To the Graduate Council:

I am submitting a dissertation written by Jude N. Tuma entitled "Caregivers Beliefs and Attitudes Associated with Compliance to Childhood Immunization in Bamenda, Cameroon." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirement for the degree of Doctor of Philosophy with a major in Human Ecology.

Robert H. Kirk, Major Professor

We have read this dissertation
and recommend its acceptance:

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Associate Vice Chancellor and
Dean of Graduate School

CAREGIVER ATTITUDES AND BELIEFS ASSOCIATED WITH COMPLIANCE TO CHILDHOOD IMMUNIZATION IN BAMENDA, CAMEROON

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Jude N. Tuma
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DEDICATION

This dissertation is dedicated to my parents, Joseph and Ruphina Tuma. They have been very patient and supportive of my dream to pursue my academic goals. My brothers and sisters have also been very patient and I thank them for all their love, support, and encouragement. Finally I most especially dedicate this dissertation to Matilda, who kept her life on hold waiting for me, on my never-ending academic journey. I can never appreciate your patience and your love enough. The thought of you all out there looking up to me, gave me the courage to pursue this work till the very end.

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ABSTRACT

Children who are up-to-date on their immunization schedule have a good chance of resisting diseases that are vaccine-preventable. The proper use of vaccines is one of the most cost-effective methods that can be used to control the spread of infectious diseases.

The factors associated with children being up-to-date on their immunization schedule are many. The decision to immunize children is made by the caregiver, because a child cannot make this decision. Caregivers' attitudes and beliefs about immunization and vaccine-preventable diseases influence the decisions they make. The purpose of this study was to analyze the relationship of caregivers' beliefs and attitudes to childhood immunization compliance in Bamenda, Cameroon. The current rate of childhood immunization in Cameroon is 36%. This rate is very low and so the urgency to determine factors influencing immunization compliance. It is important to know caregiver beliefs and attitudes associated with compliance to childhood immunization so these could be addressed if they would lead to an increase in immunization compliance. The Health Belief Model and self-efficacy constructs were used as the theoretical framework.

To access caregiver beliefs and attitudes a survey instrument based on constructs of the Health Belief Model and self-efficacy was modified, pilot tested and validated for use in this study. Participants were present with their children for admission into class one at randomly selected primary schools in Bamenda, Cameroon. The data for this study are presented in a descriptive and analytical

format. Logistic regression, MANOVA and chi-square techniques were used for analysis.

The following major conclusions are drawn from this study:
Location of residence and level of education were associated with compliance to childhood immunization. Caregivers whose level of education was higher than classes seven were more likely to be compliant to childhood immunization than those whose level were lower than class seven. Perceived susceptibility, severity, and self-efficacy were associated with compliance to childhood immunization. Self-efficacy increased the predictive ability of the Health Belief Model.

Developing health education interventions to address these issues may improve immunization compliance in Bamenda, Cameroon. Further research is needed to address designing programs to reduce childhood mortality by increasing childhood compliance with immunization policies

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CHAPTER I

INTRODUCTION

Introduction

The purpose of this chapter is to introduce the concept of childhood immunization as related disease prevention. This concept is used to address childhood immunization specific to Cameroon and what could be done to increase the rate of immunization in the country.

Although there has been a trend in the decline of childhood mortality during the last decades, the causes of decline in different countries vary (Desgrees du Lou, Pison, & Aaby, 1995). An understanding of the epidemiology of morbidity and mortality in a specific country is important in designing immunization programs to continue to reduce childhood morbidity and mortality. The decline in childhood mortality has in part been the result of the increased and consistent use of vaccines for the control of vaccine-preventable diseases (Parker & Hill, 1994).

Immunization rates vary widely among countries (Demographic Health Survey (DHS) Analytical Report 1, 1996). Even within a country, the coverage rates vary between urban and rural areas. The differences in coverage rates are largest for the third doses of multiple-dose vaccines. Immunization rate is highest for the first dose of a multiple-dose vaccine or for single-dose vaccines and declines with multiple dose vaccines (DHS Comparative Studies, 1997). Increased immunization rate is not a once-and-all achievement for a child. The immunization frequency needs to be maintained to

ensure that the child receives all required vaccines. That is why immunization rates are highest for first dose of a multiple-dose or a single dose vaccine (Sharma, 1996). Children without the full protection of immunization increase their risk of becoming infected by an infectious vaccine-preventable disease (Chen, Rahman, & Sarder, 1980; Kuate, 1994).

Infectious vaccine-preventable diseases are among the major causes of infant morbidity and mortality in Cameroon (Kuate, 1994). Previous assessments indicate that these infectious diseases (measles, tuberculosis, diphtheria, whooping cough, polio, etc), many times resulting in a childhood death, are related to a low level of childhood immunization (Henderson, 1983a). The infant mortality rate in Cameroon was 106 per 1000 live births in 1978. This rate dropped to 69 per 1000 in 1995 (UNICEF, 1998). Although this rate shows a significant improvement (35% increase in 17 years), the number of children dying could be reduced much further. If every child under five years of age was up-to-date with their immunization schedule, the number of infected children dying from vaccine-preventable causes would be greatly reduced (Henderson, 1983b). For children to receive full protection against immunizable diseases, they must have sustained contact with immunization services that provide all recommended vaccinations.

It is estimated that worldwide, infectious diseases kill ten children and disable ten more every minute. Of these numbers, measles is responsible for one third of the deaths and disabilities (Kuate, 1994; Assaad, 1983; Henderson, 1983b). Measles is one of the main infectious diseases responsible for childhood mortality in Cameroon after diarrhea and malaria (Kuate, 1994; Cameroon DHS Summary Report, 1991). Chen and others

(1980) postulate that with effective and consistent use of vaccines worldwide, about 25% of all childhood deaths could be eliminated.

The surveillance and reporting of immunization in Cameroon is done from the provincial to the national level. There are ten provinces in Cameroon. Each province collects data and reports the number of children that are vaccinated in the province to the ministry of health at the national level. Provincial rates could be reported independent of the national rate. The surveillance and reporting of immunization rates against vaccine-preventable diseases from the provinces, and thus the national rate, has not been consistent from all the provinces. It is important that the surveillance reports on immunization be timely and disseminated regularly so planning and implementation of programs could be kept current and consistent.

In 1979, only 31% of children in Yaounde (the capital of Cameroon) 12 - 23 months of age were up-to-date on their immunization. Forty-one percent of the children had not received a single dose of a vaccine (Brown, Djogdom, Murphy, Kesseng, & Heymann, 1982). It could thus be inferred that 28% of children had received some vaccines, but were not current on their immunization. Kuate (1994) reported that in Yaounde in 1987, 32% of the children were up-to-date on immunizations by their first birthday, and 44% by their second birthday. This shows a 41% increase in an eight year period. In 1991, 41% of children in Cameroon 12 - 23 months of age had received full immunization coverage for their age (Cameroon DHS, Summary Report, 1998). In 1996, only 36% of children 12 - 23 months were reported to have received full dose of immunization for their age (Cameroon DHS, Summary report, 1998). This shows a 16%

drop in immunization. This rate is very low compared to the 90% coverage for the year 2000 set by the World Health Assembly and the 1990 World Summit for children (WHO and UNICEF, 1985). By 1990, the immunization rate in Cameroon for children up to five years had risen to 56% (UNICEF, 1998). However, in 1995, five years later, the immunization rate dropped to 34% (UNICEF, 1998). No official reasons have been published assessing reasons for this decline.

Efforts have been made to increase the rate of immunization in Cameroon. In 1985, African countries launched a massive health campaign, the African Year of Immunization (AYI), to sensitize and increase immunized population. In Cameroon, maximum campaign effort was made for the success of the program. An evaluation of the effectiveness of the program at the end of the campaign indicated that in Cameroon, 49% and 46% of children in urban and rural areas respectively were immunized (Merline, Josse, Jossaran, Owana-Essomba, Ghogomo, Sanokho, Kollo, and Kouka-Bemba 1988). These authors indicated that despite the campaign efforts, less than half of the targeted population was reached. Merline and others confirmed the need to understand the underlying factors effecting compliance with childhood immunization coverage in Cameroon.

While the immunization rate in Cameroon was 36% in 1995, immunization rates in some provinces were up to 68% - 80%, much better than the national rate. The North West Province (NWP) (one of the ten provinces of the country) had a high immunization rate. Between 1997 and 1998, the provincial immunization rate was estimated to be between 68% - 80% (Ghogomo, A. Provincial Delegate of Health NWP, personal

communication, February 16, 1999). The improved compliance rate of immunization in the North West Province has not been evaluated. The lack of assessment to identify factors that affect rates of immunization compliance in the North West Province influenced the selection Bamenda, (the provincial capital of NWP) as the site for this study.

A review of current literature focusing on Cameroon revealed no theory-based research focusing on the factors that might affect immunization compliance either in Bamenda or in Cameroon. Theory-based studies have been used in other countries to explain caregiver factors associated with the immunization of their children. To design interventions that yield desirable results, an understanding of the theory and its implications to the targets of intervention must be achieved (Glanz, Lewis, & Rimer, 1996; Van Ryn & Heaney, 1992). The understanding and use of theory can lead to the development of pragmatic programs and activities that are specific to the situation or problems identified (Glanz, et al., 1996; Van Ryan, & Heaney, 1992).

Statement of the Problem

The problem addressed in this study dealt with the issue of compliance to immunization. Over the years, the highest rate of childhood immunization coverage in Cameroon was 56% in 1990 (UNICEF 1998). By 1995 this rate dropped to 34%, a 36 percent decrease. Being compliant to childhood immunization therefore is a problem that needs to be addressed if the rate of immunization in Cameroon is to be improved. There are different ways to understand compliance to childhood immunization. The method

used in this study is to analyze caregiver beliefs and attitudes associated with compliance to childhood immunization.

Purpose of the Study

The purpose of this study therefore was to analyze the relationship of caregivers' beliefs and attitudes to childhood immunization compliance in Bamenda, Cameroon.

Research Questions

The following research questions were formulated to address the purpose of the study:

Research question 1. How may caregiver self-reported compliance with childhood immunization significantly differ for rural or urban community residence in Bamenda, Cameroon?

Research question 2. How may caregiver self-reported compliance with childhood immunization differ by different levels of education?

Research question 3. What is the relationship between age, gender, and the marital status of caregivers and compliance to childhood immunization, and the caregivers beliefs and attitudes concerning immunization and infectious diseases including self-efficacy, perceived susceptibility, severity, benefits, barriers, and cues to action?

Research question 4. What is the relationship between caregivers' compliance with childhood immunization and caregivers beliefs and attitudes concerning immunization and infectious diseases including self-efficacy, perceived susceptibility, severity, benefits, barriers, cues to action, location of residence and level of education?

Justification for Study

Strategies to increase immunization compliance must be design to include caregivers. It is important to know the degree to which caregivers' beliefs and attitudes are associated with immunization compliance of their children. It is these caregiver beliefs and attitudes that determine their immunization pattern. Preschool children are the least likely to be immunized in Cameroon (UNICEF Report, 1998). They make up 19.7% of the population of Cameroon (Demo 87). Children receiving no immunization are at the greatest risk of infection from vaccine preventable diseases (Kimmel, Madlone-kay, Burns, and Admire 1996). In addition to reducing childhood mortality, increased compliance will promote better health and increase school attendance. (Amin, Hill, Horton, Kamara, and Chowdhury, 1992). Children who miss less school increases their potential to learn more.

Theoretical Framework

The HBM is based on the psychosocial theory that was inspired by the work of social and cognitive psychologists who were interested in understanding how people's attitudes were associated with participation in chest X-ray screening for tuberculosis (Hochbaum, 1958). It was formulated to explain individual motivation to pursue activities associated with healthcare and has been used to explain the failure of people to participate in programs for the detection and prevention of diseases (Strecher & Rosenstock, 1996; Houthrow, & Carlson, 1993). HBM was therefore developed to assess factors associated with the low number of people who sought healthcare and for

use as a tool to analyze and explain human perceptions as they concern preventive health (Hochbaum, 1958; Rosenstock, 1994). From its initial development, it was used to explain people's behavior in relation to compliance with medical regimens (Becker, 1994). Bates, Fitzgerald, and Wolinsky (1994b) used this model to evaluate caregiver utilization of pediatric services. The use of HBM in this study is to determine if the caregiver's beliefs and attitudes are associated with compliance with childhood immunization.

The HBM is based on a value expectancy theory that has been used frequently to test the relationship between health concerns and peoples' behavior (Becker, 1974). HBM assumes that people who value a certain outcome and can overcome the obstacles (barriers) on their way, will do so knowing they will benefit from this action. People who believe they are susceptible to a serious disease and believe that a health program could benefit them will be more willing to participate in a preventive or treatment program (Hochbaum, 1958). People are less likely to participate in intervention programs if they do not consider themselves to be susceptible to disease or if they are unaware of the benefits of the intervention (Houchbaum, 1958). Perception of susceptibility, severity, benefits, barriers, cues to action, and self-efficacy are considered to be determining factors influencing the decision to participate in an intervention program. HBM has been used successfully to predict and explain adolescent HIV preventive behavior (Lux & Petosa, 1994), sick role behavior actions (Becker, 1974, 1979) and other preventive health actions of caregivers (Kegeles, 1980). The uses of the

HBM in these instances have shown that HBM could be relied upon in determining attitudes and beliefs.

In a comprehensive review of literature, Janz and Becker (1984) found that the HBM was valuable in understanding preventive actions and recommended its use for future studies related to prediction of health behavior and decision-making. Rosenstock, et al, (1988) and Caramel (1990) have suggested the need to expand the HBM to include self-efficacy, a stand-alone psychological construct, to make the HBM a better predictor of people's preventive intentions. Rosenstock and others (1988) suggested that the self-efficacy construct influences perceived benefits and perceived barriers and should be included with the HBM. They held that change of a specific kind could be beneficial by resulting in a valued outcome at an accepted cost, but that those needing the change must feel competent (Self-efficacious) to overcome the perceived barriers. This study incorporated HBM and self-efficacy, to assess the association between caregiver beliefs and attitudes and compliance with the immunization schedule of children. Figure 1.1 shows the elements of HBM and self-efficacy as suggested by Rosenstock (1988) and Caramel (1990). The model illustrates that each component of the HBM and self-efficacy could be associated with the likelihood of taking a preventive action. Perceived susceptibility measures an individual's subjective perception of the potential risk of developing a disease condition. It is a cognitive assessment of how likely a person believes that he or she would contract a certain condition if no preventive measures were taken. If an individual believes there is a probability of developing an illness that individual is more likely to take preventive measures than someone

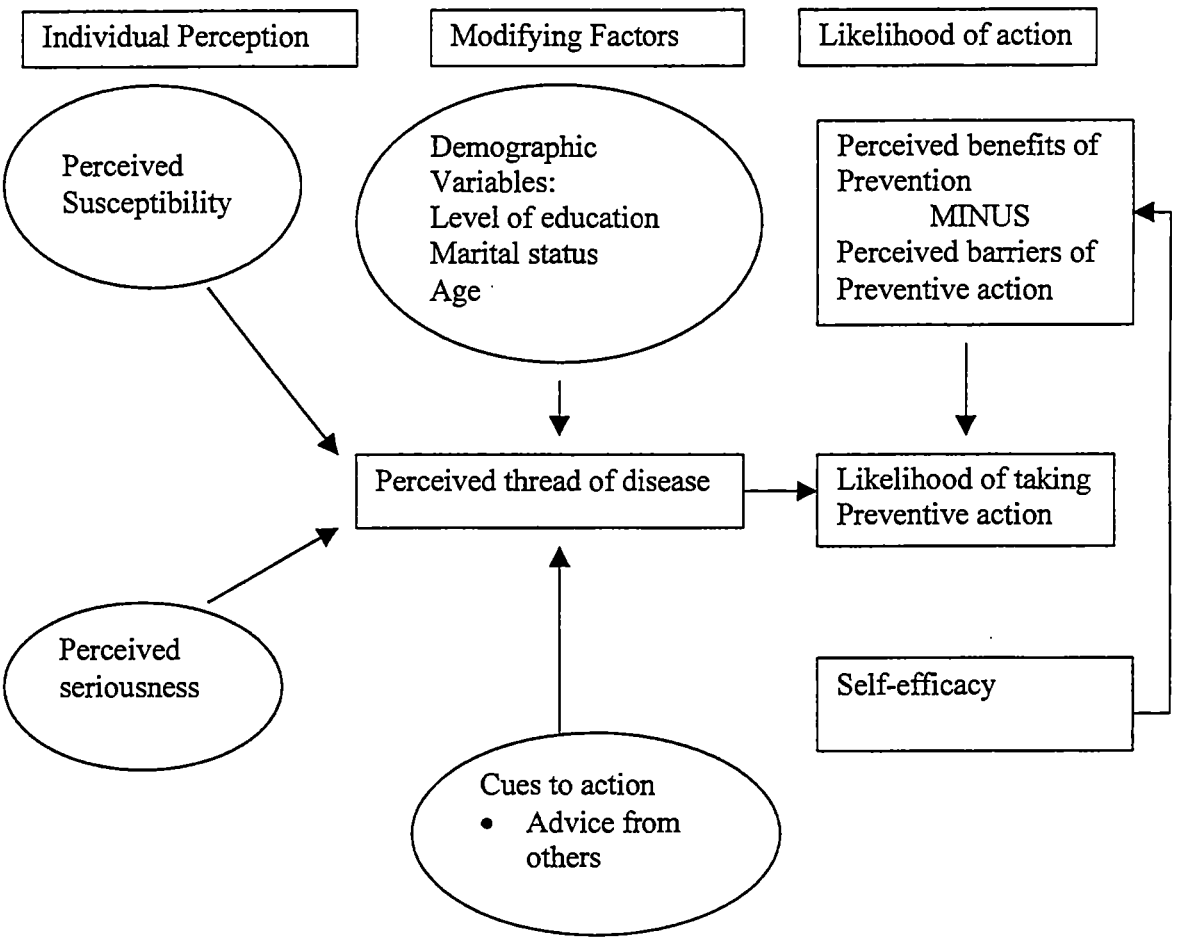

Figure 1.1. The health belief model (HBM) and self-efficacy.
Note. Adopted from: Health behavior and health education theory, research and practice (2nd ed.) Glanz, K. Lewis, F. M. and Rimer, B. K 1996, San Francisco: Josse-Bass. Copyright 1996 by Holder. (Adopted permission pending.)

who those not believe in this likelihood. (Glanz, and others 1996; Eisen & Zellman, 1986; Rosenstock, 1974).

Perceived severity is the cognitive assessment of the magnitude of a condition one suffers due to a possible threatening disease or condition. It also may be thought of as the perceived seriousness of developing a disease condition and its consequences in the person. Severity may be thought of as the degree of seriousness judged both by the emotional arousal created by the thought and the difficulties the disease condition impose on the individual (Rosenstock, 1994). It may trigger the need to seek treatment. One will be less likely to seek treatment if one does not perceive the disease condition to be very serious (Glanz and others 1996).

Perceived benefit is gained by participating in preventive intervention (Eisen & Zellman 1986). Participation in the intervention depends on the benefits of the alternatives to the intervention (Rosenstock, 1994). An individual will be more willing to participate in the program if the perceived benefits are positive and outweigh the seriousness and the perceived barriers to participation. If an individual believes treatment is effective, that individual is more willing to seek such treatments than one who does not believe in the effectiveness of the treatment. Believe in the effectiveness will lead to increased likelihood for participation in a treatment program (Houchbaum, 1958).

Perceived barriers or obstacles may be an important factor influencing an individual's participation in a program. Perceived barriers are cognitive assessments of the perceived obstacles to a preventive action (Eisen & Zellman 1986).

The individual weighs the different options, evaluating the different consequences for no action. When the individual perceives the existing barriers to be too much to overcome, this barrier becomes an impediment for action (Houchbaum, 1958). These barriers may be in the form of cost, danger, or risk , distance to immunization site, unpleasantness, or inconvenience. There is a better chance for action when the person is able to put all these obstacles behind and move forward with the decision to get treatment (Houchbaum, 1958).

Cues to action are the outside forces or triggers that may be needed to jumpstart the individual into action. Cues may be in the form of public service announcements, pressure from friends and family, and knowledge about the disease or the condition (Glanz and others 1996). Cues to action may also be in the form of information from a physician to a patient on the importance of early diagnosis and options the patient could take (Stein, Fox, and Morisky, 1992) for prevention or treatment. Cues to action instigate the individual and sets the process of action into motion (Rosenstack, 1994).

Self-efficacy is not a part of the HBM. It is a construct in its own right. Self-efficacy is the perceived conviction or confidence one has that performing a certain behavior will lead to a certain outcome that one is willing and capable of carrying through (Strecher, & Rosenstock, 1996). Some outcomes may need a very long time to produce expected results (Strecher, & Rosenstock, 1996). This duration may be discouraging to some people who may be used to a quick fix. When people know the reason for a required change, and they have the confidence that they can take the required action to experience the change, they will be willing to participate in the intervention

(Strecher, & Rosenstock, 1996). Bandura (1995) holds that when people believe in their causative capabilities, they do what they have to in order to acquire what they want. Causative capability lets people organize and execute the courses of action required to manage prospective situations to meet their needs (Bandura, 1995). When people believe in their capabilities, they persevere and strive to rebound even in the face of adversity. With self-efficacy, an individual develops the conviction that enables them to execute the behavior required to produce the desired outcome (Strecher & Rosenstock, 1996).

Self-efficacy has a great potential for exploration as an indicator or a predictor of behavior (Strecher & Rosenstock, 1996). Perceived self-efficacy could be the motivation to action. In regards to this study, it is anticipated that caregivers who have confidence in themselves and in vaccines will be willing to get their children vaccinated and stay compliant with the immunization schedule. The HBM and self-efficacy are used as a framework to analyze caregiver beliefs and attitudes associated with childhood immunization.

This study's focus is childhood immunization, and caregiver beliefs and attitudes as they relate to childhood immunization. An understanding of the caregivers' beliefs and attitudes regarding immunization is important for the development of the most effective interventions.

Assumptions

The basic assumptions made regarding this study were as follows:

1. The subjects understood and responded truthfully and honestly to the questions posed to them.
2. Respondents were aware of the confidentiality of their responses.
3. The instrument used to collect data is valid and reliable.

Delimitation

For the purpose of this study the following delimitation was made:

This study was delimited to caregivers present with their children for admission into class one at selected primary schools in Bamenda, Cameroon.

Limitations

The study was limited in the following ways:

1. Caregivers were self-reporting immunization compliance. No effort was made to ascertain the reliability of what they reported.
2. Some children of caregivers who may comply with immunization but may not survive to school age due to increased susceptibility to infections may not be represented in this study. Therefore those caregivers would not be at the schools (used as sample sites) to enroll a child who did not survive to reach school age.

Definitions of Terms

Specific terms operationally defined for purpose of this study are as follows:

Caregivers: Those who are responsible for the regular care of the child. Their responsibilities may include providing for the emotional, social, and physical needs of the child, who is dependent on this caregiver and cannot provide for his or her own needs. The word is not limited to the biological relation between caregiver and child (Baker, 1995). In this study it was that assumed the person enrolling the student in school was a caregiver.

Caregiver beliefs: principles governing the values of the caregiver.

Caregiver attitude: factors governing caregivers way of thinking or mind-set.

Primary schools: In Cameroon primary schools are same as from kindergarten to middle schools in the U. S.

Self-reported immunization compliance: Caregivers taking their children to receive vaccines when they are scheduled.

Surveillance: The ongoing systematic collection, analysis, and interpretation of health data.

Health Belief Model: A theory developed as a tool to explain and predict health-related behaviors (Hochbaum, 1958).

Perceived susceptibility: Individual's subjective perception of risk of contracting a disease (Hochbaum, 1958).

Perceived severity: Feelings concerning the seriousness of contracting a disease (Hochbaum, 1958).

Perceived benefits: Beliefs regarding the effectiveness of various available actions in reducing the disease threat (Hochbaum, 1958).

Perceived barriers: The negative aspects of a particular health action that may act as an impediment to undertaking a recommended health action (Hochbaum, 1958).

Cues to action: The circumstances that lead to the readiness to take action (Hochbaum, 1958).

Self-efficacy: The conviction that one can successfully execute the behavior required to meeting an outcome (Strecher & Rosenstock 1996).

Levels of education in Cameroon:

1) Less than class seven is equal to any level below fifth grade in the U.S. educational system.
2) Class seven is equal to fifth grade level in the U.S. system.
3) Some college is considered any level attained between the sixth and eighth grades.
4) High school is considered to be between the ninth and twelfth grade in the U.S.
5) University in Cameroon is normally called college education in the U.S.

Summary

Childhood immunization rates worldwide may be high, but the rate in Cameroon (36%) is still very low. The reasons for the low immunization rate in Cameroon are not known. It is very important that the reasons for the low rates are know if the trend is to be reversed. To understand caregiver beliefs and attitudes related to compliance to childhood immunization in Cameroon, the health belief model and self-efficacy was

adopted as the theoretical foundation. Self-efficacy was added to the health belief model because studies have shown that this addition increases the predictive power of the health belief mode. In this chapter, the introduction, the purpose, and the research questions that guided the study were presented. Also presented were the delimitation, limitations and the justification for the study. Following is the review of the relevant literature, the methodology used in collecting and analyzing the data, the discussion, and the conclusion of this study. The study in retrospect is presented in chapter VI.

CHAPTER II

REVIEW OF LITERATURE

Introduction

This chapter presents a careful review of the relevant literature that deals with immunization and the different levels of immunization coverage. It presents the consequences of low immunization coverage on the health status of children. The literature was reviewed for methodology and content. The literature related in content focused on research conducted and reported on different aspects of immunization, both in Cameroon and in other parts of the world.

Cameroon

Cameroon may be called Africa in miniature because it lies on the equator, and extends north and south of the equator. The climatic conditions in Cameroon almost reflect all the different climatic conditions of the different countries in Africa. The geography of Cameroon spreads from an equatorial rain forest in the western part of the country to the semi-arid and arid lands in the far north of the country. It coastal line extends for 217 kilometers. The topography of the land is dissected with coastal plains in the southwest and mountains and undulating plateaus in the west and northern parts of the country. The map of Cameroon is shown in Figure 2.1. French and English are the two main languages of the country, but there are over 260 different dialects spoken within Cameroon.

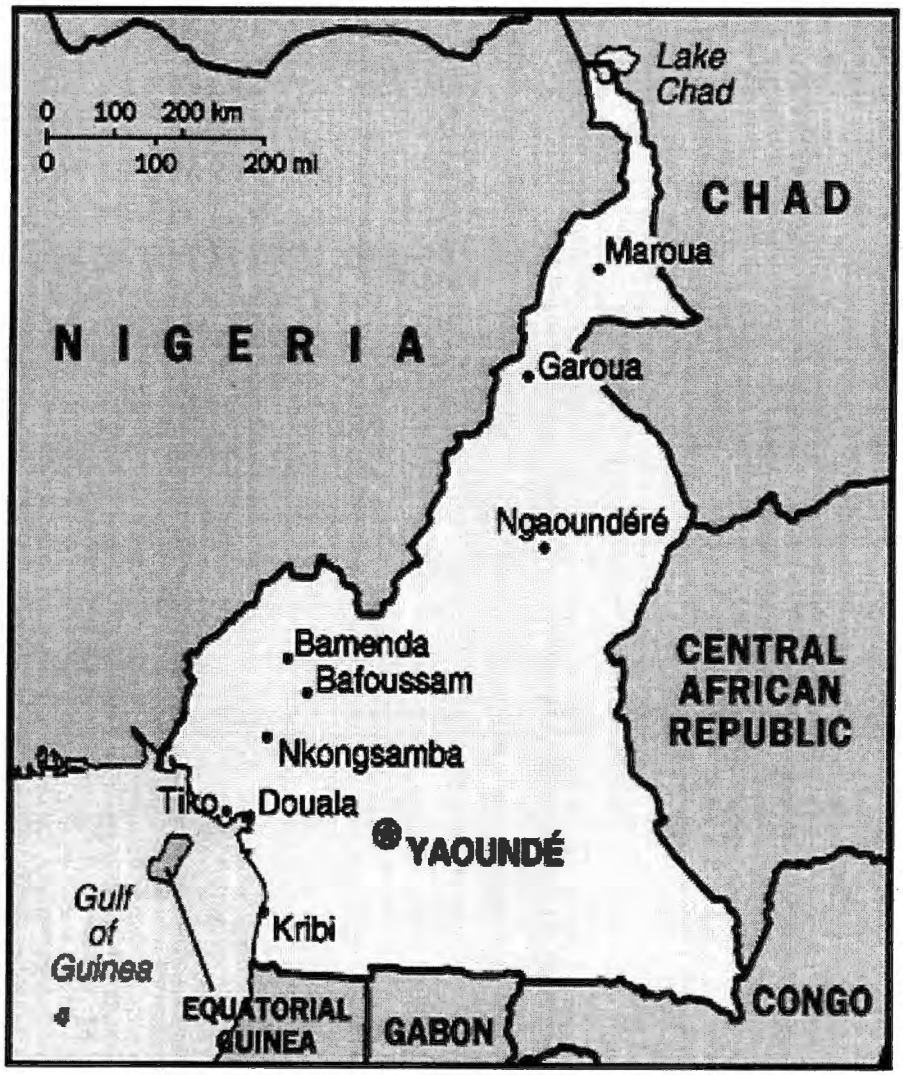

Figure 2.1: Map of Cameroon

The population of Cameroon according to its 1992 census was 12,659,000 (World Atlas, 1993) and had a growth rate of 3.22%. It was projected to be about 14 million by 1995. In 1995 the fertility rate was 5.7 children per woman of childbearing age. In the late 1980s the population was estimated to double within 26 years (UNDP Report, 1995). It is currently estimated to be 21.5 years (World Atlas, 1993). About 63% of the population is literate, and approximately half the population is below 15 years old (Meddleton, 1997)

Life expectancy for both males and females in Cameroon was estimated to be 56 and 65 years respectively (World Atlas, 1993). More than half the population of Cameroon does not have accesses to health care services (UNDP Report, 1995). There were 17,466 persons per physician and 12,500 persons per nurse in Cameroon in 1993.

The population of Bamenda in 1991 was estimated to be 300,000 with a growth rate of 2.1 %. This rate is lower than the 3.22 % national average (National population commission, 1993). Bamenda is located in the northwestern part of Cameroon. It is an urban center and the provincial capital of the North West Province. The economy of Bamenda, like that of Cameroon, revolves around agriculture. The population is heavily concentrated in the Western and Central part of the country where the soil is very fertile and where most of the economic and political activities of the country are centered. Although the overall population density is 28 persons per square kilometer, the mean population density in the rural area is 13 persons per square kilometer (Middleton, 1997).

There is a great rural–to-urban migration especially to Douala and Yaounde, the economic and political capitals of the country. The population densities for the

provincial capitals are greater compared to other places in the province. A relatively good road network helps move food supplies from the rural areas to the urban cities. Most people in rural settings participate in some form of agricultural activity. They produce and sell surplus to the urban centers. In rural areas most people work in the fields, while in urban areas more men work in offices and factories.

The government is the major health care provider in Cameroon. It has hospitals and other health care services in the provincial and divisional capitals of the country. Some sub-divisions also have government-owned health services. Some religious affiliations in Cameroon (i.e. Catholic, Baptist, and Presbyterian) provide health delivery services. Treatment at the government-owned facilities used to be available at a minimal fee or for free. At sectarian health care facilities health care is more expensive than at government-owned centers. Most of these health care providers provide either immunization services for women and children or have designated centers where women and children can go for these services.

Infant mortality rate was 170 per thousand live births in 1963 and dropped to 88 per thousand in 1987. Child mortality rate dropped from 89.2 per thousands to 81.7 per thousand between 1976 and 1987. Within this same time period, life expectancy increased from 37 years to 53.4 years (National Population Commission, 1993). The National Population Policy gives priority to preventive medicine in order to reduce infant mortality, yet the rate of immunization coverage in Cameroon is still very low, 34% in 1998 (UNICEF Report 1998).

Literature Related in Content

Measles in Cameroon

In a 1981 article on the epidemiology and control of measles in Yaounde, Cameroon, between 1968 and 1975, Guyer and McBean described the pattern and the frequency of measles. Although this article was written 18 years ago, it sets the stage for analysis of trends and patterns of the spread of one of the vaccine-preventable diseases in the country.

In this article the authors stressed, that to have an effective measles control strategy, it was important to have an understanding of the epidemiology of the disease in this setting. Healthcare in Yaounde was described as being delivered by many different groups, which were either government, private, military, or secularly owned. At these different health facilities, cases of measles were reported on weekly bases. From these reports, it was apparent that measles increased to epidemic proportion during the months of November to January. The rains were very heavy in Cameroon at that time. The incidence rate declines after this rainy season. During the rainy season, there was always a mass movement of women and children from the urban center to rural areas to engage in farming activities. These seasonal movements to and from the rural countryside influenced the susceptibility of children to measles, because they were not able to obtain their schedule immunization. As a result of this movement pattern of caregivers, the authors estimated about 32% to 41% of the children went without immunization and were left vulnerable to the disease.

The constant movement of women and children does not create the opportunity for the children to stay in one location and receive all their vaccines to develop herd immunity to prevent the seasonal epidemics. Therefore, given that the local women and children are always on the move during planting seasons Yaounde is a reservoir of measles infection. They were never in the same place long enough so that their children could get all the vaccines they needed, and they did not take their children to be immunized at the new location. Based on this information, the authors concluded that there is the potential for a large number of children to be infected with each measles outbreak. During the eight years of study, at least 15 cases of measles per 1000 children between the ages of 6 and 35 months were reported. The incidence of measles was common among children between the ages of 6 and 23 months. The authors also reported that as a result of these outbreaks, the government initiated a vaccination campaign, but only after there had been an outbreak. No campaign to immunize children was in place prior to the outbreak. Therefore, vaccines were given to children who had already been exposed - they developed the infection after receiving the vaccine. Lack of confidence in vaccines, grew because many caregivers knew children who developed measles after receiving (the) vaccination(s).

Low Immunization in Cameroon

In the article, "Identifying the reasons for low immunization coverage: a case study of Yaounde (United Republic of Cameroon)" Brown, Djogdom, Murphy, Kesseng, and Heymann (1982), reported their observations working with the Expanded Program

on Immunization (EPI) in Cameroon. The goal of the Cameroon EPI, which began in 1975, was to increase the immunization rate from less than 30% to 80% within two years. In 1979, the authors analyzed data that had been collected earlier by IFORD and EPI. They reviewed each child's vaccination card or had a staff observe scar marks as indications of immunization. From these observations, they determined whether or not the child had been immunized. Both the scar and/or the indication of immunization in the child's record were used as compliance indicators. The results of this study reported that the EPI fell below its stated goal. Thirty-one percent of the children in this study were found to be successfully immunized. Twenty-eight percent of the children were found to have begun the series, and 41% of the children between the ages of 12 and 23 months were found to have no immunizations.

An analysis of their data showed among other things that coverage rate of immunization for the different parts of the city was between 13% and 60%. They recommended special attention for the areas with the lowest rates of coverage. The population in areas of the city that had the lowest coverage rate also had low participation rate in the education programs in Yaounde. Those with low incomes and or with less education were the least likely to immunize their children. Non-working mothers were less likely to immunize their children. Also, those recently moving into the city were less likely to immunize their children. It was found that women who did not speak the French language were less likely to return for immunization. Like Guyer and McBean (1981) had reported earlier, these authors indicated that all participants had some degree of mistrust in vaccines, because they knew someone who developed measles after receiving

the vaccine. Caregivers lacked basic information about the immunization program. Eighty percent of the surveyed population did not know the schedule for immunization in their neighborhood. Fifty percent did not know where to get vaccines and 76% did not know when to take their children for immunization. Given these results, they concluded there were many reasons why 41% of caregivers with children between 12 and 23 months of age had not taken any vaccine. It therefore seemed to indicate there is a great need for health education programs to create awareness of the importance of preventive health.

The use of the French language as the main form of communication at the different immunization sites was a barrier to immunization, as some caregivers could not comprehend the French language. Some caregivers incorrectly translated what was communicated to them in the French language. This language barrier increased the potential for being less compliant with immunization schedules. Families at the lower socio-economic levels had a higher proportion(s) of non-immunized children than families with higher socio-economic levels. Being poorly educated, unemployed, a new resident in town, and a resident in substandard housing was associated with low levels of immunization in Yaounde. These factors thought to be related to immunization compliance were identified in their study.

Merlin, Josse, Josseran, Kollo, and Kouka-Bemba (1986) completed a mid-course review of the Expanded Program on Immunization in nine different areas both rural and urban. They used the cluster sampling technique and studied 210 participants from 30 different localities. The participants in the study were children between 12 and 23

months of age. Participants were studied at their homes. To know if the child had been immunized, they referred to the child's immunization record or looked for a scar on the arm, indicative that the child had been vaccinated. Six urban areas and three rural areas were evaluated.

Results of the study showed that the program's short-term goals to reach at least 30% of the population were reached in certain urban areas. Only a few rural areas came close to the short-term goal of 30%. In the urban areas, it was common for clients to come to the health provider for their needs; in the rural communities the providers had to go out to residents to provide immunization. Many obstacles to attaining the long-term goal of an 85% immunization rate by 1990 were observed. They reported that Bacteria Calmet Guirie (BCG) vaccine had a high rate of coverage, while measles had the lowest rate of coverage. Measles posed the greatest threat and was the number one cause of death in the childhood population.

The sixth five-year Development Plan of Cameroon named measles, tetanus, malnutrition, and diarrhea as the leading causes of infant mortality in the country. Measles and tetanus are vaccine-preventable diseases. Based on this study, the objectives of EPI were reassessed, and the short-term objective was to make effort to reach the one-third of the childhood population that had received only some of their vaccines. The long-term goal was to reach and immunize children who had not even started immunization.

In 1988, Merlin, Josse, Josseran, Owona-Essomba, Ghogomu, Sanokho, and Kouka-Bemba did a study of the impact of the African Year (AYI) of Immunization on

immunization coverage in Cameroon that was launched in 1985. The Ministry of Health in Cameroon gave oversight of AYI to an organization that was completely outside and independent of government control. UNICEF and L'OCEAC coordinated this oversight.

The authors concentrated their study on children who were supposed to have received all of their vaccines by the date of the 1985 AYI activities. They did a retrospective study and analyzed the immunization cards of participating children for the number of vaccines they had received by the date of the AYI. There were 330 children from the urban areas studied and 1020 from the rural areas. The authors found that this was the best immunization campaign that had been undertaken in Cameroon to that point in time. Seventy-eight percent of the children in urban areas and 81% of the rural children had immunization card. The immunization coverage rates for urban and rural areas were 46% and 49% respectively. Given the mass campaign efforts and the less than average results obtained, they wondered if such an effort could be repeated and asked what it would take to maintain the success rate to reach the 85% goal.

Immunization efforts in other countries

In a 1992 article on immunization coverage, the authors Amin, Hill, Horton, Kamara, and Chowdhury examined the progress and reduction in the infant mortality and morbidity rate in Sierra Leone as a result of increased immunization coverage. The study reported that, prior to 1971, the infant mortality rate in Sierra Leone ranged between 206 and 260 deaths. The aim of their study was to examine the progress EPI had brought to immunization coverage in Freetown, and how it influenced infant mortality rates.

Random samples of households were surveyed for this study. There were 1841 participants between the ages of 12 and 49 who had given birth to at least one child within the last five years. The immunization status of these children was used to assess immunization coverage in Freetown. A multivariate analysis statistic technique was used to identify the factors that had contributed to the reduction in infant mortality.

Immunization rate was the only factor that showed a significant difference in coverage rate. There was an increase in Diphtheria Pertusis Tetanus (DPT) vaccine coverage from 21.8% to 77.3% from 1975 to 1990. The coverage rate for measles increased from 14.3% to 61.8% for the same time frame. The coverage rate for BCG vaccine increased from 11.9 to 89.4%. The socio-economic and educational levels of the participants did not change during this study interval. Infant mortality declined from 162 deaths per 1000 live births to 70 per 1000 live births from 1970 to 1987. From this, they concluded that the increased level of immunization coverage for children was the one factor that could be responsible for the reduction in mortality rate.

This study showed that, when there is an increased rate of immunization in the country, it could lead to a reduction in infant mortality rate. The fact that data was collected for the study based on verbal reporting and participants' reports were not corroborated means the results of the study may not be accurate. Still, the findings were very informative in showing the potential benefits to be derived from increased immunization rates.

Eng, Naimoli, Naimoli, Parker, and Lowenthal 1991, wrote on the acceptability of childhood immunization to Togolese mothers from a sociobehavioral perspective.

They traced the progress and investments of Non-Governmental Organizations (NGO) in immunization programs in developing countries. According to their assessment, an increase in the number of children immunized in developing countries was not realized. The reasons why more children were not being immunized were not unique to each area studied; they could be generalized across cultures and ethnic groups. They advocated that social science theories should be used in health service research to find out why some caregivers did not use immunization services and opportunities.

The immunization coordinating team in Togo selected nine immunization centers in different districts and surveyed to determine the number of children that were immunized in each. When the data from all the centers were collected and analyzed, only 31% of the eligible population of children (12 – 23 months of age) were immunized. Based on the results of the survey, focus groups were conducted to determine the reasons women had for their survey responses and what factors influenced the immunization of their children. The HBM was used as the basis for questioning at the focus group sessions. Mothers were asked about their perceptions of childhood diseases, perceptions on the seriousness of these diseases, the benefits of different health interventions, obstacles they faced by taking their child to be immunized, and what recommendation they had to improve immunization in the area.

The focused group transcripts were analyzed using qualitative methods. Nota Bene was used to identify word strings in the text and to categorize responses into one of 12 factors. Responses showed that mothers had a good understanding of vaccines and why children were immunized. Reasons given by mothers who did not immunize their

children included laziness, ignorance, and lack of finances. Some caregivers reported that not having an immunization card or having to take it along every time the child went for immunization was burdensome. Some women complained that the distance to the immunization center was too far for them to travel.

They reported that program planners could increase caregivers' willingness to immunize their children by using the knowledge gained at these focus group sessions. The women thought it was the responsibility of their local leaders to remind them regularly to take children to be immunized. In the southern part of Togo, mothers wanted those who had immunized their children to speak at local gatherings organized by their local leaders to encourage other women to take their children to be immunized. It was found that for immunization programs to be successful, it must not be imposed on the consumers. Involving the local community in the planning and execution of the program can play a great role in attaining the objectives of the program. Whereas immunization cards are good for record keeping, in Togo some saw it as a hindrance for regular immunization. There is a greater chance that immunization programs will succeed if the broader public health paradigm includes plan for social and behavioral approaches.

In an article in 1994 on "Immunization coverage and its relationship to health care visits among inner-city children in Baltimore", Guyer, Hughart, Holt, Ross, Stanton, Keane, Bonner, Dwyer, and Cwi conducted a community survey on a sample of 557 Baltimore children born between August 1988 and March 1989. The purpose of the study was to describe immunization coverage and the receipt of preventive health care by inner-city preschool children in Baltimore and to provide tangible information to policy

makers. They found significant patterns within the time frame for first vaccine initiation and the maintenance of immunization schedules. Without facts on immunization coverage, appropriate policies may not be developed to meet the needs of the inner-city population. Of those initially screened, 33.2% were excluded from participation. Participants' characteristics were very similar to that of the local population.

Trained personnel conducted structured interviews in the homes of caregivers. With the caregivers' consent, interviewers contacted the family physician and reviewed the child's medical records to check for immunization compliance. Univariate and multivariate analyses were performed to determine trends and factors influencing immunization. Based on their findings, they proposed to policy makers that the initial patterns of immunization in the first six months of life were critical for later compliance with the immunization schedule.

Friede, Waternaux, Guyer, De Jesus and Filipp (1985) completed an epidemiological assessment of immunization program participation in the Philippines in the early 1980s to assess why some children were not immunized. The International Institute for Rural Reconstruction (IIRR) organized this immunization initiative, and was the main employer in Cavite, Philippines. The organizers of the immunization campaign were expecting most, if not all, of the children to be immunized since they were living in a small, rural, poor community that had previously lacked this cost-effective preventive health care service. Cavite had a population between 1000 and 3000 people. International Institute of Rural Reconstruction was expecting most Cavite residents to

bring their children for immunization. However, most of these children did not receive their immunization.

All families in this community were interviewed to determine their reasons for not participating in the immunization project. Pearson Chi-square and logistic regression were performed on the data variables associated with participation in the program and the probability of a child being immunized. Variables associated with adversity were found to be the main factors that contributed to a child not being immunized. These adversity factors included the distance to the immunization center and the time of the year the vaccines were offered. The caregivers' beliefs and use of a traditional doctor also played an important role in determining if a child got vaccines. Some doctors were found to recommend against a child being immunized for conditions that should not normally have been contra-indicated. The percentage of children at risk of not being immunized if further measures were not taken rose to 91%. Their results also showed that as the distance from the immunization site increased the number of children immunized decreased. Thus, they advised that immunization should be taken to the people rather than for the children to be brought to them for immunization. They concluded that better planning and management of the pre-vaccination initiative could lead to better immunization results.

In a 1993 evaluation of the perception of vaccine efficacy, illness and health among low-income inner-city caregivers residing in the Baltimore area, researchers discovered how caregivers' perceptions influenced their attitudes (Keane, Stanton, Horton, Aronson, Galbraith, & Hughart). In this study, focus-group discussion was used

to assess participants' knowledge of the function of and perceptions about immunization requirements. Ninety-two percent of those who met the criteria for inclusion in the study were African-Americans. Only one person in this study group associated immunization with caregiver roles. Most associated chicken pox as a vaccine-preventable disease and cited its presence in a child as evidence that vaccines do not work and when they do, did not last long. They considered vaccines to be moderately effective. Most also reported that the illness the child developed after an immunization was an indication that vaccines make the child sick (Taylor & Cufley, 1996). The researchers concluded from their findings that educational strategies specific to building on local perceptions could be an effective method to improve the awareness among low income Baltimore residents. If this knowledge specific education is given to this group, there is a better chance that they will be more willing to participate in immunization coverage for their children.

Mark Nichter (1995), exalted the importance of sensitivity and the process of sensitization of the population before the introduction of new technologies so consumers have a better appreciation of what they bargain. Nichter reported on factors that could influence people to question the viability of immunization as a method to prevent disease. From extensive studies in Asia and South East Asia, he reported that where there is political will, vaccination rates may be increased dramatically as a result of an intensive campaign to educate the public about vaccinations. The initial educational campaign should not stop at the end of the vaccination program. The educational effort should be persistent enough for the community to learn more and buy into the program. It is not acceptable for politicians to assume that people got the message and they will

follow through. An informed public will demand to be immunized, because they will have perceived the benefit of immunization. When the public is not well informed, they may initially comply with the orders, but because they are not convinced of its benefits, they may not follow through the next time.

Examples were cited from India where some Hindus believed the Indian government was using vaccination as a ploy to control and sterilize women of childbearing age. They blamed the government and the U.S. for using immunization as a way to limit the reproductive potential of women. Misinformed politicians were quoted as saying vaccination programs represent an example of selective primary health care failure. Thus, for immunization programs to be successful, the people will need to be educated. Healthcare workers need to do more to educate the public and not merely encourage them to get their children immunized.

These different studies identified factors found to influence compliance to childhood immunization. These factors included: the constant movement between different localities for farming and residential reasons, lack of educational sensitization campaigns to prepare the population about up-coming health programs, and language barrier. Other factors included: caregivers level of education, low perception of the seriousness or severity of vaccine preventable diseases, not involving community leaders in the planning of immunization programs, and the lack of understanding of the function of vaccines. In the next section the literature related in a methodology is reviewed to address issues related to the proposed methodology. The literature will focus on cluster sampling methodology and surveying in rural and urban areas.

Literature Related in Methodology

This section concentrates on a review of literature related in methodology. The literature reviewed in this section focused on sample size, data collection, and the analysis of the data. Although this study revolves around childhood immunization, it is the caregiver that is its main focus. Sampling randomized caregivers will show factors within this group associated with compliance to childhood immunization. Understanding the factors that are associated with compliance to childhood immunization provides a framework for developing strategies and programs to meet identified needs. These could lead to increased compliance to immunization schedules and an increase in immunization rates.

Henderson and Sanderson (1982) used cluster-sampling techniques to assess immunization coverage in developing countries. The Expanded Program on Immunization (EPI) was created with the goal of strengthening immunization services for children in developing countries and to provide an appropriate method for evaluating the effectiveness of the different immunization programs. In this article, the authors analyzed sample size for which the effectiveness of immunization can be calculated at a low cost to maintain statistical significance. They used immunization data from different countries in Africa and computer simulated data for analysis.

They reported that for the methodology to be effective, the geographic area and the age group of interest must be identified. The procedure will include: a random selection of 30 different sites from within the chosen geographic area; random selection of a starting point; and at least seven samples from each of the 30 sites. At each site all

household members between 6 and 36 months of age are included in the sample. The alpha level was set at 0.95 and the p = value at 0.05.

According to this procedure, it is easier to take several participants from each sample unit at any given time to analyze. People in a group tend to share the same characteristics, such as health care coverage, food preferences, and use the same educational amenities due to their geographical proximity to each other. With at least seven participants drawn from each of the 30 different areas, the groups tend to be normally distributed. Results from 60 such surveys conducted in 25 developing countries were included in this analysis. The primary objective of the analysis was to determine what proportion of the results had 95% confidence limits within ±10% as was desired in the design, and how that was related to the sample size. Immunization coverage rate was the only variable associated with the size of the confidence interval. Of the 446 sample estimates of immunization coverage analyzed, 83% of the results had confidence limits within ±10% of 95%; and non-of the confidence limits of the rest exceeded ±13%. Results showed that a sample size of 210 could be used for power analysis. Analysis of the computer-simulated data was very close to the actual data obtained from the field.

Immunization coverage in the West and Central African countries was started in 1966. An evaluation of the methodology used in these early days of immunization shows the progress made in disease prevention, the obstacles faced, and how some of them have been overcome. Henderson, Davis, Eddins, and Foege (1973) assessed the success of these programs. All age groups were involved in the early immunization initiative. In phase one of the program, participating countries planned a two to three year all-out

campaign to immunize as many people as they could in each country. Phase two was the maintenance phase and the goal was to maintain the levels of immunization archived in phase one. Smallpox and BCG vaccines were the main vaccines dispensed at that time.

The methodology used to immunize the people was based on the collecting point principle. All the inhabitants in a village were invited to assemble at a given point and time. The immunization team was to meet the group and vaccinate them as needed. To assess what fraction of the population was immunized, a random sample of at least 1000 persons was drawn from each of the sampling units using a stratified cluster-sampling frame. To maximize the possible number to be included in the sample, a p-value of 0.5 was adopted and the precision d set at 10%. Initially the total sample population was to be selected from at least 30 different sites for each of the five participating countries in the study; however they wanted to make sure that no case of smallpox went unreported, so the number of sampling sites was increased to 67. At least 16 persons were selected from each site adding to a total of 1072 from each of the countries in the study. Sites were randomly chosen from a list of villages at the program office. The team then went to these sites and interviewed the village leaders to learn more about the villages and hamlets. Using a random number table with digits between 000 and 539, from the center to the edge of the village, residents were selected with each housing unit having an equal opportunity of being included in the study. The houses that intersected the eastward direction from the starting point were chosen for participation in the survey. If less than 16 people were sampled from this starting point to the edge of the village, the interviewer made a clockwise turn and continued sampling the next house as they moved back to the

center of the town. All the participants sampled had the same probability of belonging to the same social class.

A total of 7851 participants were sampled. As a result of heavy rainfall, some villages in Western Nigeria were inaccessible to the survey team. The results of each of the sampling sites were weighted according to the population of the sampling site. Smaller villages were analyzed separately from the larger ones. The smaller villages were the least accessible to the vaccination team, and they were the ones with the lowest rate of participation. The inhabitants of these smaller villages had to walk long distances to immunization sites and this may have influenced the number of people that came to be immunized. Although Western Nigeria had the best communication network, they had the least immunized population. This was attributed to the fact that the people in Western Nigeria did not accept the immunization program, and they did not trust their leaders. The Northern Nigerians had the highest percentage of immunized population. The Northerners respected their leaders and when the leaders made the call for the villagers to assemble at a designated location for immunization, they all attended. Within the different sites, children between the ages one and four years old were the least immunized followed by women between the ages of 15-49 years. The fact that the children between one and four years of age were the least immunized showed the need for maintenance of the immunization program. If the immunization program is not maintained, a cohort could grow without being immunized. It could also be attributed to the fact that children had to depend on their caregivers to take them to be immunized. When the mother did not take the child to be immunized, they were not immunized.

Also, the fact that Northern Nigerians will listen to or all go out for immunization as called by their leaders, showed the need for a leader the people can trust to direct them. This study design showed how random cluster sample methodology could be used for data collection to produce meaningful results relevant to the research purpose.

Although the EPI survey format has been used for evaluating the proportion of children vaccinated compared to those not vaccinated in the population, the method of estimating has the potential of missing some children in the cluster. Brogan, Flagg, Deming, and Waldman (1994) developed a method that can modify the EPI statistical approach, so it can detect even the smallest changes in vaccination coverage level, segmenting, and sub-segmenting sample clusters for better listing and mapping of the area. The technique was designed for rapid evaluation of a cross-section of the population with a fair degree of accuracy in the confidence limits. Brogan and others (1994) were concerned that the estimated sample calculated with the current EPI survey design did not meet the population parameter being estimated and lead to a biased estimation.

One of the suggestions they proposed was to increase the Primary Sample Unit (PSU) size by increasing not only the number of Housing Units (HU) in the sample, but also to estimate the proportion of children in the population and use that estimate to determine what fraction of the interested population could be used in the required sample. In an area that is not congested, all the HUs in the geographic area could be included in the survey list, sketched, or mapped. Where the sampling unit is very large, it could be segmented or sub-segmented, as needed, into smaller units to make counting and

mapping easier. This approach ensures that each child has an equal and known probability of participating in the study. When a participant is not present at home, it should not be left up to the field interviewer to replace this missing participant with a willing neighbor. This may lead to a biased estimation. By over-sampling, missing subjects can be accounted for when analyzing data obtained from this type of sampling plan.

When the sample estimate is unequal, selection probabilities should be weighed and calculated. By making these adjustments, it becomes possible to use cluster sampling and accurately estimate the proportion of the sample that was successfully immunized.

Summary

Literature review provides the opportunity to review international research in the area of compliance to childhood immunization. It also presents a snapshot of Cameroon in relation to how its past history may be influencing immunization. The literature presents some of the determinants of compliance to immunization schedules in Cameroon and a need to find out strategies that could be used to increase compliance rate in the country. Content and methodology used in these studies provide a frame for reference to the development of this study.

CHAPTER III

METHODOLOGY

Introduction

The Health Belief Model (HBM) and self-efficacy were used as the theoretical foundation to develop a questionnaire designed to assess caregivers' attitudes and beliefs about immunization compliance for children. Data were gathered concerning the association of specific caregiver attitudes and beliefs and actual compliance with immunization for children starting class one in Bamenda, Cameroon. The instrument used to collect these data included questions about perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy. This chapter describes the methodology employed in this study. Specifically, this chapter presents a description of the population of interest, the sampling methodology, the instrument used for data collection, and plan for data analysis.

Study Population

The target population for this study is caregivers enrolling children into class one at randomly selected primary schools in Bamenda, Cameroon. This audience was selected because a cross-section caregivers in Bamenda were deemed to be present getting their children registered into class one. In this study, caregivers are defined as those who are responsible for the regular care of the child; the caregiver may not necessarily be the biological caregiver of the child. A caregiver may be a grandparent, a

relative or a surrogate who meets the above conditions. For this study, the caregiver present with the children for admission at the randomly selected schools in Bamenda during the time of admission into class one were invited to participate in the study.

Sampling Technique

This study used stratified cluster sampling to obtain a cross-section of the population of primary caregivers of class one children in Bamenda. In stratified cluster sampling, an exhaustive list of all Primary Sampling Units (PSU) is required. In this study the select primary schools served as the PSU. The size of each PSU is estimated based on the total population of the area (Brogan, et al 1994). According to Yoon, Katz, Brendel and West (1997), it is the researcher who defines the unit used. Estimates and/or calculations are based on this sample unit. The sampling unit may be a city block if the study is done in an urban setting or it may be a village if it is done in a rural setting. Cluster sampling was integrated within this sampling design because Bamenda is spread over a large geographic area and reaching everyone is overwhelming and unnecessary. A sample that is properly selected and which is representative of the population would give results that closely represent the population (Hendersen & Sanderson 1982). Cluster sampling can also be useful when it is difficult to develop a list the people in the geographic area, but the list of the sampling unit could be easily generated. In cluster sampling, a cross-sectional estimate of an unbiased sample can be surveyed and a fairly accurate result with a close confidence interval can be obtained, to reflect an accurate picture of the population (Brogan, et al 1997).

Different cluster sizes have been used to study health characteristics of defined populations around the world. In Guinea, 30 clusters of villages with 68 children in each village cluster were used to monitor selective components of primary health care (Dabis, et al, 1989). In Kenya, 30 village clusters with 70 children drawn from each village were used to survey neonatal tetanus mortality rate (Melgaard, Mutie, and Kimani, 1987). In the Philippines, 19 village clusters with 10-13 children in each village cluster were used to study the extent of vaccine coverage (Auer & Tanner, 1990). In South Africa, 45 clusters of caregivers at different clinic sites with eight children from each clinic site were used to study breast-feeding practices (Zollner & Carlier, 1993).

For this study the primary schools were the PSU of interest. With this in mind, the 1999 Inspector of Primary and Nursery Education for Bamenda provided an exhaustive list of primary schools (PSU). There were 64 primary schools during the 1999-2000 academic year in Bamenda. Of these schools, 33 schools were located in an urban area, while 31 were located in a rural area. Of the 33 schools in the urban area, 32 of them were large schools, and one was classified as a small school. Of the 31 schools in the rural areas, 23 were large schools and eight were small schools. A large urban school registered about 100 students in primary one, while urban small school registered about 50 students in the same grade. In the rural area, large schools registered about 75 students in primary one, and about 30 students in small schools (Inspector of Primary Education Bamenda, 1999). The standard for school size is influenced by the classification of the site as either an urban or a rural area. Table 3.1 shows the number of schools in the different strata.

Table 3.1

Number of school per sampling unit

Location	Large school	Small school	Total
Urban school	32	1*	33
Rural school	23	8	31
Totals	55	9	**64**

Note. * Not included because it was a reformatory school.

In the urban areas only large schools participated in the study. The only small urban school was excluded from the study, because it was a reformatory school and students were older than those normally admitted into class one.

For primary schools to participate as sites for data collection, they were randomly selected from the inclusive list of 64 primary schools in Bamenda. These schools were stratified according to size and location. From this stratified list of primary schools, random samples were selected. A random number table was used to select schools participating in the study. From the random number table, starting with the first column of numbers and moving down the table, any set of numbers whose last two digits corresponded to any on the list of 64 primary schools was selected the first time it matched a number in any of the stratified cells. The selection was based on the weight of schools in that cell in relation to the total number of primary schools and possible school size. According to these criteria Table 3.2 shows the number of schools and the possible

Table 3.2

Number of students in primary schools per strata

Location	Large school	Small school	Total
Urban	4(100*)	0	400
Rural	3(75*)	2(30*)	285
Totals	635	110	**685**

Note. * Number of students in class one

number of caregivers anticipated from each strata based on the number of students in the schools for that strata. A total of ten different primary schools were randomly selected from the list of primary schools within Bamenda as PSU sites for data collection. The first 4, *3, and 2 schools* from the urban large, rural large, and rural small schools were respectively selected from the list of schools, as representative PSU for the respective cells.

From each cell, one additional school was selected as an alternate school should any of the selected schools in that stratum decline participation in the study. There was only one small urban school and due to the age distribution of its students, it was excluded from the study. All eligible caregivers at each cluster site had an equal chance of participating in the study. Recruitment of caregivers was achieved by requiring surveyors to approach each caregiver who was present with a child who was to be admitted into class one at select sites and request their participation in the study. Every eligible participant from each primary school selected was requested to participate. If the

caregiver consented to participate in the study, they were invited to sit at a table and fill out the survey form after completing the school admission forms. Based on the number of primary schools selected to participate in the study, 685 caregivers were anticipated.

Data Collection

Given that there was no direct contact with children, only caregivers participated in the study, and that participation was under strict confidentiality and anonymity; the Institutional Review Board (IRB) at The University of Tennessee Knoxville approved a Form A for use in this study. None was required in Bamenda, but the Provincial Delegate of Health for the North West Province was contacted and permission for this health-related study was obtained. The Provincial Delegate of Education was also contacted and permission was granted to contact caregivers during the admission period of class one students to primary schools. All officials were informed of the intent of the study, the intended methodology and degree of confidentiality to be accorded participants. Permission to proceed with the study was granted by both delegates. A letter was sent through the Inspector of Education to the headmasters of primary schools in Bamenda to solicit their participation and cooperation (Appendix A). The headmasters were invited to identify a contact person at their schools who was to be present at the school, and work with the admission team. The principal investigator personally visited each contact person to explain the procedure and the methodology of the study. Visiting the schools gave the researcher an opportunity to see data collection sites.

Since many sites would need to be staffed simultaneously, it was necessary to train assistants to coordinate the collection of data at the nine sites. Twenty student nurses in Bamenda were recruited and trained for half a day on data collection procedures and methodology. This training focused on the purpose of the study, methodology for obtaining informed consent, data collection, and courtesy towards participants. At the training session, they were each given a copy of the survey instrument, and its content carefully explained. At the end of the training, 50 survey instruments and data collection material were distributed to each student nurse. These student nurses were familiar with the study community, but not necessarily the schools they were to survey. Each student nurse was then randomly assigned to a participating selected school.

On August 22, the day before admission into primary schools, the different classrooms and/or halls in which caregivers were to be met were arranged to create the appropriate environment for caregivers to fill out surveys. The rooms were arranged so that ten chairs fit around one large table so that ten participants could sit and respond to the survey instrument at the same time. The participants' tables were placed in close proximity to the admissions tables so that every prospective caregiver could be seen and invited to complete the survey. On August 23, 1999, the day admission into class one started, the nurses went to their assigned sites and worked in collaboration with the contact person on site. In order not to make participants feel obligated to the study or feel that the study influenced the admissibility of their child in school, the request to complete the study questionnaire was withheld until participants completed the admission process.

The trained survey workers explained the objective of the study to participants and responded to any questions. Participants were informed that only the researcher and a small group of people closely working with the researcher, would review what they had written, and that their responses were to be kept anonymous and confidential. Participants were also told the data collected were to be kept in a locked vault at The University of Tennessee Knoxville (UTK) for five years, after which time they were to be destroyed. Caregivers were told participation was strictly voluntarily, and that they were free to stop participation at any time. Those who wanted to participate were given a consent form and its content explained to them. Participants were then given another opportunity to ask questions or express concerns they may have. Each participant was then given the Caregiver Health Belief Questionnaire (CHBQ-1) and asked to respond to the questions to the best of their ability. The nurse read questions allowed and marked down spoken responses for illiterate caregivers and those who did not read English. The literacy rate for Cameroon is 63.4% (Middelton, 97), and it was anticipated that some caregivers might not be literate. Literate participants were given the questionnaire and ask to complete responses in writing.

Instrumentation

The instrument used for data collection was a modified version of the Caregiver Health Belief Questionnaire developed by Bates, Fitzgerald, and Wolinsky (in 1994). The original instrument was developed to assess pediatric preventive health care utilization in Muncie, Indiana. This instrument was based on the Health Belief Model constructs. Bates, Fitzgerald, and Wolinsky (1994) initially tested and validated this

instrument. They expected that caregiver responses to questions dealing with preventable and non-preventable disease would load on different factors within the constructs of the HBM. They conducted an exploratory factor analysis to determine if this occurred. The results of the analysis showed that preventable and non-preventable diseases loaded on common factors correlating to the constructs of the HBM (Bates et al 1994).

This original instrument was modified to meet the social, language, and cultural needs of the population of Bamenda, Cameroon. A panel of six experts on language and the literature of Cameroon assessed the questionnaire for content and face validity. All reviewers recommended that the word "perceived" be replaced with the word "likely". Following this review, the questionnaire was further modified to increase ease of understanding and completion by the researcher and his dissertation committee. This newly revised questionnaire was pilot tested in Cameroon in a two-time period (test and retest, one week apart), on the same subjects to assess the validity of the instrument and the reliability of the participants' responses. Following the pilot test, the revised questionnaire was utilized as the instrument in this study.

Using Statistical Package for Social Sciences (SPSS), the data collected from this pilot test were analyzed for reliability and validity. Thirty people participated in this test/retest reliability study. Thirty-five variables were analyzed from these 30 participants. Results of the analysis gave a reliability coefficient alpha = 0.7767 for pre testing and 0.7395 for post testing period analysis with the 35 variables analyzed. From these results, the instrument was determined to be reliable and dependable for data

collection. Given that HBM is composed of constructs put together, a construct by construct analysis was then made to determine how each contributed to understanding which caregiver factors were associated with childhood immunization compliance. The reliability for the Perceived susceptibility construct had a coefficient alpha = 0.9324 for pre-testing and 0.8447 for post-testing period analysis. Perceived severity construct had an alpha = 0.8749 for pre and 0.8544 for post-period analysis. Perceived benefits analysis had an alpha = 0.6273 for pre and 0.6135 for post-period analysis. Analysis of the cues to action construct gave an alpha = 0.5793 for pre and 0.7202 for post-period analysis. The perceived barrier construct, an alpha = 0.4160 was obtained for pre and 0.7404 for post period analysis. The self-efficacy construct indicated, an alpha = 0.5891in pre-period analysis and a -2121 for post-period analysis. Results for this construct in the post-period were all very high (somewhat confident or very confident); it was not the case in the pretest. This could explain in part some of the variation between the pre and post period results.

Changes were made to the survey instrument based on the pilot test results, so the questionnaire could meet the need of determining caregiver factors associated with compliance with childhood immunization. An important question omitted from the pilot was related to the dependent variable. There was no question that specifically asked caregivers if their child was current on their immunization schedule. Question three (Has your child gotten all of his/her required vaccines?) was added to reflect this finding.

Specific questions solicited information on perception to susceptibility, severity, benefits, barriers, cues to action, self-efficacy, and on demographic variables. The first

nine questions were general health and demographic related questions. All questions were close-ended Likert format questions. Questions 10 through 16 addressed perceived susceptibility. These were close-ended Likert format questions with responses ranging from "very unlikely" (1) to "very likely" (5). Questions seventeen through twenty-four were Likert format on perceived severity of select diseases. Responses to these questions ranged from "very serious" (1) to "not serious" (5). The next nine questions (25 to 33) covered perceived benefits. Cues to action were the next two (34 to 35). Perceived barriers were covered by four questions (35 to 39) with responses ranging from "strongly agree" (1) to "strongly disagree" (5). The last five questions (40 to 44) were on perceived self-efficacy. Response options ranged from "very confident" (1) to "not very confident" (5). Each question associated with a construct had a point value ranging between one and five. A copy of the specific instrument used in this study is included as Appendix B.

A detailed description of how each question on this survey instrument was used to analyze caregiver factors associated with compliance to childhood immunization is presented in the following section on data analysis. The perceived benefit construct had a scale with three possible responses including No, Not sure and Yes. The demographic questions had both open and closed ended questions. The mean score for each construct was calculated and used in analysis

Analysis of Data

The objective of this study was to determine which caregiver attitudes and beliefs were associated with childhood immunization compliance in Bamenda. A descriptive analysis of the data collected was made to present relevant information from the sample population. This descriptive analysis formed the base for the comparison that was to follow to determine the caregiver attitudes and beliefs associated with childhood immunization compliance in Bamenda. The dependent variable for this study was compliance with recommended immunization schedules (Yes/No). Since the response to the dependent variable is dichotomous (compliance or non-compliance), and the response for the independent variables are both continuous and categorical, stepwise logistic regression is determine to be useful in this type of analysis. Stepwise logistic regression was used to examine the independent variables (Health Belief Model constructs and self-efficacy) location of the school and the level of education, to identify the optimal set of variables for predicting association with compliance to immunization schedules for children. To determine if caregivers' level of education and location of residence were associated with compliance to childhood immunization, a Chi-square test at the 0.05 level of significance was performed. Level of education and location of residence are nominal data, reported as frequencies for which an association is determined. A Chi-square test followed by Multiple Analysis of Variance (MANOVA) was performed to determine how age, gender, and marital status of caregivers in Bamenda, Cameroon was associated with compliance to childhood immunization, self-efficacy, perceived susceptibility, severity, benefits, barriers, and cues to action. MANOVA was used because six

dependent variables (self-efficacy, perceived susceptibility, severity, benefits, barriers, and cues to action) and three effects (age, gender, and marital status of caregivers) were being compared.

Stepwise logistic regression was used to estimate the probability that caregivers will take their children to be immunized as demonstrated by caregiver response to the different research questions. Stepwise logistic regression is used to derive a prediction equation for the probability of an event occurring given one or more explanatory (predictors) variables. In this study, the outcome of interest is the immunization of the child. Partial correlation, likelihood and odds ratios are also produced which are used to interpret the relationship between the constructs of the Health Belief Model and self-efficacy with the likelihood of compliance with the childhood immunization schedule. The partial correlation represents the correlation between the independent variable and the dependent variable given that all other explanatory variables in the model are held constant. This coefficient could have a positive or a negative value. If the log coefficient value is positive, then as the explanatory variable goes up, so does the likelihood of the event. If the value is negative, the likelihood of the event goes down as the explanatory variable goes up. The coefficients (B) value in stepwise logistic regression are interpreted as the log odds associated with one unit change in the predictor variable (e.g. zero to one) assuming that all the other predictor variables in the model stay the same. The log odd of an event occurring takes the sign of the logistic regression coefficient (B) value. Positive coefficient increases the log odds; negative coefficient decreases the log odds. A Wald test tests the hypothesis that a particular Beta value = 0. An explanatory

variable with a logistic coefficient (B) value significantly different from 0 is a good predictor of the occurrence of the event. The odds ratio (OR) expresses the change in the odds of an event occurring when the explanatory variable has a unit change.

To perform stepwise logistic regression, responses were coded. All "No" responses to the dependent variable were coded as "0" and all "Yes" responses to the same variable were coded "1". Responses to the independent variables were both continuous and categorical. Location was a categorical variable. A participant could either be in the urban or in the rural area. Schools located in the urban area were coded "0" and schools in the rural area coded "1". The direction of change is from the urban to the rural area. Responses to the Health Belief Model and self-efficacy constructs were continuous and did not need encoding. The scores to each set of questions for the different constructs were added and divided by the number of questions related to each construct so a mean score for each construct could be determined. The demographic factors were encoded to meet the needs of logistic regression. Age was collapsed into five groups. Any age group less than or equal to 19 was coded "1"; 20 and 29 were coded "2"; 30 and 39 were coded "3"; 40 and 49 were coded "4", and 50 and 72 were coded "5". When each of these is selected as the reference age group it is coded "1", the others are treated as dummy variables and coded "0".

There were six possible levels of educational attainment on the survey instrument. These include " 'no school', 'less than class seven', 'class seven', 'some college', 'high school', and 'university'". To know which levels of education were most associated with compliance to childhood immunization, logistic regressions on these educational levels

were performed to determine the association with compliance to childhood immunization. Gender was coded "0" for males and "1" for females.

Summary

This section on methodology discuses what was to be used for data collection, how the data was to be collected and what technique was to be used to analyze the data. The analysis of the data will determined if caregiver beliefs and attitudes were associated with compliance to childhood immunization in Bamenda. It will show caregivers' beliefs and attitudes as it relates to perceptions of susceptibility, severity, benefits, barriers, cues to action and self-efficacy. It will also show if the caregivers' sociodemographic factors of age, marital status, gender, level of education and location of residence are related to compliance with childhood immunization.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

Introduction

The purpose of this study therefore was to analyze the relationship of caregivers' beliefs and attitudes to childhood immunization compliance in Bamenda Cameroon. This was done by analyzing data collected from a sample of caregivers who were present with their children during admission into class one at randomly selected primary schools in both urban and rural areas in Bamenda. The participants completed a survey that focused on constructs of the Health Belief Model (HBM) and self-efficacy. This chapter presents the findings associated with the HBM survey data that were collected.

Sample Description

This study was centered in Bamenda, the provincial capital of the North West Province of Cameroon. There are 64 primary schools in Bamenda, ten of which were randomly selected to participate in this study. Of these, nine primary schools chose to participate. Four of these were large schools located in the urban center. This urban center also had one small that was not used as a site for data collection. This small school was excluded because the ages of its students were greater than five years of age. There was no other small urban school in Bamenda that could be substituted. Instead of the projected 735 subjects, only 685 could now be involved in the study. The four large urban schools contributed 350 (63.6%) participants to the study. Five rural primary schools, three large and two small schools participated in the study for a total of 200

(36.4%) participants from the rural area. There was a total of 550 (n=550) participants in this study for a response rate of 81.49%. Respondents by school size and location of school are depicted in Table 4.1.

There were 358 (65.1%) female participants and 191 (34.7%) male participants in the study. Two percent of participants did not report their gender; more females than males participated in this study. There were 130 (23.6%) fathers and 269 (48.9%) mothers who were present with their children for admission into class one and consented to participate in this study. Fewer (n=151, 27%) other family members accompanied children for admission into class one.

The number and percentage of participants' responses to the demographic variables are depicted in Table 4.2.

The age distribution of participants ranged between 14 and 72 years with a median age of 30 years. The mean age for participants was 32.6 ± 10.9 years. The level of education of participants ranged from those who had not gone to school to those who had completed a university education.

Table 4.1

Respondents by school size and location.

Location of School	Large Schools	Small Schools	**Totals**
Rural Schools	136	64	200
Urban Schools	350	0	350
Total	486	64	**550**

Table 4.2

Characteristic of caregivers completing immunization survey

Variable	%	N
Gender		
Males	65.1	358
Females	34.7	191
Missing	1	2
Relationship to child		
Father	23.6	130
Mother	48.9	269
Grandmother	4.0	22
Grandfather	3.8	21
Brother	4.5	25
Sisters	7.6	42
Others	7.5	41
Age of Caregiver (years)		
14 – 17	10.0	55
20 – 29	32.2	177
30 – 39	33.8	188
40 – 41	11.8	65
50+	9.8	54
Marital Status		
Single	28.7	158
Married	68.5	360
Widowed	3.1	17
Divorced	2.7	15
Level of Education		
No School	8.8	48
Less than class 7	6.8	38
Class 7	21.9	120
Some College	36.4	200
High School	14.5	80
University	11.2	62
Missing	0.4	2

Most participants had some college education while the least had less than class seven level of education. Participants' level of education is depicted in Table 4.2. There were 36.4% of the participants who had some college education, 21.8% had class seven education level, 14.5% of the participants had high school education, 11.3% had university education, 8.7% of participants had not been to school, and 6.9% had less than class seven level of education. Within the sample, 68.5% were married, 28.7% single, 3.1widowed, and 2.7 divorced.

The response rate (88%) of usable surveys reflect 486 of the 500 participants. Of all the participants who responded to the question "Has your child received all of his/her required vaccination," 157 (28.5%) responded "No" and 393 (71.5%) participants responded "Yes". Participants' responses were not corroborated in this study.

Perceived Susceptibility

Seven questions addressed this construct. Responses to these questions indicated how participants' felt their perceived susceptibility to the conditions posed influenced their compliance to childhood immunization. Table 4.3 shows participants' responses to the questions on the HBM and self-efficacy constructs.

Responses for perceived susceptibility ranged from a low of one, "Very unlikely" to a high five of five "Very likely." Participants' responses to these questions were all moderate. The strongest negative perception to perceived susceptibility construct with a mean of 2.8 ± 1.2 was associated to the question which asked participants to determine the risk of their child developing polio in the next 12 months. Of the number of

Table 4.3

Responses to Questions on HBM and Self-efficacy Constructs

Perceived Susceptibility	**#**	**Mean**	**SD**
10) What is the risk of your child developing whopping cough in the next 12 months?	542	2.56	1.32
11) What is the risk of your child developing polio in the next 12 months?	541	2.28	1.22
12) What is the risk of your child developing measles in the next 12 months?	541	2.70	1.33
13) What is the risk of your child developing fever for 2 days in the next month?	538	3.33	1.25
14) What is the risk of your child vomiting for at least 3 hours?	540	2.70	1.29
15) What is the risk of your child developing an ear infection in the next month?	541	3.17	1.26
16) What is the risk of your child developing mumps in the next month?	538	3.14	1.38
Overall Mean for Perceived Susceptibility		**2.84**	**0.83**
Perceived Severity			
17) If your child developed measles, how serious do you think the attack will be?	535	2.24	1.39
18) If your child were to develop an ear infection how serious would it be?	535	2.81	1.40
19) If your child were to develop a skin rash, how serious would it be?	532	2.59	1.33
20) If your child were to develop a fever, how serious would it be?	534	2.69	1.34
21) If your child were to develop diarrhea, how serious would it be?	533	2.70	1.42
22) If your child were to develop whooping cough, how serious would it be?	535	2.49	1.49
23) If your child were to develop polio infection, how serious would it be?	535	2.37	1.47
24) If your child were to start vomiting, how serious would it be	533	2.52	1.38
Overall Mean for Perceived Severity		**2.55**	**0.91**

(Table 4.3 continued)

Perceived Benefit Questions	#	Mean	SD
25) Do you think a vaccine will prevent your child from developing a rash?	537	1.88	0.89
26) Do you think taking a vaccine would prevent your child from vomiting?	539	1.62	0.80
27) Do you think a vaccine would prevent your child from developing an earache?	534	1.64	0.77
28) Do you believe that vaccine can prevent your child from developing a fever?	537	1.73	0.87
29) Do you think there are benefits to your child being vaccinated against diarrhea?	535	2.05	0.90
30) Do you think there are benefits for vaccinating your child against polio?	535	2.90	0.40
31) Do you see benefits for vaccinating your child against measles?	535	2.93	0.32
32) Do you think there are benefits for vaccinating your child against whooping cough?	534	2.81	0.52
33) Do you think are benefits for vaccinating your your child against mumps?	539	2.24	0.82
Overall Mean for Perceived Benefits		**2.22**	**0.42**
Cues to Action Questions			
34) I have social influences around me that motivate me to have my child vaccinated.	536	3.27	1.57
35) When other people around me vaccinate their children, I want to do the same with mine.	537	3.36	1.55
Over Mean for Cues to Action		**3.31**	**1.37**
Perceived Barrier Questions			
36) It is difficult for me to take my child to be vaccinated.	536	1.90	1.08
37) I do not have the time to take my child for his/her vaccination.	535	1.82	1.07
38) Because of my other responsibilities, I have not taken my child to be vaccinated.	535	1.77	1.07
39) If the vaccination center was near my home, I will take my child there regularly to be vaccinated.	535	3.33	1.61
Overall Mean for Perceived barriers		**2.20**	**0.87**

(Table 4.3 continued)

Self-efficacy Questions	**#**	**Mean**	**SD**
40) How confident are you that you will take your child to be vaccinated when it is due?	536	4.54	1.17
41) How confident are you that you can make your child practice healthy habits?	535	4.43	0.96
42) How confident are you that you can control difficulties in your life?	535	3.81	1.15
43) How confident are you that you will take your child to be vaccinated even when he/she has a fever?	535	3.39	1.55
44) How confident are you that you will seek help whenever your child is sick?	534	4.51	1.03
Overall Mean for Self-efficacy		**4.13**	**0.67**

participants responding to this question, 34% responded that it was "Very unlikely" for their children to develop polio within the next 12 months and 6.9% responding that it was "Very likely" their child could develop polio in the next 12 months. The strongest positive perception to perceived susceptibility construct had a mean of 3.3 ± 1.3. Nine percent and 19% responded that it was "Very unlikely" and "Very likely" respectively that it was possible for their children to develop a high fever within the next 12 months. The mean responses to the questions pertaining to perceived susceptibility were all very close to the mean. This indicates that there was not much difference between those who responded negatively and those who responded positively to these questions.

Perceived Severity

This construct was measured with eight different questions. These questions revolved around determining how the caregivers' perception of the severity of a disease condition was associated with the decisions they make about being compliant with the immunization schedule of their children. Participants' responses to these eight questions were used to make this determination. The question with the strongest negative response was related to participants' perception of the seriousness of a measles attack on their children. Of all the participants (531) responding to this question 67.1%, felt the attack would not be serious and 41.2% thought it would not be very serious.

In Cameroon measles is reported to be among the main causes of childhood mortality in the country (Kuate, 1994; DHS, 1998). However, the strongest positive perception to the influence of perceived severity revolved around participants' perception

of the seriousness of an ear infection to their child. Only 45.8% of the participants perceived that an ear infection would either "Not be serious" (23.9%) or "Not be very serious" (21.9%) for their children. The mean response to this question was 2.8 ± 1.4. The mean responses to this category of questions were all very close to the overall mean score.

Perceived Benefits

There were nine questions used to determine perceived benefits of immunization. These questions all revolved around caregiver perceptions of benefits. The response with the lowest mean score had the strongest negative perception of the association of perceived benefits to compliance to childhood immunization. Question 27 had the lowest mean score (1.6 ± 0.77). There were 534 responses to this question. Of this, 57% of the participants responded "No" that taking vaccines would not prevent their child from vomiting while 20% responded "Yes" to the same question. The question with the strongest positive response revolved around the benefits for immunizing the child against mumps with 47% of the participants responding that they perceived there were benefits for vaccinating a child against mumps. Twenty-four percent responded that there were no benefits for immunizing the child against mumps. The responses to the questions posed in this construct indicated a need to educate caregivers on disease conditions that could or could not be prevented with the use of vaccines. At this time, the use of a vaccine is not beneficial to all childhood disease conditions.

Cues to Action

Two questions were used to assess caregiver perception of how cues to action were associated with their decision to be compliant with the immunization status of their child. The question with the strongest positive response had a score of 32%. Twenty-six percent of the participants responding to this question "Strongly agree" or "Agree", that when they see people around them vaccinating their children, they want to do the same with their own. On the other extreme, 18% "Strongly disagree" or "Disagree" that seeing others around them immunize their children does not influence them to do the same. Thirty-seven percent of the participants did not perceive cues to action to be a significant factor associated with their being compliant with the immunization schedule of their children.

Perceived Barriers

Four questions were used to assess how perceived barriers were associated with caregivers being compliant with the immunization status of children. To this construct responses indicated that 43% and 37% (80%) respectively "Strongly disagree" or "Disagree" that it was difficult for them to take their children to be vaccinated. On the other extreme, 7% and 4% "Agree" or "Strongly disagree" that it was difficult for them to take their child to be vaccinated. This question had a mean response score of 1.9 ± 1.1. At the same time, 48% and 33% respectively "Strongly disagree" or "Disagree" that they do not have the time to take their children to be vaccinated. On the other extreme, 8% and 3% respectively "Agree" or "Strongly agree" that they do not have the time to take

their children to be vaccinated because of other responsibilities. The other responsibilities of 12% of respondents were perceived to be barriers to childhood immunization compliance. This question had a mean of 1.8 ± 1.1. If the vaccination center was near the home of the respondents, 24% and 34% of the participants respectively "Agree" or "Strongly agree" they would take their children regularly to be vaccinated. Thus, 57% of the participants perceived bringing the immunization center closer to their home would reduce the barriers to immunizing their children. Of this 57%, 92 participants responded "No" that that their children were not up-to-date with their immunization schedule. Based on the sample, establishing immunization centers closer to the people may increase the immunization rate by about 17%.

Self-efficacy

Five questions were used to assess caregivers' perception of the influence of this construct to compliance with the immunization schedule of the children. Responses to this construct all had very high mean scores. The mean to the question with the strongest positive score was 4.54 ± 1.17. Fifteen percent and 72% were either "Somewhat confident" or "Very confident" that they will take their children to be vaccinated when it was due. At the same time, 3.8% and 4.2% respectively had "No confidence" or were "Not very confident" that they will take their child to be vaccinated when it was due. The mean of the question with the strongest negative score (3.39 ± 1.55) was related to taking a child to be vaccinated even when that child had a fever. To this question, 18% and 13% indicated having "No confidence" or were "Not very confident" that they would take

their child to be vaccinated. On the other extreme, 17% and 36% respectively were "Somewhat confidence" or "Very confident" they will take their children to be vaccinated even if they had a fever. Compared to the other constructs, responses to self-efficacy had the highest mean scores, possibly indicating that participants were very positive they could do the things stated in the questions in this construct.

The responses to the questions associated with the different constructs all show how participants perceived the constructs contributed to their being compliant with the immunization schedule of the their children. Table 4.4 shows the responses per construct. Participants' responses per construct are a mean score of the responses for rural and urban areas.

When the participants' responses per construct were evaluated by location, changes were noticed to the response rate per construct. The mean scores for perceived susceptibility were 3.0 and 2.7 for rural and urban areas respectively. The mean scores for perceived severity were 2.9 and 2.4 for rural and urban areas respectively. Perceived

Table 4.4

Overall summary data of constructs used in this study

	N	Mean	Std. Deviation
Perceived Susceptibility	542	2.8386	.8294
Perceived Severity	535	2.5523	.9088
Perceived Benefits	539	2.1984	.4190
Cues to Action	537	3.3138	1.3743
Perceived Barriers	536	2.2043	.8651
Self Efficacy	535	4.1294	.6744
Valid N (listwise)	522		

benefits had a mean score of 2.2 and 2.2 for rural and urban areas respectively. Cues to action had mean scores of 3.5 and 3.2 respectively for rural and urban areas. Perceived barriers had a mean score of 2.4 and 2.1 for rural and urban areas. With the self-efficacy construct rural and urban areas had mean scores of 4.2 and 4.1 respectively. The self-efficacy mean scores were the highest scores for both the rural and urban areas while the perceived benefit mean scores were the lowest for rural and urban areas.

These differences in participants' responses to the constructs for rural and urban areas are shown in table 4.5. Both in the urban and rural areas cues to action had the

Table 4.5

Participants responses to constructs per location

	Rural			Urban		
Constructs	**#**	**Mean**	**SD**	**#**	**Mean**	**SD**
Perceived susceptibility	192	3.03	0.82	350	2.73	0.81
Perceived severity	185	2.91	0.79	350	2.37	0.91
Perceived benefits	190	2.20	0.42	349	2.20	0.42
Perceived barriers	190	2.41	0.83	346	2.09	0.86
Cues to action	190	3.54	1.23	347	3.19	1.43
Self-efficacy	188	4.22	061	347	4.08	0.70

most diverse responses compared to the other constructs. This meant that the responses in the urban area were more varied than responses in the rural area. Responses for self-efficacy were the highest mean scores in both rural and urban areas. This implied that these participants were very confident they could perform the actions stated in the questions. The mean scores for perceived barriers and perceived severity were not very different for both rural and urban areas.

Statistical Analysis

The purpose of this study was to assess caregiver beliefs and attitudes associated with compliance to childhood immunization in Bamenda. Responding to the research questions showed how caregiver attitudes and beliefs were associated with compliance to childhood immunization. Chi-square, MANOVA, and logistic regression statistical techniques were performed to determine how caregiver attitudes and beliefs were associated with compliance to childhood immunization. These tests were determined to be appropriate, because responses to the dependent variable (compliance to childhood immunization) were recorded as categorical and binary entries.

Location of residence in an urban or rural area in Bamenda, Cameroon and compliance to childhood immunization A Chi-square test at the 0.05 level of significance with a critical value of 3.841 was performed to determine if there was an association between location of residence and compliance to childhood immunization in Bamenda. The value of the test statistic 2.522,was less than the critical value of 3.841 and the p =

0.112. At the 0.05 level of significance no significant difference was found in the caregiver self-reported responses from rural or urban communities in Bamenda, Cameroon to being compliant with childhood immunization. Table 4.6 provides the results of the Chi-square test performed to determine the association between location of residence and compliance to childhood immunization.

Caregivers' Level of Education and Compliance to Childhood Immunization

A Chi-square test at the 0.05 level of significance and a critical value of 3.841 was performed to respond to this question. Six possible levels of education in Bamenda, Cameroon were included for participants to chose from. These include no school, less

Table 4.6

Chi-square results of location of residence and compliance to immunization

	Has your child receive all of his/her required vaccinations		
Location of residence	No	Yes	Total
Rural	49	151	200
Urban	108	242	350
Total	157	393	550

Chi-square **2.52** df = 1 Level of significance = **0.112**

than class seven, class seven, some college, high school, and university. Results of the Chi-square analysis showed that there was a significant association for certain level of education and compliance with childhood immunization. The Chi-square value 18.276, was significantly higher than the critical value (3.841), and the p = 0.003. It could therefore be concluded that caregivers' level of education in Bamenda, Cameroon was significantly associated with compliance to childhood immunization. This result is reported in Table 4.7.

Table 4.7:

Caregivers' level of education and compliance to childhood immunization

	Has your child received his/her required vaccine		
Level of Education	**No**	**Yes**	**Total**
No School	21	27	48
Less than class seven	8	30	38
Class seven	46	74	120
Some college	50	150	200
High school	21	59	80
University	10	52	62
Total	**156**	**392**	**548**

Chi-square = **18.28** df = 5 Level of Significance **0.003**

Association between caregivers' socio-demographic characteristics of age, gender, marital status, and perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy with compliance to childhood immunization

A Chi-square using a 0.05 level of significance and a critical value of 3.481 was used to determine if a significant difference existed between different socio-demographic responses of age, gender, and marital status and compliance to childhood immunization in Bamenda, Cameroon. MANOVA was then used to determine how the multiple demographic factors were associated with self-efficacy, perceived susceptibility, severity, benefits, barriers, cues to action and compliance with childhood immunization in Bamenda, Cameroon.

The Chi-square test found there was no significant difference in caregivers' gender associated with compliance to childhood immunization in Bamenda. The Chi-square test statistics was 0.103, df = 1, and the p = 0. 748. Since the test statistics (0.10) was less than the critical value (3.481), it was therefore concluded that there was no statistically significant difference between gender and compliance to childhood immunization in Bamenda, Cameroon. This result is reported in Table 4.8.

The Chi-square test performed to determine a significant difference between age and compliance to childhood immunization in Bamenda, Cameroon determined there was no significant difference. It had a test value of 2.4 with a p= 0.66. This p value was greater than the critical value at the 0.05 level. It is therefore concluded that there was no significant difference between age and compliance to childhood immunization in Bamenda, Cameroon. Table 4.9 shows these results.

Table 4.8

Caregivers' gender and compliance to childhood immunization

	Has your child received all of his/her required vaccines		
Gender	No	Yes	Total
Male	53	138	191
Female	104	254	358
Total	157	392	549

Chi-square = **0.103** df = 1 Level of Significance = **0.748**

Table 4.9

Caregivers age and compliance to childhood Immunization

	Has this child received all of his/her required vaccines		
Age Group	No	Yes	Total
14 – 19	20	35	55
20 – 20	49	128	177
30 –39	48	138	186
40 – 49	19	46	65
50 +	15	39	54
Total	151	386	537

Chi-square = **2.4** df = 4 Level of significance = **0.66**

The significant difference between marital status with compliance to childhood immunization was also performed. The Chi-square results = 1.716, and a p = 0.63 indicate that there was no statistically significant difference between marital status and compliance with childhood immunization in Bamenda, Cameroon. Table 4.10 shows the Chi-square test scores for marital status and compliance to childhood immunization.

Results of MANOVA showed that fixed demographic factors of age, gender, and marital status were not associated with the HBM and self-efficacy constructs of perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy which are characteristic samples. Significance would have implied some of the variables are associated with compliance to childhood immunization. As shown in Table 4.11 there

Table 4.11

Table 4.10

Caregivers marital status and compliance to childhood immunization

	Has your child received all of his/her required vaccines		
Marital status	No	Yes	Total
Single	46	112	158
Married	99	261	360
Widow	7	10	17
Divorced	5	10	15
Total	157	393	550

Chi-square = **1.7** df = 3 Level of significance = **0.63**

Results of MANOVA and the fixed characteristics

Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.924	946.788[a]	6.000	467.000	.000
	Wilks' Lambda	.076	946.788[a]	6.000	467.000	.000
	Hotelling's Trace	12.164	946.788[a]	6.000	467.000	.000
	Roy's Largest Ro	12.164	946.788[a]	6.000	467.000	.000
GENDER	Pillai's Trace	.020	1.561[a]	6.000	467.000	.157
	Wilks' Lambda	.980	1.561[a]	6.000	467.000	.157
	Hotelling's Trace	.020	1.561[a]	6.000	467.000	.157
	Roy's Largest Ro	.020	1.561[a]	6.000	467.000	.157
MSTATUS	Pillai's Trace	.041	1.638	12.000	936.000	.076
	Wilks' Lambda	.959	1.639[a]	12.000	934.000	.076
	Hotelling's Trace	.042	1.640	12.000	932.000	.075
	Roy's Largest Ro	.032	2.508[b]	6.000	468.000	.021
AGEGROUP	Pillai's Trace	.047	.935	24.000	1880.000	.553
	Wilks' Lambda	.953	.934	24.000	1630.378	.554
	Hotelling's Trace	.048	.934	24.000	1862.000	.555
	Roy's Largest Ro	.028	2.217[b]	6.000	470.000	.040
GENDER * MSTATUS	Pillai's Trace	.031	1.247	12.000	936.000	.246
	Wilks' Lambda	.969	1.251[a]	12.000	934.000	.243
	Hotelling's Trace	.032	1.255	12.000	932.000	.241
	Roy's Largest Ro	.029	2.273[b]	6.000	468.000	.036
GENDER * AGEGRO	Pillai's Trace	.032	.639	24.000	1880.000	.910
	Wilks' Lambda	.968	.637	24.000	1630.378	.911
	Hotelling's Trace	.033	.635	24.000	1862.000	.913
	Roy's Largest Ro	.014	1.110[b]	6.000	470.000	.355
MSTATUS * AGEGRO	Pillai's Trace	.065	.856	36.000	2832.000	.712
	Wilks' Lambda	.937	.854	36.000	2053.502	.715
	Hotelling's Trace	.066	.852	36.000	2792.000	.719
	Roy's Largest Ro	.026	2.032[b]	6.000	472.000	.060
GENDER * MSTATUS AGEGROUP	Pillai's Trace	.055	1.098	24.000	1880.000	.337
	Wilks' Lambda	.945	1.101	24.000	1630.378	.334
	Hotelling's Trace	.057	1.104	24.000	1862.000	.330
	Roy's Largest Ro	.039	3.049[b]	6.000	470.000	.006

a. Exact statistic

b. The statistic is an upper bound on F that yields a lower bound on the significance level.

c. Design: Intercept+GENDER+MSTATUS+AGEGROUP+GENDER * MSTATUS+GENDER * AGEGROUP+MSTATUS * AGEGROUP+GENDER * MSTATUS * AGEGROUP

was no significant association. The MANOVA test statistics was 0.945 and the Wilks' Lambda F score for within groups was 1.1 with a p = .334. There was no within group interaction between the socio-demographic variables associated with self–efficacy or HBM constructs and compliance to childhood immunization in Bamenda.

The Association between HBM and self-efficacy constructs, location of residence, level of education and compliance to childhood immunization

The stepwise logistic regression retained some of the HBM and self-efficacy constructs as being associated with compliance to childhood immunization in Bamenda, Cameroon. Table 4.12 lists the constructs that were retained in the logistic regression.

Variables retained in the model are associated with compliance to childhood immunization in Bamenda, Cameroon. Perceived susceptibility had an OR = 0.75 (95%

Table 4.12

Variables associated with compliance to childhood immunization

Variable name	Odds Ratio	95% C . I	
		Lower	Upper
Perceived susceptibility	0.75	0.57	0.99
Perceived severity	0.74	0.57	0.96
Self-efficacy	1.57	1.18	2.10
School location	0.52	0.33	0.83
Level of education	1.32	1.06	1.44

CI 0.57 - 0.99). It had a Beta of - 0.286. Perceived severity had an OR = 0.74 (95% CI 0.57 - 0.96) with a Beta value of - 0. 298. Self-efficacy had an OR = 1.57 (95% CI 1.18-2.10). The logistic regression retained location of residence as a variable associated with compliance with childhood immunization in Bamenda, Cameroon. Location of residence had an OR = 0.53 (95% C I of 0.33 - 0.83) and a Beta value of - 0. 65. This implied as caregivers' location of residence changed from 0 to 1 (urban to rural residence), compliance to childhood immunization decreased by a value of 0.53. Location of residence had the least strength (0.53) compared to the other variables retained in the regression as contributing to compliance to childhood immunization. Participants' level of education was also retained in the model of best fit. It had an OR = 1.23 (95% C I of 1.05 – 1.44) and a Beta value of - 0.097. This implied that as caregivers level of education changed from 0 to 1 (less than class seven to higher than class seven) compliance to childhood immunization increases by a factor of 1.23. These were the five variables retained in the model as factors associated with compliance to childhood immunization in Bamenda, Cameroon indicating that compliance to childhood immunization is multifactorial.

These five variables associated with compliance to childhood immunization in Bamenda (perceived susceptibility, perceived severity, self-efficacy, location of residence, and level of education), contributed variably to compliance with childhood immunization. Perceived susceptibility with OR = 0.75 (95% C I of 0.56 - 0.99) and a Beta of - 0.30 indicate that as caregivers perception of risk to their child of contracting vaccine-preventable diseases increased, their chances of being compliant with the

immunization status of the child decreased by a factor of 0.75. As caregiver perceptions of the degree of severity of disease or its complications increased, the chances of their being compliant with the immunization status of the child decreased. Perceived susceptibility and severity both had a protective effect. This implied that they contributed to increased likelihood for the caregiver to be compliant to the immunization status of the child. When caregivers' are self-efficacious their odds of being compliant with the immunization of their child increased by 1.57 as their confidence level changes from 0 to 1. When caregivers' self-efficacy changed from 0 to 1, compliance to childhood immunization increased by a factor of 1.57.

Although Chi-square did not find the caregivers location to be significantly associated with compliance to childhood immunization, it is not unusual. Compliance to childhood immunization is not influenced by only one factor. In the real world multiple factors associate with one another to influence compliance. It is for this reason that when location is included in the stepwise logistic regression it is found to be a significant factor associated with compliance, because many other factors are interacting at this level to determine an outcome.

Summary

This chapter presented the analysis and interpretation of the data collected from Bamenda, Cameroon. The analysis of the self-reported data showed that caregivers in Bamenda had beliefs and attitudes that were significantly associated with being in compliance with the immunization status of their children. These factors included the caregiver's level of education, perceived susceptibility, perceived severity, and self-

efficacy. Caregivers' level of education with a chi-square of 18.275 was associated with compliance to immunization. Perceived susceptibility with an odds ratio (OR) of 0.75 and perceived severity with an OR of 0.74 were both negatively associated with compliance to childhood immunization. This implied that a unit change, from 0 to one in either perceived susceptibility or severity was associated with a decreased likelihood of immunizing children. Self-efficacy, Location of residence, and level of education were positively associated with compliance to childhood immunization. This implied caregivers with a that a unit change in these factors were associated with increased likelihood that caregivers immunized children.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSION, AND RECOMMENDATIONS

Summary of the Study

The purpose of this study was to examine caregiver attitudes and beliefs associated with compliance with childhood immunization in Bamenda, Cameroon. This was done by sampling caregivers who were present with their children for admission into class one, and who consented to participate in the study at randomly selected schools in urban and rural areas in Bamenda.

To meet this need, a survey questionnaire based on the health belief model was used to collect the data. The instrument was tested to ensure validity, reliability, and cultural sensitivity. The instrument used was presented in a Likert-format and was based on one originally developed and validated by Bates and others (1994). For this study the instrument was pilot tested in Bamenda and changes made based on the results of the pilot test. Analysis of this pilot test data found that the instrument was acceptable as indicated by the indices of validity and reliability.

The data collected was coded and analyzed by using Chi-square, stepwise logistic regression, and MANOVA on explanatory variables and how they were related to increased compliance. Different logistic regressions were run to identify the model that was best able to predict compliance to childhood immunization in Bamenda. In completing the regression, 25 cases with missing variables were excluded from the final

log regression. The 95% confidence interval was used in estimating the odds ratio of increased compliance.

Findings

Location of residence in an urban or rural area in Bamenda, Cameroon and compliance to childhood immunization

i) There were 200 rural resident caregivers in Bamenda who participated in this study.

ii) Of the 200 caregivers with residence in a rural area, 25% (49) reported that their children were not up to date with their immunization schedule.

iii) Seventy-five percent of these rural residents responded that their children were up to date with their immunization schedule.

iv) There were 350 urban caregivers from Bamenda who participated in this study.

v) Thirty one percent of these urban caregivers from Bamenda reported that they were not up-to-date with their child's immunization schedule.

vi) Sixty-nine percent of urban caregivers from Bamenda reported that their children were up-to-date with their immunization schedule.

vii) Caregivers' location of residence was not found to be significantly associated with compliance to childhood immunization.

Caregivers' level of education and compliance to childhood immunization

i) Caregivers in Bamenda whose level of education were equal to or less than class

seven were less likely to be compliant with childhood immunization.

ii) Caregivers in Bamenda whose level of education was higher than class seven were more likely to be compliant with childhood immunization.

iii) Caregivers' level of education was significantly associated with compliance to childhood immunization in Bamenda.

Association between caregiver socio-demographic characteristics of age, gender, marital status and perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy with compliance to childhood immunization

i) Caregivers' gender was not found to be associated with the likelihood of increased compliance to the immunization schedule.

ii) Caregivers' age was not associated with increased likelihood of being up-to-date with childhood immunization.

iii) Caregivers' gender was not found to be significantly associated with increased likelihood of being up-to-date with childhood immunization.

iv) There was no significant association noted with the perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy with compliance to childhood immunization.

v) Caregivers' socio-demographic characteristics of age, gender, and marital status were not found to be associated with increase likelihood of childhood immunization.

The association between HBM and self-efficacy constructs, location of residence, level of education, and compliance to childhood immunization

i) Perceived susceptibility with an OR = 0.75 (95% CI 0.57 – 0.99) was associated with increased likelihood of childhood immunization in Bamenda.

ii) As caregiver perception of their susceptibility to vaccine preventable diseases increased, the likelihood of immunizing their children decreased.

iii) Perceived severity with and OR = 0.74 (95% CI 0.57 – 0.96) was associated with increased likelihood of childhood immunization in Bamenda.

iv) As caregivers' perception of the severity of vaccine-preventable diseases increased, the likelihood they would be up-to-date with childhood immunization decreased.

v) Caregivers' self-efficacy was associated with increased likelihood of immunizing their children.

vi) As caregivers' level of self-efficacy increased they showed an increased likelihood of immunizing their children.

vii) Caregivers' level of education was associated with increased likelihood of immunizing children in Bamenda.

viii) Living in an urban community in Bamenda is associated with an increased likelihood of immunizing children.

Conclusions

Within the limitations of this study, analysis of the data and the findings, the following conclusions were drawn:

1. Location of residence in an urban or rural area in Bamenda, Cameroon and compliance to childhood immunization

Although location of residence was not shown to be significantly associated with compliance to childhood immunization in Bamenda as determined using the Chi-square test, stepwise logistic regression did retain location as a factor associated with compliance to childhood immunization. This was consistent with the results of earlier studies (Merlin, et al. 1986; Merlin, et al. 1988).

2. Caregivers' level of education and compliance to childhood immunization

Caregivers' whose level of education was class seven or less, demonstrated a lower likelihood of being compliant to childhood immunization schedule in Bamenda. Caregivers' whose level of education was higher than class seven demonstrated a higher likelihood of being compliant to childhood immunization schedule in Bamenda.

3. Association between caregivers' socio-demographic characteristics of age, gender, marital status, and perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy with compliance to childhood immunization

The socio-demographic variables of age, gender, and marital status were not found to be significantly associated with compliance to childhood immunization in Bamenda, Cameroon.

4. The association between HBM and self-efficacy constructs, location of residence, level of education and compliance to childhood immunization

Some of the constructs of the Health Belief Model and Self-efficacy were found to be associated with compliance to childhood immunization. Caregivers' perception of susceptibility and severity of vaccine-preventable diseases were associated with compliance to childhood immunization. Caregivers' self-efficacy increased was associated with compliance to childhood immunization.

Recommendations

The following recommendations are based on the findings and the conclusions of this study:

1. The rate of immunization in Bamenda as reported by caregivers in this study (71.5%) was within the range 68%-81% (Ghogomo, 1099) reported by the provincial delegate of health for the North West Province. This rate is more than doubled the 34.6% (UNICEF, 1998) national average rate of immunization in Cameroon. Efforts should

be made to maintain and increase this rate in Bamenda. Also, more should be done to reach those not currently served and improve the immunization rate in Bamenda.

2. Special attention should be paid to caregivers whose level of education is class seven or less. Results of this study indicate they are at most risk for not being compliant with the immunization requirements of their children. Educational approaches should be designed to meet their level of comprehension.
3. Education should be directed at reducing the "fatalistic attitudes" caregivers have of vaccine-preventable diseases. In this study it was found that, although perceived severity was associated with compliance to childhood immunization, it had an inverse relationship.

Recommendations for Further Research

1. Additional research should be directed at determining specific barriers caregivers have that could be preventing immunization compliance.
2. Additional research study should be directed at determining why there is an inverse relation between perceived severity and compliance to childhood immunization.

Summary

Although the rate of immunization in Cameroon is only 34.6% (UNICEF, 1998), this study found the self-reported rate in Bamenda was 71.5%. This rate was consistent with that reported by the provincial delegate of health for the North West Province. This show that rate of immunization within a country differs for different parts of the country.

Attention should be directed to reach caregivers whose level of education was below class seven. They are at most risk of not being compliant with their children's immunization status. The health belief model constructs of perceived susceptibility, perceived severity, and self-efficacy were associated with compliance to childhood immunization in Bamenda. Caregivers' level of education was associated with compliance with childhood immunization. There is still room for improving on the immunization rate in Bamenda.

Caregivers' beliefs and attitudes are associated with compliance to childhood immunization. Knowing caregivers' beliefs and attitudes about immunization is important, so attention should be directed to meet the needs identified, if compliance to childhood immunization rate in Bamenda is to be increased.

CHAPTER VI

THE STUDY IN RETROSPECT

Introduction

This chapter is a retrospective review of the study covering the strengths, weaknesses, surprises and other factors that did not precisely lend themselves to analysis, but are important. It also presents the researchers insights into the study now that it has been completed. The purpose of this study was to assess caregivers' attitudes and beliefs associated with compliance to childhood immunization in Bamenda, Cameroon. This study was completed using the Health Belief Model and Self-efficacy as a framework. Participants in this study were caregivers who were present with their children for admission into class one at randomly selected primary schools in Bamenda, Cameroon.

Importance of the Study

The major reason why this study was done was to identify caregiver factors that contribute to childhood immunization compliance in Bamenda, Cameroon. Caregivers seem to play an important role in determining what children can or cannot do. Therefore a caregiver's role seem to be associated with compliance to childhood immunization and cannot be over-emphasized. Knowing parental attitudes and beliefs associated with compliance to childhood immunization in Bamenda is very important. This is especially true with the low rate of immunization coverage in Cameroon. The level of immunization in the country is very low (36.4%) according to the 1998 Demographic Health Survey, 1998. The highest this level has been was 56% in 1993, but probably due

to the current winds of political persuasions in Cameroon, the lack of appropriate health education and caregivers apathy, people are finding less reasons and motivation to immunize their children. A second reason for this study was to gain knowledge to be able to make recommendations on how to improve immunization coverage in Cameroon. When children are not fully immunized, then they are not given the full potential to develop. Given that they will easily contract diseases, fall sick, or miss school they are at risk of compromising their opportunities. When children miss school they miss the opportunity to be in class, have formal instruction, and interact with their friends and peers. Until the rate of immunization in Cameroon is significantly improved fewer and fewer children will develop to their full potential and become inactive members of their community. These children therefore become a greater burden to the government and tax payers in general. It is economically beneficial to help when timing is critical than to wait for the future when the health problems may get worse and cost more. Despite the progress made in the immunization of the childhood population in Bamenda, Cameroon there is still work to be done to immunize and to maintain compliance to immunization in Cameroon. Continuous health education could reduce caregiver apathy and increase complacency to childhood immunization.

This study is the first to treat compliance to childhood immunization in Cameroon using a theoretical framework. It is important to use a theoretical approach in studies because specific determinations can be made or anticipated based on previous model, experiences, theory, and research.

Observations about the Study

Despite the desire for this study, it was only made possible by the timely award of the McCullar Scholarship for International Studies from Center of International Studies at The University of Tennessee Knoxville. Encouragement for the study came from the highest level of the graduate school, from members of the dissertation committee (past and present) and the Head of the Department of Health and Safety Sciences, who was very kind and patient to accommodate my schedule while collecting data in Cameroon.

The planning and preparation for this study took much time and effort. Even with precautions, so many things went wrong. Communications between Cameroon and Knoxville was one of the most frustrating problems. It was very expensive to make international calls or send facsimiles. Some registered express mails sent to Bamenda has still not gotten there though it was sent almost one year ago. Many packages were sent with the hope that one could reach its correct destination and, with luck, on time. This increased the cost of the study. Contacts and instructors at the Training School for Nurses in Bamenda were invaluable in the preparation and data collection in Bamenda. The Delegate of Health for the North West Province, Dr. Ghogomo Amida, was very receptive to the study from conception to data collection in Bamenda. Without his support, this study would not have been accomplished. Although the planning for this study was intense, one must always allow room for the unthinkable. It was a good idea to anticipate the worst and plan for the unexpected.

While in Bamenda, the main researcher learned he would not be permitted entry to schools until he presented a letter, signed by the inspector of primary and nursery

education, to the headmasters of the schools participating in the study. The inspector could not be seen for two weeks, because he had other scheduled engagements. While waiting for his return, the main researcher worked on collecting data for the pilot test and recruiting student nurses to participate in the data collection process. Participants for the pilot test were nurses at the provincial hospital in Bamenda. They responded to the pilot test with enthusiasm. The nurses were interested to know why the immunization rate of Cameroon was very low. Some felt there were personal benefits to participating in the pilot test. It was explained to them that there would be no such benefits.

Twenty-four nurses signed up to participate in the training. Four came very late in the training. Given the importance of the study data we trained the participants to understand the data collection process, therefore, these late comers were excluded from participation. This action reinforced that the data collection process was to be taken seriously, and only those that were ready and prepared were able to participate.

The training stressed the importance of the study and how the data were to be collected, as well as the procedures involved. Participants were given handouts detailing the data collection procedure and the courtesy to accord caregivers. A sample of the study questionnaire was distributed to participants and its content fully explained. They were shown how to complete caregiver responses or non-response. Role playing on approaching and requesting the participation of caregivers was practiced and perfected. The words used on the questionnaire and acceptable synonyms were used in role playing to insure that every member of the team was able to ask the same questions in the same way, meaning the same thing.

The night before the data collection, the main researcher was very worried. There was a fear of the unknown and the hope that everything proceeded as planned. The next day the main researcher visited all the sites participating in the study. At some sites the researcher was very impressed with the early turnout of caregivers with their children for admission. At other sites there was not even one caregiver present by the time the main researcher left the grounds. Caregivers observed and questioned around the schools reported that they did not have the money to pay the required registration at that point in time. By the close of the day, some caregivers came to register their children into class one, and some consented to participate in the study. The nurses spent all day at the various sites because they were aware that the main researcher could appear there at any time. Overall, the data collection went well.

Strengths and Weaknesses of this Study

Although the Health Belief Model and Self-efficacy has proven to be useful in predicting parental attitudes and beliefs associated with compliance to childhood immunization in Bamenda, if this study was to be repeated, the theory of reason action may better explain immunization compliance. The theory of reason action is based on the assumption that humans are rational and make use of the information they have in deciding on a course of action with due consideration of the implications of such action (Ajzen & Fishbein, 1985). The decision to take the child to be immunized is governed by two facts: One is personal, and the other a reflection of social influences or the subjective norms of the person. A person's attitude is a function of his/her beliefs and the theory of

reason action is predicated on this premise. This was the basis of this study, and the theory of reason action would have more clearly explained caregiver attitudes and beliefs associated with compliance to childhood immunization.

Stepwise logistic regression proved to be an appropriate tool for determining factors associated with immunization compliance. The addition of more explanatory variables in this technique only explained the fact that childhood immunization compliance is multifactorial. The variables retained using this technique will be better predictors of childhood immunization compliance. Different regression models could be explored to determine the model of best fit.

Addition of Self-efficacy to the Health Belief Model

The addition of the self-efficacy construct to the Health Belief Model in determining caregiver attitudes and beliefs associated with compliance to childhood immunization in Cameroon was very important. This is evident by the fact that it was the variable with the greatest odds ratio value of 1.57 (95% C I 1.18 – 2.10), of the independent variables retained in the stepwise logistic regression and associated with childhood immunization compliance. Non of the other health belief model constructs was as powerful as self-efficacy in explaining compliance to childhood immunization. Thus with self-efficacy, the odds of increased compliance to childhood immunization increased by a factor of 1.57 with a unit change in caregivers self-efficacy. This change more than doubled the effect of perceived susceptibility with the second highest odds ratio 0.75. The call for the addition of self-efficacy to the HBM model has been

expressed in literature (Strobino, Keane, Holt, Hughart, & Guyer, 1996). In this study self-efficacy was the best predictor of compliance to childhood immunization in Bamenda, Cameroon. This researcher holds that the addition of self-efficacy to the HBM was important and encourages others to do the same when using the HBM.

Health Education Implications for Cameroon

The importance of being compliant with the immunization schedule should be emphasized to caregivers. This emphasis can be done with increased health education of caregivers. The scope of the education should be broad but be population-specific. The education should include diseases that are vaccine-preventable. It is important for caregivers to know diseases that are vaccine-preventable and those that are not vaccine-preventable. Presently most parents think all diseases are vaccine-preventable. Attention should be focused on caregivers whose level of education is less than or equal to class seven. They were the population least likely to immunize their children in both rural and urban areas.

Educate caregivers on the importance and the cost effectiveness of disease prevention over disease treatment. This is especially so in Cameroon where most caregivers cannot afford to pay for health care and health care cost is getting more and more expensive. Educate caregivers on the importance of seeking medical care and vaccination even when the child is sick. Immunization is not contra-indicated with every sickness the child may have.

It is very important to involve the stakeholders in the communities in the decision making process for immunization. Most caregivers will listen to and follow the instructions of stakeholders in their communities. When stakeholders are involved in the planning phases of programs and understand the importance of the program, they can then carry and spread the information into their communities. When these educational strategies are carried out in Cameroon, there will be an increased likelihood of caregivers being compliant with the immunization schedule of their children.

Summary

This chapter discussed some of the important issues that arose in the course of this study. Some were very important, but had no formal place in the final analysis. The strength and the weaknesses of the study were also presented and the health education implications of the study to Cameroon is also presented. An alternate methodology was also presented. It is anticipated that these comments may provide direction and insights for future researchers on this or any part of this topic.

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APPENDICES

APPENDIX A : Consent Form

Consent Form

Dear Caregivers,
This survey is being conducted to learn more about the factors associated with childhood illness and death in Bamenda, Cameroon. Your responses to these questions will greatly assist in making future decisions about health-related programs for children in Bamenda, Cameroon.

Your participation in this project, is voluntary and confidential, and will be valuable in helping reduce childhood illness and death. Your response to this survey serves as consent and acknowledgement that this is a survey research project. As you fill out this survey you may stop at any point. This survey contains no names or identifiers. You will receive no monetary compensation as a participant.

Should you have any questions about this survey you may reach Jude Tuma a University of Tennessee graduate student coordinating this project in Bamenda at 36 11 04 from August 20, to September 4. You may also reach him in the US at 011 423 974 4215 any time after September 10, 1999.

Thank you for your time and effort.

Sincerely yours,

Jude Tuma
Graduate Teaching Associate
Department of Health and Safety Sciences
University of Tennessee, Knoxville.

Appendix B: Questionnaire

Caregiver's Health Beliefs Toward Childhood Immunization

Summary: This survey seeks to determine factors that influence a caregiver's attitudes towards childhood immunization. All the information collected will be kept confidential and anonymous.

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1) How many children do you have? _____ children
2) Circle the birth order of the child you are registering for school today?

   1st 2nd 3rd 4th 5th 6th 7th 8th Others_____

3) Has this child received all of his/her required vaccination?
   _____Yes
   _____No

4) What is your relationship to this child? Mark an **X** where appropriate.
   _____ Father
   _____ Mother
   _____Grandmother
   _____Grandfather
   _____Brother
   _____Sister
   _____Other

5) What is your highest level of education? Mark **X** where appropriate.
   _____No School
   _____Less than class 7
   _____Class 7
   _____Some College
   _____High School
   _____University

6) What is your age? _____years old
7) Your gender? _____ Male
   _____ Female

8) What is your marital status?
   _____Single
   _____Married
   _____Widow
   _____Divorced
9) This child I am taking for admission today, her/his health is?
   _____Excellent
   _____Good
   _____Fair
   _____Poor

Instructions: The following sections require you to place an **X** in the box that best describes your feelings and opinions. Please do not leave any question blank. An example of how you will complete a question is below

Example

	Very Unlikely	**Unlikely**	**Not Sure**	**Likely**	**Very Likely**
It is possible for me to have headache					X

	Very Unlikely	Unlikely	Not Sure	Likely	Very Likely
10) What is the risk of your child getting whopping cough during the next 12 months?					
11) What is the risk of your child developing polio in the next 12 months?					
12) What is the risk of your child developing measles in the next year?					
13) What is the risk of your child developing a high fever for 2 days in the next month?					
14) What is the risk of your child vomiting for at least 3 hours?					
15) What is the risk of your child developing an ear infection in the next month?					
16) What is the risk of your child developing mumps in the next 12 months?					

	Not Serious	Not Very Serious	**Not Sure**	**Some what Serious**	Very Serious
17) If your child developed measles, how serious do you think the attack would be?					
18) If your child were to develop an ear infection, how serious would it be?					
19) If your child were to develop a skin rash, how serious would it be?					
20) If your child were to develop a fever, how serious would it be?					
21) If your child were to develop diarrhea, how serious would it be?					
22) If your child were to develop whopping cough, how serious would it be?					
23) If your child were to develop polio infection, how serious would it be?					
24) If your child were to start vomiting, how serious would it be?					

	No	Not Sure	Yes
25) Do you think taking a vaccine would prevent your child from developing a skin rash?			
26) Do you think taking a vaccine could prevent your child from vomiting?			
27) Do you think vaccines will prevent your child from developing an earache?			
28) Do you believe that vaccines can prevent your child from developing a fever?			
29) Do you believe there are benefits to your child being vaccinated against diarrhea?			
30) Do you think there are benefits for vaccinating your child against polio?			
31) Do you see benefits for vaccinating your child against measles?			
32) Do you think there are benefits for vaccinating your child against whopping cough?			
33) Do you think there are benefits for vaccinating your child against mumps?			

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
34) I have social influences around that motivate me to have my child vaccinated.					
35) When other people around me vaccinate their children, I want to do same with mine.					
36) It is difficult for me to take my child to be vaccinated.					
37) I do not have the time to take my child for his/her vaccination.					
38) Because of my other responsibilities I have not taken my child to be vaccinated					
39) If the Vaccination Center was near my home, I would take my child there regularly to be vaccinated					

	No Confidence	Not very Confident	Not Sure	Somewhat Confident	Very Confident
40) How confident are you that will you take your child for vaccination when it is due?					
41) How confident are you that you can make your family practice healthy habits?					
42) How confident are you that you can control difficulties in your life?					
43) How confident are you that you will take your child to be vaccinated even when s/he has a fever?					
44) How confident are you that you will seek help whenever your child is sick?					

APPENDIX C: LETTERS OF CORRESPONDENCE

Tuma Jude N
1611 Laurel Avenue Apt. 918
Knoxville, TN 37916
United States of America
Septembre 6, 1999

Through

Dr. Ghogomoh Amida
The Provincial Delegate of Public Health
North West Province
Cameroon

To

Dr. Monekosso
Honerable Minister of Public Health
Ministry of Public Health Yaounde
Cameroon

A Letter of Appreciation for Permitting me Conduct a Research on Caregiveral Attitudes Associated with Compliance to Childhood Diseases in Bamenda, Cameron

Sir

I wish to loud your effort in permitting me carry out a survey on Caregiveral Attitudes Associated with Compliance to Childhood Immunization in Bamenda, Cameroon.

Although I did not secure funding for this exercise from the Rockfeller Foundation as I had hoped, I decided to carry out this study with my meager personal resources for I hopped it would be informative, educational and could lead to an increase in my knowledge and providing a base line data for future reference on caregiverattitudes and the rate of childhood immunization coverage in Bamenda.

This exercise has been a worthwhile experience to me and it would not have been a successful one without the active support and participation of Dr. Ghogomo Amida who accomodated and gave me working space at the Provincial Delegation of Public Health Bamenda. I am taking back the data so cllected with me to the United States where I would analyze it and write a report on my findings. I do promise to submite a copy of the report to you as soon as the write up is finished.

I look forward to work in future with you.

Sincerely,

Jude Tuma

Jude Tuma
1611 Laurel Ave. Apt 918
Knoxville, TN 37916
(423) 946 6517

E-mail jtuma@utk.edu

January 30, 1999

The Provincial Delegate of Education
North West Province Bamenda

SUBJECT: **Research on the caregiver determinants of childhood compliance to immunization in Bamenda, Cameroon**

Dear Sir,

I am a Cameroonian and a doctoral candidate at the University of Tennessee Knoxville. I am interested in doing a doctoral dissertation research on the caregiver determinants of childhood compliance to immunization in Bamenda as caregivers take their children for admission into first grade. I choused this methodology for it is easiest method to contact and sample caregivers at a very short notice.

The current immunization rate of children under five years old in Cameroon is 34% as reported in the UNICEF Report The Health of Nations 1998. This rate of immunization is very low given that the government with international support in a goal to stimulate immunization within Cameroon lunched many programs and activities to increase the rate of immunization. Examples of these programs include the African Year of Immunization and National immunization Days. This low rate of immunization leaves about 66% of children at risk of vaccine-preventable infections.

No study has been done on the influence of caregivers in immunization control. There is a need to know these caregiver determinants so better strategies for immunization can be developed to improve on immunization coverage and on children's health. This study is aimed at determining caregiver factors to childhood immunization compliance in Bamenda using the Health Belief Model as the framework for data collection and analysis.

For a child to learn and get the full benefits of his or her education, the child must be healthy. This study is aimed at finding out how to make children healthier so they could learn better in school given that they could be at a higher risk of infection if they are not current on their immunization. There will be no risk to the study participants and their confidentiality will be strictly maintained.

I will like to know a tentative calendar of the school year from June. I am particularly interested in the window of the admission period of children in to first grade for most

primary schools. If I know this period I could plan my studies around that time. If this will not be demanding too much, I will like to have a list and address of the primary schools in Bamenda. I may have to contact the Headmasters of these schools to solicit their participation in the study. Do I have to communicate to them through you or may I write to them directly? Given your busy schedule, I will be willing to communicate more with a contact person you may chose for me to work with directly.

I enclose a copy of my dissertation proposal and my survey instrument for you to read and have a better understanding of what I plan to do. I would appreciate any negative criticisms you may have about any aspect of the proposal or the survey instrument for it may go to add more meaning to the worth of the study.

If all is approved, I plan to be in Bamenda before long to start working on the study. I am looking forward to read from you and hope this study will go to help us develop better preventive and immunization strategies for our children.

Sincerely

Jude Tuma

Enclosure
Dissertation proposal
Survey instrument

Inspector of Primary and Nursery Education

11/899

To All Headmaster:
Primary Schools, Bamenda Central Subdivision

Subject: **Permission to Carry Out Research with Caregivers of Your School.**

I have the honor to inform you that Mr. Jude Tuma has my permission to carry out some findings with the caregivers of your class one pupils as from August 23, 1999 the day enrollment begins.

Please give him all the assistance he needs.

VITA

VITA

Jude N. Tuma, son of Joseph and Ruphina Tuma was born and raised in Mankon, Bamenda. He is the second of eight children in the family. Graduated from the Training School for Nurses and Midwifery Bamenda, in 1986. Jude worked as a Certified Nurse in Cameroon for four years at different positions and health facilities.

In 1991 he enrolled at Eastern Kentucky University at Richmond Kentucky where he graduated in 1995 and 1996 with a BS in Community Health Education and MA in Allied Health Sciences respectively. In 1997 accepted the position of a Graduate Teaching Associate at The University of Tennessee, Knoxville. At this time he also started working on a doctoral degree. Jude graduated with a Ph. D in Human Ecology with a concentration in Community Health Education in the Spring of 2000.

Jude is looking forward to marry his longtime girlfriend Matilda Nju, and to teach in college or work as a health research consultant.