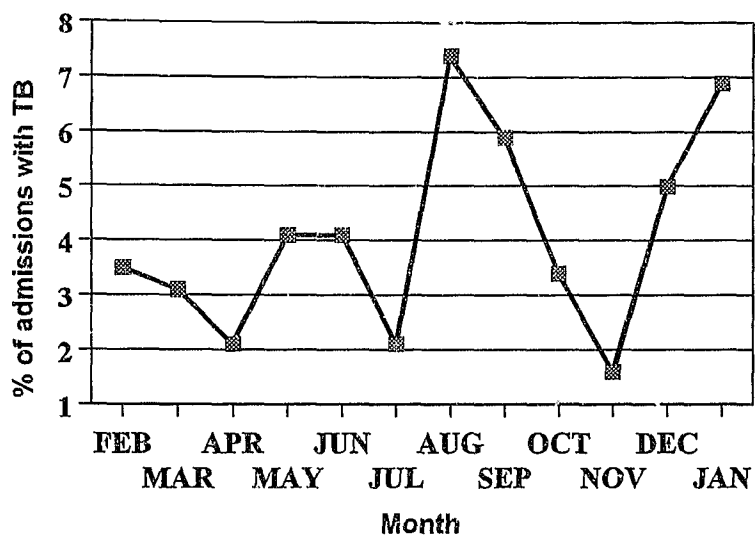
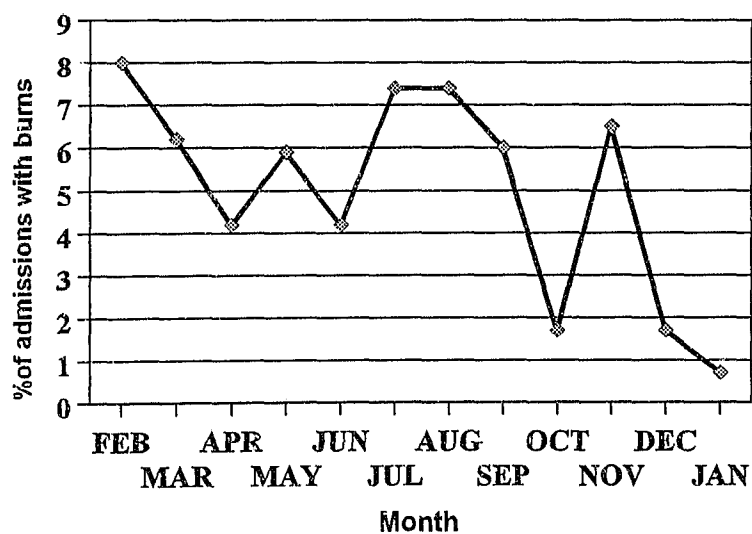


Figure 3.17: Incidence of pulmonary tuberculosis**Figure 3.18: Incidence of burns by month**

REFERENCES

- Ahmad OB; Eberstein IW; Sly DF. Proximate determinants of child mortality in Liberia. *J Biosoc Sci* 1991 Jul;23(3):313-26.
- Ahmed MF. Infant mortality in Bangladesh: a review of recent evidence. *J Biosoc Sci* 1991 Jul;23(3):327-36.
- Aikins MK; Mills A; Greenwood B; Bennett S; New L; Cham K; Langerock P; D'Alessandro U; Fox-Rushby J. The Gambian National Impregnated Bed net Program: costs, consequences and net cost-effectiveness. *Soc Sci Med* 1998 Jan;46(2):181-91.
- Amin R. Immunization coverage and child mortality in two rural districts of Sierra Leone. *Soc Sci Med* 1996 Jun;42(11):1599-604.
- Amofah GK; Oduro J; Opoku SA; Essegbey IT. Intended response of caretakers of pre-school children to acute respiratory infection in a rural district in Ghana. *East Afr Med J* 1995 Oct; 72 (10):619-22.
- Armar-Klemesu MA; Wheeler EF; Brakohiapa LA; Yamamoto S. Infant feeding and growth in rural Ghana: is the use of the traditional fermented porridge a case for early supplementation? *J Trop Pediatr* 1991 Jun;37(3):111-5.
- Awate RV; Somaiya PA; Ketkar YA. Prevalence of nutritional deficiency disorders among rural primary school children (5-15 years). *J Indian Med Assoc* 1997 Jul;95(7):410-1, 415.
- Barzgar MA; Bile MK; Sheikh MR. Female health workers boost primary care. *World Health Forum* 1997;18(2):202-10.
- Beracochea E; Thomason J; Freeman P; Dickson R. Case management quality assessment in rural areas of Papua New Guinea. *Trop Doct* 1995 Apr;25(2):69-74.
- Binka FN; Smith PG; Adiamah JH; Kajihara B; Armah GE; Maude GH; Lengeler C; Williams LA; Adjuk M; Kubaje A. Impact of permethrin impregnated bed nets on child mortality in Kassena-Nankana district, Ghana: a randomized controlled trial. *Trop Med Int Health* 1996 Apr;1(2):147-54.
- Cameron FJ; Debelle GD. Nutrition of aboriginal infants and children in the Murray Valley. *Med J Aust* 1986 Jun 23;144 Suppl:S5-8.
- Casterline JB; Cooksey EC; Ismail AF. Infant and child mortality in rural Egypt. *J Biosoc Sci* 1992 Apr;24(2):245-60.
- Chandiwana SK; Christensen NO. Analysis of the dynamics of transmission of human schistosomiasis in the highveld region of Zimbabwe. A review. *Trop Med Parasitol* 1988 Sep;39(3):187-93.
- Chavasse D; Akhtar T; Ahmad N. Scope for fly control as a diarrhoea intervention in Pakistan: a community perspective. *Soc Sci Med* 1996 Oct;43(8):1289-94.

- Chowdhury AM; Vaughan JP; Islam A; Islam MN; Chowdhury S. Control of tuberculosis by community health workers in Bangladesh. *Lancet* 1997 Jul 19;350(9072):169-72.
- Cosminsky S; Mhloyi M; Ewbank D. Child feeding practices in a rural area of Zimbabwe. *Soc Sci Med* 1993 Apr;36(7):937-47.
- Curtale F; Guerra R; LaRaja M; Lagrosa C; Siwakoti B. Improving skills and utilization of community health volunteers in Nepal. *Soc Sci Med* 1995 Apr;40(8):1117-25.
- Davies-Adetugbo AA; Adebawa HA. The Ife South Breast feeding Project: training community health extension workers to promote and manage breast feeding in rural communities. *Bull World Health Organ* 1997;75(4):323-32.
- Davies-Adetugbo AA; Fabiyi AK; Orewole Y; Adetugbo K. Breast-feeding promotion in a diarrhoea program in rural communities. *J Diarrhoeal Dis Res* 1997 Sep;15(3):161-67.
- Davies-Adetugbo AA. Sociocultural factors and the promotion of exclusive breast feeding in rural Yoruba communities of Osun State, Nigeria. *Soc Sci Med* 1997 Jul;45(1):113-25.
- Den Besten L; Walker AR; Glatthaar II; Bac M. Changes in the anthropometric status of rural African under-fives during a decade of primary health care. *J Trop Med Hyg* 1995 Dec;98(6):361-6.
- Dyer JJ; Robinson A; Munro G; Mjekevu T; Knight S; Naidoo KN. Effect of an Immunisation campaign in Natal and KwaZulu on coverage rates, 1990-1991. *S Afr Med J* 1996 Feb;86(2):158-61.
- el Katsha S; Watts S. Schistosomiasis control through rural health units. *World Health Forum* 1995;16(3):252-4.
- el Katsha S; Watts S. Schistosomiasis in two Nile delta villages: an anthropological perspective. *Trop Med Int Health* 1997 Sep;2(9):846-54.
- Forjuoh SN; Guyer B; Smith GS; Diener-West M; Keyl PM. Prevalence and age-specific incidence of burns in Ghanaian children. *J Trop Pediatr* 1995 Oct;41(5):273-7.
- Friis H; Christensen NC; Vennervald BJ; Michaelsen KF; Sandstrom B; Kaondera K; Mduluza T; Ndhlovu P. The impact of zinc supplementation on *Schistosoma mansoni* reinfection rate and intensities: a randomized, controlled trial among rural Zimbabwean schoolchildren. *Eur J Clin Nutr* 1997 Jan;51(1):33-7.
- Ghebreyesus TA; Teklehaimanot A; Witten KH; Bosman A; Alemayehu T. Community participation in malaria control in Tigray region, Ethiopia. *Acta Trop* 1996 Apr;61(2):145-56.
- Gorter AC; Smith GD; Sandiford P; Perez RM; Pauw J; Sanchez G. [Childhood diarrhea in rural Nicaragua: beliefs and traditional practices]. *Bol Oficina Sanit Panam* 1995 Nov;119(5):377-90.

- Greenwood BM; Oldfield FS; Hayes R; Tulloch S; Bradley AK; Greenwood AM. Deaths in infancy and early childhood in a well-vaccinated, rural, West African population. *Ann Trop Paediatr* 1987 Jun;7(2):91-9.
- Hesketh T; Zhu WX. Maternal and child health in China. *BMJ* 1997 Jun 28; 314 (7098): 1898-900.
- Ibrahim MM; Persson LA; Wall S; Omar HM; Aden AS. Diarrhoea among children in rural Somalia. Maternal perceptions, management and mortality. *Ann Trop Paediatr* 1994;14(3):215-22.
- Jaffar S; Greenwood BM; Obaro S; Bojang K; Ota MO Muller O; Jepson A; Greenwood AM; Leach A. Changes in the pattern of infant and childhood mortality in upper river division, The Gambia, from 1989 to 1993. *Trop Med Int Health* 1997 Jan;2(1):28-37.
- Julvez J; Alarou A; Nouhou A; Boubacar A; Hamidine M. [Malaria knowledge and practice. Medical study in Songhay-Zarma (Niger)]. *Sante* 1995 Sep-Oct;5(5):307-13.
- Kaltenthaler EC; Drasar BS. Understanding of hygiene behavior and diarrhoea in two villages in Botswana. *J Diarrhoeal Dis Res* 1996 Jun;14(2):75-80.
- Kapoor SK; Mullick AK; Sharmanna BR; Anand K. Time utilisation pattern of staff of two primary health centers in Ballavgarh, Haryana. *Indian J Public Health* 1996 Oct-Dec;40(4):112-9.
- Karungula J. Measures to reduce the infant mortality rate in Tanzania. *Int J Nurs Stud* 1992 May;29(2):113-7.
- Kauffman KS; Myers DH. The changing role of village health volunteers in northeast Thailand: an ethnographic field study. *Int J Nurs Stud* 1997 Aug;34(4):249-55.
- Kimerling ME; Goubert L; Hilderbrand K; Houth H. Identifying malaria control issues: a district hospital-based evaluation. *Southeast Asian J Trop Med Public Health* 1995 Dec;26(4):611-9.
- Knobel HH; Ho MS; Yang WS. Urban-rural and regional differences in infant mortality in Taiwan. *Soc Sci Med* 1994 Sep;39(6):815-22.
- Kolstad PR; Black RE; Kenya-Mugisha N; Kalter HD Burnham G. The integrated management of childhood illness in western Uganda. *Bull World Health Organ* 1997;75 Suppl 1:77-85
- Krause G; Diesfeld HJ; Ilboudo A; Diasso I; Coulibaly S; Ouattara K; Heinmuller R; Benzler J; Borchert M; Schleiermacher D. Diagnostic quality in rural health centers in Burkina Faso. *Trop Med Int Health* 1998 Feb;3(2):100-7.
- Lee T; Price M. Indicators and research methods for rapid assessment of a tuberculosis control program: case study of a rural area in South Africa. *Tuber Lung Dis* 1995 Oct;76(5):441-9 27.

- Loevinsohn BP; Loevinsohn ME. Improvement in coverage of primary health care in a developing country through use of food incentives. *Lancet* 1986 Jun 7;1(8493):1314-6.
- Luby SP; Olivar MA; Wirima JJ; Chitsulo L; Franco C; Hightower AW; Nwanyanwu OC; Ziba C; Redd SC; Kazembe PN. Using clinical signs to diagnose anemia in African children. *Bull World Health Organ* 1995;73(4):477-82.
- Maclure R. Primary health care and donor dependency: a case study of nongovernment assistance in Burkina Faso. *Int J Health Serv* 1995;25(3):539-58.
- Magnani RJ; Tankari K; Mercer DM; Abdoh AA; Mock NB Rice JC. The impact of primary health care services on under-five mortality in rural Niger. *Int J Epidemiol* 1996 Jun;25(3):568-77.
- Mahaluxmivala S; Fadaak H; Mathur A; Borkar A. A retrospective study of etiopathological and preventive factors in a burns unit in Saudi Arabia. *Burns* 1997 Jun;23(4):333-7.
- Mahfouz AA; al-Amari OM; al-Erian RA; Abdel-Moneim M. Impact of chlorination of water in domestic storage tanks on childhood diarrhoea: a community trial in the rural areas of Saudi Arabia. *J Trop Med Hyg* 1995 Apr;98(2):126-30.
- Malik IA; Bukhtiar N; Good MJ; Iqbal M; Azim S; Nawaz M; Ashraf L; Bhatti R; Ahmed A. Mothers' fear of child death due to acute diarrhoea: a study in urban and rural communities in northern Punjab, Pakistan. *Soc Sci Med* 1992 Oct;35(8):1043-53.
- Manun'ebbo MN; Kirkwood BR; Ashworth A; Kalengaie M; Haggerty PA. Influence of demographic, socioeconomic and environmental variables on childhood diarrhoea in a rural area of Zaire. *J Trop Med Hyg* 1994 Feb;97(1):31-8.
- Melville B; Mullings J; Bernard E; Mehan D; Fidler T. Growth monitoring: the role of community health volunteers. *Public Health* 1995 Mar;109(2):111-6.
- Messou E; Guelain J; Le Corre C; Josseran R; Sangare SV. [Effect of hygiene measures, water sanitation and oral rehydration therapy on diarrhea in children less than five years old in the south of Ivory Coast]. *Bull Soc Pathol Exot* 1997;90(1):44-7.
- Messou E; Guelain J; Le Corre C; Josseran R; Sangare SV. [Impact of improved sanitary conditions and domestic hygiene on the incidence of ascariasis and ancylostomiasis in children two to four years old in the rural zones of Ivory Coast]. *Bull Soc Pathol Exot* 1997;90(1):48-50.
- Myaux JA; de Francisco A; Khan EH; Yunus M; Chakraborty J. The effects of health services utilization on the recovery from dysentery. *J Trop Pediatr* 1996 Feb;42(1):38-42.
- Nevill CG; Snow RW; Lengeler C; Marsh K; New L; W; Mung'ala VO; Some ES. Impregnated bed nets reduce mortality and severe morbidity from malaria among children on the Kenyan coast. *Trop Med Int Health* 1996 Apr;1(2):139-46.
- O'Rourke K; Seoane G; Howard-Grabman L. Impact of community organization of women on perinatal outcomes in rural Bolivia. *Rev Panam Salud Publica* 1998 Jan;3(1):9-14.

- Omotade OO; Oladepo O; Adeyemo AA; Kayode CM. Observations on hand washing practices of mothers and environmental conditions in Ona-Ara Local Government Area of Oyo State, Nigeria. *J Diarrhoeal Dis Res* 1995 Dec;13(4):224-8.
- Onadeko MO; Ladipo OA. Intestinal parasitic infestation in rural communities: a focus for primary health care in Nigeria. *Afr J Med Med Sci* 1989 Dec;18(4):289-94.
- Onayade AA; Fabiyi AK; Abayomi IO. Urinary schistosomiasis: options for control within endemic rural communities: a case study in south-west Nigeria. *Public Health* 1996 Jul;110(4):221-7.
- Pandey MR; Shrestha IB; Gautam A; Neupane RP; Shakya GM; Gubhaju BB; Sharma PR. Impact of a pilot acute respiratory infection (ARI) control program in a rural community of the hill region of Nepal. *Ann Trop Paediatr* 1989 Dec;9(4):212-20.
- Perez-Escamilla R; Dewey KG. The epidemiology of breast-feeding in Mexico: rural vs. urban areas. *Bull Pan Am Health Organ* 1992;26(1):30-6.
- Rajaratnam J; John KR; Duraisamy S; Abel R. Morbidity pattern, health care utilization and per capita health expenditure in a rural population of Tamil Nadu. *Natl Med J India* 1996 Nov-Dec;9(6):259-62.
- Reed RP; Wegerhoiff FO. Urinary tract infection in malnourished rural African children. *Ann Trop Paediatr* 1995;15(1):21-6.
- Ryan GW. What do sequential behavioral patterns suggest about the medical decision-making process?: modeling home case management of acute illnesses in a rural Cameroonian village. *Soc Sci Med* 1998 Jan;46(2):209-25.
- Santana VS; de Andrade CA; Santos CP; Teixeira M da G. The effectiveness of the Program of Communication and Education in Health on the control of *S. mansoni* infection in some areas of the state of Bahia. *Rev Soc Bras Med Trop* 1997 Nov-Dec;30(6):447-56.
- Sastry N. What explains rural-urban differentials in child mortality in Brazil? *Soc Sci Med* 1997 Apr;44(7):989-1002.
- Sastry N. Community characteristics, individual and household attributes, and child survival in Brazil. *Demography* 1996 May;33(2):211-29.
- Savioli L; Mott KE; Kisumku UM; Dixon H. Control of morbidity due to *Schistosoma haematobium* on Pemba Island: program organization and management. *Trop Med Parasitol* 1989 Jun;40(2):189-94.
- Schoub BD; Cameron NA. Problems encountered in the delivery and storage of OPV in an African country. *Dev Biol Stand* 1996;87:27-32.
- Sfari EA; Binka F; Hori H; Sakatoku H; Nakana T Nkrumah FK. Impact of primary health care on child morbidity and mortality in rural Ghana: the Gomoa experience. *Cent Afr J Med* 1995 Oct;41(10):335.

- Shahid NS; Rahman N; Huq MI; Samadi AR; Greenough WB 3rd. Hand washing with soap reduces diarrhoea and spread of bacterial pathogens in a Bangladesh village. *J Diarrhoeal Dis Res* 1996 Jun;14(2):85-9.
- Slootweg R; Robert CF; Um JP; Polderman AM. An attempt to quantify the role of existing health facilities in controlling vesical schistosomiasis in rural northern Cameroon. *Trop Geogr Med* 1995;47(1):6-11.
- Sow O; Lemarie E; Boissinot E; Diot P; Haba F; Diallo AB. Acute respiratory infections in children: a community-based study comparing a primary health center and a pediatric unit, Republic of Guinea. *Tuber Lung Dis* 1995 Feb;76(1):4-10
- Super CM; Harkness S; Keefer CH. Child care and infectious respiratory disease during the first two years of life in a rural Kenyan community. *Soc Sci Med* 1994 ;38(2):227-9.
- Tanner M; Degremont A; De Savigny D; Burnier E; Lwihula GK. Community participation within a primary health care program. *Trop Med Parasitol* 1986 Jun;37(2):164-7.
- Teka T; Dagnew M. Health behavior of rural mothers to acute respiratory infections in children in Gondar, Ethiopia. *East Afr Med J* 1995 Oct;72(10):623-5.
- Vecchiato NL. Sociocultural aspects of tuberculosis control in Ethiopia. *Med Anthropol Q* 1997 Jun;11(2):183-201.
- Vejar ML; Sanchez CS; Navarrete MP; Castillo DC. Program for the prevention and control of acute respiratory diseases in infancy in Santiago, Chile. *Rev Panam Salud Publica* 1998 Feb;3(2):79-83.
- Villasenor A; Chissone E; Santos JI; Eavey RD; Arriaga MA. Educational outcomes of an otitis media workshop for primary care providers in Latin America. *Otolaryngol Head Neck Surg* 1998 Mar;118(3 Pt 1):394-6.
- Watson FE; Tomkins AM; Alnwick D; Onyang'o J. Ngesa A. Fermentation--a traditional anti-diarrhoeal practice lost? The use of fermented foods in urban and rural Kenya. *Int J Food Sci Nutr* 1996 Mar;47(2):171-9.
- Wilkinson D; Abdool Karim SS; Ntuli N; Cutts F. Maternal and child health indicators in a rural South African health district. *S Afr Med J* 1997 Apr;87(4):456-9.

Author Hawkrige A J

Name of thesis Paediatric Problems Admitted To A Rural Kwazulu Natal Hospital: How Could They Have Been Prevented?
Hawkrige A J 1998

PUBLISHER:

University of the Witwatersrand, Johannesburg

©2013

LEGAL NOTICES:

Copyright Notice: All materials on the University of the Witwatersrand, Johannesburg Library website are protected by South African copyright law and may not be distributed, transmitted, displayed, or otherwise published in any format, without the prior written permission of the copyright owner.

Disclaimer and Terms of Use: Provided that you maintain all copyright and other notices contained therein, you may download material (one machine readable copy and one print copy per page) for your personal and/or educational non-commercial use only.

The University of the Witwatersrand, Johannesburg, is not responsible for any errors or omissions and excludes any and all liability for any errors in or omissions from the information on the Library website.